

2023 FBC - Building, 8th edition

Chapter 1 Scope and Administration

Part 1 — Scope and Application

Section 101 Scope and General Requirements

[A] 101.1 Title

These regulations shall be known as the *Florida Building Code*, hereinafter referred to as "this code."

[A] 101.2 Scope

The provisions of this code shall apply to the construction, *alteration*, relocation, enlargement, replacement, *repair*, equipment, use and occupancy, location, maintenance, removal and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures.

Exceptions:

1. Detached one- and two-family *dwellings* and multiple single-family *dwellings (townhouses)* not more than three *stories above grade plane* in height with a separate *means of egress*, and their accessory structures not more than three *stories above grade plane* in height, shall comply with the *Florida Building Code, Residential*.
2. Code requirements that address snow loads and earthquake protection shall not be utilized or enforced.

[A] 101.2.1 Appendices

Provisions in the appendices shall not apply unless specifically adopted.

[A] 101.3 Intent

The purpose of this code is to establish the minimum requirements to provide a reasonable level of safety, public health and general welfare through structural strength, *means of egress* facilities, stability, sanitation, adequate light and ventilation, energy conservation, and safety to life and property from fire and other hazards attributed to the built environment and to provide a reasonable level of safety to fire fighters and emergency responders during emergency operations.

[A] 101.4 Referenced Codes

The other codes listed in Sections 101.4.1 through 101.4.9 and referenced elsewhere in this code shall be considered part of the requirements of this code to the prescribed extent of each such reference.

[A] 101.4.1 Gas

The provisions of the *Florida Building Code, Fuel Gas* shall apply to the installation of gas piping from the point of delivery, gas appliances and related accessories as covered in this code. These requirements apply to gas piping systems extending from the point of delivery to the inlet connections of appliances and the installation and operation of residential and commercial gas appliances and related accessories.

[A] 101.4.2 Mechanical

The provisions of the *Florida Building Code, Mechanical* shall apply to the installation, *alterations*, *repairs* and replacement of mechanical systems, including equipment, appliances, fixtures, fittings and/or appurtenances, including ventilating, heating, cooling, air-conditioning and refrigeration systems, incinerators and other energy-related systems.

[A] 101.4.3 Plumbing

The provisions of the *Florida Building Code, Plumbing* shall apply to the installation, *alteration*, *repair* and replacement of plumbing systems, including equipment, appliances, fixtures, fittings and appurtenances, and where connected to a water or sewage system and all aspects of a medical gas system.

[A] 101.4.4 Property Maintenance

Reserved.

[A] 101.4.5 Fire Prevention

For provisions related to fire prevention, refer to the *Florida Fire Prevention Code*. The *Florida Fire Prevention Code* shall apply to matters affecting or relating to structures, processes and premises from the hazard of fire and explosion arising from the storage, handling or use of structures, materials or devices; from conditions hazardous to life, property or public welfare in the occupancy of structures or premises; and from the construction, extension, *repair, alteration* or removal of fire suppression, and alarm systems or fire hazards in the structure or on the premises from occupancy or operation.

[A] 101.4.6 Energy

The provisions of the *Florida Building Code, Energy Conservation* shall apply to all matters governing the design and construction of buildings for energy efficiency.

[A] 101.4.7 Existing Buildings

The provisions of the *Florida Building Code, Existing Building* shall apply to matters governing the *repair, alteration, change of occupancy, addition to and relocation of existing buildings*.

101.4.8 Accessibility

For provisions related to accessibility, refer to the *Florida Building Code, Accessibility*.

101.4.9 Manufactured Buildings

For additional administrative and special code requirements, see Section 458, *Florida Building Code, Building*, and Rule 61-41 F.A.C.

Section 102 Applicability

[A] 102.1 General

Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall be applicable. Where, in any specific case, different sections of this code specify different materials, methods of construction or other requirements, the most restrictive shall govern.

102.1.1

The *Florida Building Code* does not apply to, and no code enforcement action shall be brought with respect to, zoning requirements, land use requirements and owner specifications or programmatic requirements which do not pertain to and govern the design, construction, erection, alteration, modification, repair or demolition of public or private buildings, structures or facilities or to programmatic requirements that do not pertain to enforcement of the *Florida Building Code*. Additionally, a local code enforcement agency may not administer or enforce the *Florida Building Code, Building* to prevent the siting of any publicly owned facility, including, but not limited to, correctional facilities, juvenile justice facilities, or state universities, community colleges, or public education facilities, as provided by law.

102.2 Building

The provisions of the *Florida Building Code* shall apply to the construction, erection, alteration, modification, repair, equipment, use and occupancy, location, maintenance, removal and demolition of every public and private building, structure or facility or floating residential structure, or any appurtenances connected or attached to such buildings, structures or facilities. Additions, alterations, repairs and changes of use or occupancy group in all buildings and structures shall comply with the provisions provided in the *Florida Building Code, Existing Building*. The following buildings, structures and facilities are exempt from the *Florida Building Code* as provided by law, and any further exemptions shall be as determined by the legislature and provided by law:

- (a) Building and structures specifically regulated and preempted by the federal government.
- (b) Railroads and ancillary facilities associated with the railroad.
- (c) Nonresidential farm buildings on farms.
- (d) Temporary buildings or sheds used exclusively for construction purposes.

- (e) Mobile or modular structures used as temporary offices, except that the provisions of Part II (Sections 553.501-553.513, *Florida Statutes*) relating to accessibility by persons with disabilities shall apply to such mobile or modular structures.
- (f) Those structures or facilities of electric utilities, as defined in Section 366.02, *Florida Statutes*, which are directly involved in the generation, transmission, or distribution of electricity.
- (g) Temporary sets, assemblies, or structures used in commercial motion picture or television production, or any sound-recording equipment used in such production, on or off the premises.
- (h) Chickees constructed by the Miccosukee Tribe of Indians of Florida or the Seminole Tribe of Florida. As used in this paragraph, the term "chickee" means an open-sided wooden hut that has a thatched roof of palm or palmetto or other traditional materials, and that does not incorporate any electrical, plumbing, or other nonwood features.
- (i) Family mausoleums not exceeding 250 square feet (23 m^2) in area which are prefabricated and assembled on site or preassembled and delivered on site and have walls, roofs, and a floor constructed of granite, marble, or reinforced concrete.
- (j) Temporary housing provided by the Department of Corrections to any prisoner in the state correctional system.
- (k) A building or structure having less than 1,000 square feet (93 m^2) which is constructed and owned by a natural person for hunting and which is repaired or reconstructed to the same dimension and condition as existed on January 1, 2011, if the building or structure:
 1. Is not rented or leased or used as a principal residence;
 2. Is not located within the 100-year flood plain according to the Federal Emergency Management Agency's current Flood Insurance Rate Map; and
 3. Is not connected to an off-site electric power or water supply.
- (l) A drone port as defined in s. 330.41(2).

102.2.1

In addition to the requirements of Sections 553.79 and 553.80, *Florida Statutes*, facilities subject to the provisions of Chapter 395, *Florida Statutes*, and Part II of Chapter 400, *Florida Statutes*, shall have facility plans reviewed and construction surveyed by the state agency authorized to do so under the requirements of Chapter 395, *Florida Statutes*, and Part II of Chapter 400, *Florida Statutes*, and the certification requirements of the federal government.

102.2.2

Residential buildings or structures moved into or within a county or municipality shall not be required to be brought into compliance with the state minimum building code in force at the time the building or structure is moved, provided:

1. The building or structure is structurally sound and in occupiable condition for its intended use;
2. The occupancy use classification for the building or structure is not changed as a result of the move;
3. The building is not substantially remodeled;
4. Current fire code requirements for ingress and egress are met;
5. Electrical, gas and plumbing systems meet the codes in force at the time of construction and are operational and safe for reconnection; and

6. Foundation plans are sealed by a professional engineer or architect licensed to practice in this state, if required by the *Florida Building Code, Building* for all residential buildings or structures of the same occupancy class.

102.2.3

The building official shall apply the same standard to a moved residential building or structure as that applied to the remodeling of any comparable residential building or structure to determine whether the moved structure is substantially remodeled. The cost of the foundation on which the moved building or structure is placed shall not be included in the cost of remodeling for purposes of determining whether a moved building or structure has been substantially remodeled.

102.2.4

This section does not apply to the jurisdiction and authority of the Department of Agriculture and Consumer Services to inspect amusement rides or the Department of Financial Services to inspect state-owned buildings and boilers.

102.2.5

Each enforcement district shall be governed by a board, the composition of which shall be determined by the affected localities.

1. At its own option, each enforcement district or local enforcement agency may adopt rules granting to the owner of a single-family residence one or more exemptions from the *Florida Building Code* relating to:

- a. Addition, alteration, or repairs performed by the property owner upon his or her own property, provided any addition or alteration shall not exceed 1,000 square feet (93 m^2) or the square footage of the primary structure, whichever is less.
- b. Addition, alteration, or repairs by a nonowner within a specific cost limitation set by rule, provided the total cost shall not exceed \$5,000 within any 12-month period.
- c. Building and inspection fees.

2. However, the exemptions under subparagraph 1 do not apply to single-family residences that are located in mapped flood hazard areas, as defined in the code, unless the enforcement district or local enforcement agency has determined that the work, which is otherwise exempt, does not constitute a substantial improvement, including the repair of substantial damage, of such single-family residences.

3. Each code exemption, as defined in sub-subparagraphs 1a, 1b, and 1c shall be certified to the local board 10 days prior to implementation and shall only be effective in the territorial jurisdiction of the enforcement district or local enforcement agency implementing it.

102.2.6

This section does not apply to swings and other playground equipment accessory to a one- or two-family dwelling.

Exception: Electrical service to such playground equipment shall be in accordance with Chapter 27 of this code.

[A] 102.3 Application of References

References to chapter or section numbers, or to provisions not specifically identified by number, shall be construed to refer to such chapter, section or provision of this code.

[A] 102.4 Referenced Codes and Standards

The codes and standards referenced in this code shall be considered part of the requirements of this code to the prescribed extent of each such reference and as further regulated in Sections 102.4.1 and 102.4.2.

[A] 102.4.1 Conflicts

Where conflicts occur between provisions of this code and referenced codes and standards, the provisions of this code shall apply.

[A] 102.4.2 Provisions in Referenced Codes and Standards

Where the extent of the reference to a referenced code or standard includes subject matter that is within the scope of this code or the Florida Codes listed in Section 101.4, the provisions of this code or the Florida Codes listed in Section 101.4, as applicable, shall take precedence over the provisions in the referenced code or standard.

[A] 102.5 Partial Invalidity

Reserved.

[A] 102.6 Existing Structures

The legal occupancy of any structure existing on the date of adoption of this code shall be permitted to continue without change, except as otherwise specifically provided in this code, the *Florida Building Code*, *Existing Building* or the *Florida Fire Prevention Code*.

[A] 102.6.1 Buildings Not Previously Occupied

A building or portion of a building that has not been previously occupied or used for its intended purpose in accordance with the laws in existence at the time of its completion shall comply with the provisions of the *Florida Building Code*, *Building* or *Florida Building Code, Residential*, as applicable, for new construction or with any current permit for such occupancy.

[A] 102.6.2 Buildings Previously Occupied

The legal occupancy of any building existing on the date of adoption of this code shall be permitted to continue without change, except as otherwise specifically provided in this code, the *Florida Fire Prevention Code* or as is deemed necessary by the *building official* for the general safety and welfare of the occupants and the public.

102.7 Relocation of Manufactured Buildings

- (1) Relocation of an existing manufactured building does not constitute an alteration.
- (2) A relocated building shall comply with wind speed requirements of the new location, using the appropriate wind speed map. If the existing building was manufactured in compliance with the Standard Building Code (prior to March 1, 2002), the wind speed map of the Standard Building Code shall be applicable. If the existing building was manufactured in compliance with the *Florida Building Code* (after March 1, 2002), the wind speed map of the *Florida Building Code* shall be applicable.
- (3) A relocated building shall comply with the flood hazard area requirements of the new location, if applicable.

102.8 Existing Mechanical Equipment

An agency or local government may not require that existing mechanical equipment located on or above the surface of a roof be installed in compliance with the requirements of the *Florida Building Code* except during reroofing when the equipment is being replaced or moved and is not in compliance with the provisions of the *Florida Building Code* relating to roof-mounted mechanical units.

Part 2 — Administration and Enforcement

Section 103 Department of Building Safety

RESERVED

Section 104 Duties and Powers of Building Official

[A] 104.1 General

Reserved.

[A] 104.2 Applications and Permits

Reserved.

[A] 104.2.1 Determination of Substantially Improved or Substantially Damaged Existing Buildings and Structures in Flood Hazard Areas

Reserved.

[A] 104.3 Notices and Orders

Reserved.

[A] 104.4 Inspections

Reserved.

[A] 104.5 Identification

Reserved.

[A] 104.6 Right of Entry

Reserved.

[A] 104.7 Department Records

Reserved.

[A] 104.8 Liability

Reserved.

[A] 104.8.1 Legal Defense

Reserved.

[A] 104.9 Approved Materials and Equipment

Materials, equipment and devices *approved* by the *building official* shall be constructed and installed in accordance with such approval.

[A] 104.9.1 Used Materials and Equipment

The use of used materials that meet the requirements of this code for new materials is permitted. Used equipment and devices shall not be reused unless *approved* by the *building official*.

[A] 104.10 Modifications

Reserved.

[A] 104.10.1 Flood Hazard Areas

Reserved.

[A] 104.11 Alternative Materials, Design and Methods of Construction and Equipment

The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been *approved*. An alternative material, design or method of construction shall be *approved* where the *building official* finds that the proposed alternative meets all of the following:

1. The alternative material, design or method of construction is satisfactory and complies with the intent of the provisions of this code.
2. The material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code as it pertains to the following:
 - 2.1. Quality.
 - 2.2. Strength.
 - 2.3. Effectiveness.
 - 2.4. *Fire resistance*.
 - 2.5. Durability.

2.6. Safety.

Where the alternative material, design or method of construction is not approved, the *building official* shall respond in writing, stating the reasons why the alternative was not approved.

[A] 104.11.1 Research Reports

Supporting data, where necessary to assist in the approval of materials or assemblies not specifically provided for in this code, shall consist of valid research reports from *approved* sources.

[A] 104.11.2 Tests

Whenever there is insufficient evidence of compliance with the provisions of this code, or evidence that a material or method does not conform to the requirements of this code, or in order to substantiate claims for alternative materials or methods, the *building official* shall have the authority to require tests as evidence of compliance to be made at no expense to the jurisdiction. Test methods shall be as specified in this code or by other recognized test standards. In the absence of recognized and accepted test methods, the *building official* shall approve the testing procedures. Tests shall be performed by an *approved agency*. Reports of such tests shall be retained by the *building official* for the period required for retention of public records.

Section 105 Permits

[A] 105.1 Required

Any owner or owner's authorized agent who intends to construct, enlarge, alter, *repair*, move, demolish or change the occupancy of a building or structure, or to erect, install, enlarge, alter, *repair*, remove, convert or replace any impact-resistant coverings, electrical, gas, mechanical or plumbing system, the installation of which is regulated by this code, or to cause any such work to be performed, shall first make application to the *building official* and obtain the required *permit*.

[A] 105.1.1 Annual Facility Permit

In lieu of an individual *permit* for each *alteration* to an existing electrical, gas, mechanical, plumbing or interior nonstructural office system(s), the *building official* is authorized to issue an annual *permit* for any occupancy to facilitate routine or emergency service, repair, refurbishing, minor renovations of service systems or manufacturing equipment installations/relocations. The building official shall be notified of major changes and shall retain the right to make inspections at the facility site as deemed necessary. An annual facility permit shall be assessed with an annual fee and shall be valid for one year from date of issuance. A separate permit shall be obtained for each facility and for each construction trade, as applicable. The permit application shall contain a general description of the parameters of work intended to be performed during the year.

[A] 105.1.2 Annual Permit Records

The person to whom an annual *permit* is issued shall keep a detailed record of *alterations* made under such annual *permit*. The *building official* shall have access to such records at all times or such records shall be filed with the *building official* as designated.

105.1.3 Food Permit

In accordance with Section 500.12, *Florida Statutes*, a food permit from the Department of Agriculture and Consumer Services is required of any person who operates a food establishment or retail store.

105.1.4 Public Swimming Pool

The local enforcing agency may not issue a building permit to construct, develop, or modify a public swimming pool without proof of application, whether complete or incomplete, for an operating permit pursuant to Section 514.031, *Florida Statutes*. A certificate of completion or occupancy may not be issued until such operating permit is issued. The local enforcing agency shall conduct their review of the building permit application upon filing and in accordance with Chapter 553, *Florida Statutes*. The local enforcing agency may confer with the Department of Health, if necessary, but may not delay the building permit application review while awaiting comment from the Department of Health.

[A] 105.2 Work Exempt From Permit

Exemptions from *permit* requirements of this code shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of this code. *Permits* shall not be required for the following:

Gas:

Portable heating appliance.

Replacement of any minor part that does not alter approval of equipment or make such equipment unsafe.

Mechanical:

Portable heating appliance.

Portable ventilation equipment.

Portable cooling unit.

Steam, hot or chilled water piping within any heating or cooling equipment regulated by this code.

Replacement of any part that does not alter its approval or make it unsafe.

Portable evaporative cooler.

Self-contained refrigeration system containing 10 pounds (4.54 kg) or less of refrigerant and actuated by motors of 1 horsepower (0.75 kW) or less.

The installation, replacement, removal or metering of any load management control device.

Plumbing:

The stopping of leaks in drains, water, soil, waste or vent pipe, provided, however, that if any concealed trap, drain pipe, water, soil, waste or vent pipe becomes defective and it becomes necessary to remove and replace the same with new material, such work shall be considered as new work and a *permit* shall be obtained and inspection made as provided in this code.

The clearing of stoppages or the repairing of leaks in pipes, valves or fixtures and the removal and reinstallation of water closets, provided such repairs do not involve or require the replacement or rearrangement of valves, pipes or fixtures.

[A] 105.2.1 Emergency Repairs

Where equipment replacements and repairs must be performed in an emergency situation, the *permit* application shall be submitted within the next working business day to the *building official*.

[A] 105.2.2 Minor Repairs

Ordinary minor repairs may be made with the approval of the building official without a permit, provided the repairs do not include the cutting away of any wall, partition or portion thereof, the removal or cutting of any structural beam or load-bearing support, or the removal or change of any required *means of egress*, or rearrangement of parts of a structure affecting the egress requirements; nor shall ordinary repairs include *addition to, alteration of, replacement or relocation of any standpipe, water supply, sewer, drainage, drain leader, gas, soil, waste, vent or similar piping, electric wiring systems or mechanical equipment or other work affecting public health or general safety*, and such repairs shall not violate any of the provisions of the technical codes.

[A] 105.2.3 Public Service Agencies

Reserved.

[A] 105.3 Application for Permit

To obtain a *permit*, the applicant shall first file an application therefor in writing on a form furnished by the building department for that purpose.

Permit application forms shall be in the format prescribed by a local administrative board, if applicable, and must comply with the requirements of Sections 713.135(5) and (6), *Florida Statutes*.

Each application shall be inscribed with the date of application, and the code in effect as of that date. For a building permit for which an application is submitted prior to the effective date of the *Florida Building Code*, the state minimum building code in effect in the permitting

jurisdiction on the date of the application governs the permitted work for the life of the permit and any extension granted to the permit.

Effective October 1, 2017, a local enforcement agency shall post each type of building permit application on its website. Completed applications must be able to be submitted electronically to the appropriate building department. Accepted methods of electronic submission include, but are not limited to, e-mail submission of applications in portable document format or submission of applications through an electronic fill-in form available on the building department's website or through a third-party submission management software. Payments, attachments, or drawings required as part of the permit application may be submitted in person in a nonelectronic format, at the discretion of the building official.

[A] 105.3.1 Action on Application

The *building official* shall examine or cause to be examined applications for *permits* and amendments thereto within a reasonable time after filing. If the application or the *construction documents* do not conform to the requirements of pertinent laws, the *building official* shall reject such application in writing, stating the reasons therefor. If the *building official* is satisfied that the proposed work conforms to the requirements of this code and laws and ordinances applicable thereto, the *building official* shall issue a *permit* therefor as soon as practicable. When authorized through contractual agreement with a school board, in acting on applications for permits, the building official shall give first priority to any applications for the construction of, or addition or renovation to, any school or educational facility.

105.3.1.1

If a state university, Florida college or public school district elects to use a local government's code enforcement offices, fees charged by counties and municipalities for enforcement of the *Florida Building Code* on buildings, structures, and facilities of state universities, state colleges, and public school districts shall not be more than the actual labor and administrative costs incurred for plans review and inspections to ensure compliance with the code.

105.3.1.2

No permit may be issued for any building construction, erection, alteration, modification, repair, or addition unless the applicant for such permit provides to the enforcing agency which issues the permit any of the following documents which apply to the construction for which the permit is to be issued and which shall be prepared by or under the direction of an engineer registered under Chapter 471, *Florida Statutes*:

1. Plumbing documents for any new building or addition which requires a plumbing system with more than 250 fixture units or which costs more than \$125,000.
2. Fire sprinkler documents for any new building or addition which includes a fire sprinkler system which contains 50 or more sprinkler heads. Personnel as authorized by chapter 633 *Florida Statutes*, may design a new fire sprinkler system of 49 or fewer heads; may design the alteration of an existing fire sprinkler system if the alteration consists of the relocation, addition or deletion of 49 heads or fewer, notwithstanding the size of the existing fire sprinkler system; or may design the alteration of an existing fire sprinkler system if the alteration consists of the relocation or deletion of 249 or fewer sprinklers and the addition of up to 49 sprinklers, as long as the cumulative total number of fire sprinklers being added, relocated, or deleted does not exceed 249, notwithstanding the size of the existing fire sprinkler system, if there is no change of occupancy of the affected areas, as defined in this Code and the *Florida Fire Prevention Code*, and there is no change in the water demand as defined in NFPA 13, "Standard for the Installation of Sprinkler Systems," and if the occupancy hazard classification as defined in NFPA 13 is reduced or remains the same as a result of the alteration.
3. Heating, ventilation, and air-conditioning documents for any new building or addition which requires more than a 15-ton-per-system capacity which is designed to accommodate 100 or more persons or for which the system costs more than \$125,000. This paragraph does not include any document for the replacement or repair of an existing system in which the work does not require altering a structural part of the building or for work on a residential one-, two-, three-, or four-family structure.

An air-conditioning system may be designed by an installing air-conditioning contractor certified under Chapter 489, *Florida Statutes*, to serve any building or addition which is designed to accommodate fewer than 100 persons and requires an air-conditioning system with a value of \$125,000 or less; and when a 15-ton-per system or less is designed for a singular space of a building and each 15-ton system or less has an independent duct system. Systems not complying with the above require design documents that are to be sealed by a professional engineer.

Example 1: When a space has two 10-ton systems with each having an independent duct system, the contractor may design these two systems since each unit (system) is less than 15 tons.

Example 2: Consider a small single-story office building which consists of six individual offices where each office has a single three-ton package air conditioning heat pump. The six heat pumps are connected to a single water cooling tower. The cost of the entire heating, ventilation and air-conditioning work is \$47,000 and the office building accommodates fewer than 100 persons. Because the six mechanical units are connected to a common water tower, this is considered to be an 18-ton system.

Note: It was further clarified by the Commission that the limiting criteria of 100 persons and \$125,000 apply to the building occupancy load and the cost for the total air-conditioning system of the building.

4. Any specialized mechanical, electrical, or plumbing document for any new building or addition which includes a medical gas, oxygen, steam, vacuum, toxic air filtration, halon, or fire detection and alarm system which costs more than \$5,000.

Exception: Simplified permitting processes. —

- (1) As used in this section, the term:

- (a) "Component" means valves, fire sprinklers, escutcheons, hangers, compressors, or any other item deemed acceptable by the local enforcing agency. For purposes of this paragraph, a valve does not include pressure-regulating, pressure-reducing, or pressure-control valves.
 - (b) "Contractor" means a person who:
 1. Is qualified to engage in the business of electrical or alarm system contracting pursuant to a certificate or registration issued by the department under part II of chapter 489, Florida Statutes; or
 2. Is qualified to engage in the business of fire protection system contracting pursuant to a license or certificate issued by the State Fire Marshal.
 - (c) "Fire alarm system project" means a fire alarm system alteration of a total of or fewer initiating devices and notification devices, or the installation or replacement of a fire communicator connected to an existing fire alarm control panel in an existing commercial, residential, apartment, cooperative, or condominium building.
 - (d) "Fire sprinkler system project" means a fire protection system alteration of a total of 20 or fewer fire sprinklers in which the sprinklers are of the same K-factor and located in spaces where there is no change of hazard classification or increased system coverage area, or the installation or replacement of an equivalent fire sprinkler system component in an existing commercial, residential, apartment, cooperative, or condominium building. For purposes of this paragraph, a component is equivalent if the component has the same or better characteristics, including electrical, hydraulic, pressure losses, and required listings and spacing as the component being replaced.
- (2) (a) A local enforcement agency may require a contractor, as a condition of obtaining a permit for a fire alarm system project or fire sprinkler system project, to submit a completed application and payment.
 - (b) A local enforcement agency may not require a contractor to submit plans or specifications as a condition of obtaining a permit for a fire alarm system project or fire sprinkler system project.
- (3) A local enforcement agency must issue a permit for a fire alarm system project or fire sprinkler system project in person or electronically.
 - (4) A local enforcement agency must require at least one inspection of a fire alarm system project or fire sprinkler system project to ensure compliance with applicable codes and standards. If a fire alarm system project or fire sprinkler

system project fails an inspection, the contractor must take corrective action as necessary to pass inspection.

- (5) (a) For a fire alarm system project, a contractor must keep a copy of the plans and specifications at the fire alarm system project worksite and make such plans and specifications available to the inspector at each inspection.
- (b) For a fire sprinkler system project to alter an existing fire protection system, a contractor must keep a copy of the plans and specifications at the fire sprinkler system project worksite and make such plans and specifications available to the inspector at each inspection.
- (c) For a fire sprinkler system project to install or replace a component, a contractor must keep a copy of the manufacturer's installation instructions and any pertinent testing instructions needed to certify or accept the component at the fire sprinkler system project worksite and make such documents available to the inspector at each inspection.

5. Electrical documents. See *Florida Statutes 471.003(2)(h)*.

Documents requiring an engineer seal by this part shall not be valid unless a professional engineer who possesses a valid certificate of registration has signed, dated, and stamped such document as provided in Section 471.025, *Florida Statutes*.

6. All public swimming pools and public bathing places defined by and regulated under Chapter 514, *Florida Statutes*.

105.3.1.3 Reviewing Application for Building Permit

1. When reviewing an application for a building permit, a local government may not request additional information from the applicant more than three times, unless the applicant waives such limitation in writing.
2. If a local government requests additional information from an applicant and the applicant submits the requested additional information to the local government within 30 days after receiving the request, the local government must, within 15 days after receiving such information:
 - a. Determine if the application is properly completed;
 - b. Approve the application;
 - c. Approve the application with conditions;
 - d. Deny the application; or
 - e. Advise the applicant of information, if any, that is needed to deem the application properly completed or to determine the sufficiency of the application.
3. If a local government makes a second request for additional information from the applicant and the applicant submits the requested additional information to the local government within 30 days after receiving the request, the local government must, within 10 days after receiving such information:
 - a. Determine if the application is properly completed;
 - b. Approve the application;

- c. Approve the application with conditions;
 - d. Deny the application; or
 - e. Advise the applicant of information, if any, that is needed to deem the application properly completed or to determine the sufficiency of the application.
4. Before a third request for additional information may be made, the applicant must be offered an opportunity to meet with the local government to attempt to resolve outstanding issues. If a local government makes a third request for additional information from the applicant and the applicant submits the requested additional information to the local government within 30 days after receiving the request, the local government must, within 10 days after receiving such information unless the applicant waived the local government's limitation in writing, determine that the application is complete and:
- a. Approve the application;
 - b. Approve the application with conditions; or
 - c. Deny the application.
5. If the applicant believes the request for additional information is not authorized by ordinance, rule, statute, or other legal authority, the local government, at the applicant's request, must process the application and either approve the application, approve the application with conditions, or deny the application.

[A] 105.3.2 Time Limitation of Application

An application for a *permit* for any proposed work shall be deemed to have been abandoned 180 days after the date of filing, unless such application has been pursued in good faith or a *permit* has been issued; except that the *building official* is authorized to grant one or more extensions of time for additional periods not exceeding 90 days each. The extension shall be requested in writing and justifiable cause demonstrated.

105.3.3

An enforcing authority may not issue a building permit for any building construction, erection, alteration, modification, repair or addition unless the permit either includes on its face or there is attached to the permit the following statement: "NOTICE: In addition to the requirements of this permit, there may be additional restrictions applicable to this property that may be found in the public records of this county, and there may be additional permits required from other governmental entities such as water management districts, state agencies, or federal agencies."

105.3.4 Building Permit Application to Local Government

105.3.4.1

- (a) A local government must approve, approve with conditions, or deny a building permit application after receipt of a completed and sufficient application within the following timeframes, unless the applicant waives such timeframes in writing:
 1. Within 30 business days after receiving a complete and sufficient application, for an applicant using a local government plans reviewer to obtain the following building permits if the structure is less than 7,500 square feet: residential units, including a single-family residential unit or a single-family residential dwelling, accessory structure, alarm, electrical, irrigation, landscaping, mechanical, plumbing, or roofing.
 2. Within 60 business days after receiving a complete and sufficient application, for an applicant using a local government plans reviewer to obtain the following building permits if the structure is 7,500 square feet or more: residential units, including a single-family residential unit or a single-family residential dwelling, accessory structure, alarm, electrical, irrigation, landscaping, mechanical, plumbing, or roofing.

3. Within 60 business days after receiving a complete and sufficient application, for an applicant using a local government plans reviewer to obtain the following building permits: signs or nonresidential buildings that are less than 25,000 square feet.
4. Within 60 business days after receiving a complete and sufficient application, for an applicant using a local government plans reviewer to obtain the following building permits: multifamily residential, not exceeding 50 units; site-plan approvals and subdivision plats not requiring public hearing or public notice; and lot grading and site alteration.
5. Within 12 business days after receiving a complete and sufficient application, for an applicant using a master building permit consistent with s. 553.794 to obtain a site-specific building permit.
6. Within 10 business days after receiving a complete and sufficient application, for an applicant for a single-family residential dwelling applied for by a contractor licensed in this state on behalf of a property owner who participates in a Community Development Block Grant-Disaster Recovery program administered by the Department of Commerce, unless the permit application fails to satisfy the Florida Building Code or the enforcing agency's laws or ordinances. However, the local government may not require the waiver of the timeframes in this section as a condition precedent to reviewing an applicant's building permit application.

105.3.4.2

A local government must meet the timeframes set forth in this section for reviewing building permit applications unless the timeframes set by local ordinance are more stringent than those prescribed in this section.

105.3.4.3

After an applicant submits an application to the local government, the local government must provide written notice to the applicant within 5 business days after receipt of the application advising the applicant what information, if any, is needed to deem or determine that the application is properly completed in compliance with the filing requirements published by the local government. If the local government does not provide timely written notice that the applicant has not submitted the properly completed application, the application is automatically deemed or determined to be properly completed and accepted.

105.3.4.4

A local government shall maintain on its website a policy containing procedures and expectations for expedited processing of those building permits and development orders required by law to be expedited.

105.3.4.5

If a local government fails to meet a deadline under this subsection, it must reduce the building permit fee by 10 percent for each business day that it fails to meet the deadline, unless the parties agree in writing to a reasonable extension of time, the delay is caused by the applicant, or the delay is attributable to a force majeure or other extraordinary circumstances. Each 10-percent reduction shall be based on the original amount of the building permit fee, unless the parties agree to an extension of time.

105.3.4.6

A local enforcement agency does not have to reduce the building permit fee if it provides written notice to the applicant by e-mail or United States Postal Service within the respective timeframes in paragraph (a) which specifically states the reasons the permit application fails to satisfy the Florida Building Code or the enforcing agency's laws or ordinances. The written notice must also state that the applicant has 10 business days after receiving the written notice to submit revisions to correct the permit application and that failure to correct the application within 10 business days will result in a denial of the application.

105.3.4.7

If the applicant submits revisions within 10 business days after receiving the written notice, the local enforcement agency has 10 business days after receiving such revisions to approve or deny the building permit unless the applicant agrees to a longer period in writing. If the local enforcement agency fails to issue or deny the building permit within 10 business days after receiving the revisions, it must reduce the building permit fee by 20 percent for each business day that it fails to meet the deadline unless the applicant agrees to a longer period in writing.

105.3.5 Identification of Minimum Premium Policy

Except as otherwise provided in Chapter 440, *Florida Statutes*, Workers' Compensation, every employer shall, as a condition to receiving a building permit, show proof that it has secured compensation for its employees as provided in Sections 440.10 and 440.38, *Florida*

Statutes.

105.3.6 Asbestos Removal

Moving, removal or disposal of asbestos-containing materials on a residential building where the owner occupies the building, the building is not for sale or lease, and the work is performed according to the owner-builder limitations provided in this paragraph. To qualify for exemption under this paragraph, an owner must personally appear and sign the building permit application. The permitting agency shall provide the person with a disclosure statement in substantially the following form:

Disclosure Statement: State law requires asbestos abatement to be done by licensed contractors. You have applied for a permit under an exemption to that law. The exemption allows you, as the owner of your property, to act as your own asbestos abatement contractor even though you do not have a license. You must supervise the construction yourself. You may move, remove or dispose of asbestos-containing materials on a residential building where you occupy the building and the building is not for sale or lease, or the building is a farm outbuilding on your property. If you sell or lease such building within 1 year after the asbestos abatement is complete, the law will presume that you intended to sell or lease the property at the time the work was done, which is a violation of this exemption. You may not hire an unlicensed person as your contractor. Your work must be done according to all local, state and federal laws and regulations which apply to asbestos abatement projects. It is your responsibility to make sure that people employed by you have licenses required by state law and by county or municipal licensing ordinances.

105.3.7 Applicable Code for Manufactured Buildings

Manufacturers should be permitted to complete all buildings designed and approved prior to the effective date of a new code edition, provided a clear signed contract is in place. The contract shall provide specific data mirroring that required by an application for permit, specifically, without limitation, date of execution, building owner or dealer, and anticipated date of completion. However, the construction activity must commence within 6 months of the contract's execution. The contract is subject to verification by the Department of Business and Professional Regulation.

105.3.8

A local government may not require a contract between a builder and an owner for the issuance of a building permit or as a requirement for the submission of a building permit application.

105.4 Conditions of the Permit

105.4.1 Permit Intent

A permit issued shall be construed to be a license to proceed with the work and not as authority to violate, cancel, alter or set aside any of the provisions of the technical codes, nor shall issuance of a permit prevent the building official from thereafter requiring a correction of errors in plans, construction or violations of this code. Every permit issued shall become invalid unless the work authorized by such permit is commenced within 6 months after its issuance, or if the work authorized by such permit is suspended or abandoned for a period of 6 months after the time the work is commenced.

105.4.1.1

If work has commenced and the permit is revoked, becomes null and void, or expires because of lack of progress or abandonment, a new permit covering the proposed construction shall be obtained before proceeding with the work.

105.4.1.2

If a new permit is not obtained within 180 days from the date the initial permit became null and void, the building official is authorized to require that any work which has been commenced or completed be removed from the building site. Alternately, a new permit may be issued on application, providing the work in place and required to complete the structure meets all applicable regulations in effect at the time the initial permit became null and void and any regulations which may have become effective between the date of expiration and the date of issuance of the new permit.

105.4.1.3

Work shall be considered to be in active progress when the permit has received an approved inspection within 180 days. This provision shall not be applicable in case of civil commotion or strike or when the building work is halted due directly to judicial injunction, order or similar process.

105.4.1.4

The fee for renewal reissuance and extension of a permit shall be set forth by the administrative authority.

105.4.1.5

After the local enforcing agency issues a permit, the local enforcing agency may not make or require any substantive changes to the plans or specifications except changes required for compliance with the Florida Building Code, the Florida Fire Prevention Code, or the Life Safety Code, or local amendments thereto. If a local enforcing agency makes or requires substantive changes to the plans or specifications after a permit is issued, the local enforcing agency must identify the specific plan features that do not comply with the applicable codes, identify the specific code chapters and sections upon which the finding is based, and provide the information to the permitholder in writing.

105.5 Additional Options for Closing a Permit

Pursuant to Section 553.79(15), *Florida Statutes*, a property owner, regardless of whether the property owner is the one listed on the application for the building permit, may close a building permit by complying with the following requirements:

1. The property owner may retain the original contractor listed on the permit or hire a different contractor appropriately licensed in this state to perform the work necessary to satisfy the conditions of the permit and to obtain any necessary inspection in order to close the permit. If a contractor other than the original contractor listed on the permit is hired by the property owner to close the permit, such contractor is not liable for any defects in the work performed by the original contractor and is only liable for the work that he or she performs.
2. The property owner may assume the role of an ownerbuilder, in accordance with Sections 489.103(7) and 489.503(6), *Florida Statutes*.
3. If a building permit is expired and its requirements have been substantially completed, as determined by the local enforcement agency, the permit may be closed without having to obtain a new building permit, and the work required to close the permit may be done pursuant to the building code in effect at the time the local enforcement agency received the application for the permit, unless the contractor has sought and received approval from the local enforcement agency for an alternative material, design or method of construction.
4. A local enforcement agency may close a building permit 6 years after the issuance of the permit, even in the absence of a final inspection, if the local enforcement agency determines that no apparent safety hazard exists.

For purposes of this section, the term "close" means that the requirements of the permit have been satisfied.

[A] 105.6 Denial or Revocation

Whenever a permit required under this section is denied or revoked because the plan, or the construction, erection, alteration, modification, repair, or demolition of a building, is found by the local enforcing agency to be not in compliance with the *Florida Building Code*, the local enforcing agency shall identify the specific plan or project features that do not comply with the applicable codes, identify the specific code chapters and sections upon which the finding is based, and provide this information to the permit applicant. If the local building code administrator or inspector finds that the plans are not in compliance with the *Florida Building Code*, the local building code administrator or inspector shall identify the specific plan features that do not comply with the applicable codes, identify the specific code chapters and sections upon which the finding is based, and provide this information to the local enforcing agency. The local enforcing agency shall provide this information to the permit applicant.

Pursuant to Section 553.79(16), *Florida Statutes*, a local enforcement agency may not deny issuance of a building permit to; issue a notice of violation to; or fine, penalize, sanction or assess fees against an arm's-length purchaser of a property for value solely because a building permit applied for by a previous owner of the property was not closed. The local enforcement agency shall maintain all rights and remedies against the property owner and contractor listed on the permit.

Pursuant to Section 553.79(16), *Florida Statutes*, a local enforcement agency may not deny issuance of a building permit to a contractor solely because the contractor is listed on other building permits that were not closed.

[A] 105.7 Placement of Permit

The building permit or copy shall be kept on the site of the work until the completion of the project.

105.8 Notice of Commencement

In accordance with Section 713.135, *Florida Statutes*, when any person applies for a building permit, the authority issuing such permit shall print on the face of each permit card in no less than 14-point, capitalized, boldfaced type: "WARNING TO OWNER: YOUR FAILURE TO RECORD A NOTICE OF COMMENCEMENT MAY RESULT IN YOUR PAYING TWICE FOR IMPROVEMENTS TO YOUR PROPERTY. A NOTICE OF

COMMENCEMENT MUST BE RECORDED AND POSTED ON THE JOB SITE BEFORE THE FIRST INSPECTION. IF YOU INTEND TO OBTAIN FINANCING, CONSULT WITH YOUR LENDER OR AN ATTORNEY BEFORE RECORDING YOUR NOTICE OF COMMENCEMENT."

105.9 Asbestos

The enforcing agency shall require each building permit for the demolition or renovation of an existing structure to contain an asbestos notification statement which indicates the owner's or operator's responsibility to comply with the provisions of Section 469.003, *Florida Statutes*, and to notify the Department of Environmental Protection of his or her intentions to remove asbestos, when applicable, in accordance with state and federal law.

105.10 Certificate of Protective Treatment for Prevention of Termites

A weather-resistant job-site posting board shall be provided to receive duplicate treatment certificates as each required protective treatment is completed, providing a copy for the person the permit is issued to and another copy for the building permit files. The treatment certificate shall provide the product used, identity of the applicator, time and date of the treatment, site location, area treated, chemical used, percent concentration and number of gallons used, to establish a verifiable record of protective treatment. If the soil chemical barrier method for termite prevention is used, final exterior treatment shall be completed prior to final building approval.

105.11 Notice of Termite Protection

A permanent sign which identifies the termite treatment provider and need for reinspection and treatment contract renewal shall be provided. The sign shall be posted near the water heater or electric panel.

105.12 Work Starting Before Permit Issuance

Upon approval of the building official, the scope of work delineated in the building permit application and plan may be started prior to the final approval and issuance of the permit, provided any work completed is entirely at risk of the permit applicant and the work does not proceed past the first required inspection.

105.13 Phased Permit Approval

After submittal of the appropriate construction documents, the building official is authorized to issue a permit for the construction of foundations or any other part of a building or structure before the construction documents for the whole building or structure have been submitted. The holder of such permit for the foundation or other parts of a building or structure shall proceed at the holder's own risk with the building operation and without assurance that a permit for the entire structure will be granted. Corrections may be required to meet the requirements of the technical codes.

105.14 Permit Issued on Basis of an Affidavit

Whenever a permit is issued in reliance upon an affidavit or whenever the work to be covered by a permit involves installation under conditions which, in the opinion of the building official, are hazardous or complex, the building official shall require that the architect or engineer who signed the affidavit or prepared the drawings or computations shall supervise such work. In addition, they shall be responsible for conformity to the permit, provide copies of inspection reports as inspections are performed, and upon completion make and file with the building official written affidavit that the work has been done in conformity to the reviewed plans and with the structural provisions of the technical codes. In the event such architect or engineer is not available, the owner shall employ in his stead a competent person or agency whose qualifications are reviewed by the building official. The building official shall ensure that any person conducting plans review is qualified as a plans examiner under Part XII of Chapter 468, *Florida Statutes*, and that any person conducting inspections is qualified as a building inspector under Part XII of Chapter 468, *Florida Statutes*.

105.14.1 Affidavits in Flood Hazard Areas

Permit issued on basis of an affidavit shall not extend to the flood load and flood resistance requirements of the *Florida Building Code* and the building official shall review and inspect those requirements.

105.15 Opening Protection

When any activity requiring a building permit, not including roof covering replacement or repair work associated with the prevention of degradation of the residence, that is applied for on or after July 1, 2008, and for which the estimated cost is \$50,000 or more for a site built single-family detached residential structure that is located in the wind-borne debris region as defined in this code and that has an insured value of \$750,000 or more, or, if the site built single-family detached residential structure is uninsured or for which documentation of insured value is not presented, has a just valuation for the structure for purposes of ad valorem taxation of \$750,000 or more; opening protections as required within this code or *Florida Building Code, Residential* for new construction shall be provided.

Exception: Single family residential structures permitted subject to the *Florida Building Code* are not required to comply with this section.

105.16 Inspection of Existing Residential Building Not Impacted by Construction

- (a) A local enforcing agency, and any local building code administrator, inspector, or other official or entity, may not require as a condition of issuance of a one- or two-family residential building permit the inspection of any portion of a building, structure, or real property that is not directly impacted by the construction, erection, alteration, modification, repair, or demolition of the building, structure, or real property for which the permit is sought.
- (b) This subsection does not apply to a building permit sought for:
 1. A substantial improvement as defined in s. 161.54, *Florida Statutes* or as defined in the *Florida Building Code*.
 2. A change of occupancy as defined in the *Florida Building Code*.
 3. A conversion from residential to nonresidential or mixed use pursuant to s. 553.507(2)(a), *Florida Statutes* or as defined in the *Florida Building Code*.
 4. A historic building as defined in the *Florida Building Code*.
- (c) This subsection does not prohibit a local enforcing agency, or any local building code administrator, inspector, or other official or entity, from:
 1. Citing any violation inadvertently observed in plain view during the ordinary course of an inspection conducted in accordance with the prohibition in paragraph (a).
 2. Inspecting a physically nonadjacent portion of a building, structure, or real property that is directly impacted by the construction, erection, alteration, modification, repair, or demolition of the building, structure, or real property for which the permit is sought in accordance with the prohibition in paragraph (a).
 3. Inspecting any portion of a building, structure, or real property for which the owner or other person having control of the building, structure, or real property has voluntarily consented to the inspection of that portion of the building, structure, or real property in accordance with the prohibition in paragraph (a).
 4. Inspecting any portion of a building, structure, or real property pursuant to an inspection warrant issued in accordance with ss. 933.20-933.30, *Florida Statutes*.

105.17 Streamlined Low-Voltage Alarm System Installation Permitting

- (1) As used in this section, the term:
 - (a) "Contractor" means a person who is qualified to engage in the business of electrical or alarm system contracting pursuant to a certificate or registration issued by the department under Part II of Chapter 489, *Florida Statutes*.
 - (b) "Low-voltage alarm system project" means a project related to the installation, maintenance, inspection, replacement, or service of a new or existing alarm system, as defined in s. 489.505, *Florida Statutes*, including video cameras and closed-circuit television systems used to signal or detect a burglary, fire, robbery or medical emergency, that is hardwired and operating at low voltage, as defined in the *National Electrical Code Standard 70, Current Edition*, or a new or existing low-voltage electric fence. The term also includes ancillary components or equipment attached to a low-voltage alarm system or low-voltage electric fence, including, but not limited to, home-automation equipment, thermostats, closed-circuit television systems, access controls, battery recharging devices, and video cameras.

- (c) "Low-voltage electric fence" means an alarm system, as defined in s. 489.505, that consists of a fence structure and an energizer powered by a commercial storage battery not exceeding 12 volts which produces an electric charge upon contact with the fence structure.
 - (d) "Wireless alarm system" means a burglar alarm system or smoke detector that is not hardwired.
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- (2) Notwithstanding any provision of this code, this section applies to all low-voltage alarm system projects for which a permit is required by a local enforcement agency. However, a permit is not required to install, maintain, inspect, replace, or service a wireless alarm system, including any ancillary components or equipment attached to the system.
 - (3) A low-voltage electric fence must meet all of the following requirements to be permitted as a low-voltage alarm system project and no further permit shall be required for the low-voltage alarm system project other than as provided in this section:
 - (a) The electric charge produced by the fence upon contact must not exceed energizer characteristics set forth in paragraph 22.108 and depicted in Figure 102 of International Electrotechnical Commission Standard No. 60335-2-76, Current Edition.
 - (b) A nonelectric fence or wall must completely enclose the outside perimeter of the low-voltage electric fence. The low-voltage electric fence must be 2 feet higher than the perimeter nonelectric fence or wall.
 - (c) The low-voltage electric fence must be identified using warning signs attached to the fence at intervals of not more than 60 feet.
 - (d) A low-voltage electric fence is allowed in any area unless the area is zoned exclusively for single-family or multifamily residential use. An area is not considered to be zoned exclusively for single-family or multifamily residential use if the area is within more than one zoning category.
 - (e) The low-voltage electric fence shall not enclose the portions of a property which are used for residential purposes.
 - (4) This section does not apply to the installation or replacement of a fire alarm if a plan review is required.
 - (5) A local enforcement agency shall make uniform basic permit labels available for purchase by a contractor to be used for the installation or replacement of a new or existing alarm system at a cost as indicated in s. 553.793, *Florida Statutes*. The local enforcement agency may not require the payment of any additional fees, charges, or expenses associated with the installation or replacement of a new or existing alarm.
 - (a) A local enforcement agency may not require a contractor, as a condition of purchasing a label, to submit information other than identification information of the licensee and proof of registration or certification as a contractor.
 - (b) A label is valid for 1 year after the date of purchase and may only be used within the jurisdiction of the local enforcement agency that issued the label. A contractor may purchase labels in bulk for one or more unspecified current or future projects.
 - (6) A contractor shall post an unused uniform basic permit label in a conspicuous place on the premises of the low-voltage alarm system project site before commencing work on the project.
 - (7) A contractor is not required to notify the local enforcement agency before commencing work on a low-voltage alarm system project. However, a contractor must submit a Uniform Notice of a Low-Voltage Alarm System Project as provided under subsection (7) to the local enforcement agency within 14 days after completing the project. A local enforcement agency may take disciplinary action against a contractor who fails to timely submit a Uniform Notice of a Low-Voltage Alarm System Project.
 - (8) The Uniform Notice of a Low-Voltage Alarm System Project may be submitted electronically or by facsimile if all submissions are signed by the owner, tenant, contractor, or authorized representative of such persons. The Uniform Notice of a Low-Voltage Alarm

System Project shall be in the format prescribed by the local enforcement agency and must comply with the requirements of s. 553.793(7), *Florida Statutes*.

- (9) A local enforcement agency may coordinate directly with the owner or customer to inspect a low-voltage alarm system to ensure compliance with applicable codes and standards. If a low-voltage alarm system project fails an inspection, the contractor must take corrective action as necessary to pass inspection.
- (10) A municipality, county, district, or other entity of local government may not adopt or maintain in effect any ordinance or rule regarding a low-voltage alarm system project that provides additional requirements beyond those set out in this section for the installation or maintenance of a low-voltage alarm system project or that is otherwise inconsistent with this section.
- (11) A uniform basic permit label shall not be required for the subsequent maintenance, inspection, or service of an alarm system that was permitted in accordance with this section. The provisions of this act are not intended to impose new or additional licensure requirements on persons licensed in accordance with the applicable provisions of Chapter 489, *Florida Statutes*

Section 106 Floor and Roof Design Loads

[A] 106.1 Live Loads Posted

In commercial or industrial buildings, for each floor or portion thereof designed for *live loads* exceeding 50 psf (2.40 kN/m²), such design *live loads* shall be conspicuously posted by the owner or the owner's authorized agent in that part of each *story* in which they apply, using durable signs. It shall be unlawful to remove or deface such notices.

[A] 106.2 Issuance of Certificate of Occupancy

A certificate of occupancy required by Section 111 shall not be issued until the floor load signs, required by Section 106.1, have been installed.

[A] 106.3 Restrictions on Loading

It shall be unlawful to place, or cause or permit to be placed, on any floor or roof of a building, structure or portion thereof, a load greater than is permitted by this code.

Section 107 Submittal Documents

[A] 107.1 General

Submittal documents consisting of *construction documents*, statement of *special inspections*, geotechnical report and other data shall be submitted in two or more sets with each *permit* application. The *construction documents* shall be prepared by a *registered design professional* where required by Chapter 471, *Florida Statutes* or Chapter 481, *Florida Statutes*. Where special conditions exist, the *building official* is authorized to require additional *construction documents* to be prepared by a *registered design professional*.

Exception: The *building official* is authorized to waive the submission of *construction documents* and other data not required to be prepared by a *registered design professional* if it is found that the nature of the work applied for is such that review of *construction documents* is not necessary to obtain compliance with this code.

107.1.1 Replacement of Windows, Doors, or Garage Doors

Sealed drawings by a design professional are not required for the replacement of windows, doors, or garage doors in an existing one-family or two-family dwelling or townhouse if all of the following conditions are met:

1. The replacement windows, doors, or garage doors are installed in accordance with the manufacturer's instructions for the appropriate wind zone.
2. The replacement windows, doors, or garage doors meet the design pressure requirements in the most recent version of the Florida Building Code, Residential.
3. A copy of the manufacturer's instructions is submitted with the permit application in a printed or digital format.

4. The replacement windows, doors, or garage doors are the same size and are installed in the same opening as the existing windows, doors, or garage doors.

[A] 107.2 Construction Documents

Construction documents shall be in accordance with Sections 107.2.1 through 107.2.6.

[A] 107.2.1 Information on Construction Documents

Construction documents shall be dimensioned and drawn upon suitable material. Electronic media documents are permitted to be submitted where *approved* by the *building official*. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that it will conform to the provisions of this code and relevant laws, ordinances, rules and regulations, as determined by the *building official*.

[A] 107.2.2 Fire Protection System Shop Drawings

Shop drawings for the *fire protection system(s)* shall be submitted to indicate conformance to this code and the *construction documents* and shall be *approved* prior to the start of system installation. Shop drawings shall contain all information as required by the referenced installation standards in Chapter 9.

[A] 107.2.3 Means of Egress

The *construction documents* shall show in sufficient detail the location, construction, size and character of all portions of the *means of egress* including the path of the *exit discharge* to the *public way* in compliance with the provisions of this code. In other than occupancies in Groups R-2, R-3, and I-1, the *construction documents* shall designate the number of occupants to be accommodated on every floor, and in all rooms and spaces.

[A] 107.2.4 Exterior Wall Envelope

Construction documents for all buildings shall describe the *exterior wall envelope* in sufficient detail to determine compliance with this code. The *construction documents* shall provide details of the *exterior wall envelope* as required, including flashing, intersections with dissimilar materials, corners, end details, control joints, intersections at roof, eaves or parapets, means of drainage, water-resistive membrane and details around openings.

The *construction documents* shall include manufacturer's installation instructions that provide supporting documentation that the proposed penetration and opening details described in the *construction documents* maintain the weather resistance of the *exterior wall envelope*. The supporting documentation shall fully describe the *exterior wall* system that was tested, where applicable, as well as the test procedure used.

107.2.5 Exterior Balcony and Elevated Walking Surfaces

Where balcony or other elevated walking surfaces are exposed to water from direct or blowing rain or irrigation, and the structural framing is protected by an impervious moisture barrier, the construction documents shall include details for all elements of the impervious moisture barrier system. The construction documents shall include manufacturer's installation instructions.

[A] 107.2.6 Site Plan

The *construction documents* submitted with the application for *permit* shall be accompanied by a site plan showing to scale the size and location of new construction and existing structures on the site, distances from *lot lines*, the established street grades and the proposed finished grades and, as applicable, *flood hazard areas*, *floodways*, and *design flood elevations*; and it shall be drawn in accordance with an accurate boundary line survey. In the case of demolition, the site plan shall show construction to be demolished and the location and size of existing structures and construction that are to remain on the site or plot. The *building official* is authorized to waive or modify the requirement for a site plan where the application for *permit* is for *alteration* or *repair* or where otherwise warranted.

[A] 107.2.6.1 Design Flood Elevations

Where *design flood elevations* are not specified, they shall be established in accordance with Section 1612.3.1.

107.2.6.2

For the purpose of inspection and record retention, site plans for a building may be maintained in the form of an electronic copy at the worksite. These plans must be open to inspection by the *building official* or a duly authorized representative, as required by the *Florida Building Code*.

[A] 107.2.7 Structural Information

The *construction documents* shall provide the information specified in Section 1603.

[A] 107.3 Examination of Documents

The *building official* shall examine or cause to be examined the accompanying submittal documents and shall ascertain by such examinations whether the construction indicated and described is in accordance with the requirements of this code and other pertinent laws or ordinances.

Exceptions:

1. Building plans approved pursuant to Section 553.77(5), *Florida Statutes*, and state-approved manufactured buildings are exempt from local codes enforcing agency plan reviews except for provisions of the code relating to erection, assembly or construction at the site. Erection, assembly and construction at the site are subject to local permitting and inspections. Photocopies of plans approved according to Rule 61-41.009, *Florida Administrative Code*, shall be sufficient for local permit application documents of record for the modular building portion of the permitted project.
2. Industrial construction on sites where design, construction and fire safety are supervised by appropriate design and inspection professionals and which contain adequate in-house fire departments and rescue squads is exempt, subject to local government option, from review of plans and inspections, providing owners certify that applicable codes and standards have been met and supply appropriate approved drawings to local building and fire-safety inspectors.

[A] 107.3.1 Approval of Construction Documents

When the *building official* issues a *permit*, the *construction documents* shall be *approved*, in writing or by stamp, as "Reviewed for Code Compliance." One set of *construction documents* so reviewed shall be retained by the *building official*. The other set shall be returned to the applicant, shall be kept at the site of work and shall be open to inspection by the *building official* or a duly authorized representative.

[A] 107.3.2 Previous Approvals

This code shall not require changes in the *construction documents*, construction or designated occupancy of a structure for which a lawful *permit* has been heretofore issued or otherwise lawfully authorized, and the construction of which has been pursued in good faith within 180 days after the effective date of this code and has not been abandoned.

[A] 107.3.3 Phased Approval

The *building official* is authorized to issue a *permit* for the construction of foundations or any other part of a building or structure before the *construction documents* for the whole building or structure have been submitted, provided that adequate information and detailed statements have been filed complying with pertinent requirements of this code. The holder of such *permit* for the foundation or other parts of a building or structure shall proceed at the holder's own risk with the building operation and without assurance that a *permit* for the entire structure will be granted.

[A] 107.3.4 Design Professional in Responsible Charge

Reserved.

[A] 107.3.4.1 Deferred Submittals

Deferral of any submittal items shall have the prior approval of the *building official*. The *registered design professional in responsible charge* shall list the deferred submittals on the *construction documents* for review by the *building official*.

Documents for deferred submittal items shall be submitted to the *registered design professional in responsible charge* who shall review them and forward them to the *building official* with a notation indicating that the deferred submittal documents have been reviewed and found to be in general conformance to the design of the building. The deferred submittal items shall not be installed until the deferred submittal documents have been *approved* by the *building official*.

107.3.4.2

Certifications by contractors authorized under the provisions of Section 489.115(4)(b), *Florida Statutes*, shall be considered equivalent to sealed plans and specifications by a person licensed under Chapter 471, *Florida Statutes*, or Chapter 481, *Florida Statutes*, by local enforcement agencies for plans review for permitting purposes relating to compliance with the windresistance provisions of the code or alternate methodologies approved by the Florida Building Commission for one- and two-family dwellings. Local enforcement agencies may rely upon such certification by contractors that the plans and specifications submitted conform to the requirements of

the code for wind resistance. Upon good cause shown, local government code enforcement agencies may accept or reject plans sealed by persons licensed under Chapters 471, 481 or 489, *Florida Statutes*.

107.3.5 Minimum Plan Review Criteria for Buildings

The examination of the documents by the building official shall include the following minimum criteria and documents: a floor plan; site plan; foundation plan; floor/roof framing plan or truss layout; all fenestration penetrations; flashing; and rough opening dimensions; and all exterior elevations:

Commercial Buildings:

Building:

1. Site requirements:

Parking

Fire access

Vehicle loading

Driving/turning radius

Fire hydrant/water supply/post indicator valve (PIV)

Set back/separation (assumed property lines)

Location of specific tanks, water lines and sewer lines

Flood hazard areas, flood zones, and design flood elevations

2. Occupancy group and special occupancy requirements shall be determined.

3. Minimum type of construction shall be determined (see Section 503).

4. Fire-resistant construction requirements shall include the following components:

Fire-resistant separations

Fire-resistant protection for type of construction

Protection of openings and penetrations of rated walls

Fire blocking and draftstopping and calculated fire resistance

5. Fire suppression systems shall include:

Early warning smoke evacuation systems

Schematic fire sprinklers

Standpipes

Pre-engineered systems

Riser diagram.

6. Life safety systems shall be determined and shall include the following requirements:

Occupant load and egress capacities

Early warning

Smoke control

Stair pressurization

Systems schematic

7. Occupancy load/egress requirements shall include:

Occupancy load

Gross

Net

Means of egress

Exit access

Exit

Exit discharge

Stairs construction/geometry and protection

Doors

Emergency lighting and exit signs

Specific occupancy requirements

Construction requirements

Horizontal exits/exit passageways

8. Structural requirements shall include:

Soil conditions/analysis

Termite protection

Design loads

Wind requirements

Building envelope

Impact resistant coverings or systems

Structural calculations (if required)

Foundation

Flood requirements in accordance with Section 1612, including lowest floor elevations, enclosures, flood damage-resistant materials

Wall systems

Floor systems

Roof systems

Threshold inspection plan

Stair systems

9. Materials shall be reviewed and shall at a minimum include the following:

Wood

Steel

Aluminum

Concrete

Plastic

Glass

Masonry

Gypsum board and plaster

Insulating (mechanical)

Roofing

Insulation

10. Accessibility requirements shall include the following:

Site requirements

Accessible route

Vertical accessibility

Toilet and bathing facilities

Drinking fountains

Equipment

Special occupancy requirements

Fair housing requirements

11. Interior requirements shall include the following:

Interior finishes (flame spread/smoke development)

Light and ventilation

Sanitation

12. Special systems:

Elevators

Escalators

Lifts

13. Swimming pools:

 Barrier requirements

 Spas

 Wading pools

14. Location and installation details. The specific location and installation details of each fire door, fire damper, ceiling damper and smoke damper shall be shown and properly identified on the building plans by the designer.

Electrical:

1. Electrical:

 Wiring

 Services

 Feeders and branch circuits

 Overcurrent protection

 Grounding

 Wiring methods and materials

 GFCIs

2. Equipment

3. Special occupancies

4. Emergency systems

5. Communication systems

6. Low voltage

7. Load calculations

8. Design flood elevation

Plumbing:

1. Minimum plumbing facilities

2. Fixture requirements

3. Water supply piping

4. Sanitary drainage

5. Water heaters

6. Vents

7. Roof drainage

8. Back flow prevention
9. Irrigation
10. Location of water supply line
11. Grease traps
12. Environmental requirements
13. Plumbing riser
14. Design flood elevation

Mechanical:

1. Energy calculations
2. Exhaust systems:
 - Clothes dryer exhaust
 - Kitchen equipment exhaust
 - Specialty exhaust systems
3. Equipment
4. Equipment location
5. Make-up air
6. Roof-mounted equipment
7. Duct systems
8. Ventilation
9. Combustion air
10. Chimneys, fireplaces and vents
11. Appliances
12. Boilers
13. Refrigeration
14. Bathroom ventilation
15. Laboratory
16. Design flood elevation

Gas:

1. Gas piping
2. Venting
3. Combustion air
4. Chimneys and vents
5. Appliances

6. Type of gas
7. Fireplaces
8. LP tank location
9. Riser diagram/shutoffs
10. Design flood elevation

Demolition:

1. Asbestos removal

Residential (one- and two-family):

1. Site requirements:

Set back/separation (assumed property lines)

Location of septic tanks

2. Fire-resistant construction (if required)

3. Fire

4. Smoke detector locations

5. Egress:

Egress window size and location stairs construction requirements

6. Structural requirements shall include:

Wall section from foundation through roof, including assembly and materials connector tables wind requirements structural calculations (if required)

Flood hazard areas, flood zones, design flood elevations, lowest floor elevations, enclosures, equipment, and flood damage-resistant materials

7. Accessibility requirements:

Show/identify

Accessible bath

8. Impact resistant coverings or systems

Exceptions: Plans examination by the building official shall not be required for the following work:

1. Replacing existing equipment such as mechanical units, water heaters, etc.
2. Reroofs
3. Minor electrical, plumbing and mechanical repairs
4. Annual maintenance permits
5. Prototype plans:

Except for local site adaptions, siding, foundations and/or modifications.

Except for structures that require waiver.

6. Manufactured buildings plan except for foundations and modifications of buildings on site.

[A] 107.4 Amended Construction Documents

Work shall be installed in accordance with the *approved construction documents*, and any changes made during construction that are not in compliance with the *approved construction documents* shall be resubmitted for approval as an amended set of *construction documents*.

[A] 107.5 Retention of Construction Documents

One set of *approved construction documents* shall be retained by the *building official* for a period of not less than 180 days from date of completion of the permitted work, or as required by state or local laws.

107.6 Affidavits

The building official may accept a sworn affidavit from a registered architect or engineer stating that the plans submitted conform to the technical codes. For buildings and structures, the affidavit shall state that the plans conform to the laws as to egress, type of construction and general arrangement and, if accompanied by drawings, show the structural design and that the plans and design conform to the requirements of the technical codes as to strength, stresses, strains, loads and stability. The building official may without any examination or inspection accept such affidavit, provided the architect or engineer who made such affidavit agrees to submit to the building official copies of inspection reports as inspections are performed and upon completion of the structure, electrical, gas, mechanical or plumbing systems a certification that the structure, electrical, gas, mechanical or plumbing system has been erected in accordance with the requirements of the technical codes. Where the building official relies upon such affidavit, the architect or engineer shall assume full responsibility for compliance with all provisions of the technical codes and other pertinent laws or ordinances. The building official shall ensure that any person conducting plans review is qualified as a plans examiner under Part XII of Chapter 468, *Florida Statutes*, and that any person conducting inspections is qualified as a building inspector under Part XII of Chapter 468, *Florida Statutes*.

107.6.1 Building Permits Issued in Flood Hazard Areas on the Basis of an Affidavit

Pursuant to the requirements of federal regulation for participation in the National Flood Insurance Program (44 C.F.R. Parts 59 and 60), the authority granted to the *building official* to issue permits, to rely on inspections, and to accept plans and construction documents on the basis of affidavits and plans submitted pursuant to Sections 105.14 and 107.6, shall not extend to the flood load and flood-resistance construction requirements of the *Florida Building Code*.

107.6.2 Affidavits Provided Pursuant to Section 553.791, Florida Statutes

For a building or structure in a flood hazard area, the building official shall review any affidavit certifying compliance with the flood load and flood-resistant construction requirements of the *Florida Building Code*.

107.7

If the local building code administrator or inspector finds that the plans are not in compliance with the Florida Building Code, the local building code administrator or inspector shall identify the specific plan features that do not comply with the applicable codes, identify the specific code chapters and sections upon which the finding is based, and provide this information to the local enforcing agency. If the building code administrator, plans examiner, or inspector requests another local enforcing agency employee or a person contracted by the local enforcing agency to review the plans and that employee or person identifies specific plan features that do not comply with the applicable codes, the building code administrator, plans examiner, or inspector must provide this information to the local enforcing agency. The local enforcing agency shall provide this information to the permit applicant.

Section 108 Temporary Structures and Uses

[A] 108.1 General

The *building official* is authorized to issue a *permit* for temporary structures and temporary uses. Such *permits* shall be limited as to time of service, but shall not be permitted for more than 180 days. The *building official* is authorized to grant extensions for demonstrated cause.

[A] 108.2 Conformance

Temporary structures and uses shall comply with the requirements in Section 3103.

[A] 108.3 Temporary Power

The *building official* is authorized to give permission to temporarily supply and use power in part of an electric installation before such installation has been fully completed and the final certificate of completion has been issued. The part covered by the temporary certificate shall comply with the requirements specified for temporary lighting, heat or power in NFPA 70.

[A] 108.4 Termination of Approval

The *building official* is authorized to terminate such *permit* for a temporary structure or use and to order the temporary structure or use to be discontinued.

Section 109 Fees

[A] 109.1 Payment of Fees

A *permit* shall not be valid until the fees prescribed by law have been paid, nor shall an amendment to a *permit* be released until the additional fee, if any, has been paid.

[A] 109.2 Schedule of Permit Fees

On buildings, structures, electrical, gas, mechanical, and plumbing systems or *alterations* requiring a *permit*, a fee for each *permit* shall be paid as required, in accordance with the schedule as established by the applicable governing authority.

[A] 109.3 Building Permit Valuations

The applicant for a *permit* shall provide an estimated *permit* value at time of application. *Permit* valuations shall include total value of work, including materials and labor, for which the *permit* is being issued, such as electrical, gas, mechanical, plumbing equipment and permanent systems. If, in the opinion of the *building official*, the valuation is underestimated on the application, the *permit* shall be denied, unless the applicant can show detailed estimates to meet the approval of the *building official*. Final building *permit* valuation shall be set by the *building official*.

[A] 109.4 Work Commencing Before Permit Issuance

Any person who commences any work on a building, structure, electrical, gas, mechanical or plumbing system before obtaining the necessary *permits* shall be subject to a fee established by the *building official* that shall be in addition to the required *permit* fees.

[A] 109.5 Related Fees

Reserved.

[A] 109.6 Refunds

Reserved.

Section 110 Inspections

[A] 110.1 General

Construction or work for which a *permit* is required shall be subject to inspection by the *building official* and such construction or work shall remain exposed and provided with access for inspection purposes until *approved*. Approval as a result of an inspection shall not be construed to be an approval of a violation of the provisions of this code or of other ordinances of the jurisdiction. Inspections presuming to give authority to violate or cancel the provisions of this code or of other ordinances of the jurisdiction shall not be valid. It shall be the duty of the *owner* or the owner's authorized agent to cause the work to remain exposed and provided with access for inspection purposes. Neither the *building official* nor the jurisdiction shall be liable for expense entailed in the removal or replacement of any material required to allow inspection.

[A] 110.2 Preliminary Inspection

Before issuing a *permit*, the *building official* is authorized to examine or cause to be examined buildings, structures and sites for which an application has been filed.

[A] 110.3 Required Inspections

The building official upon notification from the permit holder or his or her agent shall make the following inspections, and shall either release that portion of the construction or shall notify the permit holder or his or her agent of any violations which must be corrected in order to comply with the technical codes. The building official shall determine the timing and sequencing of when inspections occur and what elements are inspected at each inspection.

Building

1. Foundation inspection. To be made after trenches are excavated and forms erected and shall at a minimum include the following building components:

- Stem-wall
- Monolithic slab-on-grade
- Piling/pile caps
- Footers/grade beams

1.1. In flood hazard areas, upon placement of the lowest floor, including basement, and prior to further vertical construction, the elevation certification shall be submitted to the authority having jurisdiction.

2. Framing inspection. To be made after the roof, all framing, fireblocking and bracing is in place, all concealing wiring, all pipes, chimneys, ducts and vents are complete and shall at a minimum include the following building components:

- Window/door framing
- Vertical cells/columns
- Lintel/tie beams
- Framing/trusses/bracing/connectors
- Draft stopping/fire blocking
- Curtain wall framing
- Energy insulation
- Accessibility
- Verify rough opening dimensions are within tolerances.

3. Sheathing inspection. To be made either as part of a dry-in inspection or done separately at the request of the contractor after all roof and wall sheathing and fasteners are complete and shall at a minimum include the following building components:

- Roof sheathing
- Wall sheathing
- Sheathing fasteners
- Roof/wall dry-in

4. Exterior wall coverings. Shall at a minimum include the following building components in progress inspections:

- Exterior wall coverings and veneers
- Soffit coverings

5. Roofing inspection. Shall at a minimum include the following building components:

- Dry-in
- Insulation
- Roof coverings
- Flashing

6. Final inspection. To be made after the building is completed and ready for occupancy.

6.1. In flood hazard areas, as part of the final inspection, a final certification of the lowest floor elevation or the elevation to which a building is dry floodproofed, as applicable, shall be submitted to the authority having jurisdiction.

7. Swimming pool inspection. First inspection to be made after excavation and installation of reinforcing steel, bonding and main drain and prior to placing of concrete.

Final inspection to be made when the swimming pool is complete and all required enclosure requirements are in place.

In order to pass final inspection and receive a certificate of completion, a residential swimming pool must meet the requirements relating to pool safety features as described in Section 454.2.17 of this code.

8. Demolition inspections. First inspection to be made after all utility connections have been disconnected and secured in such manner that no unsafe or unsanitary conditions shall exist during or after demolition operations.

Final inspection to be made after all demolition work is completed.

9. Manufactured building inspections. The building department shall inspect construction of foundations; connecting buildings to foundations; installation of parts identified on plans as site installed items, joining the modules, including utility crossovers; utility connections from the building to utility lines on site; and any other work done on site which requires compliance with the *Florida Building Code*. Additional inspections may be required for public educational facilities (see Section 453.27.20 of this code).

10. Where impact-resistant coverings or impact-resistant systems are installed, the building official shall schedule adequate inspections of impact-resistant coverings or impact-resistant systems to determine the following:

The system indicated on the plans was installed.

The system is installed in accordance with the manufacturer's installation instructions and the product approval.

Electrical

1. Underground inspection. To be made after trenches or ditches are excavated, conduit or cable installed, and before any backfill is put in place.

2. Rough-in inspection. To be made after the roof, framing, fireblocking and bracing is in place and prior to the installation of wall or ceiling membranes.

3. Final inspection. To be made after the building is complete, all required electrical fixtures are in place and properly connected or protected, and the structure is ready for occupancy.

4. Existing Swimming Pools. To be made after all repairs or alterations are complete, all required electrical equipment, GFCI protection, and equipotential bonding are in place on said alterations or repairs.

Plumbing

1. Underground inspection. To be made after trenches or ditches are excavated, piping installed, and before any backfill is put in place.

2. Rough-in inspection. To be made after the roof, framing, fireblocking and bracing is in place and all soil, waste and vent piping is complete, and prior to this installation of wall or ceiling membranes.

3. Final inspection. To be made after the building is complete, all plumbing fixtures are in place and properly connected, and the structure is ready for occupancy.

Note: See Section 312 of the *Florida Building Code, Plumbing* for required tests.

Mechanical

1. Underground inspection. To be made after trenches or ditches are excavated, underground duct and fuel piping installed, and before any backfill is put in place.

2. Rough-in inspection. To be made after the roof, framing, fire blocking and bracing are in place and all ducting, and other concealed components are complete, and prior to the installation of wall or ceiling membranes.

3. Final inspection. To be made after the building is complete, the mechanical system is in place and properly connected, and the structure is ready for occupancy.

Gas

1. Rough piping inspection. To be made after all new piping authorized by the permit has been installed, and before any such piping has been covered or concealed or any fixtures or gas appliances have been connected.
2. Final piping inspection. To be made after all piping authorized by the permit has been installed and after all portions which are to be concealed by plastering or otherwise have been so concealed, and before any fixtures or gas appliances have been connected. This inspection shall include a pressure test.
3. Final inspection. To be made on all new gas work authorized by the permit and such portions of existing systems as may be affected by new work or any changes, to ensure compliance with all the requirements of this code and to assure that the installation and construction of the gas system is in accordance with reviewed plans.

[A] 110.3.1 Footing and Foundation Inspection

Reserved.

[A] 110.3.2 Concrete Slab and Under-Floor Inspection

Reserved.

[A] 110.3.3 Lowest Floor Elevation

Reserved.

[A] 110.3.4 Frame Inspection

Reserved.

[A] 110.3.5 Lath, Gypsum Board and Gypsum Panel Product Inspection

Lath, gypsum board and gypsum panel product inspections shall be made after lathing, gypsum board and gypsum panel products, interior and exterior, are in place, but before any plastering is applied or gypsum board and gypsum panel product joints and fasteners are taped and finished.

Exception: Gypsum board and gypsum panel products that are not part of a fire-resistance-rated assembly or a shear assembly.

110.3.6 Weather-Exposed Balcony and Walking Surface Waterproofing

Where balcony or other elevated walking surfaces are exposed to water from direct or blowing rain or irrigation, and the structural framing is protected by an impervious moisture barrier, all elements of the impervious-moisture-barrier system shall not be concealed until inspected and *approved*.

[A] 110.3.7 Fire- And Smoke-Resistant Penetrations

Protection of joints and penetrations in *fire-resistance-rated* assemblies, *smoke barriers* and smoke partitions shall not be concealed from view until inspected and *approved*.

[A] 110.3.8 Energy Efficiency Inspections

Inspections shall be made to determine compliance with Chapter 13 and shall include, but not be limited to, inspections for: envelope insulation R- and U-values, fenestration U-value, duct system R-value, and HVAC and water-heating equipment efficiency.

[A] 110.3.9 Other Inspections

In addition to the inspections specified in Sections 110.3 through 110.3.8, the *building official* is authorized to make or require other inspections of any construction work to ascertain compliance with the provisions of this code and other laws that are enforced by the department of building safety.

[A] 110.3.10 Special Inspections

Reserved.

[A] 110.3.11 Final Inspection

Reserved.

[A] 110.3.11.1 Flood Hazard Documentation

Reserved.

110.3.12 Termites

Building components and building surroundings required to be protected from termite damage in accordance with Section 1503.7, Section 2304.12.6 or Section 2304.12.2.8, specifically required to be inspected for termites in accordance with Section 2114, or required to have chemical soil treatment in accordance with Section 1816 shall not be covered or concealed until the release from the building official has been received.

110.3.13 Impact-Resistant Coverings or Systems

Where impact-resistant coverings or systems are installed to meet requirements of this code, the building official shall schedule adequate inspections of impact-resistant coverings or systems to determine the following:

1. The system indicated on the plans was installed.
2. The system is installed in accordance with the manufacturer's installation instructions and the product approval.

[A] 110.4 Inspection Agencies

Reserved.

[A] 110.5 Inspection Requests

It shall be the duty of the holder of the building *permit* or their duly authorized agent to notify the *building official* when work is ready for inspection. It shall be the duty of the *permit* holder to provide access to and means for inspections of such work that are required by this code.

[A] 110.6 Approval Required

Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the *building official*. The *building official*, upon notification, shall make the requested inspections and shall either indicate the portion of the construction that is satisfactory as completed, or notify the *permit* holder or his or her agent wherein the same fails to comply with this code. Any portions that do not comply shall be corrected and such portion shall not be covered or concealed until authorized by the *building official*.

110.7 Shoring

For threshold buildings, shoring and associated formwork or falsework shall be designed and inspected by a Florida licensed professional engineer prior to any required mandatory inspections by the threshold building inspector.

110.8 Threshold Building**110.8.1**

During new construction or during repair or restoration projects in which the structural system or structural loading of a building is being modified, the enforcing agency shall require a special inspector to perform structural inspections on a threshold building pursuant to a structural inspection plan prepared by the engineer or architect of record. The structural inspection plan must be submitted to the enforcing agency prior to the issuance of a building permit for the construction of a threshold building. The purpose of the structural inspection plans is to provide specific inspection procedures and schedules so that the building can be adequately inspected for compliance with the permitted documents. The special inspector may not serve as a surrogate in carrying out the responsibilities of the building official, the architect, or the engineer of record. The contractor's contractual or statutory obligations are not relieved by any action of the special inspector.

110.8.2

The special inspector shall determine that a professional engineer who specializes in shoring design has inspected the shoring and reshoring for conformance with the shoring and reshoring plans submitted to the enforcing agency. A fee simple title owner of a building, which does not meet the minimum size, height, occupancy, occupancy classification, or number-of-stories criteria which would

result in classification as a threshold building under s. 553.71(7), *Florida Statutes* may designate such building as a threshold building, subject to more than the minimum number of inspections required by the *Florida Building Code*.

110.8.3

The fee owner of a threshold building shall select and pay all costs of employing a special inspector, but the special inspector shall be responsible to the enforcement agency. The inspector shall be a person certified, licensed or registered under Chapter 471, *Florida Statutes*, as an engineer or under Chapter 481, *Florida Statutes*, as an architect.

110.8.4

Each enforcement agency shall require that, on every threshold building:

110.8.4.1

The special inspector, upon completion of the building and prior to the issuance of a certificate of occupancy, file a signed and sealed statement with the enforcement agency in substantially the following form: "To the best of my knowledge and belief, the above described construction of all structural load-bearing components complies with the permitted documents, and the shoring and reshoring conforms to the shoring and reshoring plans submitted to the enforcement agency."

110.8.4.2

Any proposal to install an alternate structural product or system to which building codes apply be submitted to the enforcement agency for review for compliance with the codes and made part of the enforcement agency's recorded set of permit documents.

110.8.4.3

All shoring and reshoring procedures, plans and details be submitted to the enforcement agency for recordkeeping. Each shoring and reshoring installation shall be supervised, inspected and certified to be in compliance with the shoring documents by the contractor.

110.8.4.4

All plans for the building which are required to be signed and sealed by the architect or engineer of record contain a statement that, to the best of the architect's or engineer's knowledge, the plans and specifications comply with the applicable minimum building codes and the applicable fire-safety standards as determined by the local authority in accordance with this section and Chapter 633, *Florida Statutes*.

110.8.5

No enforcing agency may issue a building permit for construction of any threshold building except to a licensed general contractor, as defined in Section 489.105(3)(a), *Florida Statutes*, or to a licensed building contractor, as defined in Section 489.105(3)(b), *Florida Statutes*, within the scope of her or his license. The named contractor to whom the building permit is issued shall have the responsibility for supervision, direction, management and control of the construction activities on the project for which the building permit was issued.

110.8.6

The building department may allow a special inspector to conduct the minimum structural inspection of threshold buildings required by this code, Section 553.73, *Florida Statutes*, without duplicative inspection by the building department. The building official is responsible for ensuring that any person conducting inspections is qualified as a building inspector under Part XII of Chapter 468, *Florida Statutes*, or certified as a special inspector under Chapter 471 or 481, *Florida Statutes*. Inspections of threshold buildings required by Section 553.79(5), *Florida Statutes*, are in addition to the minimum inspections required by this code.

Section 111 Certificate of Occupancy

[A] 111.1 Use and Occupancy

A building or structure shall not be used or occupied, and a change in the existing use or occupancy classification of a building or structure or portion thereof shall not be made, until the *building official* has issued a certificate of occupancy therefor as provided herein. Issuance of a certificate of occupancy shall not be construed as an approval of a violation of the provisions of this code or of other ordinances of the jurisdiction.

Exception: Certificates of occupancy are not required for work exempt from *permits* in accordance with Section 105.2.

[A] 111.2 Certificate Issued

After the *building official* inspects the building or structure and does not find violations of the provisions of this code or other laws that are enforced by the department of building safety, the *building official* shall issue a certificate of occupancy that contains the following:

1. The building *permit* number.
2. The address of the structure.
3. The name and address of the *owner* or the owner's authorized agent.
4. A description of that portion of the structure for which the certificate is issued.
5. A statement that the described portion of the structure has been inspected for compliance with the requirements of this code for the occupancy and division of occupancy and the use for which the proposed occupancy is classified.
6. For buildings and structures in flood hazard areas, a statement that documentation of the as-built lowest floor elevation has been provided and is retained in the records of the authority having jurisdiction
7. The name of the *building official*.
8. The edition of the code under which the *permit* was issued.
9. The use and occupancy, in accordance with the provisions of Chapter 3.
10. The type of construction as defined in Chapter 6.
11. The design *occupant load*.
12. If an *automatic sprinkler system* is provided, whether the sprinkler system is required.
13. Any special stipulations and conditions of the building *permit*.

[A] 111.3 Temporary Occupancy

The *building official* is authorized to issue a temporary certificate of occupancy before the completion of the entire work covered by the *permit*, provided that such portion or portions shall be occupied safely. The *building official* shall set a time period during which the temporary certificate of occupancy is valid.

[A] 111.4 Revocation

The *building official* is authorized to, in writing, suspend or revoke a certificate of occupancy or completion issued under the provisions of this code wherever the certificate is issued in error, or on the basis of incorrect information supplied, or where it is determined that the building or structure or portion thereof is in violation of any ordinance or regulation or any of the provisions of this code.

111.5 Certificate of Completion

A certificate of completion is proof that a structure or system is complete and for certain types of permits is released for use and may be connected to a utility system. This certificate does not grant authority to occupy a building, such as shell building, prior to the issuance of a certificate of occupancy.

Section 112 Service Utilities

[A] 112.1 Connection of Service Utilities

A person shall not make connections from a utility, source of energy, fuel or power to any building or system that is regulated by this code for which a *permit* is required, until released by the *building official*.

[A] 112.2 Temporary Connection

The *building official* shall have the authority to authorize the temporary connection of the building or system to the utility, source of energy, fuel or power.

[A] 112.3 Authority to Disconnect Service Utilities

The *building official* shall have the authority to authorize disconnection of utility service to the building, structure or system regulated by this code and the referenced codes and standards set forth in Section 101.4 in case of emergency where necessary to eliminate an immediate hazard to life or property or where such utility connection has been made without the approval required by Section 112.1 or 112.2. The *building official* shall notify the serving utility, and wherever possible the *owner* and occupant of the building, structure or service system of the decision to disconnect prior to taking such action. If not notified prior to disconnecting, the *owner* or occupant of the building, structure or service system shall be notified in writing, as soon as practical thereafter.

Section 113 Board of Appeals

RESERVED

Section 114 Violations

RESERVED

Section 115 Stop Work Order

[A] 115.1 Authority

Where the *building official* finds any work regulated by this code being performed in a manner either contrary to the provisions of this code or dangerous or unsafe, the *building official* is authorized to issue a stop work order.

[A] 115.2 Issuance

The stop work order shall be in writing and shall be given to the *owner* of the property involved, the owner's authorized agent or the person performing the work. Upon issuance of a stop work order, the cited work shall immediately cease. The stop work order shall state the reason for the order and the conditions under which the cited work will be permitted to resume.

[A] 115.3 Unlawful Continuance

Any person who shall continue any work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be subject to penalties as prescribed by law.

Section 116 Unsafe Structures and Equipment

RESERVED

Section 117 Variances in Flood Hazard Areas

117.1 Flood Hazard Areas

Pursuant to Section 553.73(5), *Florida Statutes*, the variance procedures adopted in the local flood plain management ordinance shall apply to requests submitted to the building official for variances to the provisions of Section 1612.4 of the *Florida Building Code, Building* or, as applicable, the provisions of Section R322 of the *Florida Building Code, Residential*. This section shall not apply to Section 3109 of the *Florida Building Code, Building*.

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Chapter 2 Definitions

Section 201 General

201.1 Scope

Unless otherwise expressly stated, the following words and terms shall, for the purposes of this code, have the meanings shown in this chapter.

201.2 Interchangeability

Words used in the present tense include the future; words stated in the masculine gender include the feminine and neuter; the singular number includes the plural and the plural, the singular.

201.3 Terms Defined in Other Codes

Where terms are not defined in this code and are defined in the *Florida Building Code, Energy Conservation; Florida Building Code, Fuel Gas; Florida Fire Prevention Code; Florida Building Code, Mechanical or Florida Building Code, Plumbing*, such terms shall have the meanings ascribed to them as in those codes.

201.4 Terms Not Defined

Where terms are not defined through the methods authorized by this section, such terms shall have ordinarily accepted meanings such as the context implies.

Section 202 Definitions

24-HOUR BASIS. The actual time that a person is an occupant within a facility for the purpose of receiving care. It shall not include a facility that is open for 24 hours and is capable of providing care to someone visiting the facility during any segment of the 24 hours.

[BS] AAC MASONRY. Masonry made of autoclaved aerated concrete (AAC) units, manufactured without internal reinforcement and bonded together using thin- or thick-bed mortar.

ACCESSIBLE. See the *Florida Building Code, Accessibility*.

ACCESSIBLE MEANS OF EGRESS. A continuous and unobstructed way of egress travel from any *accessible* point in a *building* or *facility* to a *public way*.

ACCESSIBLE ROUTE. See the *Florida Building Code, Accessibility*.

ACCESSIBLE UNIT. See the *Florida Building Code, Accessibility*.

ACCESSORY COMPONENTS. Components used in the installation of pedestals and pedestrian deck panels or pavers of the exterior elevated flooring system. Accessory components are made of either plastic, metal or other approved materials. Accessory components may be used to provide lateral bracing of the pedestals, to provide vertical support, for leveling the pedestal, to restrain the pedestrian deck panels or pavers to the top of the pedestal, or for other system requirements.

ACCESSORY STRUCTURE. A structure that is accessory to and incidental to that of a building or *dwelling(s)* and that is located on the same *lot*.

ACCREDITATION BODY. An *approved*, third-party organization that is independent of the grading and inspection agencies, and the lumber mills, and that initially accredits and subsequently monitors, on a continuing basis, the competency and performance of a grading or inspection agency related to carrying out specific tasks.

[A] ADDITION. An extension or increase in floor area, number of stories or height of a building or structure.

[BS] ADHERED MASONRY VENEER. Veneer secured and supported through the adhesion of an *approved* bonding material applied to an *approved backing*.

[BS] ADOBE CONSTRUCTION. Construction in which the exterior *load-bearing* and *nonload-bearing walls* and partitions are of unfired clay masonry units, and floors, roofs and interior framing are wholly or partly of wood or other *approved* materials.

Adobe, stabilized. Unfired clay *masonry units* to which admixtures, such as emulsified asphalt, are added during the manufacturing process to limit the units' water absorption so as to increase their durability.

Adobe, unstabilized. Unfired clay *masonry units* that do not meet the definition of "Adobe, stabilized."

[F] AEROSOL CONTAINER. A metal can or a glass or plastic bottle designed to dispense an aerosol.

[F] AEROSOL PRODUCT. A product that is dispensed from an *aerosol container* by a propellant. Aerosol products shall be classified by means of the calculation of their chemical heats of combustion and shall be designated Level 1, Level 2 or Level 3.

Level 1 aerosol products. Those with a total chemical heat of combustion that is less than or equal to 8,600 British thermal units per pound (Btu/lb) (20 kJ/g).

Level 2 aerosol products. Those with a total chemical heat of combustion that is greater than 8,600 Btu/lb (20 kJ/g), but less than or equal to 13,000 Btu/lb (30 kJ/g).

Level 3 aerosol products. Those with a total chemical heat of combustion that is greater than 13,000 Btu/lb (30 kJ/g).

[BS] AGGREGATE. In roofing, crushed stone, crushed slag or water-worn gravel used for surfacing for *roof coverings*.

AGRICULTURAL BUILDING. Reserved.

AIR-IMPERMEABLE INSULATION. An insulation having an air permeance equal to or less than $0.02 \text{ l/s} \times \text{m}^2$ at 75 pa pressure differential tested in accordance with ASTM E2178 or ASTM E283.

AIR-INFLATED STRUCTURE. A structure that uses air-pressurized membrane beams, arches or other elements to enclose space. Occupants of such a structure do not occupy the pressurized area used to support the structure.

AIR-SUPPORTED STRUCTURE. A structure wherein the shape of the structure is attained by air pressure and occupants of the structure are within the elevated pressure area. Air-supported structures are of two basic types:

Double skin. Similar to a single skin, but with an attached liner that is separated from the outer skin and provides an airspace which serves for insulation, acoustic, aesthetic or similar purposes.

Single skin. Where there is only the single outer skin and the air pressure is directly against that skin.

AISLE. An unenclosed *exit access* component that defines and provides a path of egress travel.

AISLE ACCESSWAY. That portion of an *exit access* that leads to an *aisle*.

[F] ALARM NOTIFICATION APPLIANCE. A *fire alarm system* component such as a bell, horn, speaker, light or text display that provides audible, tactile or visible outputs, or any combination thereof.

[F] ALARM SIGNAL. A signal indicating an emergency requiring immediate action, such as a signal indicative of fire.

[F] ALARM VERIFICATION FEATURE. A feature of *automatic fire detection and alarm systems* to reduce unwanted alarms wherein *smoke detectors* report alarm conditions for a minimum period of time, or confirm alarm conditions within a given time period, after being automatically reset, in order to be accepted as a valid alarm-initiation signal.

ALLOWABLE STRESS DESIGN. A method of proportioning structural members, such that elastically computed stresses produced in the members by *nominal loads* do not exceed *specified allowable stresses* (also called "working stress design").

[A] ALTERATION. Any construction or renovation to an *existing structure* other than *repair* or *addition*.

ALTERNATING TREAD DEVICE. A device that has a series of steps between 50 and 70 degrees (0.87 and 1.22 rad) from horizontal, usually attached to a center support rail in an alternating manner so that the user does not have both feet on the same level at the same time.

AMBULATORY CARE FACILITY. Buildings or portions thereof used to provide medical, surgical, psychiatric, nursing or similar care on a less than 24-hour basis to persons who are rendered *incapable of self-preservation* by the services provided.

ANCHOR BUILDING. An exterior perimeter building of a group other than H having direct access to a *covered or open mall building* but having required *means of egress* independent of the mall.

[BS] ANCHORED MASONRY VENEER. *Veneer* secured with *approved* mechanical fasteners to an *approved backing*.

ANNULAR SPACE. The opening around the penetrating item.

[F] ANNUNCIATOR. A unit containing one or more indicator lamps, alphanumeric displays or other equivalent means in which each indication provides status information about a circuit, condition or location.

APPLICABLE GOVERNING BODY. A city, county, state, state agency or other political government subdivision or entity authorized to administer and enforce the provisions of this code, as adopted or amended. Also applies to administrative authority.

[A] APPROVED. Acceptable to the *building official*.

[A] APPROVED AGENCY. An established and recognized agency that is regularly engaged in conducting tests or furnishing inspection services, where such agency has been *approved* by the *building official*.

[BS] APPROVED FABRICATOR. An established and qualified person, firm or corporation *approved* by the *building official* pursuant to Chapter 17 of this code.

[A] APPROVED SOURCE. An independent person, firm or corporation, *approved* by the *building official*, who is competent and experienced in the application of engineering principles to materials, methods or systems analyses.

ARCHITECT. A Florida-registered architect.

[BS] AREA (for masonry).

Gross cross-sectional. The *area* delineated by the out-to-out *specified* dimensions of *masonry* in the plane under consideration.

Net cross-sectional. The *area of masonry units, grout and mortar* crossed by the plane under consideration based on out-to-out *specified* dimensions.

AREA, BUILDING. The area included within surrounding *exterior walls* (or *exterior walls* and *fire walls*) exclusive of vent *shafts* and *courts*. Areas of the building not provided with surrounding walls shall be included in the building area if such areas are included within the horizontal projection of the roof or floor above.

AREA OF REFUGE. An area where persons unable to use *stairways* can remain temporarily to await instructions or assistance during emergency evacuation.

AREA OF SPORT ACTIVITY. That portion of an indoor or outdoor space where the play or practice of a sport occurs.

AREAWAY. A subsurface space adjacent to a building open at the top or protected at the top by a grating or *guard*.

ASSEMBLY SEATING, MULTILEVEL. See "Multilevel assembly seating."

atrium. A vertical space that is closed at the top connecting two or more *stories* in Group I-2 and I-3 Occupancies or three stories in all other occupancies.

ATTIC. The space between the ceiling beams of the top *story* and the roof rafters.

[F] AUDIBLE ALARM NOTIFICATION APPLIANCE. A notification appliance that alerts by the sense of hearing.

[F] AUTOMATIC. As applied to fire protection devices, a device or system providing an emergency function without the necessity for human intervention and activated as a result of a predetermined temperature rise, rate of temperature rise or combustion products.

[F] AUTOMATIC FIRE-EXTINGUISHING SYSTEM. An *approved* system of devices and equipment which *automatically* detects a fire and discharges an *approved* fire-extinguishing agent onto or in the area of a fire.

AUTOMATIC FLUSH BOLT. Door-locking hardware, installed on the inactive leaf of a pair of doors, which has a bolt that is extended automatically into the door frame or floor when the active leaf is closed after the inactive leaf, and which holds the inactive leaf in a closed position. When the active leaf is opened, the automatic flush bolt retracts the bolt or rod allowing the inactive leaf to be opened (see CONSTANT LATCHING BOLT, DEAD BOLT, MANUAL BOLT).

[F] AUTOMATIC SMOKE DETECTION SYSTEM. A *fire alarm system* that has initiation devices that utilize *smoke detectors* for protection of an area such as a room or space with detectors to provide early warning of fire.

[F] AUTOMATIC SPRINKLER SYSTEM. An *automatic sprinkler system*, for fire protection purposes, is an integrated system of underground and overhead piping designed in accordance with fire protection engineering standards. The system includes a suitable water supply. The portion of the system above the ground is a network of specially sized or hydraulically designed piping installed in a structure or area, generally overhead, and to which *automatic* sprinklers are connected in a systematic pattern. The system is usually activated by heat from a fire and discharges water over the fire area.

[F] AUTOMATIC WATER MIST SYSTEM. A system consisting of a water supply, a pressure source, and a distribution piping system with attached nozzles, which, at or above a minimum operating pressure, defined by its listing, discharges water in fine droplets meeting the

requirements of NFPA 750 for the purpose of the control, suppression or extinguishment of a fire. Such systems include wet-pipe, dry-pipe and preaction types. The systems are designed as engineered, preengineered, local-application or total-flooding systems.

[F] AVERAGE AMBIENT SOUND LEVEL. The root mean square, A-weighted sound pressure level measured over a 24-hour period, or the time any person is present, whichever time period is less.

AWNING. An architectural projection that provides weather protection, identity or decoration and is partially or wholly supported by the building to which it is attached. An awning is comprised of a lightweight *frame structure* over which a covering is attached. An awning may be fixed or moveable, cantilevered, or otherwise entirely supported from a building.

BACKING. The wall or surface to which the *veneer* is secured.

BALANCED DOOR. A door equipped with double-pivoted hardware so designed as to cause a semicounterbalanced swing action when opening.

[F] BALED COTTON. A natural seed fiber wrapped in and secured with industry accepted materials, usually consisting of burlap, woven polypropylene, polyethylene or cotton or sheet polyethylene, and secured with steel, synthetic or wire bands or wire; also includes linters (lint removed from the cottonseed) and motes (residual materials from the ginning process).

[F] BALED COTTON, DENSELY PACKED. Cotton made into banded bales with a packing density of not less than 22 pounds per cubic foot (360 kg/m³), and dimensions complying with the following: a length of 55 inches (1397 mm), a width of 21 inches (533.4 mm) and a height of 27.6 to 35.4 inches (701 to 899 mm).

[BS] BALLAST. In roofing, ballast comes in the form of large stones or paver systems or light-weight interlocking paver systems and is used to provide uplift resistance for roofing systems that are not adhered or mechanically attached to the *roof deck*.

[F] BARRICADE. A structure that consists of a combination of walls, floor and roof, which is designed to withstand the rapid release of energy in an *explosion* and which is fully confined, partially vented or fully vented; or other effective method of shielding from explosive materials by a natural or artificial barrier.

Artificial barricade. An artificial mound or revetment a minimum thickness of 3 feet (914 mm).

Natural barricade. Natural features of the ground, such as hills, or timber of sufficient density that the surrounding exposures that require protection cannot be seen from the magazine or building containing explosives when the trees are bare of leaves.

[BS] BASE FLOOD. The *flood* having a 1-percent chance of being equaled or exceeded in any given year.

[BS] BASE FLOOD ELEVATION. The elevation of the *base flood*, including wave height, relative to the National Geodetic Vertical Datum (NGVD), North American Vertical Datum (NAVD) or other datum specified on the *Flood Insurance Rate Map* (FIRM).

[BS] BASEMENT (for flood loads). The portion of a building having its floor subgrade (below ground level) on all sides. This definition of "Basement" is limited in application to the provisions of Section 1612.

BASEMENT. A story that is not a *story above grade plane* (see "Story above grade plane"). This definition of "Basement" does not apply to the provisions of Section 1612 for flood *loads*.

BEARING WALL STRUCTURE. A building or other structure in which vertical *loads* from floors and roofs are primarily supported by walls.

[BS] BED JOINT. The horizontal layer of *mortar* on which a *masonry unit* is laid.

BLEACHERS. Tiered seating supported on a dedicated structural system and two or more rows high and is not a building element (see "Grandstand").

BOARDING HOUSE. A building arranged or used for lodging for compensation, with or without meals, and not occupied as a single-family unit.

[F] BOILING POINT. The temperature at which the vapor pressure of a *liquid* equals the atmospheric pressure of 14.7 pounds per square inch (psia) (101 kPa) or 760 mm of mercury. Where an accurate boiling point is unavailable for the material in question, or for mixtures which do not have a constant boiling point, for the purposes of this classification, the 20-percent evaporated point of a distillation performed in accordance with ASTM D86 shall be used as the boiling point of the *liquid*.

[BS] BRACED WALL LINE. A straight line through the building plan that represents the location of the lateral resistance provided by the wall bracing.

[BS] BRACED WALL PANEL. A full-height section of wall constructed to resist in-plane shear loads through interaction of framing members, sheathing material and anchors. The panel's length meets the requirements of its particular bracing method and contributes toward the total amount of bracing required along its *braced wall line*.

BREAKOUT. For revolving doors, a process whereby wings or door panels can be pushed open manually for *means of egress* travel.

[BS] BRICK.

Calcium silicate (sand lime brick). A pressed and subsequently autoclaved unit that consists of sand and lime, with or without the inclusion of other materials.

Clay or shale. A solid or hollow *masonry unit* of clay or shale, usually formed into a rectangular *prism*, then burned or fired in a kiln; brick is a ceramic product.

Concrete. A concrete *masonry unit* made from Portland cement, water, and suitable aggregates, with or without the inclusion of other materials.

[A] BUILDING. Any structure used or intended for supporting or sheltering any use or occupancy.

BUILDING AREA. See "Area, building."

BUILDING ELEMENT. A fundamental component of building construction, listed in Table 601, which may or may not be of fire-resistance-rated construction and is constructed of materials based on the building type of construction.

BUILDING HEIGHT. See "Height, building."

BUILDING-INTEGRATED PHOTOVOLTAIC (BIPV) PRODUCT. A building product that incorporates photovoltaic modules and functions as a component of the building envelope.

BUILDING LINE. The line established by law, beyond which a building shall not extend, except as specifically provided by law.

[A] BUILDING OFFICIAL. The officer or other designated authority charged with the administration and enforcement of this code, or a duly authorized representative.

[BS] BUILT-UP ROOF COVERING. Two or more layers of felt cemented together and surfaced with a cap sheet, mineral *aggregate*, smooth coating or similar surfacing material.

BURIAL CHAMBER MAUSOLEUM. A family mausoleum consisting of six or fewer casket placement crypts plus a chamber to be used for loading of caskets from the interior of the mausoleum which is not below the level of the ground and which is substantially exposed above ground.

CANOPY. A permanent structure or architectural projection of rigid construction over which a covering is attached that provides weather protection, identity or decoration. A canopy is permitted to be structurally independent or supported by attachment to a building on one or more sides.

[F] CARBON DIOXIDE EXTINGUISHING SYSTEMS. A system supplying carbon dioxide (CO₂) from a pressurized vessel through fixed pipes and nozzles. The system includes a manual- or *automatic*-actuating mechanism.

CARBON MONOXIDE ALARM. A device for the purpose of detecting carbon monoxide, that produces a distinct audible alarm, and is listed or labeled with the appropriate standard, either ANSI/UL 2034, Standard for Single and Multiple Station CO Alarms, or UL 2075, Gas and Vapor Detector Sensor, in accordance with its application.

CARE SUITE. In Group I-2 occupancies, a group of treatment rooms, care recipient sleeping rooms and the support rooms or spaces and circulation space within the suite where staff are in attendance for supervision of all care recipients within the suite, and the suite is in compliance with the requirements of Section 407.4.4.

[BS] CAST STONE. A building stone manufactured from Portland cement concrete precast and used as a *trim*, *veeर* or facing on or in buildings or structures.

[F] CEILING LIMIT. The maximum concentration of an airborne contaminant to which one may be exposed. The ceiling limits utilized are those published in DOL 29 CFR Part 1910.1000. The ceiling Recommended Exposure Limit (REL-C) concentrations published by the U.S. National Institute for Occupational Safety and Health (NIOSH), Threshold Limit Value—Ceiling (TLV-C) concentrations published by the American Conference of Governmental Industrial Hygienists (ACGIH), Ceiling Workplace Environmental Exposure Level (WEEL-Ceiling) Guides published by the American Industrial Hygiene Association (AIHA), and other *approved*, consistent measures are allowed as surrogates for hazardous substances not listed in DOL 29 CFR Part 1910.1000.

CEILING RADIATION DAMPER. A *listed* device installed in a ceiling membrane of a fire-resistance-rated floor/ceiling or roof/ceiling assembly to limit *automatically* the radiative heat transfer through an air inlet/outlet opening. Ceiling radiation dampers include air terminal units, ceiling dampers and ceiling air diffusers. Ceiling radiation dampers are classified for use in either static systems that will automatically shut down in the event of a fire, or in dynamic systems that continue to operate during a fire. A dynamic ceiling radiation damper is tested and rated for closure under elevated temperature airflow.

CELL (Group I-3 occupancy). A room within a housing unit in a detention or correctional facility used to confine inmates or prisoners.

[BS] CELL (masonry). A void space having a gross cross-sectional *area* greater than $1\frac{1}{2}$ square inches (967 mm^2).

CELL TIER. Levels of *cells* vertically stacked above one another within a *housing unit*.

[BS] CEMENT PLASTER. A mixture of Portland or blended cement, Portland cement or blended cement and hydrated lime, masonry cement or plastic cement and aggregate and other *approved* materials as specified in this code.

CERAMIC FIBER BLANKET. A high-temperature *mineral wool* insulation material made of alumina-silica ceramic or calcium magnesium silicate soluble fibers and weighing 4 to 10 pounds per cubic foot (pcf) (64 to 160 kg/m³).

CERTIFICATE OF COMPLIANCE. A certificate stating that materials and products meet specified standards or that work was done in compliance with *approved construction documents*.

CHANGE OF OCCUPANCY. Either of the following shall be considered as a change of occupancy where this code requires a greater degree of safety, accessibility, structural strength, fire protection, means of egress, ventilation or sanitation than is existing in the current building or structure:

1. Any change in the occupancy classification of a building or structure.
2. Any change in the purpose of, or a change in the level of activity within, a building or structure.

CHAPEL MAUSOLEUM. A mausoleum for the public that has heat or air conditioning, with or without a committal area or office.

[M] CHIMNEY. A primarily vertical structure containing one or more flues, for the purpose of carrying gaseous products of combustion and air from a fuel-burning appliance to the outdoor atmosphere.

Factory-built chimney. A *listed* and *labeled* chimney composed of factory-made components, assembled in the field in accordance with manufacturer's instructions and the conditions of the listing.

Masonry chimney. A field-constructed *chimney* composed of solid masonry units, bricks, stones, or concrete.

Metal chimney. A field-constructed *chimney* of metal.

[M] CHIMNEY TYPES.

High-heat appliance type. An *approved* chimney for removing the products of combustion from fuel-burning, high-heat appliances producing combustion gases in excess of 2000°F (1093°C) measured at the appliance flue outlet (see Section 2113.11.3).

Low-heat appliance type. An *approved* chimney for removing the products of combustion from fuel-burning, low-heat appliances producing combustion gases not in excess of 1000°F (538°C) under normal operating conditions, but capable of producing combustion gases of 1400°F (760°C) during intermittent forces firing for periods up to 1 hour. Temperatures shall be measured at the appliance flue outlet.

Masonry type. A field-constructed chimney of solid *masonry units* or stones.

Medium-heat appliance type. An *approved* chimney for removing the products of combustion from fuel-burning, medium-heat appliances producing combustion gases not exceeding 2000°F (1093°C) measured at the appliance flue outlet (see Section 2113.11.2).

CIRCULATION PATH. See the *Florida Building Code, Accessibility*.

[F] CLEAN AGENT. Electrically nonconducting, volatile or gaseous fire extinguishant that does not leave a residue upon vaporization.

[E] CLIMATE ZONE. A geographical region that has been assigned climatic criteria as specified in Chapters 3CE and 3RE of the *Florida Building Code, Energy Conservation*.

CLINIC, OUTPATIENT. Buildings or portions thereof used to provide *medical care* on less than a 24-hour basis to persons who are not rendered *incapable of self-preservation* by the services provided.

[F] CLOSED SYSTEM. The use of a *solid* or *liquid hazardous material* involving a closed vessel or system that remains closed during normal operations where vapors emitted by the product are not liberated outside of the vessel or system and the product is not exposed to the atmosphere during normal operations; and all uses of *compressed gases*. Examples of closed systems for *solids* and *liquids* include product conveyed through a piping system into a closed vessel, system or piece of equipment.

[BS] COASTAL A ZONE. Area within a *special flood hazard area*, landward of a V zone or landward of an open coast without mapped *coastal high hazard areas*. In a coastal A zone, the principal source of flooding must be astronomical tides, storm surges, seiches or tsunamis, not riverine flooding. During the base flood conditions, the potential for breaking wave height shall be greater than or equal to $1\frac{1}{2}$ feet (457 mm). The inland limit of the coastal A zone is (a) the Limit of Moderate Wave Action if delineated on a FIRM, or (b) designated by the authority having jurisdiction.

[BS] COASTAL HIGH HAZARD AREA. Area within the *special flood hazard area* extending from offshore to the inland limit of a primary dune along an open coast and any other area that is subject to high-velocity wave action from storms or seismic sources, and shown on a Flood Insurance Rate Map (FIRM) or other flood hazard map as velocity Zone V, VO, VE or V1-30.

[BS] COLLAR JOINT. Vertical longitudinal space between *wythes of masonry* or between *masonry wythe* and backup construction that is permitted to be filled with *mortar* or grout.

[BS] COLLECTOR. A horizontal *diaphragm* element parallel and in line with the applied force that collects and transfers *diaphragm* shear forces to the vertical elements of the lateral force-resisting system or distributes forces within the *diaphragm*, or both.

COLUMBIARIUM. A permanent structure consisting of niches.

COMBINATION FIRE/SMOKE DAMPER. A *listed* device installed in ducts and air transfer openings designed to close *automatically* upon the detection of heat and resist the passage of flame and smoke. The device is installed to operate *automatically*, controlled by a smoke detection system, and where required, is capable of being positioned from a *fire command center*.

COMBINED PILE RAFT. A geotechnical composite construction that combines the bearing effect of both foundation elements, raft and piles, by taking into account interactions between the foundation elements and the subsoil.

[F] COMBUSTIBLE DUST. Finely divided *solid* material that is 420 microns or less in diameter and which, when dispersed in air in the proper proportions, could be ignited by a flame, spark or other source of ignition. Combustible dust will pass through a U.S. No. 40 standard sieve.

[F] COMBUSTIBLE FIBERS. Readily ignitable and free-burning materials in a fibrous or shredded form, such as cocoa fiber, cloth, cotton, excelsior, hay, hemp, henequen, istle, jute, kapok, oakum, rags, sisal, Spanish moss, straw, tow, wastepaper, certain synthetic fibers or other like materials. This definition does not include densely packed baled cotton.

[F] COMBUSTIBLE LIQUID. A *liquid* having a closed cup *flash point* at or above 100°F (38°C). Combustible liquids shall be subdivided as follows:

Class II. *Liquids* having a closed cup *flash point* at or above 100°F (38°C) and below 140°F (60°C).

Class IIIA. *Liquids* having a closed cup *flash point* at or above 140°F (60°C) and below 200°F (93°C).

Class IIIB. *Liquids* having a closed cup *flash point* at or above 200°F (93°C).

The category of combustible liquids does not include *compressed gases* or *cryogenic fluids*.

COMMERCIAL MOTOR VEHICLE. A motor vehicle used to transport passengers or property where the motor vehicle:

1. Has a gross vehicle weight rating of 10,000 pounds (4540 kg) or more; or
2. Is designed to transport 16 or more passengers, including the driver.

COMMISSION. The Florida Building Commission, created per Section 553.74, *Florida Statutes*.

COMMON PATH OF EGRESS TRAVEL. That portion of *exit access* travel distance measured from the most remote point of each room, area or space to that point where the occupants have separate and distinct access to two *exits* or *exit access* doorways.

COMMON USE. Interior or exterior *circulation paths*, rooms, spaces or elements that are not for public use and are made available for the shared use of two or more people.

COMPANION CRYPT. A permanent chamber in a mausoleum for the containment of human remains of more than one individual.

[F] COMPRESSED GAS. A material, or mixture of materials, that:

1. Is a gas at 68°F (20°C) or less at 14.7 pounds per square inch atmosphere (psia) (101 kPa) of pressure; and
2. Has a *boiling point* of 68°F (20°C) or less at 14.7 psia (101 kPa) which is either liquefied, nonliquefied or in solution, except those gases which have no other health- or physical-hazard properties are not considered to be compressed until the pressure in the packaging exceeds 41 psia (282 kPa) at 68°F (20°C).

The states of a compressed gas are categorized as follows:

1. Nonliquefied compressed gases are gases, other than those in solution, which are in a packaging under the charged pressure and are entirely gaseous at a temperature of 68°F (20°C).
2. Liquefied compressed gases are gases that, in a packaging under the charged pressure, are partially *liquid* at a temperature of 68°F (20°C).
3. Compressed gases in solution are nonliquefied gases that are dissolved in a solvent.
4. Compressed gas mixtures consist of a mixture of two or more compressed gases contained in a packaging, the hazard properties of which are represented by the properties of the mixture as a whole.

[BS] CONCRETE.

Carbonate aggregate. Concrete made with aggregates consisting mainly of calcium or magnesium carbonate, such as limestone or dolomite, and containing 40 percent or less quartz, chert or flint.

Cellular. A lightweight insulating concrete made by mixing a preformed foam with Portland cement slurry and having a dry unit weight of approximately 30 pcf (480 kg/m³).

Lightweight aggregate. Concrete made with aggregates of expanded clay, shale, slag or slate or sintered fly ash or any natural lightweight aggregate meeting ASTM C330 and possessing equivalent fire-resistance properties and weighing 85 to 115 pcf (1360 to 1840 kg/m³).

Perlite. A lightweight insulating concrete having a dry unit weight of approximately 30 pcf (480 kg/m³) made with perlite concrete aggregate. Perlite aggregate is produced from a volcanic rock which, when heated, expands to form a glass-like material of cellular structure.

Sand-lightweight. Concrete made with a combination of expanded clay, shale, slag, slate, sintered fly ash, or any natural lightweight aggregate meeting ASTM C330 and possessing equivalent fire-resistance properties and natural sand. Its unit weight is generally between 105 and 120 pcf (1680 and 1920 kg/m³).

Siliceous aggregate. Concrete made with normal-weight aggregates consisting mainly of silica or compounds other than calcium or magnesium carbonate, which contains more than 40-percent quartz, chert or flint.

Vermiculite. A light weight insulating concrete made with vermiculite concrete aggregate which is laminated micaceous material produced by expanding the ore at high temperatures. When added to a Portland cement slurry the resulting concrete has a dry unit weight of approximately 30 pcf (480 kg/m³).

CONGREGATE LIVING FACILITIES. A building or part thereof that contains *sleeping units* where residents share bathroom or kitchen facilities, or both.

CONSTANT LATCHING BOLT. Door-locking hardware installed on the inactive leaf of a pair of doors, which has a bolt that automatically latches into the door frame or the floor, and which holds the inactive leaf in a closed position. The latch bolt is retracted manually to allow the

inactive leaf to be opened (see AUTOMATIC FLUSH BOLT, DEAD BOLT, MANUAL BOLT).

[F] CONSTANTLY ATTENDED LOCATION. A designated location at a facility staffed by trained personnel on a continuous basis where alarm or supervisory signals are monitored and facilities are provided for notification of the fire department or other emergency services.

[A] CONSTRUCTION DOCUMENTS. Written, graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a building *permit*.

CONSTRUCTION TYPES. See Section 602.

Type I. See Section 602.2.

Type II. See Section 602.2.

Type III. See Section 602.3.

Type IV. See Section 602.4.

Type V. See Section 602.5.

[F] CONTROL AREA. Spaces within a building where quantities of *hazardous materials* not exceeding the maximum allowable quantities per control area are stored, dispensed, *used* or handled. See the definition of "Outdoor control area" in the *Florida Fire Prevention Code*.

CONTROLLED LOW-STRENGTH MATERIAL. A self-compacted, cementitious material used primarily as a backfill in place of compacted fill.

CONVENTIONAL LIGHT-FRAME CONSTRUCTION. Construction whose primary structural elements are formed by a system of repetitive wood-framing members. See Chapter 23 for conventional light-frame construction provisions.

CORNICE. A projecting horizontal molded element located at or near the top of an architectural feature.

CORRIDOR. An enclosed *exit access* component that defines and provides a path of egress travel.

CORRIDOR, OPEN-ENDED. See "Open-ended corridor."

CORRIDOR DAMPER. A *listed* device intended for use where air ducts penetrate or terminate at horizontal openings in the ceilings of fire-resistance-rated corridors, where the corridor ceiling is permitted to be constructed as required for the corridor walls.

[BS] CORROSION RESISTANCE. The ability of a material to withstand deterioration of its surface or its properties when exposed to its environment.

[F] CORROSIVE. A chemical that causes visible destruction of, or irreversible alterations in, living tissue by chemical action at the point of contact. A chemical shall be considered corrosive if, when tested on the intact skin of albino rabbits by the method described in DOTN 49 CFR, Part 173.137, such chemical destroys or changes irreversibly the structure of the tissue at the point of contact following an exposure period of 4 hours. This term does not refer to action on inanimate surfaces.

COURT. An open, uncovered space, unobstructed to the sky, bounded on three or more sides by exterior building walls or other enclosing devices.

COVERED MALL BUILDING. A single building enclosing a number of tenants and occupants, such as retail stores, drinking and dining establishments, entertainment and amusement facilities, passenger transportation terminals, offices and other similar uses wherein two or more tenants have a main entrance into one or more malls. *Anchor buildings* shall not be considered as a part of the covered mall building. The term "covered mall building" shall include *open mall buildings* as defined below.

Mall. A roofed or covered common pedestrian area within a *covered mall building* that serves as access for two or more tenants and not to exceed three levels that are open to each other. The term "mall" shall include open malls as defined below.

Open mall. An unroofed common pedestrian way serving a number of tenants not exceeding three levels. Circulation at levels above grade shall be permitted to include open exterior balconies leading to *exits* discharging at grade.

Open mall building. Several structures housing a number of tenants, such as retail stores, drinking and dining establishments, entertainment and amusement facilities, offices, and other similar uses, wherein two or more tenants have a main entrance into one or more open malls. *Anchor buildings* are not considered as a part of the open mall building.

[BS] CRIPPLE WALL. A framed stud wall extending from the top of the foundation to the underside of floor framing for the lowest occupied floor level.

[F] CRITICAL CIRCUIT. A circuit that requires continuous operation to ensure safety of the structure and occupants.

[BS] CROSS-LAMINATED TIMBER. A prefabricated engineered wood product consisting of not less than three layers of solid-sawn lumber or *structural composite lumber* where the adjacent layers are cross oriented and bonded with structural adhesive to form a solid wood element.

[F] CRYOGENIC FLUID. A liquid having a *boiling point* lower than -150°F (-101°C) at 14.7 pounds per square inch atmosphere (psia) (an absolute pressure of 101 kPa).

CRYPT. A permanent chamber in a mausoleum for the containment of human remains.

CUSTODIAL CARE. Assistance with day-to-day living tasks; such as assistance with cooking, taking medication, bathing, using toilet facilities and other tasks of daily living. Custodial care includes persons receiving care who have the ability to respond to emergency situations and evacuate at a slower rate and/or who have mental and psychiatric complications.

[BS] DALLE GLASS. A decorative composite glazing material made of individual pieces of glass that are embedded in a cast matrix of concrete or epoxy.

DAMPER. See "Ceiling radiation damper," "Combination fire/smoke damper," "Corridor damper," "Fire damper" and "Smoke damper."

[BS] DANGEROUS. Any building, structure or portion thereof that meets any of the conditions described below shall be deemed dangerous:

1. The building or structure has collapsed, has partially collapsed, has moved off its foundation or lacks the necessary support of the ground.
2. There exists a significant risk of collapse, detachment or dislodgment of any portion, member, appurtenance or ornamentation of the building or structure under permanent, routine, or frequent loads; under actual loads already in effect; or under wind, rain, flood, or other environmental loads when such loads are imminent.

[F] DAY BOX. A portable magazine designed to hold explosive materials constructed in accordance with the requirements for a Type 3 magazine as defined and classified in the *Florida Fire Prevention Code*.

DEAD BOLT. Door-locking hardware with a bolt which is extended and retracted by action of the lock mechanism (see AUTOMATIC FLUSH BOLT, CONSTANT LATCHING BOLT, MANUAL BOLT).

[BS] DEAD LOAD. The weight of materials of construction incorporated into the building, including but not limited to walls, floors, roofs, ceilings, stairways, built-in partitions, finishes, cladding and other similarly incorporated architectural and structural items, and the weight of fixed service equipment, including cranes and material-handling systems.

DECORATIVE CEMENTITIOUS FINISH. A skim coat, as defined in ASTM C926, of Portland cement-based plaster applied to concrete or masonry surfaces intended for cosmetic purposes.

[BS] DECORATIVE GLASS. A carved, leaded or *Dalle glass* or glazing material whose purpose is decorative or artistic, not functional; whose coloring, texture or other design qualities or components cannot be removed without destroying the glazing material and whose surface, or assembly into which it is incorporated, is divided into segments.

[F] DECORATIVE MATERIALS. All materials applied over the building *interior finish* for decorative, acoustical or other effect including, but not limited to, curtains, draperies, fabrics and streamers; and all other materials utilized for decorative effect including, but not limited to, bulletin boards, artwork, posters, photographs, batting, cloth, cotton, hay, stalks, straw, vines, leaves, trees, moss and similar items, foam plastics and materials containing foam plastics. Decorative materials do not include wall coverings, ceiling coverings, floor coverings, ordinary window shades, *interior finish* and materials 0.025 inch (0.64 mm) or less in thickness applied directly to and adhering tightly to a substrate.

[BS] DEEP FOUNDATION. A deep foundation is a foundation element that does not satisfy the definition of a *shallow foundation*.

DEFEND-IN-PLACE. A method of emergency response that engages building components and trained staff to provide occupant safety during an emergency. Emergency response involves remaining in place, relocating within the building, or both, without evacuating the building.

[A] DEFERRED SUBMITTAL. Those portions of the design that are not submitted at the time of the application and that are to be submitted to the *building official* within a specified period.

[F] DEFLAGRATION. An exothermic reaction, such as the extremely rapid oxidation of a flammable dust or vapor in air, in which the reaction progresses through the unburned material at a rate less than the velocity of sound. A deflagration can have an explosive effect.

DELAYED ACTION CLOSER. Self-closing device that incorporates a delay prior to the initiation of closing. Delayed action closers are mechanical devices with an adjustable delay.

[F] DELUGE SYSTEM. A sprinkler system employing open sprinklers attached to a piping system connected to a water supply through a valve that is opened by the operation of a detection system installed in the same areas as the sprinklers. When this valve opens, water flows into the piping system and discharges from all sprinklers attached thereto.

[BS] DESIGN FLOOD. The *flood* associated with the greater of the following two areas:

1. Area with a flood plain subject to a 1-percent or greater chance of *flooding* in any year.
2. Area designated as a *flood hazard area* on a community's flood hazard map, or otherwise legally designated.

[BS] DESIGN FLOOD ELEVATION. The elevation of the "*design flood*," including wave height, relative to the datum specified on the community's legally designated flood hazard map. In areas designated as Zone AO, the *design flood elevation* shall be the elevation of the highest existing grade of the building's perimeter plus the depth number (in feet) specified on the flood hazard map. In areas designated as Zone AO where a depth number is not specified on the map, the depth number shall be taken as being equal to 2 feet (610 mm).

[A] DESIGN PROFESSIONAL, REGISTERED. See "Registered design professional."

[A] DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE, REGISTERED. See "Registered design professional in responsible charge."

[BS] DESIGN STRENGTH. The product of the nominal strength and a *resistance factor* (or strength reduction factor).

[F] DETACHED BUILDING. A separate single-story building, without a basement or crawl space, used for the storage or *use of hazardous materials* and located an *approved* distance from all structures.

[BS] DETAILED PLAIN CONCRETE STRUCTURAL WALL. See Section 1905.1.1

DETECTABLE WARNING. See the *Florida Building Code, Accessibility*.

[F] DETECTOR, HEAT. A fire detector that senses heat—either abnormally high temperature or rate of rise, or both.

[F] DETONATION. An exothermic reaction characterized by the presence of a shock wave in the material which establishes and maintains the reaction. The reaction zone progresses through the material at a rate greater than the velocity of sound. The principal heating mechanism is one of shock compression. Detonations have an explosive effect.

DETOXIFICATION FACILITIES. Facilities that provide treatment for substance abuse, serving care recipients who are *incapable of self-preservation* or who are harmful to themselves or others.

[BS] DIAPHRAGM. A horizontal or sloped system acting to transmit lateral forces to vertical elements of the lateral force-resisting system. When the term "diaphragm" is used, it shall include horizontal bracing systems.

Diaphragm, blocked. In *light-frame construction*, a diaphragm in which all sheathing edges not occurring on a framing member are supported on and fastened to blocking.

Diaphragm boundary. In *light-frame construction*, a location where shear is transferred into or out of the diaphragm sheathing. Transfer is either to a boundary element or to another force-resisting element.

Diaphragm chord. A diaphragm boundary element perpendicular to the applied load that is assumed to take axial stresses due to the diaphragm moment.

Diaphragm, unblocked. A diaphragm that has edge nailing at supporting members only. Blocking between supporting structural members at panel edges is not included. Diaphragm panels are field nailed to supporting members.

DIMENSIONS (for Chapter 21).

Nominal. The *specified dimension* plus an allowance for the *joints* with which the units are to be laid. Nominal dimensions are usually stated in whole numbers. Thickness is given first, followed by height and then length.

Specified. Dimensions specified for the manufacture or construction of a unit, *joint* or element.

DIRECT ACCESS. A path of travel from a space to an immediately adjacent space through an opening in the common wall between the two spaces.

[F] DISPENSING. The pouring or transferring of any material from a container, tank or similar vessel, whereby vapors, dusts, fumes, mists or gases are liberated to the atmosphere.

DOOR, BALANCED. See "Balanced door."

DOOR, LOW-ENERGY POWER-OPERATED. See "Low-energy power-operated door."

DOOR, POWER-ASSISTED. See "Power-assisted door."

DOOR, POWER-OPERATED. See "Power-operated door."

DOORWAY, EXIT ACCESS. See "Exit access doorway."

DORMITORY. A space in a building where group sleeping accommodations are provided in one room, or in a series of closely associated rooms, for persons not members of the same family group, under joint occupancy and single management, as in college dormitories or fraternity houses.

DRAFTSTOP. A material, device or construction installed to restrict the movement of air within open spaces of concealed areas of building components such as crawl spaces, floor/ceiling assemblies, roof/ceiling assemblies and attics.

[BS] DRAG STRUT. See "Collector."

[BS] DRILLED SHAFT. A cast-in-place deep foundation element, also referred to as caisson, drilled pier and bored pile, constructed by drilling a hole (with or without permanent casing or drilling fluid) into soil or rock and filling it with fluid concrete after the drilling equipment is removed.

Socketed drilled shaft. A drilled shaft with a permanent pipe or tube casing that extends down to bedrock and an uncased socket drilled into the bedrock.

[F] DRY-CHEMICAL EXTINGUISHING AGENT. A powder composed of small particles, usually of sodium bicarbonate, potassium bicarbonate, urea-potassium-based bicarbonate, potassium chloride or monoammonium phosphate, with added particulate material supplemented by special treatment to provide resistance to packing, resistance to moisture absorption (caking) and the proper flow capabilities.

[BS] DRY FLOODPROOFING. A combination of design modifications that results in a building or structure, including the attendant utilities and equipment and sanitary facilities, being water tight with walls substantially impermeable to the passage of water and with structural components having the capacity to resist *loads* as identified in ASCE 7.

DWELLING. A building that contains one or two *dwelling units* used, intended or designed to be used, rented, leased, let or hired out to be occupied for living purposes.

DWELLING UNIT. A single unit providing complete, independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking and sanitation.

DWELLING UNIT, EFFICIENCY. A dwelling unit where all permanent provisions for living, sleeping, eating and cooking are contained in a single room.

DWELLING UNIT OR SLEEPING UNIT, MULTISTORY. See "Multistory unit."

DWELLING UNIT OR SLEEPING UNIT, TYPE A. Reserved.

DWELLING UNIT OR SLEEPING UNIT, TYPE B. Reserved.

EGRESS COURT. A *court* or *yard* which provides access to a *public way* for one or more *exits*.

ELECTRICAL CIRCUIT PROTECTIVE SYSTEM. A specific construction of devices, materials, or coatings installed as a fire-resistive barrier system applied to electrical system components, such as cable trays, conduits and other raceways, open run cables and conductors, cables, and conductors.

[F] ELEVATOR GROUP. A grouping of elevators in a building located adjacent or directly across from one another that responds to common hall call buttons.

[F] EMERGENCY ALARM SYSTEM. A system to provide indication and warning of emergency situations involving *hazardous materials*.

[F] EMERGENCY CONTROL STATION. An *approved* location on the premises where signals from emergency equipment are received and which is staffed by trained personnel.

EMERGENCY ESCAPE AND RESCUE OPENING. An operable exterior window, door or other similar device that provides for a means of escape and access for rescue in the event of an emergency.

[F] EMERGENCY VOICE/ALARM COMMUNICATIONS. Dedicated manual or *automatic* facilities for originating and distributing voice instructions, as well as alert and evacuation signals pertaining to a fire emergency, to the occupants of a building.

[F] EMERGENCY POWER SYSTEM. A source of automatic electric power of a required capacity and duration to operate required life safety, fire alarm, detection and ventilation systems in the event of a failure of the primary power. Emergency power systems are required for electrical loads where interruption of the primary power could result in loss of human life or serious injuries.

EMITTANCE. The ratio of radiant heat flux emitted by a specimen to that emitted by a blackbody at the same temperature and under the same conditions.

EMPLOYEE WORK AREA. See the *Florida Building Code, Accessibility*.

ENFORCEMENT AGENCY.

Local enforcement agency. An agency of local government, a local school board, a community college board of trustees, or a university board of trustees in the State University System with jurisdiction to make inspections of buildings and to enforce the codes which establish standards for design, construction, erection, alteration, repair, modification, or demolition of public or private buildings, structures, or facilities.

State enforcement agency. The agency of state government with authority to make inspections of buildings and to enforce the codes, as required by Chapter 553, *Florida Statutes*, which establish standards for design, construction, erection, alteration, repair, modification, or demolition of public or private buildings, structures, or facilities.

ENGINEER. A Florida-registered engineer.

[BS] ENGINEERED WOOD RIM BOARD. A full-depth structural composite lumber, wood structural panel, structural glued laminated timber or prefabricated wood I-joist member designed to transfer horizontal (shear) and vertical (compression) loads, provide attachment for diaphragm sheathing, siding and exterior deck ledgers, and provide lateral support at the ends of floor or roof joists or rafters.

ENTRANCE, PUBLIC. See "Public entrance."

ENTRANCE, RESTRICTED. See "Restricted entrance."

ENTRANCE, SERVICE. See "Service entrance."

EQUIPMENT PLATFORM. An unoccupied, elevated platform used exclusively for mechanical systems or industrial process equipment, including the associated elevated walkways, stairways, alternating tread devices and ladders necessary to access the platform (see Section 505.3).

ESSENTIAL FACILITIES. Buildings and other structures that are intended to remain operational in the event of extreme environmental loading from *flood*, wind or tornado.

[F] EXHAUSTED ENCLOSURE. An appliance or piece of equipment that consists of a top, a back and two sides providing a means of local exhaust for capturing gases, fumes, vapors and mists. Such enclosures include laboratory hoods, exhaust fume hoods and similar appliances and equipment used to locally retain and exhaust the gases, fumes, vapors and mists that could be released. Rooms or areas provided with general *ventilation*, in themselves, are not exhausted enclosures.

EXISTING BUILDING. A building erected prior to the date of adoption of the appropriate code, or one for which a legal building permit has been issued.

[BS] EXISTING STRUCTURE. A structure erected prior to the date of adoption of the appropriate code, or one for which a legal building *permit* has been issued.

EXIT. That portion of a *means of egress* system between the *exit access* and the *exit discharge* or *public way*. Exit components include exterior exit doors at the *level of exit discharge*, *interior exit stairways* and *ramps*, *exit passageways*, *exterior exit stairways* and *ramps* and *horizontal exits*.

EXIT ACCESS. That portion of a *means of egress* system that leads from any occupied portion of a building or structure to an *exit*.

EXIT ACCESS DOORWAY. A door or access point along the path of egress travel from an occupied room, area or space where the path of egress enters an intervening room, *corridor, exit access stairway or ramp*.

EXIT ACCESS RAMP. A *ramp* within the exit access portion of the means of egress system.

EXIT ACCESS STAIRWAY. A *stairway* with the exit access portion of the means of egress system.

EXIT DISCHARGE. That portion of a *means of egress* system between the termination of an *exit* and a *public way*.

EXIT DISCHARGE, LEVEL OF. The *story* at the point at which an *exit* terminates and an *exit discharge* begins.

EXIT, HORIZONTAL. See "Horizontal exit."

EXIT PASSAGEWAY. An *exit* component that is separated from other interior spaces of a building or structure by fire-resistance-rated construction and opening protectives, and provides for a protected path of egress travel in a horizontal direction to an *exit* or to the *exit discharge*.

EXPANDED VINYL WALL COVERING. Wall covering consisting of a woven textile backing, an expanded vinyl base coat layer and a nonexpanded vinyl skin coat. The expanded base coat layer is a homogeneous vinyl layer that contains a blowing agent. During processing, the blowing agent decomposes, causing this layer to expand by forming closed cells. The total thickness of the wall covering is approximately 0.055 inch to 0.070 inch (1.4 mm to 1.78 mm).

[F] EXPLOSION. An effect produced by the sudden violent expansion of gases, which may be accompanied by a shock wave or disruption, or both, of enclosing materials or structures. An explosion could result from any of the following:

1. Chemical changes such as rapid oxidation, *deflagration* or *detonation*, decomposition of molecules and runaway polymerization (usually *detonations*).
2. Physical changes such as pressure tank ruptures.
3. Atomic changes (nuclear fission or fusion).

[F] EXPLOSIVE. A chemical compound, mixture or device, the primary or common purpose of which is to function by explosion. The term includes, but is not limited to, dynamite, black powder, pellet powder, initiating explosives, detonators, safety fuses, squibs, detonating cord, igniter cord, igniters and display fireworks, 1.3G.

The term "explosive" includes any material determined to be within the scope of USC Title 18: Chapter 40 and also includes any material classified as an explosive other than consumer fireworks, 1.4G by the *hazardous materials* regulations of DOTn 49 CFR Parts 100-185.

High explosive. Explosive material, such as dynamite, which can be caused to detonate by means of a No. 8 test blasting cap when unconfined.

Low explosive. Explosive material that will burn or deflagrate when ignited. It is characterized by a rate of reaction that is less than the speed of sound. Examples of low explosives include, but are not limited to, black powder; safety fuse; igniters; igniter cord; fuse lighters; fireworks, 1.3G and propellants, 1.3C.

Mass-detonating explosives. Division 1.1, 1.2 and 1.5 explosives alone or in combination, or loaded into various types of ammunition or containers, most of which can be expected to explode virtually instantaneously when a small portion is subjected to fire, severe concussion, impact, the impulse of an initiating agent or the effect of a considerable discharge of energy from without. Materials that react in this manner represent a mass explosion hazard. Such an explosive will normally cause severe structural damage to adjacent objects. Explosive propagation could occur immediately to other items of ammunition and explosives stored sufficiently close to and not adequately protected from the initially exploding pile with a time interval short enough so that two or more quantities must be considered as one for quantity-distance purposes.

UN/DOTn Class 1 explosives. The former classification system used by DOTn included the terms "high" and "low" explosives as defined herein. The following terms further define explosives under the current system applied by DOTn for all explosive materials defined as hazard Class 1 materials. Compatibility group letters are used in concert with the division to specify further limitations on each division noted (i.e., the letter G identifies the material as a pyrotechnic substance or article containing a pyrotechnic substance and similar materials).

Division 1.1. Explosives that have a mass explosion hazard. A mass explosion is one which affects almost the entire load instantaneously.

Division 1.2. Explosives that have a projection hazard but not a mass explosion hazard.

Division 1.3. Explosives that have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard.

Division 1.4. Explosives that pose a minor explosion hazard. The explosive effects are largely confined to the package and no projection of fragments of appreciable size or range is to be expected. An external fire must not cause virtually instantaneous explosion of almost the entire contents of the package.

Division 1.5. Very insensitive explosives. This division is comprised of substances that have a mass explosion hazard, but that are so insensitive there is very little probability of initiation or of transition from burning to *detonation* under normal conditions of transport.

Division 1.6. Extremely insensitive articles which do not have a mass explosion hazard. This division is comprised of articles that contain only extremely insensitive detonating substances and which demonstrate a negligible probability of accidental initiation or propagation.

EXTERIOR ELEVATED FLOORING SYSTEM. An assembly installed over a roof assembly or other exterior supporting structure consisting of a walking surface of pedestrian deck panels or pavers mounted on pedestals using other accessory components, mechanical fasteners or adhesives as required by the manufacturer's installation instructions for attaching pedestrian deck panels or pavers to pedestals and other accessory components. Exterior elevated flooring systems may have pedestals attached to the roof or other supporting structure or pedestals installed independently of the roof or supporting structure with the restraint of the pavers at the perimeter and discontinuous edges. Exterior elevated flooring systems are not part of the roof assembly.

Attached systems. Attached systems are those where pedestals are attached to the roof or other supporting structure by mechanical fasteners, adhesives or both.

Independent systems. Independent systems are those where pedestals are not attached to the roof but rest on the roof or other supporting structure.

EXTERIOR EXIT RAMP. An exit component that serves to meet one or more *means of egress* design requirements, such as required number of exits or *exit access* travel distance, and is open to *yards, courts or public ways*.

EXTERIOR EXIT STAIRWAY. An exit component that serves to meet one or more *means of egress* design requirements, such as required number of exits or *exit access* travel distance, and is open to *yards, courts or public ways*.

EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS). EIFS are nonstructural, nonload-bearing, *exterior wall* cladding systems that consist of an insulation board attached either adhesively or mechanically, or both, to the substrate; an integrally reinforced base coat and a textured protective finish coat.

EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS) WITH DRAINAGE. An EIFS that incorporates a means of drainage applied over a *water-resistant barrier*.

EXTERIOR SURFACES. Weather-exposed surfaces.

EXTERIOR WALL. A wall, bearing or nonbearing, that is used as an enclosing wall for a building, other than a *fire wall*, and that has a slope of 60 degrees (1.05 rad) or greater with the horizontal plane.

EXTERIOR WALL COVERING. A material or assembly of materials applied on the exterior side of *exterior walls* for the purpose of providing a weather-resisting barrier, insulation or for aesthetics, including but not limited to, *veneers, siding, exterior insulation and finish systems, architectural trim* and embellishments such as *cornices, soffits, fascias, gutters and leaders*.

EXTERIOR WALL ENVELOPE. A system or assembly of *exterior wall* components, including *exterior wall* finish materials, that provides protection of the building structural members, including framing and sheathing materials, and conditioned interior space, from the detrimental effects of the exterior environment.

F RATING. The time period that the *through-penetration firestop system* limits the spread of fire through the penetration when tested in accordance with ASTM E814 or UL 1479.

FABRIC PARTITION. A partition consisting of a finished surface made of fabric, without a continuous rigid backing, that is directly attached to a framing system in which the vertical framing members are spaced greater than 4 feet (1219 mm) on center.

[BS] FABRICATED ITEM. Structural, load-bearing or lateral load-resisting members of assemblies consisting of materials assembled prior to installation in a building or structure, or subjected to operations such as heat treatment, thermal cutting, cold working or reforming after manufacture and prior to installation in a building or structure. Materials produced in accordance with standards referenced by this code, such as rolled structural steel shapes, steel reinforcing bars, *masonry units* and *wood structural panels*, or in accordance with a referenced standard that provides requirements for quality control done under the supervision of a third-party quality control agency, are not "fabricated items."

[F] FABRICATION AREA. An area within a semiconductor fabrication facility and related research and development areas in which there are processes using hazardous production materials. Such areas are allowed to include ancillary rooms or areas such as dressing rooms and offices that are directly related to the fabrication area processes.

[A] FACILITY. All or any portion of buildings, structures, *site* improvements, elements and pedestrian or vehicular routes located on a *site*.

[BS] FACTORED LOAD. The product of a *nominal load* and a *load factor*.

FAMILY MAUSOLEUM. A mausoleum for the private use of a family or group of family members.

FENESTRATION. Products classified as either vertical fenestration or skylights and sloped glazing, installed in such a manner as to preserve the weather-resistant barrier of the wall or roof in which they are installed. Fenestration includes products with glass or other transparent or translucent materials.

FENESTRATION, VERTICAL. Windows that are fixed or movable, opaque doors, glazed doors, glazed block and combination opaque and glazed doors installed in a wall at less than 15 degrees from vertical.

[BS] FIBER-CEMENT (BACKER BOARD, SIDING, SOFFIT, TRIM AND UNDERLayment) PRODUCTS. Manufactured thin section composites of hydraulic cementitious matrices and discrete nonasbestos fibers.

FIBER-REINFORCED POLYMER. A polymeric composite material consisting of reinforcement fibers, such as glass, impregnated with a fiber-binding polymer which is then molded and hardened. Fiber-reinforced polymers are permitted to contain cores laminated between fiber-reinforced polymer facings.

[BS] FIBERBOARD. A fibrous, homogeneous panel made from lignocellulosic fibers (usually wood or cane) and having a density of less than 31 pounds per cubic foot (pcf) (497 kg/m³) but more than 10 pcf (160 kg/m³).

[BS] FIELD NAILING. See "Nailing, field."

FIRE ALARM BOX, MANUAL. See "Manual fire alarm box."

[F] FIRE ALARM CONTROL UNIT. A system component that receives inputs from *automatic* and manual *fire alarm* devices and may be capable of supplying power to detection devices and transponders or off-premises transmitters. The control unit may be capable of providing a transfer of power to the notification appliances and transfer of condition to relays or devices.

[F] FIRE ALARM SIGNAL. A signal initiated by a *fire alarm-initiating device* such as a *manual fire alarm box*, *automatic fire detector*, waterflow switch or other device whose activation is indicative of the presence of a fire or fire signature.

[F] FIRE ALARM SYSTEM. A system or portion of a combination system consisting of components and circuits arranged to monitor and annunciate the status of *fire alarm* or *supervisory signal-initiating devices* and to initiate the appropriate response to those signals.

FIRE AREA. The aggregate floor area enclosed and bounded by *fire walls*, *fire barriers*, *exterior walls* or *horizontal assemblies* of a building. Areas of the building not provided with surrounding walls shall be included in the fire area if such areas are included within the horizontal projection of the roof or floor next above.

FIRE BARRIER. A fire-resistance-rated wall assembly of materials designed to restrict the spread of fire in which continuity is maintained.

[F] FIRE COMMAND CENTER. The principal attended or unattended location where the status of detection, alarm communications and control systems is displayed, and from which the systems can be manually controlled.

FIRE DAMPER. A *listed* device installed in ducts and air transfer openings designed to close *automatically* upon detection of heat and resist the passage of flame. Fire dampers are classified for use in either static systems that will *automatically* shut down in the event of a fire, or in dynamic systems that continue to operate during a fire. A dynamic fire damper is tested and rated for closure under elevated temperature airflow.

[F] FIRE DETECTOR, AUTOMATIC. A device designed to detect the presence of a fire signature and to initiate action.

FIRE DOOR. The door component of a *fire door assembly*.

FIRE DOOR ASSEMBLY. Any combination of a *fire door*, frame, hardware and other accessories that together provide a specific degree of fire protection to the opening.

FIRE DOOR ASSEMBLY, FLOOR. See "Floor fire door assembly."

FIRE EXIT HARDWARE. *Panic hardware* that is *listed* for use on *fire door assemblies*.

[F] FIRE LANE. A road or other passageway developed to allow the passage of fire apparatus. A fire lane is not necessarily intended for vehicular traffic other than fire apparatus.

FIRE PARTITION. A vertical assembly of materials designed to restrict the spread of fire in which openings are protected.

FIRE PROTECTION RATING. The period of time that an opening protective will maintain the ability to confine a fire as determined by tests specified in Section 716. Ratings are stated in hours or minutes.

[F] FIRE PROTECTION SYSTEM. *Approved* devices, equipment and systems or combinations of systems used to detect a fire, activate an alarm, extinguish or control a fire, control or manage smoke and products of a fire or any combination thereof.

FIRE RESISTANCE. That property of materials or their assemblies that prevents or retards the passage of excessive heat, hot gases or flames under conditions of use.

[F] FIRE SAFETY FUNCTIONS. Building and fire control functions that are intended to increase the level of life safety for occupants or to control the spread of harmful effects of fire.

FIRE SEPARATION DISTANCE. The distance measured from the building face to one of the following:

1. The closest interior *lot line*.
2. To the centerline of a street, an alley or *public way*.
3. To an imaginary line between two buildings on the lot.

The distance shall be measured at right angles from the face of the wall.

FIRE WALL. A fire-resistance-rated wall having protected openings, which restricts the spread of fire and extends continuously from the foundation to or through the roof, with sufficient structural stability under fire conditions to allow collapse of construction on either side without collapse of the wall.

FIRE WINDOW ASSEMBLY. A window constructed and glazed to give protection against the passage of fire.

FIREBLOCKING. Building materials, or materials *approved* for use as fireblocking, installed to resist the free passage of flame to other areas of the building through concealed spaces.

[M] FIREPLACE. A hearth and fire chamber or similar prepared place in which a fire may be made and which is built in conjunction with a chimney.

FIREPLACE THROAT. The opening between the top of the firebox and the smoke chamber.

FIRE-RATED GLAZING. Glazing with either a *fire protection rating* or a *fire-resistance rating*.

FIRE-RESISTANCE RATING. The period of time a building element, component or assembly maintains the ability to confine a fire, continues to perform a given structural function, or both, as determined by the tests, or the methods based on tests, prescribed in Section 703.

FIRE-RESISTANT JOINT SYSTEM. An assemblage of specific materials or products that are designed, tested and fire-resistance rated in accordance with either ASTM E1966 or UL 2079 to resist for a prescribed period of time the passage of fire through *joints* made in or between fire-resistance-rated assemblies.

FIRESTOP, MEMBRANE-PENETRATION. See "Membrane-penetration firestop."

FIRESTOP, PENETRATION. See "Penetration firestop."

FIRESTOP SYSTEM, THROUGH-PENETRATION. See "Through-penetration firestop system."

[F] FIREWORKS. Any composition or device for the purpose of producing a visible or audible effect for entertainment purposes by combustion, *deflagration* or *detonation* that meets the definition of 1.4G fireworks or 1.3G fireworks.

Fireworks, 1.3G. Large fireworks devices, which are explosive materials, intended for use in fireworks displays and designed to produce audible or visible effects by combustion, *deflagration* or *detonation*. Such 1.3G fireworks include, but are not limited to, firecrackers containing more than 130 milligrams (2 grains) of explosive composition, aerial shells containing more than 40 grams of pyrotechnic composition, and other display pieces which exceed the limits for classification as 1.4G fireworks. Such 1.3G fireworks are also described as fireworks, UN0335 by the DOTn.

Fireworks, 1.4G. Small fireworks devices containing restricted amounts of pyrotechnic composition designed primarily to produce visible or audible effects by combustion. Such 1.4G fireworks which comply with the construction, chemical composition and labeling regulations of the DOTn for fireworks, UN0336, and the U.S. Consumer Product Safety Commission (CPSC) as set forth in CPSC 16 CFR: Parts 1500 and 1507, are not explosive materials for the purpose of this code.

FIXED BASE OPERATOR (FBO). A commercial business granted the right by the airport sponsor to operate on an airport and provide aeronautical services, such as fueling, hangaring, tie-down and parking, aircraft rental, aircraft maintenance and flight instruction.

FIXED SEATING. Furniture or fixture designed and installed for the use of sitting and secured in place including bench-type seats and seats with or without backs or armrests.

FLAME SPREAD. The propagation of flame over a surface.

FLAME SPREAD INDEX. A comparative measure, expressed as a dimensionless number, derived from visual measurements of the spread of flame versus time for a material tested in accordance with ASTM E84 or UL 723.

[F] FLAMMABLE GAS. A material that is a gas at 68°F (20°C) or less at 14.7 pounds per square inch atmosphere (psia) (101 kPa) of pressure [a material that has a *boiling point* of 68°F (20°C) or less at 14.7 psia (101 kPa)] which:

1. Is ignitable at 14.7 psia (101 kPa) when in a mixture of 13 percent or less by volume with air; or
2. Has a flammable range at 14.7 psia (101 kPa) with air of at least 12 percent, regardless of the lower limit.

The limits specified shall be determined at 14.7 psi (101 kPa) of pressure and a temperature of 68°F (20°C) in accordance with ASTM E681.

[F] FLAMMABLE LIQUEFIED GAS. A liquefied compressed gas which, under a charged pressure, is partially liquid at a temperature of 68°F (20°C) and which is flammable.

[F] FLAMMABLE LIQUID. A *liquid* having a closed cup *flash point* below 100°F (38°C). Flammable liquids are further categorized into a group known as Class I liquids. The Class I category is subdivided as follows:

Class IA. *Liquids* having a *flash point* below 73°F (23°C) and a *boiling point* below 100°F (38°C).

Class IB. *Liquids* having a *flash point* below 73°F (23°C) and a *boiling point* at or above 100°F (38°C).

Class IC. *Liquids* having a *flash point* at or above 73°F (23°C) and below 100°F (38°C). The category of flammable liquids does not include compressed gases or cryogenic fluids.

[F] FLAMMABLE MATERIAL. A material capable of being readily ignited from common sources of heat or at a temperature of 600°F (316°C) or less.

[F] FLAMMABLE SOLID. A *solid*, other than a blasting agent or *explosive*, that is capable of causing fire through friction, absorption or moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which has an ignition temperature below 212°F (100°C) or which burns so vigorously and persistently when ignited as to create a serious hazard. A chemical shall be considered a flammable solid as determined in accordance with the test method of CPSC 16 CFR; Part 1500.44, if it ignites and burns with a self-sustained flame at a rate greater than 0.1 inch (2.5 mm) per second along its major axis.

[F] FLAMMABLE VAPORS OR FUMES. The concentration of flammable constituents in air that exceeds 25 percent of their *lower flammable limit (LFL)*.

[F] FLASH POINT. The minimum temperature in degrees Fahrenheit at which a *liquid* will give off sufficient vapors to form an ignitable mixture with air near the surface or in the container, but will not sustain combustion. The flash point of a *liquid* shall be determined by appropriate

test procedure and apparatus as specified in ASTM D56, ASTM D93 or ASTM D3278.

FLIGHT. A continuous run of rectangular treads, *winders* or combination thereof from one landing to another.

FLOATING RESIDENTIAL UNIT. A structure primarily designed or constructed as a living unit, built on a floating base, which is not designed primarily as a vessel, is not self-propelled although it may be towed about from place to place, and is primarily intended to be anchored or otherwise moored in a fixed location.

[BS] FLOOD or FLOODING. A general and temporary condition of partial or complete inundation of normally dry land from:

1. The overflow of inland or tidal waters.
2. The unusual and rapid accumulation or runoff of surface waters from any source.

[BS] FLOOD DAMAGE-RESISTANT MATERIALS. Any construction material capable of withstanding direct and prolonged contact with floodwaters without sustaining any damage that requires more than cosmetic *repair*.

FLOOD, DESIGN. See "Design flood."

FLOOD ELEVATION, DESIGN. See "Design flood elevation."

[BS] FLOOD HAZARD AREA. The greater of the following two areas:

1. The area within a flood plain subject to a 1-percent or greater chance of *flooding* in any year.
2. The area designated as a flood hazard area on a community's flood hazard map, or otherwise legally designated.

FLOOD HAZARD AREAS, SPECIAL. See "Special flood hazard area."

[BS] FLOOD INSURANCE RATE MAP (FIRM). An official map of a community on which the Federal Emergency Management Agency (FEMA) has delineated both the *special flood hazard areas* and the risk premium zones applicable to the community.

[BS] FLOOD INSURANCE STUDY. The official report provided by the Federal Emergency Management Agency containing the Flood Insurance Rate Map (FIRM), the Flood Boundary and Floodway Map (FBFM), the water surface elevation of the *base flood* and supporting technical data.

[BS] FLOODWAY. The channel of the river, creek or other watercourse and the adjacent land areas that must be reserved in order to discharge the *base flood* without cumulatively increasing the water surface elevation more than a designated height.

FLOOR AREA, GROSS. The floor area within the inside perimeter of the *exterior walls* of the building under consideration, exclusive of vent *shafts* and *courts*, without deduction for *corridors*, *stairways*, *ramps*, closets, the thickness of interior walls, columns or other features. The floor area of a building, or portion thereof, not provided with surrounding *exterior walls* shall be the usable area under the horizontal projection of the roof or floor above. The gross floor area shall not include *shafts* with no openings or interior *courts*.

FLOOR AREA, NET. The actual occupied area not including unoccupied accessory areas such as *corridors*, *stairways*, *ramps*, toilet rooms, mechanical rooms and closets.

FLOOR FIRE DOOR ASSEMBLY. A combination of a *fire door*, a frame, hardware and other accessories installed in a horizontal plane, which together provide a specific degree of fire protection to a through-opening in a fire-resistance-rated floor (see Section 712.1.13.1).

[F] FOAM-EXTINGUISHING SYSTEM. A special system discharging a foam made from concentrates, either mechanically or chemically, over the area to be protected.

FOAM PLASTIC INSULATION. A plastic that is intentionally expanded by the use of a foaming agent to produce a reduced-density plastic containing voids consisting of open or closed cells distributed throughout the plastic for thermal insulating or acoustical purposes and that has a density less than 20 pounds per cubic foot (pcf) (320 kg/m³).

FOLDING AND TELESCOPIC SEATING. Tiered seating having an overall shape and size that is capable of being reduced for purposes of moving or storing and is not a building element.

FOOD COURT. A public seating area located in the *mall* that serves adjacent food preparation tenant spaces.

FOSTER CARE FACILITIES. Facilities that provide care to more than five children, 2 $\frac{1}{2}$ years of age or less.

[BS] FOUNDATION PIER (for Chapter 21). An isolated vertical foundation member whose horizontal dimension measured at right angles to its thickness does not exceed three times its thickness and whose height is equal to or less than four times its thickness.

FRAME STRUCTURE. A building or other structure in which vertical *loads* from floors and roofs are primarily supported by columns.

GABLE. The triangular portion of a wall beneath the end of a dual-slope, pitched, or mono-slope roof or portion thereof and above the top plates of the story or level of the ceiling below.

GARAGE DOOR MANUFACTURER. The party responsible for the completed assembly of the garage door components.

GARDEN MAUSOLEUM. A mausoleum for the public built without heat or air conditioning but may contain an open-air committal area.

[F] GAS CABINET. A fully enclosed, ventilated noncombustible enclosure used to provide an isolated environment for *compressed gas* cylinders in storage or *use*. Doors and access ports for exchanging cylinders and accessing pressure-regulating controls are allowed to be included.

[F] GAS DETECTION SYSTEM. A system or portion of a combination system that utilizes one or more stationary sensors to detect the presence of a specified gas at a specified concentration and initiate one or more responses required by this code, such as notifying a responsible person, activating an alarm signal, or activating or deactivating equipment. A self-contained gas detection and alarm device is not classified as a gas detection system.

[F] GAS ROOM. A separately ventilated, fully enclosed room in which only *compressed gases* and associated equipment and supplies are stored or *used*.

[F] GASEOUS HYDROGEN SYSTEM. An assembly of piping, devices and apparatus designed to generate, store, contain, distribute or transport a nontoxic, gaseous hydrogen-containing mixture having not less than 95-percent hydrogen gas by volume and not more than 1-percent oxygen by volume. Gaseous hydrogen systems consist of items such as *compressed gas* containers, reactors and appurtenances, including pressure regulators, pressure relief devices, manifolds, pumps, compressors and interconnecting piping and tubing and controls.

GLASS FIBERBOARD. Fibrous glass roof insulation consisting of inorganic glass fibers formed into rigid boards using a binder. The board has a top surface faced with asphalt and kraft reinforced with glass fiber.

GLASS MAT GYPSUM PANEL. A gypsum panel consisting of a noncombustible core primarily of gypsum, surfaced with glass mat partially or completely embedded in the core.

[BS] GRADE (LUMBER). The classification of lumber in regard to strength and utility in accordance with American Softwood Lumber Standard DOC PS 20 and the grading rules of an *approved* lumber rules-writing agency.

GRADE PLANE. A reference plane representing the average of finished ground level adjoining the building at *exterior walls*. Where the finished ground level slopes away from the *exterior walls*, the reference plane shall be established by the lowest points within the area between the building and the *lot line* or, where the *lot line* is more than 6 feet (1829 mm) from the building, between the building and a point 6 feet (1829 mm) from the building.

GRADE PLANE, STORY ABOVE. See "Story above grade plane."

GRANDSTAND. Tiered seating supported on a dedicated structural system and two or more rows high and is not a building element (see "*Bleachers*").

GROSS LEASABLE AREA. The total floor area designed for tenant occupancy and exclusive use. The area of tenant occupancy is measured from the centerlines of joint partitions to the outside of the tenant walls. All tenant areas, including areas used for storage, shall be included in calculating gross leasable area.

GROUP HOME. A facility for social rehabilitation, substance abuse or mental health problems that contains a group housing arrangement that provides *custodial care* but does not provide medical care.

GUARD. A building component or a system of building components located at or near the open sides of elevated walking surfaces that minimizes the possibility of a fall from the walking surface to a lower level.

GUEST ROOM. A room used or intended to be used by one or more guests for living or sleeping purposes.

GYPSUM BOARD. The generic name for a family of sheet products consisting of a noncombustible core primarily of gypsum with paper surfacing.

[BS] GYPSUM PANEL PRODUCT. The general name for a family of sheet products consisting essentially of gypsum complying with the standards specified in Tables 2506.2 and 2507.2, and Chapter 35. Gypsum board and glass mat gypsum panels are examples of gypsum panel products.

[BS] GYPSUM PLASTER. A mixture of calcined gypsum or calcined gypsum and lime and aggregate and other *approved* materials as specified in this code.

GYPSUM SHEATHING. Gypsum panel products specifically manufactured with enhanced water resistance for use as a substrate for exterior surface materials.

[BS] GYPSUM VENEER PLASTER. *Gypsum plaster* applied to an *approved* base in one or more coats normally not exceeding $\frac{1}{4}$ inch (6.4 mm) in total thickness.

GYPSUM WALLBOARD. A gypsum board used primarily as an interior surfacing for building structures.

HABITABLE SPACE. A space in a building for living, sleeping, eating or cooking. Bathrooms, toilet rooms, closets, halls, screen enclosures, sunroom Categories I, II, III and IV as defined in Section 2002.6, storage or utility spaces and similar areas are not considered habitable spaces.

[F] HALOGENATED EXTINGUISHING SYSTEM. A fire-extinguishing system using one or more atoms of an element from the halogen chemical series: fluorine, chlorine, bromine and iodine.

[F] HANDLING. The deliberate transport by any means to a point of storage or *use*.

HANDRAIL. A horizontal or sloping rail intended for grasping by the hand for guidance or support.

HARDBOARD. A fibrous-felted, homogeneous panel made from lignocellulosic fibers consolidated under heat and pressure in a hot press to a density not less than 31 pcf (497 kg/m³).

HARDWARE. See "Fire exit hardware" and "Panic hardware."

[F] HAZARDOUS MATERIALS. Those chemicals or substances that are *physical hazards* or *health hazards* as classified in Section 307 and the *Florida Fire Prevention Code*, whether the materials are in usable or waste condition.

[F] HAZARDOUS PRODUCTION MATERIAL (HPM). A *solid, liquid* or gas associated with semiconductor manufacturing that has a degree-of-hazard rating in health, flammability or instability of Class 3 or 4 as ranked by NFPA 704 and which is *used* directly in research, laboratory or production processes which have as their end product materials that are not hazardous.

[BS] HEAD JOINT. Vertical *mortar joint* placed between *masonry units* within the *wythe* at the time the *masonry units* are laid.

[F] HEALTH HAZARD. A classification of a chemical for which there is statistically significant evidence that acute or chronic health effects are capable of occurring in exposed persons. The term "health hazard" includes chemicals that are *toxic* or *highly toxic*, and *corrosive*.

HEAT DETECTOR. See "Detector, heat."

HEIGHT, BUILDING. The vertical distance from *grade plane* to the average height of the highest roof surface.

HEIGHT, THRESHOLD BUILDING. The height of the building is at the mean distance between the eaves and the ridge of the roofing structure. If the distance from grade to the line which is the mean distance between the eaves and the ridge of the roofing structure is more than 50 feet (16 240 mm), the building is to be considered a "threshold building" within the contemplation of the Threshold Building Act.

HELICAL PILE. Manufactured steel deep foundation element consisting of a central shaft and one or more helical bearing plates. A helical pile is installed by rotating it into the ground. Each helical bearing plate is formed into a screw thread with a uniform defined pitch.

HELIPAD. A structural surface that is used for the landing, taking off, taxiing and parking of helicopters.

HELIPORT. An area of land or water or a structural surface that is used, or intended for use, for the landing and taking off of helicopters, and any appurtenant areas that are used, or intended for use, for heliport buildings or other heliport facilities.

HELISTOP. The same as "heliport," except that no fueling, defueling, maintenance, repairs or storage of helicopters is permitted.

HIGH-PRESSURE DECORATIVE EXTERIOR-GRADE COMPACT LAMINATE (HPL). Panels consisting of layers of cellulose fibrous material impregnated with thermosetting resins and bonded together by a high-pressure process to form a homogeneous nonporous core suitable for exterior use.

HIGH-PRESSURE DECORATIVE EXTERIOR-GRADE COMPACT LAMINATE (HPL) SYSTEM. An *exterior wall covering* fabricated using HPL in a specific assembly including joints, seams, attachments, substrate, framing and other details as appropriate to a particular design.

HIGH-RISE BUILDING. A building with an occupied floor located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access.

HIGH VELOCITY HURRICANE ZONE. This zone consists of Broward and Miami-Dade counties.

[F] HIGHLY TOXIC. A material which produces a lethal dose or lethal concentration that falls within any of the following categories:

1. A chemical that has a median lethal dose (LD_{50}) of 50 milligrams or less per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.
2. A chemical that has a median lethal dose (LD_{50}) of 200 milligrams or less per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between 2 and 3 kilograms each.
3. A chemical that has a median lethal concentration (LC_{50}) in air of 200 parts per million by volume or less of gas or vapor, or 2 milligrams per liter or less of mist, fume or dust, when administered by continuous inhalation for 1 hour (or less if death occurs within 1 hour) to albino rats weighing between 200 and 300 grams each.

Mixtures of these materials with ordinary materials, such as water, might not warrant classification as *highly toxic*. While this system is basically simple in application, any hazard evaluation that is required for the precise categorization of this type of material shall be performed by experienced, technically competent persons.

[A] HISTORIC BUILDINGS. Buildings that are listed in or eligible for listing in the National Register of Historic Places, or designated as historic under an appropriate state or local law (see Chapter 12 of the *Florida Building Code, Existing Building*).

HORIZONTAL ASSEMBLY. A fire-resistance-rated floor or *roof assembly* of materials designed to restrict the spread of fire in which continuity is maintained.

HORIZONTAL EXIT. An *exit* component consisting of fire-resistance-rated construction and opening protectives intended to compartmentalize portions of a building or another building thereby creating refuge areas that afford safety from the fire and smoke from the area of fire origin.

HOSPITALS AND PSYCHIATRIC HOSPITALS. Facilities that provide care or treatment for the medical, psychiatric, obstetrical, or surgical treatment of care recipients who are *incapable of self-preservation*.

HOUSING UNIT. A *dormitory* or a group of *cells* with a common dayroom in Group I-3.

[F] HPM. See "Hazardous Production Material."

[F] HPM ROOM. A room used in conjunction with or serving a Group H-5 occupancy, where *HPM* is stored or *used* and which is classified as a Group H-2, H-3 or H-4 occupancy.

[BS] HURRICANE-PRONE REGIONS. Areas vulnerable to hurricanes defined as:

1. The U. S. Atlantic Ocean and Gulf of Mexico coasts where the ultimate design wind speed, V_{ult} , for Risk Category II buildings is greater than 115 mph (51.4 m/s);
2. Hawaii, Puerto Rico, Guam, Virgin Islands and American Samoa.

[F] HYDROGEN FUEL GAS ROOM. A room or space that is intended exclusively to house a *gaseous hydrogen system*.

[BS] ICE-SENSITIVE STRUCTURE. A structure for which the effect of an atmospheric ice *load* governs the design of a structure or portion thereof. This includes, but is not limited to, lattice structures, guyed masts, overhead lines, light suspension and cable-stayed bridges, aerial cable systems (e.g., for ski lifts or logging operations), amusement rides, open catwalks and platforms, flagpoles and signs.

[F] IMMEDIATELY DANGEROUS TO LIFE AND HEALTH (IDLH). The concentration of airborne contaminants which poses a threat of death, immediate or delayed permanent adverse health effects, or effects that could prevent escape from such an environment. This contaminant concentration level is established by the National Institute of Occupational Safety and Health (NIOSH) based on both toxicity and flammability. It generally is expressed in parts per million by volume (ppmv/v) or milligrams per cubic meter (mg/m³). If adequate data do not exist for precise establishment of IDLH concentrations, an independent certified industrial hygienist, industrial toxicologist, appropriate regulatory agency or other source *approved* by the *building official* shall make such determination.

[BS] IMPACT LOAD. The *load* resulting from moving machinery, elevators, craneways, vehicles and other similar forces and kinetic *loads*, pressure and possible surcharge from fixed or moving *loads*.

INCAPABLE OF SELF-PRESERVATION. Persons who, because of age, physical limitations, mental limitations, chemical dependency or medical treatment, cannot respond as an individual to an emergency situation.

[F] INCOMPATIBLE MATERIALS. Materials that, when mixed, have the potential to react in a manner that generates heat, fumes, gases or byproducts which are hazardous to life or property.

INDIVIDUAL TRUSS MEMBER. A truss chord or truss web.

[F] INERT GAS. A gas that is capable of reacting with other materials only under abnormal conditions such as high temperatures, pressures and similar extrinsic physical forces. Within the context of the code, inert gases do not exhibit either physical or health hazard properties as defined (other than acting as a simple asphyxiant) or hazard properties other than those of a *compressed gas*. Some of the more common inert gases include argon, helium, krypton, neon, nitrogen and xenon.

[F] INITIATING DEVICE. A system component that originates transmission of a change-of-state condition, such as in a *smoke detector*, *manual fire alarm box* or supervisory switch.

INSULATING SHEATHING. A rigid panel or board insulation material having a thermal resistance of not less than R-2 of the core material with properties suitable for use on walls, floors, roofs or foundations.

INTENDED TO BE OCCUPIED AS A RESIDENCE. This refers to a *dwelling unit* or *sleeping unit* that can or will be used all or part of the time as the occupant's place of abode.

INTERIOR EXIT RAMP. An *exit* component that serves to meet one or more *means of egress* design requirements, such as required number of *exits* or *exit access* travel distance, and provides for a protected path of egress travel to the *exit discharge* or *public way*.

INTERIOR EXIT STAIRWAY. An *exit* component that serves to meet one or more *means of egress* design requirements, such as required number of *exits* or *exit access* travel distance, and provides for a protected path of egress travel to the *exit discharge* or *public way*.

INTERIOR FINISH. Interior finish includes *interior wall and ceiling finish* and *interior floor finish*.

INTERIOR FLOOR FINISH. The exposed floor surfaces of buildings including coverings applied over a finished floor or *stair*, including risers.

INTERIOR FLOOR-WALL BASE. *Interior floor finish trim* used to provide a functional or decorative border at the intersection of walls and floors.

INTERIOR SURFACES. Surfaces other than weather exposed surfaces.

INTERIOR WALL AND CEILING FINISH. The exposed *interior surfaces* of buildings, including but not limited to: fixed or movable walls and partitions; toilet room privacy partitions; columns; ceilings; and interior wainscoting, paneling or other finish applied structurally or for decoration, acoustical correction, surface insulation, structural fire resistance or similar purposes, but not including *trim*.

[BS] INTERLAYMENT. A layer of felt or nonbituminous saturated felt not less than 18 inches (457 mm) wide, shingled between each course of a wood-shake *roof covering*.

INTUMESCENT FIRE-RESISTIVE MATERIAL. Liquid mixture applied to substrates by brush, roller, spray or trowel which expands into a protective foamed layer to provide fire-resistive protection of the substrates when exposed to flame or intense heat.

[BS] JOINT. The opening in or between adjacent assemblies that is created due to building tolerances, or is designed to allow independent movement of the building in any plane caused by thermal, wind or any other loading.

[A] JURISDICTION. The governmental unit that has adopted this code under due legislative authority.

L RATING. The air leakage rating of a *through penetration firestop system* or a fire-resistant *joint system* when tested in accordance with UL 1479 or UL 2079, respectively.

[A] LABEL. An identification applied on a product by the manufacturer that contains the name of the manufacturer, the function and performance characteristics of the product or material and the name and identification of an *approved agency*, and that indicates that the representative sample of the product or material has been tested and evaluated by an *approved agency* (see Section 1703.5, "Manufacturer's designation" and "Mark").

[A] LABELED. Equipment, materials or products to which has been affixed a *label*, seal, symbol or other identifying *mark* of a nationally recognized testing laboratory, *approved agency* or other organization concerned with product evaluation that maintains periodic inspection of the production of the above-labeled items and whose labeling indicates either that the equipment, material or product meets identified standards or has been tested and found suitable for a specified purpose.

LANDSCAPE ARCHITECT. A Florida-registered landscape architect.

LEVEL OF EXIT DISCHARGE. See "Exit discharge, level of."

LIGHT-DIFFUSING SYSTEM. Construction consisting in whole or in part of lenses, panels, grids or baffles made with light-transmitting plastics positioned below independently mounted electrical light sources, skylights or light-transmitting plastic roof panels. Lenses, panels, grids and baffles that are part of an electrical fixture shall not be considered as a light-diffusing system.

LIGHT-FRAME CONSTRUCTION. Construction whose vertical and horizontal structural elements are primarily formed by a system of repetitive wood or cold-formed steel framing members.

LIGHT-TRANSMITTING PLASTIC ROOF PANELS. Structural plastic panels other than skylights that are fastened to structural members, or panels or sheathing and that are used as light-transmitting media in the plane of the roof.

LIGHT-TRANSMITTING PLASTIC WALL PANELS. Plastic materials that are fastened to structural members, or to structural panels or sheathing, and that are used as light-transmitting media in *exterior walls*.

[BS] LIMIT OF MODERATE WAVE ACTION. Line shown on FIRMs to indicate the inland limit of the 1½-foot (457 mm) breaking wave height during the base flood.

[BS] LIMIT STATE. A condition beyond which a structure or member becomes unfit for service and is judged to be no longer useful for its intended function (serviceability limit state) or to be unsafe (strength limit state).

[F] LIQUID. A material that has a melting point that is equal to or less than 68°F (20°C) and a *boiling point* that is greater than 68°F (20°C) at 14.7 pounds per square inch absolute (psia) (101 kPa). When not otherwise identified, the term "liquid" includes both *flammable* and *combustible liquids*.

[F] LIQUID STORAGE ROOM. A room classified as a Group H-3 occupancy used for the storage of *flammable* or *combustible liquids* in a closed condition.

[F] LIQUID USE, DISPENSING AND MIXING ROOM. A room in which Class I, II and IIIA *flammable* or *combustible liquids* are used, dispensed or mixed in open containers.

[A] LISTED. Equipment, materials, products or services included in a list published by an organization acceptable to the *building* official and concerned with evaluation of products or services that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services and whose listing states either that the equipment, material, product or service meets identified standards or has been tested and found suitable for a specified purpose.

[BS] LIVE LOAD. A *load* produced by the use and occupancy of the building or other structure that does not include construction or environmental *loads* such as wind load, rain load, flood load or *dead load*.

[BS] LIVE LOAD, ROOF. A *load* on a roof produced:

1. During maintenance by workers, equipment and materials; or
2. During the life of the structure by movable objects such as planters or other similar small decorative appurtenances that are not occupancy related.

LIVE/WORK UNIT. A *dwelling unit* or *sleeping unit* in which a significant portion of the space includes a nonresidential use that is operated by the tenant.

[BS] LOAD AND RESISTANCE FACTOR DESIGN (LRFD). A method of proportioning structural members and their connections using load and *resistance factors* such that no applicable *limit state* is reached when the structure is subjected to appropriate *load* combinations. The term "LRFD" is used in the design of steel and wood structures.

[BS] LOAD EFFECTS. Forces and deformations produced in structural members by the applied *loads*.

[BS] LOAD FACTOR. A factor that accounts for deviations of the actual *load* from the *nominal load*, for uncertainties in the analysis that transforms the *load* into a *load effect*, and for the probability that more than one extreme *load* will occur simultaneously.

[BS] LOADS. Forces or other actions that result from the weight of building materials, occupants and their possessions, environmental effects, differential movement and restrained dimensional changes. Permanent loads are those loads in which variations over time are rare or of small magnitude, such as *dead loads*. All other loads are variable loads (see "*Nominal loads*").

LOCAL FLOOD PLAIN MANAGEMENT ORDINANCE. An ordinance or regulation adopted pursuant to the requirements in Title 44 Code of Federal Regulations, Parts 59 and 60 for participation in the National Flood Insurance Program.

LODGING HOUSE. A one-family dwelling where one or more occupants are primarily permanent in nature and rent is paid for guest rooms.

[A] LOT. A portion or parcel of land considered as a unit.

[A] LOT LINE. A line dividing one lot from another, or from a street or any public place.

LOW-ENERGY POWER-OPERATED DOOR. A swinging, sliding or folding door that opens automatically upon an action by a pedestrian such as pressing a push plate or waving a hand in front of a sensor. The door closes automatically, and operates with decreased forces and decreased speeds (see "Power-assisted door" and "Power-operated door").

[F] LOWER FLAMMABLE LIMIT (LFL). The minimum concentration of vapor in air at which propagation of flame will occur in the presence of an ignition source. The LFL is sometimes referred to as "LEL" or "lower explosive limit."

[BS] LOWEST FLOOR. The lowest floor of the lowest enclosed area, including *basement*, but excluding any unfinished or flood-resistant enclosure, usable solely for vehicle parking, building access or limited storage provided that such enclosure is not built so as to render the structure in violation of Section 1612.

[BS] MAIN WINDFORCE-RESISTING SYSTEM. An assemblage of structural elements assigned to provide support and stability for the overall structure. The system generally receives wind loading from more than one surface.

MALL BUILDING, COVERED and MALL BUILDING, OPEN. See "Covered mall building."

MANUAL BOLT. Door-locking hardware operable from one side of the door, or from the edge of a door leaf, with a bolt or rod extended and retracted by manual movement of the bolt or rod, such as a manual flush bolt or manual surface bolt (see AUTOMATIC FLUSH BOLT, CONSTANT LATCHING BOLT, DEAD BOLT).

[F] MANUAL FIRE ALARM BOX. A manually operated device used to initiate an *alarm signal*.

[A] MANUFACTURER'S DESIGNATION. An identification applied on a product by the manufacturer indicating that a product or material complies with a specified standard or set of rules (see "*Label*" and "*Mark*").

[A] MARK. An identification applied on a product by the manufacturer indicating the name of the manufacturer and the function of a product or material (see "*Label*" and "*Manufacturer's designation*").

MARQUEE. A canopy that has a top surface which is sloped less than 25 degrees from the horizontal and is located less than 10 feet (3048 mm) from operable openings above or adjacent to the level of the marquee.

[BS] MASONRY. A built-up construction or combination of building units or materials of clay, shale, concrete, glass, gypsum, stone or other *approved* units bonded together with or without *mortar* or grout or other accepted methods of joining.

Glass unit masonry. Masonry composed of glass units bonded by *mortar*.

Plain masonry. Masonry in which the tensile resistance of the masonry is taken into consideration and the effects of stresses in reinforcement are neglected.

Reinforced masonry. Masonry construction in which reinforcement acting in conjunction with the masonry is used to resist forces.

Solid masonry. Masonry consisting of solid masonry units laid contiguously with the *joints* between the units filled with *mortar*.

Unreinforced (plain) masonry. Masonry in which the tensile resistance of masonry is taken into consideration and the resistance of the reinforcing steel, if present, is neglected.

[BS] MASONRY UNIT. Brick, tile, stone, glass block or concrete block conforming to the requirements specified in Section 2103.

Hollow. A masonry unit whose net cross-sectional *area* in any plane parallel to the load-bearing surface is less than 75 percent of its gross cross-sectional *area* measured in the same plane.

Solid. A masonry unit whose net cross-sectional *area* in every plane parallel to the load-bearing surface is 75 percent or more of its gross cross-sectional *area* measured in the same plane.

MATERIAL CODE VIOLATION. A material code violation is a violation that exists within a completed building, structure or facility which may reasonably result, or has resulted, in physical harm to a person or significant damage to the performance of a building or its systems.

MATERIAL VIOLATION. As defined in *Florida Statutes*.

MAUSOLEUM. A permanent structure or building which is substantially exposed above the ground and is intended for the interment, entombment, or inurnment of human remains.

MEANS OF EGRESS. A continuous and unobstructed path of vertical and horizontal egress travel from any occupied portion of a building or structure to a *public way*. A means of egress consists of three separate and distinct parts: the *exit access*, the *exit* and the *exit discharge*.

MEANS OF ESCAPE. As used in Section 1010.3.5, a way out of a building or structure that does not conform to the strict definition of means of egress but does provide an alternate way out. A means of escape consists of a door, stairway, passage or hall providing a way of unobstructed travel to the outside at street or ground level. It may also consist of a passage through an adjacent nonlockable space, independent of and remotely located from the means of egress, to any approved exit.

[BG] MECHANICAL-ACCESS ENCLOSED PARKING GARAGE. An enclosed parking garage that employs parking machines, lifts, elevators or other mechanical devices for vehicle moving from and to street level and in which public occupancy in the garage is prohibited in all areas except the vehicle access bay.

MECHANICAL-ACCESS OPEN PARKING GARAGES. Open parking garages employing parking machines, lifts, elevators or other mechanical devices for vehicles moving from and to street level and in which public occupancy is prohibited above the street level.

MECHANICAL EQUIPMENT SCREEN. A rooftop structure, not covered by a roof, used to aesthetically conceal plumbing, electrical or mechanical equipment from view.

MEDICAL CARE. Care involving medical or surgical procedures, nursing or for psychiatric purposes.

MEMBRANE-COVERED CABLE STRUCTURE. A nonpressurized structure in which a mast and cable system provides support and tension to the membrane weather barrier and the membrane imparts stability to the structure.

MEMBRANE-COVERED FRAME STRUCTURE. A nonpressurized building wherein the structure is composed of a rigid framework to support a tensioned membrane which provides the weather barrier.

MEMBRANE PENETRATION. A breach in one side of a floor-ceiling, roof-ceiling or wall assembly to accommodate an item installed into or passing through the breach.

MEMBRANE-PENETRATION FIRESTOP. A material, device or construction installed to resist for a prescribed time period the passage of flame and heat through openings in a protective membrane in order to accommodate cables, cable trays, conduit, tubing, pipes or similar items.

MEMBRANE-PENETRATION FIRESTOP SYSTEM. An assemblage consisting of a fire-resistance-rated floor-ceiling, roof-ceiling or wall assembly, one or more penetrating items installed into or passing through the breach in one side of the assembly and the materials or devices, or both, installed to resist the spread of fire into the assembly for a prescribed period of time.

MERCHANDISE PAD. A merchandise pad is an area for display of merchandise surrounded by *aisles*, permanent fixtures or walls. Merchandise pads contain elements such as nonfixed and moveable fixtures, cases, racks, counters and partitions from which customers browse or shop.

METAL COMPOSITE MATERIAL (MCM). A factory-manufactured panel consisting of metal skins bonded to both faces of a solid plastic core.

METAL COMPOSITE MATERIAL (MCM) SYSTEM. An *exterior wall covering* fabricated using MCM in a specific assembly including *joints*, seams, attachments, substrate, framing and other details as appropriate to a particular design.

[BS] METAL ROOF PANEL. An interlocking metal sheet having a minimum installed weather exposure of 3 square feet (0.279 m²) per sheet.

[BS] METAL ROOF SHINGLE. An interlocking metal sheet having an installed weather exposure less than 3 square feet (0.279 m^2) per sheet.

[RB] METAL ROOF PANEL, METAL ROOF SHINGLE MANUFACTURER. The party responsible that forms raw material into metal roof panels and/or metal roof shingles used in building construction.

MEZZANINE. An intermediate level or levels between the floor and ceiling of any story and in accordance with Section 505.

[BS] MICROPILE. A micropile is a bored, grouted-in-place *deep foundation* element that develops its load-carrying capacity by means of a bond zone in soil, bedrock or a combination of soil and bedrock.

MINERAL BOARD. A rigid felted thermal insulation board consisting of either felted *mineral fiber* or cellular beads of expanded aggregate formed into flat rectangular units.

MINERAL FIBER. Insulation composed principally of fibers manufactured from rock, slag or glass, with or without binders.

MINERAL WOOL. Synthetic vitreous fiber insulation made by melting predominately igneous rock or furnace slag, and other inorganic materials, and then physically forming the melt into fibers.

[BS] MODIFIED BITUMEN ROOF COVERING. One or more layers of polymer-modified asphalt sheets. The sheet materials shall be fully adhered or mechanically attached to the substrate or held in place with an *approved* ballast layer.

[BS] MORTAR. A mixture consisting of cementitious materials, fine aggregates, water, with or without admixtures, that is used to construct unit masonry assemblies.

[BS] MORTAR, SURFACE-BONDING. A mixture to bond concrete *masonry units* that contains hydraulic cement, glass fiber reinforcement with or without inorganic fillers or organic modifiers and water.

MULTILEVEL ASSEMBLY SEATING. Seating that is arranged in distinct levels where each level is comprised of either multiple rows, or a single row of box seats accessed from a separate level.

[F] MULTIPLE-STATION ALARM DEVICE. Two or more single-station alarm devices that can be interconnected such that actuation of one causes all integral or separate audible alarms to operate. A multiple-station alarm device can consist of one single-station alarm device having connections to other detectors or to a *manual fire alarm box*.

[F] MULTIPLE-STATION SMOKE ALARM. Two or more single-station alarm devices that are capable of interconnection such that actuation of one causes the appropriate *alarm signal* to operate in all interconnected alarms.

MULTISTORY UNIT. A *dwelling unit* or *sleeping unit* with *habitable space* located on more than one *story*.

[BF] NAILABLE SUBSTRATE. A product or material such as framing, sheathing or furring, composed of wood, wood-based materials or other materials providing equivalent fastener withdrawal resistance.

[BS] NAILING, BOUNDARY. A special nailing pattern required by design at the boundaries of *diaphragms*.

[BS] NAILING, EDGE. A special nailing pattern required by design at the edges of each panel within the assembly of a *diaphragm* or *shear wall*.

[BS] NAILING, FIELD. Nailing required between the sheathing panels and framing members at locations other than *boundary nailing* and *edge nailing*.

[BS] NATURALLY DURABLE WOOD. The heartwood of the following species except for the occasional piece with corner sapwood, provided 90 percent or more of the width of each side on which it occurs is heartwood.

Decay resistant. Redwood, cedar, black locust and black walnut.

Termite resistant. Redwood, Alaska yellow cedar, Eastern red cedar and Western red cedar.

NICHE. A permanent chamber in a columbarium or mausoleum to hold the cremated remains of one or more individuals.

[BS] NOMINAL LOADS. The magnitudes of the *loads* specified in Chapter 16 (dead, live, soil, wind, tornadoes, rain, and *flood*).

[BS] NOMINAL SIZE (LUMBER). The commercial size designation of width and depth, in standard sawn lumber and glued-laminated lumber *grades*; somewhat larger than the standard net size of dressed lumber, in accordance with DOCPS 20 for sawn lumber and with the ANSI/AWC NDS for glued-laminated lumber.

NONCOMBUSTIBLE MEMBRANE STRUCTURE. A membrane structure in which the membrane and all component parts of the structure are noncombustible.

[BS] NONSTRUCTURAL CONCRETE. Any element made of plain or reinforced concrete that is not part of a structural system required to transfer either gravity or lateral loads to the ground.

NONVISITATION CRYPT MAUSOLEUM. A mausoleum for the public where the crypts are not accessible to the public.

[F] NORMAL TEMPERATURE AND PRESSURE (NTP). A temperature of 70°F (21°C) and a pressure of 1 atmosphere [14.7 psia (101 kPa)].

NOSING. The leading edge of treads of *stairs* and of landings at the top of *stairway flights*.

NOTIFICATION ZONE. See "Zone, notification."

[F] NUISANCE ALARM. An alarm caused by mechanical failure, malfunction, improper installation or lack of proper maintenance, or an alarm activated by a cause that cannot be determined.

NURSING HOMES. Facilities that provide care, including both intermediate care facilities and skilled nursing facilities where any of the persons are *incapable of self-preservation*.

OCCUPANT LOAD. The number of persons for which the *means of egress* of a building or portion thereof is designed.

OCCUPIABLE SPACE. A room or enclosed space designed for human occupancy in which individuals congregate for amusement, educational or similar purposes or in which occupants are engaged at labor, and which is equipped with *means of egress* and light and *ventilation* facilities meeting the requirements of this code.

OPEN-AIR ASSEMBLY SEATING. Seating served by means of egress that is not subject to smoke accumulation within or under a structure and is open to the atmosphere.

OPEN-ENDED CORRIDOR. An interior corridor that is open on each end and connects to an exterior *stairway* or *ramp* at each end with no intervening doors or separation from the corridor.

OPEN PARKING GARAGE. A structure or portion of a structure with the openings as described in Section 406.5.2 on two or more sides that is used for the parking or storage of private motor vehicles as described in Section 406.5.3.

[F] OPEN SYSTEM. The *use* of a *solid* or *liquid hazardous material* involving a vessel or system that is continuously open to the atmosphere during normal operations and where vapors are liberated, or the product is exposed to the atmosphere during normal operations. Examples of open systems for *solids* and *liquids* include dispensing from or into open beakers or containers, dip tank and plating tank operations.

[F] OPERATING BUILDING. A building occupied in conjunction with the manufacture, transportation or *use* of explosive materials. Operating buildings are separated from one another with the use of intraplant or intraline distances.

[BS] ORDINARY PRECAST STRUCTURAL WALL. See Section 1905.1.1.

[BS] ORDINARY REINFORCED CONCRETE STRUCTURAL WALL. See Section 1905.1.1.

[BS] ORDINARY STRUCTURAL PLAIN CONCRETE WALL. See Section 1905.1.1.

[F] ORGANIC PEROXIDE. An organic compound that contains the bivalent -O-O- structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms have been replaced by an organic radical. Organic peroxides can pose an *explosion hazard* (*detonation* or *deflagration*) or they can be shock sensitive. They can also decompose into various unstable compounds over an extended period of time.

Class I. Those formulations that are capable of *deflagration* but not *detonation*.

Class II. Those formulations that burn very rapidly and that pose a moderate reactivity hazard.

Class III. Those formulations that burn rapidly and that pose a moderate reactivity hazard.

Class IV. Those formulations that burn in the same manner as ordinary combustibles and that pose a minimal reactivity hazard.

Class V. Those formulations that burn with less intensity than ordinary combustibles or do not sustain combustion and that pose no reactivity hazard.

Unclassified detonable. Organic peroxides that are capable of *detonation*. These peroxides pose an extremely high *explosion hazard* through rapid explosive decomposition.

[BS] ORTHOGONAL. To be in two horizontal directions, at 90 degrees (1.57 rad) to each other.

[BS] OTHER STRUCTURES (for Chapters 16-23). Structures, other than buildings, for which *loads* are specified in Chapter 16.

OUTPATIENT CLINIC. See "Clinic, outpatient."

[A] OWNER. Any person, agent, operator, entity, firm or corporation having any legal or equitable interest in the property; or recorded in the official records of the state, county or municipality as holding an interest or title to the property; or otherwise having possession or control of the property, including the guardian of the estate of any such person, and the executor or administrator of the estate of such person if ordered to take possession of real property by a court.

[F] OXIDIZER. A material that readily yields oxygen or other *oxidizing gas*, or that readily reacts to promote or initiate combustion of combustible materials and, if heated or contaminated, can result in vigorous self-sustained decomposition.

Class 4. An oxidizer that can undergo an explosive reaction due to contamination or exposure to thermal or physical shock and that causes a severe increase in the burning rate of combustible materials with which it comes into contact. Additionally, the oxidizer causes a severe increase in the burning rate and can cause spontaneous ignition of combustibles.

Class 3. An oxidizer that causes a severe increase in the burning rate of combustible materials with which it comes in contact.

Class 2. An oxidizer that will cause a moderate increase in the burning rate of combustible materials with which it comes in contact.

Class 1. An oxidizer that does not moderately increase the burning rate of combustible materials.

[F] OXIDIZING GAS. A gas that can support and accelerate combustion of other materials more than air does.

[BS] PANEL (PART OF A STRUCTURE). The section of a floor, wall or roof comprised between the supporting frame of two adjacent rows of columns and girders or column bands of floor or roof construction.

PANIC HARDWARE. A door-latching assembly incorporating a device that releases the latch upon the application of a force in the direction of egress travel. See "Fire exit hardware."

[BS] PARTICLEBOARD. A generic term for a panel primarily composed of cellulosic materials (usually wood), generally in the form of discrete pieces or particles, as distinguished from fibers. The cellulosic material is combined with synthetic resin or other suitable bonding system by a process in which the interparticle bond is created by the bonding system under heat and pressure.

PEDESTAL. A fixed or adjustable-height support column composed of a support base, a vertical structural element and a load-bearing top cap surface.

PEDESTRIAN DECK PANELS OR PAVERS. Pedestrian deck panels or pavers for this section are manufactured from materials such as naturally durable wood, ceramic, stone or concrete suitable for exterior applications.

PENETRATION FIRESTOP. A through-penetration firestop or a *membrane-penetration firestop*.

PENTHOUSE. An enclosed, unoccupied rooftop structure used for sheltering mechanical and electrical equipment, tanks, elevators and related machinery, and vertical *shaft* openings.

[BS] PERFORMANCE CATEGORY. A designation of wood structural panels as related to the panel performance used in Chapter 23.

PERMANENT INDIVIDUAL TRUSS MEMBER DIAGONAL BRACING (PITMDB). Structural member or assembly intended to permanently stabilize the *PITMRs*.

PERMANENT INDIVIDUAL TRUSS MEMBER RESTRAINT (PITMR). Restraint that is used to prevent local buckling of an individual truss chord or web member because of the axial forces in the individual truss member.

[A] PERMIT. An official document or certificate issued by the *building official* that authorizes performance of a specified activity.

[A] PERSON. An individual, heirs, executors, administrators or assigns, and also includes a firm, partnership or corporation, its or their successors or assigns, or the agent of any of the aforesaid.

PERSONAL CARE SERVICE. The care of persons who do not require *medical care*. Personal care involves responsibility for the safety of the persons while inside the building

PHOTOLUMINESCENT. Having the property of emitting light that continues for a length of time after excitation by visible or invisible light has been removed.

PHOTOVOLTAIC MODULE. A complete, environmentally protected unit consisting of solar cells, optics and other components, exclusive of tracker, designed to generate DC power when exposed to sunlight.

PHOTOVOLTAIC PANEL. A collection of modules mechanically fastened together, wired and designed to provide a field-installable unit.

PHOTOVOLTAIC PANEL SYSTEM. A system that incorporates discrete photovoltaic panels, that converts solar radiation into electricity, including rack support systems.

PHOTOVOLTAIC SHINGLES. A *roof covering* resembling shingles that incorporates photovoltaic modules.

[F] PHYSICAL HAZARD. A chemical for which there is evidence that it is a *combustible liquid, cryogenic fluid, explosive, flammable (solid, liquid or gas), organic peroxide (solid or liquid), oxidizer (solid or liquid), oxidizing gas, pyrophoric (solid, liquid or gas), unstable (reactive) material (solid, liquid or gas) or water-reactive material (solid or liquid)*.

[F] PHYSIOLOGICAL WARNING THRESHOLD LEVEL. A concentration of airborne contaminants, normally expressed in parts per million (ppm) or milligrams per cubic meter (mg/m^3), that represents the concentration at which persons can sense the presence of the contaminant due to odor, irritation or other quick-acting physiological response. When used in conjunction with the permissible exposure limit (PEL) the physiological warning threshold levels are those consistent with the classification system used to establish the PEL. See the definition of "Permissible exposure limit (PEL)" in the *Florida Fire Prevention Code*.

PLACE OF RELIGIOUS WORSHIP. See "Religious worship, place of."

PLANS. All construction drawings and specifications for any structure necessary for the building official to review in order to determine whether a proposed structure, addition or renovation will meet the requirements of this code and other applicable codes.

PLASTIC, APPROVED. Any thermoplastic, thermosetting or reinforced thermosetting plastic material that conforms to combustibility classifications specified in the section applicable to the application and plastic type.

PLASTIC COMPOSITE. A generic designation that refers to wood/plastic composites, plastic lumber and similar materials.

PLASTIC GLAZING. Plastic materials that are glazed or set in frame or sash and not held by mechanical fasteners that pass through the glazing material.

PLASTIC LUMBER. A manufactured product made primarily of plastic materials (filled or unfilled) which is generally rectangular in cross section.

PLATFORM. A raised area within a building used for worship, the presentation of music, plays or other entertainment; the head table for special guests; the raised area for lecturers and speakers; boxing and wrestling rings; theater-in-the-round *stages*; and similar purposes wherein, other than horizontal sliding curtains, there are no overhead hanging curtains, drops, scenery or stage effects other than lighting and sound. A temporary platform is one installed for not more than 30 days.

PLAY STRUCTURE. A structure composed of one or more components, where the user enters a play environment.

POLYPROPYLENE SIDING. A shaped material, made principally from polypropylene homopolymer, or copolymer, which in some cases contains fillers or reinforcements, that is used to clad *exterior walls* of buildings.

[BS] PORCELAIN TILE. Ceramic tile having an absorption of 0.5 percent or less in accordance with ANSI A137.1, Table 10 or ANSI A137.3, Tables 4 or 5.

[BS] POSITIVE ROOF DRAINAGE. The drainage condition in which consideration has been made for all loading deflections of the *roof deck*, and sufficient slope has been provided to ensure drainage of the roof within 48 hours of precipitation.

POWER-ASSISTED DOOR. Swinging door which opens by reduced pushing or pulling force on the door-operating hardware. The door closes automatically after the pushing or pulling force is released and functions with decreased forces. See "Low-energy power-operated door" and "Power-operated door."

POWER-OPERATED DOOR. Swinging, sliding, or folding door which opens automatically when approached by a pedestrian or opens automatically upon an action by a pedestrian. The door closes automatically and includes provisions such as presence sensors to prevent entrapment. See "Low-energy power-operated door" and "Power-assisted door."

[BS] PREFABRICATED WOOD I-JOIST. Structural member manufactured using sawn or structural composite lumber flanges and wood structural panel webs bonded together with exterior exposure adhesives, which forms an "I" cross-sectional shape.

[BS] PRESTRESSED MASONRY. *Masonry* in which internal stresses have been introduced to counteract potential tensile stresses in *masonry* resulting from applied *loads*.

PRIMARY STRUCTURAL FRAME. The primary structural frame shall include all of the following structural members:

1. The columns.
2. Structural members having direct connections to the columns, including girders, beams, trusses and spandrels.
3. Members of the floor construction and roof construction having direct connections to the columns.
4. Bracing members that are essential to the vertical stability of the primary structural frame under gravity loading shall be considered part of the primary structural frame whether or not the bracing member carries gravity loads.

PRIVATE GARAGE. A building or portion of a building in which motor vehicles used by the owner or tenants of the building or buildings on the premises are stored or kept, without provisions for repairing or servicing such vehicles for profit.

PROFESSIONAL SURVEYOR AND MAPPER. An individual who is licensed or registered to engage in the practice of surveying and mapping under Chapter 472, *Florida Statutes*.

PROSCENIUM WALL. The wall that separates the *stage* from the auditorium or assembly seating area.

PSYCHIATRIC HOSPITALS. See "Hospitals."

PUBLIC ENTRANCE. An entrance that is not a *service entrance* or a *restricted entrance*.

PUBLIC-USE AREAS. Interior or exterior rooms or spaces that are made available to the general public.

[A] PUBLIC WAY. A street, alley or other parcel of land open to the outside air leading to a street, that has been deeded, dedicated or otherwise permanently appropriated to the public for public use and which has a clear width and height of not less than 10 feet (3048 mm).

[F] PYROPHORIC. A chemical with an auto-ignition temperature in air, at or below a temperature of 130°F (54.4°C).

[F] PYROTECHNIC COMPOSITION. A chemical mixture that produces visible light displays or sounds through a self-propagating, heat-releasing chemical reaction which is initiated by ignition.

RADIANT BARRIER. A material having a low-emittance surface of 0.1 or less installed in building assemblies.

RAMP. A walking surface that has a running slope steeper than one unit vertical in 20 units horizontal (5-percent slope).

RAMP-ACCESS OPEN PARKING GARAGES. Open parking garages employing a series of continuously rising floors or a series of interconnecting ramps between floors permitting the movement of vehicles under their own power from and to the street level.

RAMP, EXIT ACCESS. See "Exit access ramp."

RAMP, EXTERIOR EXIT. See "Exterior exit ramp."

RAMP, INTERIOR EXIT. See "Interior exit ramp."

[A] RECORD DRAWINGS. Drawings ("as built") that document the location of all devices, appliances, wiring sequences, wiring methods and connections of the components of a *fire alarm system* as installed.

REFLECTIVE PLASTIC CORE INSULATION. An insulation material packaged in rolls, that is less than $\frac{1}{2}$ inch (12.7 mm) thick, with not less than one exterior low-emittance surface (0.1 or less) and a core material containing voids or cells.

[A] REGISTERED DESIGN PROFESSIONAL. An individual who is registered or licensed to practice their respective design profession as defined by the statutory requirements of the professional registration laws of the state or *jurisdiction* in which the project is to be constructed. This includes any registered design professional so long as they are practicing within the scope of their license, which includes those licensed under Chapters 471 and 481, *Florida Statutes*.

[A] REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE. A *registered design professional* engaged by the owner or the owner's authorized agent to review and coordinate certain aspects of the project, as determined by the *building official*, for compatibility with the design of the building or structure, including submittal documents prepared by others, deferred submittal documents and phased submittal documents.

REGISTERED TERMITICIDE. Product listed as registered for use as a preventative treatment for termites for new construction by the Florida Department of Agriculture and Consumer Services under authority of Chapter 487, *Florida Statutes*.

RELIGIOUS WORSHIP, PLACE OF. A building or portion thereof intended for the performance of religious services.

[A] REPAIR. The reconstruction or renewal of any part of an existing building for the purpose of its maintenance or to correct damage.

[BS] REROOFING. The process of recovering or replacing an existing *roof covering*. See "Roof recover" and "Roof replacement."

RESIDENTIAL AIRCRAFT HANGAR. An accessory building less than 2,000 square feet (186 m^2) and 20 feet (6096 mm) in *building height* constructed on a one- or two-family property where aircraft are stored. Such use will be considered as a residential accessory use incidental to the dwelling.

[BS] RESISTANCE FACTOR. A factor that accounts for deviations of the actual strength from the *nominal strength* and the manner and consequences of failure (also called "strength reduction factor").

RESTRICTED ENTRANCE. An entrance that is made available for *common use* on a controlled basis, but not public use, and that is not a *service entrance*.

RETRACTABLE AWNING. A retractable *awning* is a cover with a frame that retracts against a building or other structure to which it is entirely supported.

[BS] RISK CATEGORY. A categorization of buildings and other structures for determination of *flood*, wind, tornado and ice *loads* based on the risk associated with unacceptable performance.

[BS] ROOF ASSEMBLY A system designed to provide weather protection and resistance to design *loads*. The system consists of a *roof covering* and *roof deck* or a single component serving as both the roof covering and the *roof deck*. A roof assembly includes the roof covering, *roof deck* and may include a *vapor retarder*, thermal barrier, insulation or similar substrate.

[BS] ROOF COVERING. The covering applied to the *roof deck* for weather resistance, fire classification or appearance.

[BS] ROOF DECK. The flat or sloped surface constructed on top of the *exterior walls* of a building or other supports for the purpose of enclosing the *story* below, or sheltering an area, to protect it from the elements, not including its supporting members or vertical supports.

ROOF DRAINAGE, POSITIVE. See "Positive roof drainage."

[BS] ROOF RECOVER. The process of installing an additional *roof covering* over a prepared existing *roof covering* without removing the existing *roof covering*.

[BS] ROOF REPAIR. Reconstruction or renewal of any part of an existing roof for the purposes of its maintenance.

[BS] ROOF REPLACEMENT. The process of removing the existing *roof covering*, repairing any damaged substrate and installing a new *roof covering*.

ROOF SECTION. A separation or division of a roof area by existing joints, parapet walls, flashing (excluding valleys), difference of elevation (excluding hips and ridges), roof type or legal description; not including the roof area required for a proper tie-off with an existing system.

ROOF SYSTEM. A roof system consists of a roof covering and other interacting roofing components and may include vapor retarder, thermal barrier, insulation or other similar substrate. The system does not include the roof deck unless it is part of a single component serving as the roof covering and the roof deck.

ROOF VENTILATION. The natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, *attics*, cathedral ceilings or other enclosed spaces over which a *roof assembly* is installed.

ROOFTOP STRUCTURE. A structure erected on top of the *roof deck* or on top of any part of a building.

[BS] RUNNING BOND. The placement of *masonry units* such that *head joints* in successive courses are horizontally offset at least one-quarter the unit length.

SALLYPORT. A security vestibule with two or more doors or gates where the intended purpose is to prevent continuous and unobstructed passage by allowing the release of only one door or gate at a time.

SCISSOR STAIRWAY. Two interlocking *stairways* providing two separate paths of egress located within one *exit enclosure*.

SCREEN ENCLOSURE. A building or part thereof, in whole or in part self-supporting, and having walls of insect screening with or without removable vinyl or acrylic wind break panels and a roof of insect screening, plastic, aluminum or similar lightweight material, or other materials and assemblies such as a patio, deck, or the roof of a structure.

[BS] SCUPPER. An opening in a wall or parapet that allows water to drain from a roof.

SECONDARY MEMBERS. The following structural members shall be considered secondary members and not part of the *primary structural frame*:

1. Structural members not having direct connections to the columns.
2. Members of the floor construction and roof construction not having direct connections to the columns.
3. Bracing members other than those that are part of the *primary structural frame*.

SELF-CLOSING. As applied to a *fire door* or other opening protective, means equipped with a device that will ensure closing after having been opened.

SELF-LUMINOUS. Illuminated by a self-contained power source, other than batteries, and operated independently of external power sources.

SELF-PRESERVATION, INCAPABLE OF. See "Incable of self-preservation."

SELF-SERVICE STORAGE FACILITY. Real property designed and used for the purpose of renting or leasing individual storage spaces to customers for the purpose of storing and removing personal property on a self-service basis.

SEPARATE ATMOSPHERE. The atmosphere that exists between rooms, spaces, or areas that are separated by an approved smoke barrier.

[F] SERVICE CORRIDOR. A fully enclosed passage used for transporting *HPM* and purposes other than required *means of egress*.

SERVICE ENTRANCE. An entrance intended primarily for delivery of goods or services.

SHAFT. An enclosed space extending through one or more *stories* of a building, connecting vertical openings in successive floors, or floors and roof.

SHAFT ENCLOSURE. The walls or construction forming the boundaries of a *shaft*.

[BS] SHALLOW FOUNDATION. A shallow foundation is an individual or strip footing, a mat foundation, a slab-on-grade foundation or a similar foundation element.

[BS] SHEAR WALL (for Chapter 23). A wall designed to resist lateral forces parallel to the plane of a wall.

Shear wall, perforated. A wood structural panel sheathed wall with openings, that has not been specifically designed and detailed for force transfer around openings.

Shear wall segment, perforated. A section of shear wall with full-height sheathing that meets the height-to-width ratio limits of Section 4.3.4 of AWC SDPWS.

[BS] SHINGLE FASHION. A method of installing roof or wall coverings, water-resistive barriers, flashing or other building components such that upper layers of material are placed overlapping lower layers of material to provide for drainage via gravity and moisture control.

[BS] SINGLE-PLY MEMBRANE. A roofing membrane that is field applied using one layer of membrane material (either homogeneous or composite) rather than multiple layers.

[F] SINGLE-STATION SMOKE ALARM. An assembly incorporating the detector, the control equipment and the alarm-sounding device in one unit, operated from a power supply either in the unit or obtained at the point of installation.

SITE. A parcel of land bounded by a *lot line* or a designated portion of a public right-of-way.

SITE-FABRICATED STRETCH SYSTEM. A system, fabricated on site and intended for acoustical, tackable or aesthetic purposes, that is composed of three elements:

1. A frame (constructed of plastic, wood, metal or other material) used to hold fabric in place;
2. A core material (infill, with the correct properties for the application); and
3. An outside layer, composed of a textile, fabric or vinyl, that is stretched taut and held in place by tension or mechanical fasteners via the frame.

[BS] SKYLIGHT, UNIT. A factory-assembled, glazed fenestration unit, containing one panel of glazing material that allows for natural lighting through an opening in the *roof assembly* while preserving the weather-resistant barrier of the roof.

[BS] SKYLIGHTS AND SLOPED GLAZING. Glass or other transparent or translucent glazing material installed at a slope of 15 degrees (0.26 rad) or more from vertical. Glazing material in skylights, including *unit skylights, tubular daylighting devices, solariums, sunrooms, roofs and sloped walls*, are included in this definition.

SLEEPING UNIT. A single unit providing rooms or spaces for one or more persons, which can also include permanent provisions for living, eating, sleeping and either sanitation or kitchen facilities but not both. Such rooms and spaces that are also part of a *dwelling unit* are not sleeping units.

[F] SMOKE ALARM. A single- or multiple-station alarm responsive to smoke. See "Multiple-station smoke alarm" and "Single-station smoke alarm."

SMOKE BARRIER. A continuous membrane, either vertical or horizontal, such as a wall, floor or ceiling assembly, that is designed and constructed to restrict the movement of smoke.

SMOKE COMPARTMENT. A space within a building separated from other interior areas of the building by smoke barriers, including interior walls and horizontal assemblies.

SMOKE DAMPER. A *listed* device installed in ducts and air transfer openings designed to resist the passage of smoke. The device is installed to operate *automatically*, controlled by a smoke detection system, and where required, is capable of being positioned from a *fire command center*.

[F] SMOKE DETECTOR. A *listed* device that senses visible or invisible particles of combustion.

SMOKE-DEVELOPED INDEX. A comparative measure, expressed as a dimensionless number, derived from measurements of smoke obscuration versus time for a material tested in accordance with ASTM E84.

SMOKEPROOF ENCLOSURE. An *exit stairway* or *ramp* designed and constructed so that the movement of the products of combustion produced by a fire occurring in any part of the building into the enclosure is limited.

SMOKE-PROTECTED ASSEMBLY SEATING. Seating served by *means of egress* that is not subject to smoke accumulation within or under a structure for a specified design time by means of passive design or by mechanical ventilation.

SMOKE-PROTECTIVE CURTAIN ASSEMBLY FOR HOISTWAY. An automatic-closing smoke and draft control curtain assembly.

SOFT CONTAINED PLAY EQUIPMENT STRUCTURE. A play structure containing one or more components where the user enters a play environment that utilizes pliable materials.

[F] SOLID. A material that has a melting point, decomposes or sublimes at a temperature greater than 68°F (20°C).

SPECIAL AMUSEMENT BUILDING. A special amusement building is any temporary or permanent building or portion thereof that is occupied for amusement, entertainment or educational purposes and that contains a device or system that conveys passengers or provides a walkway along, around or over a course in any direction so arranged that the *means of egress* path is not readily apparent due to visual or audio distractions or is intentionally confounded or is not readily available because of the nature of the attraction or mode of conveyance through the building or structure.

SPECIAL EVENT STRUCTURE. Any ground-supported structure, platform, stage, stage scaffolding or rigging, canopy, tower or similar structure supporting entertainment-related equipment or signage.

[BS] SPECIAL FLOOD HAZARD AREA. The land area subject to flood hazards and shown on a *Flood Insurance Rate Map* or other flood hazard map as Zone A, AE, A1-30, A99, AR, AO, AH, V, VO, VE or V1-30.

[BS] SPECIAL INSPECTION. Reserved.

[BS] SPECIAL INSPECTOR. Reserved.

[BS] SPECIFIED COMPRESSIVE STRENGTH OF MASONRY, f_m . Minimum compressive strength, expressed as force per unit of net cross-sectional area, required of the *masonry* used in construction by the *approved construction documents*, and upon which the project design is based. Whenever the quantity f_m is under the radical sign, the square root of numerical value only is intended and the result has units of pounds per square inch (psi) (MPa).

SPlice. The result of a factory and/or field method of joining or connecting two or more lengths of a *fire-resistant joint system* into a continuous entity.

SPORT ACTIVITY, AREA OF. See "Area of sport activity."

SPRAY-APPLIED FOAM PLASTIC. Single- and multiple-component, spray-applied foam plastic insulation used in nonstructural applications that are installed at locations wherein the material is applied in a liquid or frothed state, permitted to free rise and cure in situ.

SPRAYED FIRE-RESISTIVE MATERIALS. Cementitious or fibrous materials that are sprayed to provide fire-resistive protection of the substrates.

STAGE. A space within a building utilized for entertainment or presentations, which includes overhead hanging curtains, drops, scenery or stage effects other than lighting and sound.

STAIR. A change in elevation, consisting of one or more risers.

STAIRWAY. One or more *flights of stairs*, either exterior or interior, with the necessary landings and platforms connecting them, to form a continuous and uninterrupted passage from one level to another.

STAIRWAY, EXIT ACCESS. See "Exit access stairway."

STAIRWAY, EXTERIOR EXIT. See "Exterior exit stairway."

STAIRWAY, INTERIOR EXIT. See "Interior exit stairway."

STAIRWAY, SCISSOR. See "Scissor stairway."

STAIRWAY, SPIRAL. A *stairway* having a closed circular form in its plan view with uniform section-shaped treads attached to and radiating from a minimum-diameter supporting column.

[F] STANDBY POWER SYSTEM. A source of automatic electric power of a required capacity and duration to operate required building, hazardous materials or ventilation systems in the event of a failure of the primary power. Standby power systems are required for electrical loads where interruption of the primary power could create hazards or hamper rescue or fire-fighting operations.

[F] STANDPIPE SYSTEM, CLASSES OF. Standpipe classes are as follows:

Class I system. A system providing 2 $\frac{1}{2}$ -inch (64 mm) hose connections to supply water for use by fire departments and those trained in handling heavy fire streams.

Class II system. A system providing 1 $\frac{1}{2}$ -inch (38 mm) hose stations to supply water for use primarily by the building occupants or by the fire department during initial response.

Class III system. A system providing 1 $\frac{1}{2}$ -inch (38 mm) hose stations to supply water for use by building occupants and 2 $\frac{1}{2}$ -inch (64 mm) hose connections to supply a larger volume of water for use by fire departments and those trained in handling heavy fire streams.

[F] STANDPIPE, TYPES OF. Standpipe types are as follows:

Automatic dry. A dry standpipe system, normally filled with pressurized air, that is arranged through the use of a device, such as dry pipe valve, to admit water into the system piping *automatically* upon the opening of a hose valve. The water supply for an *automatic dry* standpipe system shall be capable of supplying the system demand.

Automatic wet. A wet standpipe system that has a water supply that is capable of supplying the system demand *automatically*.

Manual dry. A dry standpipe system that does not have a permanent water supply attached to the system. Manual dry standpipe systems require water from a fire department pumper to be pumped into the system through the fire department connection in order to meet the system demand.

Manual wet. A wet standpipe system connected to a water supply for the purpose of maintaining water within the system but does not have a water supply capable of delivering the system demand attached to the system. Manual-wet standpipe systems require water from a fire department pumper (or the like) to be pumped into the system in order to meet the system demand.

Semiautomatic dry. A dry standpipe system that is arranged through the use of a device, such as a deluge valve, to admit water into the system piping upon activation of a remote control device located at a hose connection. A remote control activation device shall be provided at each hose connection. The water supply for a semiautomatic dry standpipe system shall be capable of supplying the system demand.

[BS] START OF CONSTRUCTION. The date of issuance for new construction and *substantial improvements to existing structures*, provided the actual start of construction, *repair*, reconstruction, rehabilitation, *addition*, placement or other improvement is within 180 days after the date of issuance. The actual start of construction means the first placement of permanent construction of a building (including a manufactured home) on a site, such as the pouring of a slab or footings, installation of pilings or construction of columns.

Permanent construction does not include land preparation (such as clearing, excavation, grading or filling), the installation of streets or walkways, excavation for a *basement*, footings, piers or foundations, the erection of temporary forms or the installation of accessory buildings such as garages or sheds not occupied as *dwelling units* or not part of the main building. For a *substantial improvement*, the actual "start of construction" means the first *alteration* of any wall, ceiling, floor or other structural part of a building, whether or not that *alteration* affects the external dimensions of the building.

STATE ENFORCEMENT AGENCY. The agency of state government with authority to make inspections of buildings and to enforce the codes, as required by this part, which establish standards for design, construction, erection, alteration, repair, modification or demolition of public or private buildings, structures or facilities.

[BS] STEEL CONSTRUCTION, COLD-FORMED. That type of construction made up entirely or in part of *steel structural members* cold formed to shape from sheet or strip steel such as *roof deck*, floor and wall panels, studs, floor joists, roof joists and other structural elements.

[BS] STEEL ELEMENT, STRUCTURAL. Any *steel structural member* of a building or structure consisting of rolled shapes, pipe, hollow structural sections, plates, bars, sheets, rods or steel castings other than cold-formed steel or steel joist members.

[BS] STEEL JOIST. Any *steel structural member* of a building or structure made of hot-rolled or cold-formed solid or open-web sections, or riveted or welded bars, strip or sheet steel members, or slotted and expanded, or otherwise deformed rolled sections.

STEEP SLOPE. A roof slope two units vertical in 12 units horizontal (17-percent slope) or greater.

[BS] STONE MASONRY. Masonry composed of field, quarried or *cast stone* units bonded by *mortar*.

[F] STORAGE, HAZARDOUS MATERIALS. The keeping, retention or leaving of hazardous materials in closed containers, tanks, cylinders, or similar vessels; or vessels supplying operations through closed connections to the vessel.

[BS] STORAGE RACKS. Cold-formed or hot-rolled steel structural members which are formed into steel storage racks, including pallet storage racks, movable-shelf racks, rack-supported systems, automated storage and retrieval systems (stacker racks), push-back racks, pallet-flow racks, case-flow racks, pick modules and rack-supported platforms. Other types of racks, such as drive-in or drive-through racks, cantilever racks, portable racks or racks made of materials other than steel, are not considered storage racks for the purpose of this code.

STORM SHELTER. A building, structure or portions thereof, constructed in accordance with ICC 500 and designated for use during a severe wind storm event, such as a hurricane or tornado.

Community storm shelter. A storm shelter not defined as a "Residential storm shelter."

Residential storm shelter. A storm shelter serving occupants of *dwelling units* and having an *occupant load* not exceeding 16 persons.

STORY. That portion of a building included between the upper surface of a floor and the upper surface of the floor or roof next above (see "*Basement*," "*Building height*," "*Grade plane*" and "*Mezzanine*"). A story is measured as the vertical distance from top to top of two successive tiers of beams or finished floor surfaces and, for the topmost story, from the top of the floor finish to the top of the ceiling joists or, where there is not a ceiling, to the top of the roof rafters.

STORY ABOVE GRADE PLANE. Any *story* having its finished floor surface entirely above *grade plane*, or in which the finished surface of the floor next above is:

1. More than 6 feet (1829 mm) above *grade plane*; or

2. More than 12 feet (3658 mm) above the finished ground level at any point.

[BS] STRENGTH (For Chapter 21).

Design strength. Nominal strength multiplied by a strength reduction factor.

Nominal strength. Strength of a member or cross section calculated in accordance with these provisions before application of any strength-reduction factors.

Required strength. Strength of a member or cross section required to resist *factored loads*.

[BS] STRENGTH (for Chapter 16).

Nominal strength. The capacity of a structure or member to resist the effects of *loads*, as determined by computations using *specified* material strengths and dimensions and equations derived from accepted principles of structural mechanics or by field tests or laboratory tests of scaled models, allowing for modeling effects and differences between laboratory and field conditions.

Required strength. Strength of a member, cross section or connection required to resist *factored loads* or related internal moments and forces in such combinations as stipulated by these provisions.

Strength design. A method of proportioning structural members such that the computed forces produced in the members by *factored loads* do not exceed the member design strength [also called "*load and resistance factor design*" (LRFD)]. The term "strength design" is used in the design of concrete and *masonry* structural elements.

[BS] STRUCTURAL COMPOSITE LUMBER. Structural member manufactured using wood elements bonded together with exterior adhesives.

Examples of structural composite lumber are:

Laminated strand lumber (LSL). A composite of wood strand elements with wood fibers primarily oriented along the length of the member, where the least dimension of the wood strand elements is 0.10 inch (2.54 mm) or less and their average lengths not less than 150 times the least dimension of the wood strand elements.

Laminated veneer lumber (LVL). A composite of wood veneer sheet elements with wood fibers primarily oriented along the length of the member, where the veneer element thicknesses are 0.25 inches (6.4 mm) or less.

Oriented strand lumber (OSL). A composite of wood strand elements with wood fibers primarily oriented along the length of the member, where the least dimension of the wood strand elements is 0.10 inches (2.54 mm) or less and their average lengths not less than 75 times and less than 150 times the least dimension of the strand elements.

Parallel strand lumber (PSL). A composite of wood strand elements with wood fibers primarily oriented along the length of the member where the least dimension of the wood strand elements is 0.25 inches (6.4 mm) or less and their average lengths not less than 300 times the least dimension of the wood strand elements.

[BS] STRUCTURAL GLUED-LAMINATED TIMBER. An engineered, stress-rated product of a timber laminating plant, comprised of assemblies of specially selected and prepared wood laminations in which the grain of all laminations is approximately parallel longitudinally and the laminations are bonded with adhesives.

[BS] STRUCTURAL OBSERVATION. Reserved.

[A] STRUCTURE. That which is built or constructed.

[BS] SUBSTANTIAL DAMAGE. Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

[BS] SUBSTANTIAL IMPROVEMENT. Any *repair*, reconstruction, rehabilitation, alteration, *addition* or other improvement of a building or structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the improvement or repair is started. If the structure has sustained *substantial damage*, any *repairs* are considered substantial improvement regardless of the actual *repair* work performed. The term does not, however, include either:

1. Any project for improvement of a building required to correct existing health, sanitary or safety code violations identified by the *building official* and that is the minimum necessary to assure safe living conditions.

2. Any *alteration* of a historic structure provided that the *alteration* will not preclude the structure's continued designation as a historic structure.

[BS] SUBSTANTIAL STRUCTURAL DAMAGE. A condition where one or both of the following apply:

1. The vertical elements of the lateral force-resisting system have suffered damage such that the lateral load-carrying capacity of any *story* in any horizontal direction has been reduced by more than 33 percent from its predamage condition.
2. The capacity of any vertical component carrying gravity load, or any group of such components, that has a tributary area more than 30 percent of the total area of the structure's floors and roofs has been reduced more than 20 percent from its predamage condition and the remaining capacity of such affected elements, with respect to all dead and *live loads*, is less than 75 percent of that required by this code for new buildings of similar structure, purpose and location.

SUN CONTROL STRUCTURE. An accessory structure consisting of columns or posts supporting an open roof of girders, beams or cross rafters with or without fixed or operational louvers serving to direct sunlight.

[E] SUNROOM.

1. A one-story structure attached to a building with a glazing area in excess of 40 percent of the gross area of the structure's *exterior walls* and roof.
2. A one-story structure added to a dwelling with solid roof panels without sloped glazing. The sunroom walls may have any configuration, provided the open areas consisting of operable or fixed glass or windows or side hinged or sliding glass doors of the longer wall and one additional wall is equal to at least 65 percent of the area below 6 foot 8 inches (2032 mm) of each wall, measured from the floor. For the purposes of this code the term sunroom as used herein shall include conservatories, sunspaces, solariums, and porch or patio covers or enclosures.

[F] SUPERVISING STATION. A facility that receives signals and at which personnel are in attendance at all times to respond to these signals.

[F] SUPERVISORY SERVICE. The service required to monitor performance of guard tours and the operative condition of fixed suppression systems or other systems for the protection of life and property.

[F] SUPERVISORY SIGNAL. A signal indicating the need of action in connection with the supervision of guard tours, the fire suppression systems or equipment or the maintenance features of related systems.

[F] SUPERVISORY SIGNAL-INITIATING DEVICE. An initiation device, such as a valve supervisory switch, water-level indicator or low-air pressure switch on a dry-pipe sprinkler system, whose change of state signals an off-normal condition and its restoration to normal of a fire protection or life safety system, or a need for action in connection with guard tours, fire suppression systems or equipment or maintenance features of related systems.

[BS] SUSCEPTIBLE BAY. A roof or portion thereof with:

1. A slope less than $\frac{1}{4}$ -inch per foot (0.0208 rad); or
2. On which water is impounded, in whole or in part, and the secondary drainage system is functional but the primary drainage system is blocked.

A roof surface with a slope of $\frac{1}{4}$ -inch per foot (0.0208 rad) or greater towards points of free drainage is not a susceptible bay.

SWIMMING POOL. Any structure, basin, chamber or tank containing an artificial body of water for swimming, diving or recreational bathing located in a residential area serving four or fewer living units having a depth of 2 feet (610 mm) or more at any point as defined in Section 515.25, *Florida Statutes*, or the body of water is a public pool as defined in Section 514.011, *Florida Statutes*.

T RATING. The time period that the *penetration firestop system*, including the penetrating item, limits the maximum temperature rise to 325°F (163°C) above its initial temperature through the penetration on the nonfire side when tested in accordance with ASTM E814 or UL 1479.

TECHNICAL PRODUCTION AREA. Open elevated areas or spaces intended for entertainment technicians to walk on and occupy for servicing and operating entertainment technology systems and equipment. Galleries, including fly and lighting galleries, gridirons, catwalks, and similar areas are designed for these purposes.

TENSILE MEMBRANE STRUCTURE. A membrane structure having a shape that is determined by tension in the membrane and the geometry of the support structure. Typically, the structure consists of both flexible elements (e.g., membrane and cables), nonflexible elements (e.g., struts, masts, beams and arches) and the anchorage (e.g., supports and foundations). This includes frame-supported tensile membrane structures.

TENT. A structure, enclosure or shelter, with or without sidewalls or drops, constructed of fabric or pliable material supported in any manner except by air or the contents it protects.

TERMINATED STOPS. Factory feature of a door frame where the stops of the door frame are terminated not more than 6 inches from the bottom of the door frame. Terminated stops are also known as "hospital stops" or "sanitary stops."

[E] THERMAL ISOLATION. A separation of conditioned spaces, between a *sunroom* and a *dwelling unit*, consisting of existing or new walls, doors or windows.

THERMOPLASTIC MATERIAL. A plastic material that is capable of being repeatedly softened by increase of temperature and hardened by decrease of temperature.

THERMOSETTING MATERIAL. A plastic material that is capable of being changed into a substantially nonreformable product when cured.

THRESHOLD BUILDING. In accordance with *Florida Statute*, any building which is greater than 3 stories or 50 feet (15 240 mm) in height, or which has an assembly occupancy classification that exceeds 5,000 square feet (464.52 m²) in area and an occupant content of greater than 500 persons.

THROUGH PENETRATION. A breach in both sides of a floor, floor-ceiling or wall assembly to accommodate an item passing through the breaches.

THROUGH-PENETRATION FIRESTOP SYSTEM. An assemblage consisting of a fire-resistance-rated floor, floor-ceiling, or wall assembly, one or more penetrating items passing through the breaches in both sides of the assembly and the materials or devices, or both, installed to resist the spread of fire through the assembly for a prescribed period of time.

[BS] TIE-DOWN (HOLD-DOWN). A device used to resist uplift of the chords of *shear walls*.

[BS] TIE, WALL. Metal connector that connects *wythes* of *masonry* walls together.

[BS] TILE, STRUCTURAL CLAY. A hollow *masonry unit* composed of burned clay, shale, fire clay or mixture thereof, and having parallel *cells*.

[F] TIRES, BULK STORAGE OF. Storage of tires where the area available for storage exceeds 20,000 cubic feet (566 m³).

[A] TOWNHOUSE. A single-family *dwelling unit* not exceeding three stories in height constructed in a group of two or more attached units with property lines separating such units in which each unit extends from the foundation to roof and with a yard or public way on not less than two sides.

[F] TOXIC. A chemical falling within any of the following categories:

1. A chemical that has a median lethal dose (LD₅₀) of more than 50 milligrams per kilogram, but not more than 500 milligrams per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.
2. A chemical that has a median lethal dose (LD₅₀) of more than 200 milligrams per kilogram, but not more than 1,000 milligrams per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between 2 and 3 kilograms each.
3. A chemical that has a median lethal concentration (LC₅₀) in air of more than 200 parts per million, but not more than 2,000 parts per million by volume of gas or vapor, or more than 2 milligrams per liter but not more than 20 milligrams per liter of mist, fume or dust,

when administered by continuous inhalation for 1 hour (or less if death occurs within 1 hour) to albino rats weighing between 200 and 300 grams each.

TRANSIENT. Occupancy of a *dwelling unit* or *sleeping unit* for not more than 30 days.

TRANSIENT AIRCRAFT. Aircraft based at another location and that is at the transient location for not more than 90 days.

[BS] TREATED WOOD. Wood products that are conditioned to enhance fire-retardant or preservative properties.

Fire-retardant-treated wood. Wood products that, when impregnated with chemicals by a pressure process or other means during manufacture, exhibit reduced surface-burning characteristics and resist propagation of fire.

Preservative-treated wood. Wood products that, conditioned with chemicals by a pressure process or other means, exhibit reduced susceptibility to damage by fungi, insects or marine borers.

TRIM. Picture molds, chair rails, baseboards, *handrails*, door and window frames and similar decorative or protective materials used in fixed applications.

[F] TROUBLE SIGNAL. A signal initiated by the *fire alarm system* or device indicative of a fault in a monitored circuit or component.

[BS] TUBULAR DAYLIGHTING DEVICE (TDD). A non-operable *fenestration* unit primarily designed to transmit daylight from a roof surface to an interior ceiling via a tubular conduit. The basic unit consists of an exterior glazed weathering surface, a light-transmitting tube with a reflective interior surface, and an interior-sealing device such as a translucent ceiling panel. The unit can be factory assembled, or field-assembled from a manufactured kit.

24-HOUR BASIS. See "24-hour basis" located preceding "AAC masonry."

TYPE A UNIT. Reserved.

TYPE B UNIT. Reserved.

[BS] UNDERLAYMENT. One or more layers of felt, sheathing paper, nonbituminous saturated felt or other *approved* material over which a steep-slope *roof covering* is applied.

UNDERPINNING. The alteration of an existing foundation to transfer loads to a lower elevation using new piers, piles or other permanent structural support elements installed below the existing foundation.

UNIT SKYLIGHT. See "Skylight, unit."

[F] UNSTABLE (REACTIVE) MATERIAL. A material, other than an explosive, which in the pure state or as commercially produced, will vigorously polymerize, decompose, condense or become self-reactive and undergo other violent chemical changes, including *explosion*, when exposed to heat, friction or shock, or in the absence of an inhibitor, or in the presence of contaminants, or in contact with *incompatible materials*. Unstable (reactive) materials are subdivided as follows:

Class 4. Materials that in themselves are readily capable of *detonation* or explosive decomposition or explosive reaction at *normal temperatures and pressures*. This class includes materials that are sensitive to mechanical or localized thermal shock at *normal temperatures and pressures*.

Class 3. Materials that in themselves are capable of *detonation* or of explosive decomposition or explosive reaction but which require a strong initiating source or which must be heated under confinement before initiation. This class includes materials that are sensitive to thermal or mechanical shock at elevated temperatures and pressures.

Class 2. Materials that in themselves are normally unstable and readily undergo violent chemical change but do not detonate. This class includes materials that can undergo chemical change with rapid release of energy at *normal temperatures and pressures*, and that can undergo violent chemical change at elevated temperatures and pressures.

Class 1. Materials that in themselves are normally stable but which can become unstable at elevated temperatures and pressure.

[F] USE (MATERIAL). Placing a material into action, including *solids*, *liquids* and *gases*.

VAPOR DIFFUSION PORT. An assembly constructed or installed within a roof assembly at an opening in the roof deck to convey water vapor from an unvented attic to the outside atmosphere.

VAPOR PERMEABLE. The property of having a moisture vapor permeance rating of 5 perms ($2.9 \times 10^{-10} \text{ kg/Pa} \times \text{s} \times \text{m}^2$) or greater when tested in accordance with Procedure A or Procedure B of ASTM E96. A vapor permeable material permits the passage of moisture vapor.

VAPOR RETARDER CLASS. A measure of a material or assembly's ability to limit the amount of moisture that passes through that material or assembly. Vapor retarder class shall be defined using the desiccant method of ASTM E96 as follows:

Class I: 0.1 perm or less.

Class II: $0.1 < \text{perm} \leq 1.0$ perm.

Class III: $1.0 < \text{perm} \leq 10$ perm.

VEGETATIVE ROOF. An assembly of interacting components designed to waterproof a building's top surface that includes, by design, vegetation and related landscape elements.

VEHICLE BARRIER. A component or a system of components, near open sides or walls of garage floors or ramps that act as a restraint for vehicles.

VEHICULAR GATE. A gate that is intended for use at a vehicular entrance or exit to a facility, building or portion thereof, and that is not intended for use by pedestrian traffic.

VENEER. A facing attached to a wall for the purpose of providing ornamentation, protection or insulation, but not counted as adding strength to the wall.

[M] VENTILATION. The natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, any space.

VINYL SIDING. A shaped material, made principally from rigid polyvinyl chloride (PVC), that is used as an *exterior wall covering*.

[F] VISIBLE ALARM NOTIFICATION APPLIANCE. A notification appliance that alerts by the sense of sight.

WALKWAY, PEDESTRIAN. A walkway used exclusively as a pedestrian trafficway.

[BS] WALL (for Chapter 21). A vertical element with a horizontal length-to-thickness ratio greater than three, used to enclose space.

Cavity wall. A wall built of *masonry units* or of concrete, or a combination of these materials, arranged to provide an airspace within the wall, and in which the inner and outer parts of the wall are tied together with metal ties.

Dry-stacked, surface-bonded wall. A wall built of concrete *masonry units* where the units are stacked dry, without *mortar* on the bed or *head joints*, and where both sides of the wall are coated with a surface-bonding *mortar*.

Parapet wall. The part of any wall entirely above the roof line.

[BS] WALL, LOAD-BEARING. Any wall meeting either of the following classifications:

1. Any metal or wood stud wall that supports more than 100 pounds per linear foot (1459 N/m) of vertical load in addition to its own weight.
2. Any *masonry* or concrete wall that supports more than 200 pounds per linear foot (2919 N/m) of vertical load in addition to its own weight.

[BS] WALL, NONLOAD-BEARING. Any wall that is not a *load-bearing wall*.

[F] WATER-REACTIVE MATERIAL. A material that explodes; violently reacts; produces *flammable, toxic* or other hazardous gases; or evolves enough heat to cause autoignition or ignition of combustibles upon exposure to water or moisture. Water-reactive materials are subdivided as follows:

Class 3. Materials that react explosively with water without requiring heat or confinement.

Class 2. Materials that react violently with water or have the ability to boil water. Materials that produce *flammable, toxic* or other hazardous gases or evolve enough heat to cause autoignition or ignition of combustibles upon exposure to water or moisture.

Class 1. Materials that react with water with some release of energy, but not violently.

WATER-RESISTIVE BARRIER. A material behind an *exterior wall covering* that is intended to resist liquid water that has penetrated behind the exterior covering from further intruding into the *exterior wall* assembly.

WEATHER-EXPOSED SURFACES. Surfaces of walls, ceilings, floors, roofs, soffits and similar surfaces exposed to the weather except the following:

1. Ceilings and roof soffits enclosed by walls, fascia, bulkheads or beams that extend not less than 12 inches (305 mm) below such ceiling or roof soffits.
2. Walls or portions of walls beneath an unenclosed roof area, where located a horizontal distance from an open exterior opening equal to not less than twice the height of the opening.
3. Ceiling and roof soffits located a minimum horizontal distance of 10 feet (3048 mm) from the outer edges of the ceiling or roof soffits.

[F] WET-CHEMICAL EXTINGUISHING SYSTEM. A solution of water and potassium-carbonate-based chemical, potassium-acetate-based chemical or a combination thereof, forming an extinguishing agent.

WHEELCHAIR SPACE. See the *Florida Building Code, Accessibility*.

[BS] WIND-BORNE DEBRIS REGION. Areas within hurricane-prone regions located:

1. Within 1 mile (1.61 km) of the coastal mean high water line where the ultimate design wind speed, V_{ult} , is 130 mph (58 m/s) or greater; or
2. In areas where the ultimate design wind speed, V_{ult} , is 140 mph (63.6 m/s) or greater.

For *Risk Category II* buildings and other structures and *Risk Category III* buildings and other structures, except health care facilities, the wind-borne debris region shall be based on Figure 1609.3(1). For *Risk Category III* health care facilities, the wind-borne debris region shall be based on Figure 1609.3(2). For *Risk Category IV* buildings and other structures, the wind-borne debris region shall be based on Figure 1609.3(3).

WINDFORCE-RESISTING SYSTEM, MAIN. See "Main windforce-resisting system."

[BS] WIND SPEED, V_{ult} . Ultimate design wind speeds.

[BS] WIND SPEED, V_{asd} . Nominal design wind speeds.

WINDER. A tread with nonparallel edges.

[BS] WIRE BACKING. Horizontal strands of tautened wire attached to surfaces of vertical supports which, when covered with the building paper, provide a *backing* for cement plaster

[F] WIRELESS PROTECTION SYSTEM. A system or a part of a system that can transmit and receive signals without the aid of wire.

[BS] WOOD/PLASTIC COMPOSITE. A composite material made primarily from wood or cellulose-based materials and plastic.

[BS] WOOD SHEAR PANEL. A wood floor, roof or wall component sheathed to act as a *shear wall* or *diaphragm*.

[BS] WOOD STRUCTURAL PANEL. A panel manufactured from *veneers*, wood strands or wafers or a combination of *veneer* and wood strands or wafers bonded together with waterproof synthetic resins or other suitable bonding systems. Examples of wood structural panels are:

Composite panels. A wood structural panel that is comprised of wood *veneer* and reconstituted wood-based material and bonded together with waterproof adhesive;

Oriented strand board (OSB). A mat-formed wood structural panel comprised of thin rectangular wood strands arranged in cross-aligned layers with surface layers normally arranged in the long panel direction and bonded with waterproof adhesive; or

Plywood. A wood structural panel comprised of plies of wood *veneer* arranged in cross-aligned layers. The plies are bonded with waterproof adhesive that cures on application of heat and pressure.

[F] WORKSTATION. A defined space or an independent principal piece of equipment using *HPM* within a *fabrication area* where a specific function, laboratory procedure or research activity occurs. *Approved or listed hazardous materials storage cabinets, flammable liquid storage cabinets or gas cabinets* serving a workstation are included as part of the workstation. A workstation is allowed to contain *ventilation equipment, fire protection devices, detection devices, electrical devices and other processing and scientific equipment*.

[BS] WYTHE. Each continuous, vertical section of a wall, one *masonry unit* in thickness.

YARD. An open space, other than a *court*, unobstructed from the ground to the sky, except where specifically provided by this code, on the lot on which a building is situated.

[F] ZONE. A defined area within the protected premises. A zone can define an area from which a signal can be received, an area to which a signal can be sent or an area in which a form of control can be executed.

[F] ZONE, NOTIFICATION. An area within a building or facility covered by notification appliances which are activated simultaneously.

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Chapter 3 Use and Occupancy Classification

Section 301 Scope

301.1 General

The provisions of this chapter shall control the classification of all buildings and structures as to occupancy and use. Different classifications of occupancy and use represent varying levels of hazard and risk to building occupants and adjacent properties.

Section 302 Occupancy Classification and Use Designation

302.1 Occupancy Classification

Occupancy classification is the formal designation of the primary purpose of the building, structure or portion thereof. Structures shall be classified into one or more of the occupancy groups listed in this section based on the nature of the hazards and risks to building occupants generally associated with the intended purpose of the building or structure. An area, room or space that is intended to be occupied at different times for different purposes shall comply with all applicable requirements associated with such potential multipurpose. Structures containing multiple occupancy groups shall comply with Section 508. Where a structure is proposed for a purpose that is not specifically listed in this section such structure shall be classified in the occupancy it most nearly resembles based on the fire safety and relative hazard. Occupied roofs shall be classified in the group that the occupancy most nearly resembles, according to the fire safety and relative hazard involved, and shall comply with Section 503.1.4.

1. Assembly (see Section 303): Groups A-1, A-2, A-3, A-4 and A-5.
2. Business (see Section 304): Group B.
3. Educational (see Section 305): Group E.
4. Factory and Industrial (see Section 306): Groups F-1 and F-2.
5. High Hazard (see Section 307): Groups H-1, H-2, H-3, H-4 and H-5.
6. Institutional (see Section 308): Groups I-1, I-2, I-3 and I-4.
7. Mercantile (see Section 309): Group M.
8. Residential (see Section 310): Groups R-1, R-2, R-3 and R-4.
9. Storage (see Section 311): Groups S-1 and S-2.
10. Utility and Miscellaneous (see Section 312): Group U.

302.2 Use Designation

Occupancy groups contain subordinate uses having similar hazards and risks to building occupants. Uses include, but are not limited to, those functional designations listed within the occupancy group descriptions in Section 302.1. Certain uses require specific limitations and controls in accordance with the provisions of Chapter 4 and elsewhere in this code.

Section 303 Assembly Group A

303.1 Assembly Group A

Assembly Group A occupancy includes, among others, the use of a building or structure, or a portion thereof, for the gathering of persons for purposes such as civic, social or religious functions; recreation, food or drink consumption or awaiting transportation.

303.1.1 Small Buildings and Tenant Spaces

A building or tenant space used for assembly purposes with an *occupant load* of less than 50 persons shall be classified as a Group B occupancy.

303.1.2 Small Assembly Spaces

The following rooms and spaces shall not be classified as Assembly occupancies:

1. A room or space used for assembly purposes with an *occupant load* of less than 50 persons and accessory to another occupancy shall be classified as a Group B occupancy or as part of that occupancy.
2. A room or space used for assembly purposes that is less than 750 square feet (70 m^2) in area and accessory to another occupancy shall be classified as a Group B occupancy or as part of that occupancy.

303.1.3 Associated With Group E Occupancies

A room or space used for assembly purposes that is associated with a Group E occupancy is not considered a separate occupancy.

303.1.4 Accessory to Places of Religious Worship

Accessory religious educational rooms and religious auditoriums with *occupant loads* of less than 100 per room or space are not considered separate occupancies.

303.2 Assembly Group A-1

Group A-1 occupancy includes assembly uses, usually with fixed seating, intended for the production and viewing of the performing arts or motion pictures including, but not limited to:

- Motion picture theaters
- Symphony and concert halls
- Television and radio studios admitting an audience
- Theaters

303.3 Assembly Group A-2

Group A-2 occupancy includes assembly uses intended for food and/or drink consumption including, but not limited to:

- Banquet halls
- Casinos (gaming areas)
- Nightclubs
- Restaurants, cafeterias and similar dining facilities (including associated commercial kitchens)
- Taverns and bars

303.4 Assembly Group A-3

Group A-3 occupancy includes assembly uses intended for worship, recreation or amusement and other assembly uses not classified elsewhere in Group A including, but not limited to:

- Amusement arcades
- Art galleries
- Bowling alleys
- Community halls
- Courtrooms

Dance halls (not including food or drink consumption)

Exhibition halls

Funeral parlors

Gymnasiums (without spectator seating)

Indoor *swimming pools* (without spectator seating)

Indoor tennis courts (without spectator seating)

Lecture halls

Libraries

Museums

Places of religious worship

Pool and billiard parlors

Waiting areas in transportation terminals

303.5 Assembly Group A-4

Group A-4 occupancy includes assembly uses intended for viewing of indoor sporting events and activities with spectator seating including, but not limited to:

Arenas

Skating rinks

Swimming pools

Tennis courts

303.6 Assembly Group A-5

Group A-5 occupancy includes assembly uses intended for participation in or viewing outdoor activities including, but not limited to:

Amusement park structures

Bleachers

Grandstands

Stadiums

Section 304 Business Group B

304.1 Business Group B

Business Group B occupancy includes, among others, the use of a building or structure, or a portion thereof, for office, professional or service-type transactions, including storage of records and accounts. Business occupancies shall include, but not be limited to, the following:

Airport traffic control towers

Ambulatory care facilities

Animal hospitals, kennels and pounds

Banks

Barber and beauty shops

Car wash

Civic administration

Clinic, outpatient

Dry cleaning and laundries: pick-up and delivery stations and self-service

Educational occupancies for students above the 12th grade

Electronic data processing

Food processing establishments and commercial kitchens not associated with restaurants, cafeterias and similar dining facilities not more than 2,500 square feet (232 m^2) in area.

Laboratories: testing and research

Motor vehicle showrooms

Post offices

Print shops

Professional services (architects, attorneys, dentists, physicians, engineers, etc.)

Radio and television stations

Telephone exchanges

Training and skill development not in a school or academic program (this shall include, but not be limited to, tutoring centers, martial arts studios, gymnastics and similar uses regardless of the ages served, and where not classified as a Group A occupancy).

304.2 Definitions

The following terms are defined in Chapter 2:

AMBULATORY CARE FACILITY.

CLINIC, OUTPATIENT.

304.3

Public and private colleges and universities shall comply with Section 468.

304.4

Florida colleges shall comply with Section 453.

Section 305 Educational Group E

305.1 Educational Group E

Educational Group E occupancy includes, among others, the use of a building or structure, or a portion thereof, by six or more persons at any one time for educational purposes through the 12th grade.

305.1.1 Accessory to Places of Religious Worship

Religious educational rooms and religious auditoriums, which are accessory to *places of religious worship* in accordance with Section 303.1.4 and have *occupant loads* of less than 100 per room or space, shall be classified as Group A-3 occupancies.

305.2 Group E, Day Care Facilities

This group includes buildings and structures or portions thereof occupied by more than five children older than $2\frac{1}{2}$ years of age who receive educational, supervision or *personal care services* for fewer than 24 hours per day.

305.2.1 Within Places of Religious Worship

Rooms and spaces within *places of religious worship* providing such day care during religious functions shall be classified as part of the

primary occupancy.

305.2.2 Five or Fewer Children

A facility having five or fewer children receiving such day care shall be classified as part of the primary occupancy.

305.2.3 Five or Fewer Children in a Dwelling Unit

A facility such as the above within a *dwelling unit* and having five or fewer children receiving such day care shall be classified as a Group R-3 occupancy or shall comply with the *Florida Building Code, Residential*.

305.3

Public and private educational occupancies shall comply with Section 468.

305.4

Public education occupancies shall comply with Section 453.

Section 306 Factory Group F

306.1 Factory Industrial Group F

Factory Industrial Group F occupancy includes, among others, the use of a building or structure, or a portion thereof, for assembling, disassembling, fabricating, finishing, manufacturing, packaging, repair or processing operations that are not classified as a Group H hazardous or Group S storage occupancy.

306.2 Moderate-Hazard Factory Industrial, Group F-1

Factory industrial uses that are not classified as Factory Industrial F-2 Low Hazard shall be classified as F-1 Moderate Hazard and shall include, but not be limited to, the following:

Aircraft (manufacturing, not to include repair)

Appliances

Athletic equipment

Automobiles and other motor vehicles

Bakeries

Beverages: over 16-percent alcohol content

Bicycles

Boats

Brooms or brushes

Business machines

Cameras and photo equipment

Canvas or similar fabric

Carpets and rugs (includes cleaning)

Clothing

Construction and agricultural machinery

Disinfectants

Dry cleaning and dyeing

Electric generation plants

Electronics

Energy storage systems (ESS) in dedicated use buildings

Engines (including rebuilding)

Food processing establishments and commercial kitchens not associated with restaurants, cafeterias and similar dining facilities more than 2,500 square feet (232 m^2) in area.

Furniture

Hemp products

Jute products

Laundries

Leather products

Machinery

Metals

Millwork (sash and door)

Motion pictures and television filming (without spectators)

Musical instruments

Optical goods

Paper mills or products

Photographic film

Plastic products

Printing or publishing

Recreational vehicles

Refuse incineration

Shoes

Soaps and detergents

Textiles

Tobacco

Trailers

Upholstering

Water/sewer treatment facilities

Wood; distillation

Woodworking (cabinet)

306.2.1 Aircraft Manufacturing Facilities

Aircraft manufacturing facilities shall comply with Section 412.7.

306.3 Low-Hazard Factory Industrial, Group F-2

Factory industrial uses that involve the fabrication or manufacturing of noncombustible materials that during finishing, packing or processing do not involve a significant fire hazard shall be classified as F-2 occupancies and shall include, but not be limited to, the following:

Beverages: up to and including 16-percent alcohol content

Brick and masonry

Ceramic products

Foundries

Glass products

Gypsum

Ice

Metal products (fabrication and assembly)

Section 307 High-Hazard Group H

[F] 307.1 High-Hazard Group H

High-hazard Group H occupancy includes, among others, the use of a building or structure, or a portion thereof, that involves the manufacturing, processing, generation or storage of materials that constitute a physical or health hazard in quantities in excess of those allowed in *control areas* complying with Section 414, based on the maximum allowable quantity limits for *control areas* set forth in Tables 307.1(1) and 307.1(2). Hazardous occupancies are classified in Groups H-1, H-2, H-3, H-4 and H-5 and shall be in accordance with this section, the requirements of Section 415 and the *Florida Fire Prevention Code*. Hazardous materials stored, or used on top of roofs or canopies, shall be classified as outdoor storage or use and shall comply with the *Florida Fire Prevention Code*.

TABLE 307.1(1)

MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIALS POSING A PHYSICAL HAZARD^{a, j, m, n, p}

MATERIAL	CLASS	GROUP WHEN THE MAXIMUM ALLOWABLE QUANTITY IS EXCEEDED	STORAGE ^b			USE-CLOSED SYSTEMS ^b			USE-OPEN SYSTEMS ^b	
			Solid pounds (cubic feet)	Liquid gallons (pounds)	Gas cubic feet at NTP	Solid pounds (cubic feet)	Liquid gallons (pounds)	Gas cubic feet at NTP	Solid pounds (cubic feet)	Liquid gallons (pounds)
Combustible dust	NA	H-2	See Note q	NA	NA	See Note q	NA	NA	See Note q	NA
Combustible fiber ^q	Loose	H-3	(100)	NA	NA	(100)	NA	NA	(20)	NA
	Baled ^o		(1,000)			(1,000)			(200)	
Combustible liquid ^{c, i}	II	H-2 or H-3	NA	120 ^{d, e}	NA	120 ^d	NA	NA	30 ^d	NA
	IIIA	H-2 or H-3		330 ^{d, e}		330 ^d				
	IIIB	NA		13,200 ^{e, f}		13,200 ^f				
Consumer fireworks	1.4G	H-3	125 ^{e, l}	NA	NA	NA	NA	NA	NA	NA
Cryogenic flammable	NA	H-2	NA	45 ^d	NA	NA	45 ^d	NA	NA	10 ^d
Cryogenic inert	NA	NA	NA	NA	NL	NA	NA	NL	NA	NA
Cryogenic oxidizing	NA	H-3	NA	45 ^d	NA	NA	45 ^d	NA	NA	10 ^d

Explosives	Division 1.1	H-1	1 ^{e, g}	(1) ^{e, g}	NA	0.25 ^g	(0.25) ^g	NA	0.25 ^g	(0.25) ^g
	Division 1.2	H-1	1 ^{e, g}	(1) ^{e, g}		0.25 ^g	(0.25) ^g		0.25 ^g	(0.25) ^g
	Division 1.3	H-1 or H-2	5 ^{e, g}	(5) ^{e, g}		1 ^g	(1) ^g		1 ^g	(1) ^g
	Division 1.4	H-3	50 ^{e, g}	(50) ^{e, g}		50 ^g	(50) ^g		NA	NA
	Division 1.4G	H-3	125 ^{e, l}	NA		NA	NA		NA	NA
	Division 1.5	H-1	1 ^{e, g}	(1) ^{e, g}		0.25 ^g	(0.25) ^g		0.25 ^g	(0.25) ^g
	Division 1.6	H-1	1 ^{e, g}	NA		NA	NA		NA	NA
Flammable gas	Gaseous	H-2	NA	NA	1,000 ^{d, e}	NA	NA	1,000 ^{d, e}	NA	NA
	Liquefied			(150) ^{d, e}	NA		(150) ^{d, e}	NA		
Flammable liquid ^c	IA	H-2 or H-3	NA	30 ^{d, e}	NA	NA	30 ^d	NA	NA	10 ^d
	IB and IC			120 ^{d, e}			120 ^d			30 ^d
Flammable liquid, combination (IA, IB, IC)	NA	H-2 or H-3	NA	120 ^{d, e, h}	NA	NA	120 ^{d, h}	NA	NA	30 ^{d, h}
Flammable solid	NA	H-3	125 ^{d, e}	NA	NA	125 ^d	NA	NA	25 ^d	NA
Inert gas	Gaseous	NA	NA	NA	NL	NA	NA	NL	NA	NA
	Liquefied	NA	NA	NA	NL	NA	NA	NL	NA	NA
Organic peroxide	UD	H-1	1 ^{e, g}	(1) ^{e, g}	NA	0.25 ^g	(0.25) ^g	NA	0.25 ^g	(0.25) ^g
	I	H-2	5 ^{d, e}	(5) ^{d, e}		1 ^d	(1) ^d		1 ^d	(1) ^d
	II	H-3	50 ^{d, e}	(50) ^{d, e}		50 ^d	(50) ^d		10 ^d	(10) ^d
	III	H-3	125 ^{d, e}	(125) ^{d, e}		125 ^d	(125) ^d		25 ^d	(25) ^d
	IV	NA	NL	NL		NL	NL		NL	NL
	V	NA	NL	NL		NL	NL		NL	NL
Oxidizer	4	H-1	1 ^g	(1) ^{e, g}	NA	0.25 ^g	(0.25) ^g	NA	0.25 ^g	(0.25) ^g
	3 ^k	H-2 or H-3	10 ^{d, e}	(10) ^{d, e}		2 ^d	(2) ^d		2 ^d	(2) ^d
	2	H-3	250 ^{d, e}	(250) ^{d, e}		250 ^d	(250) ^d		50 ^d	(50) ^d
	1	NA	4,000 ^{e, f}	(4,000) ^{e, f}		4,000 ^f	(4,000) ^f		1,000 ^f	(1,000) ^f
Oxidizing gas	Gaseous	H-3	NA	NA	1,500 ^{d, e}	NA	NA	1,500 ^{d, e}	NA	NA

	Liquefied			(150) ^{d, e}	NA		(150) ^{d, e}	NA		
Pyrophoric	NA	H-2	4 ^{e, g}	(4) ^{e, g}	50 ^{e, g}	1 ^g	(1) ^g	10 ^{e, g}	0	0
Unstable (reactive)	4	H-1	1 ^{e, g}	(1) ^{e, g}	10 ^{e, g}	0.25 ^g	(0.25) ^g	2 ^{e, g}	0.25 ^g	(0.25) ^g
	3	H-1 or H-2	5 ^{d, e}	(5) ^{d, e}	50 ^{d, e}	1 ^d	(1) ^d	10 ^{d, e}	1 ^d	(1) ^d
	2	H-3	50 ^{d, e}	(50) ^{d, e}	750 ^{d, e}	50 ^d	(50) ^d	750 ^{d, e}	10 ^d	(10) ^d
	1	NA	NL	NL	NL	NL	NL	NL	NL	NL
Water reactive	3	H-2	5 ^{d, e}	(5) ^{d, e}	NA	5 ^d	(5) ^d	NA	1 ^d	(1) ^d
	2	H-3	50 ^{d, e}	(50) ^{d, e}		50 ^d	(50) ^d		10 ^d	(10) ^d
	1	NA	NL	NL		NL	NL		NL	NL

For SI: 1 cubic foot = 0.028 m³, 1 pound = 0.454 kg, 1 gallon = 3.785 L.

NL = Not Limited; NA = Not Applicable; UD = Unclassified Detonable.

- a. For use of control areas, see Section 414.2.
- b. The aggregate quantity in use and storage shall not exceed the quantity listed for storage.
- c. The quantities of alcoholic beverages in retail and wholesale sales occupancies shall not be limited provided the liquids are packaged in individual containers not exceeding 1.3 gallons. In retail and wholesale sales occupancies, the quantities of medicines, foodstuffs or consumer products, and cosmetics containing not more than 50 percent by volume of water-miscible liquids with the remainder of the solutions not being flammable, shall not be limited, provided that such materials are packaged in individual containers not exceeding 1.3 gallons.
- d. Maximum allowable quantities shall be increased 100 percent in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1. Where Note e also applies, the increase for both notes shall be applied accumulatively.
- e. Maximum allowable quantities shall be increased 100 percent when stored in approved storage cabinets, day boxes, gas cabinets, gas rooms or exhausted enclosures or in *listed* safety cans in accordance with the *Florida Fire Prevention Code*. Where Note d also applies, the increase for both notes shall be applied accumulatively.
- f. Quantities shall not be limited in a building equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.
- g. Allowed only in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.
- h. Containing not more than the maximum allowable quantity per *control area* of Class IA, IB or IC flammable liquids.
- i. The maximum allowable quantity shall not apply to fuel oil storage complying with the *Florida Fire Prevention Code*.
- j. Quantities in parenthesis indicate quantity units in parenthesis at the head of each column.
- k. A maximum quantity of 200 pounds of solid or 20 gallons of liquid Class 3 oxidizers is allowed when such materials are necessary for maintenance purposes, operation or sanitation of equipment when the storage containers and the manner of storage are approved.

I. Net weight of the pyrotechnic composition of the fireworks. Where the net weight of the pyrotechnic composition of the fireworks is not known, 25 percent of the gross weight of the fireworks, including packaging, shall be used.

m. For gallons of liquids, divide the amount in pounds by 10 in accordance with the *Florida Fire Prevention Code*.

n. For storage and display quantities in Group M and storage quantities in Group S occupancies complying with Section 414.2.5, see Tables 414.2.5(1) and 414.2.5(2).

o. Densely packed baled cotton that complies with the packing requirements of ISO 8115 shall not be included in this material class.

p. The following shall not be included in determining the maximum allowable quantities:

1. Liquid or gaseous fuel in fuel tanks on vehicles.

2. Liquid or gaseous fuel in fuel tanks on motorized equipment operated in accordance with the *Florida Fire Prevention Code*.

3. Gaseous fuels in piping systems and fixed appliances regulated by the *Florida Fire Prevention Code*.

4. Liquid fuels in piping systems and fixed appliances regulated by the *Florida Fire Prevention Code*.

5. Alcohol-based hand rubs classified as Class I or II liquids in dispensers that are installed in accordance with the *Florida Fire Prevention Code*. The location of the alcohol-based hand rub (ABHR) dispensers shall be provided in the construction documents.

q. Where manufactured, generated or used in such a manner that the concentration and conditions create a fire or explosion hazard based on information prepared in accordance with Section 414.1.3.

[F] TABLE 307.1(2)

MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIAL POSING A HEALTH HAZARD^{a, c, f, h, i}

MATERIAL	STORAGE ^b			USE-CLOSED SYSTEMS ^b			USE-OPEN SYSTEMS ^b	
	Solid pounds ^{d, e}	Liquid gallons (pounds) ^{d, e}	Gas cubic feet at NTP (pounds) ^d	Solid pounds ^d	Liquid gallons (pounds) ^d	Gas cubic feet at NTP (pounds) ^d	Solid pounds ^d	Liquid gallons (pounds) ^d
Corrosives	5,000	500	Gaseous 810 ^e Liquefied (150)	5,000	500	Gaseous 810 ^e Liquefied (150)	1,000	100
Highly Toxic	10	(10)	Gaseous 20 ^g Liquefied (4) ^g	10	(10)	Gaseous 20 ^g Liquefied (4) ^g	3	(3)
Toxic	500	(500)	Gaseous 810 ^e Liquefied (150) ^e	500	(500)	Gaseous 810 ^e Liquefied (150) ^e	125	(125)

For SI: 1 cubic foot = 0.028 m³, 1 pound = 0.454 kg, 1 gallon = 3.785 L.

- a. For use of control areas, see Section 414.2.
- b. The aggregate quantity in use and storage shall not exceed the quantity listed for storage.
- c. In retail and wholesale sales occupancies, the quantities of medicines, foodstuffs or consumer products, and cosmetics containing not more than 50 percent by volume of water-miscible liquids and with the remainder of the solutions not being flammable, shall not be limited, provided that such materials are packaged in individual containers not exceeding 1.3 gallons.
- d. Maximum allowable quantities shall be increased 100 percent in buildings equipped throughout with an *approved automatic sprinkler system* in accordance with Section 903.3.1.1. Where Note e also applies, the increase for both notes shall be applied accumulatively.
- e. Maximum allowable quantities shall be increased 100 percent where stored in approved storage cabinets, gas cabinets or exhausted enclosures as specified in the *Florida Fire Prevention Code*. Where Note d also applies, the increase for both notes shall be applied accumulatively.
- f. For storage and display quantities in Group M and storage quantities in Group S occupancies complying with Section 414.2.5, see Tables 414.2.5(1) and 414.2.5(2).
- g. Allowed only where stored in approved exhausted gas cabinets or exhausted enclosures as specified in the *Florida Fire Prevention Code*.
- h. Quantities in parenthesis indicate quantity units in parenthesis at the head of each column.
- i. For gallons of liquids, divide the amount in pounds by 10 in accordance with the *Florida Fire Prevention Code*.

[F] 307.1.1 Uses Other Than Group H

An occupancy that stores, uses or handles hazardous materials as described in one or more of the following items shall not be classified as Group H, but shall be classified as the occupancy that it most nearly resembles.

1. Buildings and structures occupied for the application of flammable finishes, provided that such buildings or areas conform to the requirements of Section 416 and the *Florida Fire Prevention Code*.
2. Wholesale and retail sales and storage of flammable and combustible liquids in mercantile occupancies conforming to the *Florida Fire Prevention Code*.
3. Closed piping system containing flammable or combustible liquids or gases utilized for the operation of machinery or equipment.
4. Cleaning establishments that utilize combustible liquid solvents having a flash point of 140°F (60°C) or higher in closed systems employing equipment *listed* by an *approved* testing agency, provided that this occupancy is separated from all other areas of the building by 1-hour *fire barriers* constructed in accordance with Section 707 or 1-hour *horizontal assemblies* constructed in accordance with Section 711, or both.
5. Cleaning establishments that utilize a liquid solvent having a flash point at or above 200°F (93°C).
6. Liquor stores and distributors without bulk storage.
7. Refrigeration systems.

8. The storage or utilization of materials for agricultural purposes on the premises.
9. Stationary storage battery systems installed in accordance with the *Florida Fire Prevention Code*.
10. Corrosive personal or household products in their original packaging used in retail display.
11. Commonly used corrosive building materials.
12. Buildings and structures occupied for aerosol product storage shall be classified as Group S-1, provided that such buildings conform to the requirements of the *Florida Fire Prevention Code*.
13. Display and storage of nonflammable solid and nonflammable or noncombustible liquid hazardous materials in quantities not exceeding the maximum allowable quantity per *control area* in Group M or S occupancies complying with Section 414.2.5.
14. The storage of black powder, smokeless propellant and small arms primers in Groups M and R-3 and special industrial explosive devices in Groups B, F, M and S, provided such storage conforms to the quantity limits and requirements prescribed in the *Florida Fire Prevention Code*.
15. Mercantile occupancies offering for retail sale sparklers, novelties and trick noisemakers as defined at Section 791.01, *Florida Statutes*, and that are not defined as fireworks by Chapter 791, *Florida Statutes*. Storage of sparklers and other novelties or trick noisemakers as defined in Chapter 791, *Florida Statutes*, within mercantile occupancies shall be in accordance with Section 791.055, *Florida Statutes*.
16. Stationary fuel cell power systems installed in accordance with the *Florida Fire Prevention Code*.
17. Capacitor energy storage systems in accordance with the *Florida Fire Prevention Code*.

[F] 307.1.2 Hazardous Materials

Hazardous materials in any quantity shall conform to the requirements of this code, including Section 414, and the *Florida Fire Prevention Code*.

[F] 307.2 Definitions

The following terms are defined in Chapter 2:

AEROSOL CONTAINER.**AEROSOL PRODUCT.****Level 1 aerosol products.****Level 2 aerosol products.****Level 3 aerosol products.****BALED COTTON.****BALED COTTON, DENSELY PACKED.****BARRICADE.****Artificial barricade.****Natural barricade.****BOILING POINT.****CLOSED SYSTEM.**

COMBUSTIBLE DUST.

COMBUSTIBLE FIBERS.

COMBUSTIBLE LIQUID.

Class II.

Class IIIA.

Class IIIB.

COMPRESSED GAS.

CONTROL AREA.

CORROSIVE.

CRYOGENIC FLUID.

DAY BOX.

DEFLAGRATION.

DETONATION.

DISPENSING.

EXPLOSION.

EXPLOSIVE.

High explosive.

Low explosive.

Mass-detonating explosives.

UN/DOTn Class 1 explosives.

Division 1.1.

Division 1.2.

Division 1.3.

Division 1.4.

Division 1.5.

Division 1.6.

FIREWORKS.

Fireworks, 1.3G.

Fireworks, 1.4G.

FLAMMABLE GAS.

FLAMMABLE LIQUEFIED GAS.

FLAMMABLE LIQUID.

Class IA.

Class IB.

Class IC.**FLAMMABLE MATERIAL.****FLAMMABLE SOLID.****FLASH POINT.****HANDLING.****HAZARDOUS MATERIALS.****HEALTH HAZARD.****HIGHLY TOXIC.****INCOMPATIBLE MATERIALS.****INERT GAS.****OPEN SYSTEM.****OPERATING BUILDING.****ORGANIC PEROXIDE.****Class I.****Class II.****Class III.****Class IV.****Class V.****Unclassified detonable.****OXIDIZER.****Class 4.****Class 3.****Class 2.****Class 1.****OXIDIZING GAS.****PHYSICAL HAZARD.****PYROPHORIC.****PYROTECHNIC COMPOSITION.****TOXIC.****UNSTABLE (REACTIVE) MATERIAL.****Class 4.****Class 3.****Class 2.****Class 1.**

WATER-REACTIVE MATERIAL.**Class 3.****Class 2.****Class 1.****[F] 307.3 High-Hazard Group H-1**

Buildings and structures containing materials that pose a detonation hazard shall be classified as Group H-1. Such materials shall include, but not be limited to, the following:

Detonable pyrophoric materials

Explosives:

Division 1.1

Division 1.2

Division 1.3

Division 1.4

Division 1.5

Division 1.6

Organic peroxides, unclassified detonable

Oxidizers, Class 4

Unstable (reactive) materials, Class 3 detonable and Class 4

[F] 307.3.1 Occupancies Containing Explosives Not Classified as H-1

The following occupancies containing explosive materials shall be classified as follows:

1. Division 1.3 explosive materials that are used and maintained in a form where either confinement or configuration will not elevate the hazard from a mass fire to mass explosion hazard shall be allowed in H-2 occupancies.
2. Articles, including articles packaged for shipment, that are not regulated as a Division 1.4 explosive under Bureau of Alcohol, Tobacco, Firearms and Explosives regulations, or unpackaged articles used in process operations that do not propagate a detonation or deflagration between articles shall be allowed in H-3 occupancies.

[F] 307.4 High-Hazard Group H-2

Buildings and structures containing materials that pose a deflagration hazard or a hazard from accelerated burning shall be classified as Group H-2. Such materials shall include, but not be limited to, the following:

Class I, II or IIIA flammable or combustible liquids that are used or stored in normally open containers or systems, or in closed containers or systems pressurized at more than 15 pounds per square inch gauge (103.4 kPa).

Combustible dusts where manufactured, generated or used in such a manner that the concentration and conditions create a fire or explosion hazard based on information prepared in accordance with Section 414.1.3.

Cryogenic fluids, flammable.

Flammable gases.

Organic peroxides, Class I.

Oxidizers, Class 3, that are used or stored in normally open containers or systems, or in closed containers or systems pressurized at more than 15 pounds per square inch gauge (103 kPa).

Pyrophoric liquids, solids and gases, nondetonable.

Unstable (reactive) materials, Class 3, nondetonable.

Water-reactive materials, Class 3.

[F] 307.5 High-Hazard Group H-3

Buildings and structures containing materials that readily support combustion or that pose a physical hazard shall be classified as Group H-3. Such materials shall include, but not be limited to, the following:

Class I, II or IIIA flammable or combustible liquids that are used or stored in normally closed containers or systems pressurized at 15 pounds per square inch gauge (103.4 kPa) or less.

Combustible fibers, other than densely packed baled cotton, where manufactured, generated or used in such a manner that the concentration and conditions create a fire or explosion hazard based on information prepared in accordance with Section 414.1.3.

Consumer fireworks, 1.4G (Class C, Common)

Cryogenic fluids, oxidizing

Flammable solids

Organic peroxides, Class II and III

Oxidizers, Class 2

Oxidizers, Class 3, that are used or stored in normally closed containers or systems pressurized at 15 pounds per square inch gauge (103 kPa) or less

Oxidizing gases

Unstable (reactive) materials, Class 2

Water-reactive materials, Class 2

[F] 307.6 High-Hazard Group H-4

Buildings and structures containing materials that are health hazards shall be classified as Group H-4. Such materials shall include, but not be limited to, the following:

Corrosives

Highly toxic materials

Toxic materials

[F] 307.7 High-Hazard Group H-5

Semiconductor fabrication facilities and comparable research and development areas in which hazardous production materials (HPM) are used and the aggregate quantity of materials is in excess of those listed in Tables 307.1(1) and 307.1(2) shall be classified as Group H-5. Such facilities and areas shall be designed and constructed in accordance with Section 415.11.

[F] 307.8 Multiple Hazards

Buildings and structures containing a material or materials representing hazards that are classified in one or more of Groups H-1, H-2, H-3 and H-4 shall conform to the code requirements for each of the occupancies so classified.

Section 308 Institutional Group I

308.1 Institutional Group I

Institutional Group I occupancy includes, among others, the use of a building or structure, or a portion thereof, in which care or supervision is provided to persons who are or are not capable of self-preservation without physical assistance or in which persons are detained for penal or correctional purposes or in which the liberty of the occupants is restricted. Institutional occupancies shall be classified as Group I-1, I-2, I-3 or I-4.

308.2 Definitions

The following terms are defined in Chapter 2:

24-HOUR BASIS.

CUSTODIAL CARE.

DETOXIFICATION FACILITIES.

FOSTER CARE FACILITIES.

HOSPITALS AND PSYCHIATRIC HOSPITALS.

INCAPABLE OF SELF-PRESERVATION.

MEDICAL CARE.

NURSING HOMES.

308.3 Institutional Group I-1

Institutional Group I-1 occupancy shall include buildings, structures or portions thereof for more than 16 persons, excluding staff, who reside on a 24-hour basis in a supervised environment and receive custodial care. Buildings of Group I-1 shall be classified as one of the occupancy conditions specified in Section 308.3.1 or 308.3.2. This group shall include, but not be limited to, the following:

Alcohol and drug centers

Assisted living facilities

Congregate care facilities

Group homes

Halfway houses

Residential board and care facilities

Social rehabilitation facilities

308.3.1 Condition 1

This occupancy condition shall include buildings in which all persons receiving custodial care who, without any assistance, are capable of responding to an emergency situation to complete building evacuation.

308.3.2 Condition 2

This occupancy condition shall include buildings in which there are any persons receiving custodial care who require limited verbal or physical assistance while responding to an emergency situation to complete building evacuation.

308.3.3 Six to 16 Persons Receiving Custodial Care

A facility housing not fewer than six and not more than 16 persons receiving custodial care shall be classified as Group R-4.

308.3.4 Five or Fewer Persons Receiving Custodial Care

A facility with five or fewer persons receiving custodial care shall be classified as Group R-3 or shall comply with the *Florida Building Code, Residential* provided an *automatic sprinkler system* is installed in accordance with Section 903.3.1.3 or Section P2904 of the *Florida Building Code, Residential*.

308.4 Institutional Group I-2

Institutional Group I-2 occupancy shall include buildings and structures used for *medical care* on a 24-hour basis for more than five persons who are *incapable of self-preservation*. This group shall include, but not be limited to, the following:

Foster care facilities

Detoxification facilities

Hospitals

Nursing homes

Psychiatric hospitals

308.4.1 Occupancy Conditions

Buildings of Group I-2 shall be classified as one of the occupancy conditions specified in Section 308.4.1.1 or 308.4.1.2.

308.4.1.1 Condition 1

This occupancy condition shall include facilities that provide nursing and medical care but do not provide emergency care, surgery, obstetrics or in-patient stabilization units for psychiatric or detoxification, including but not limited to nursing homes and foster care facilities.

308.4.1.2 Condition 2

This occupancy condition shall include facilities that provide nursing and medical care and could provide emergency care, surgery, obstetrics or in-patient stabilization units for psychiatric or detoxification, including but not limited to hospitals.

308.4.2 Five or Fewer Persons Receiving Medical Care

A facility with five or fewer persons receiving medical care shall be classified as Group R-3 or shall comply with the *Florida Building Code, Residential* provided an *automatic sprinkler system* is installed in accordance with Section 903.3.1.3 or Section P2904 of the *Florida Building Code, Residential*.

308.5 Institutional Group I-3

Institutional Group I-3 occupancy shall include buildings and structures that are inhabited by more than five persons who are under restraint or security. A Group I-3 facility is occupied by persons who are generally *incapable of self-preservation* due to security measures not under the occupants' control. This group shall include, but not be limited to, the following:

Correctional centers

Detention centers

Jails

Prerelease centers

Prisons

Reformatories

Buildings of Group I-3 shall be classified as one of the occupancy conditions specified in Sections 308.5.1 through 308.5.5 (see Section 408).

308.5.1 Condition 1

This occupancy condition shall include buildings in which free movement is allowed from sleeping areas, and other spaces where access or occupancy is permitted, to the exterior via *means of egress* without restraint. A Condition 1 facility is permitted to be constructed as Group R.

308.5.2 Condition 2

This occupancy condition shall include buildings in which free movement is allowed from sleeping areas and any other occupied *smoke compartment* to one or more other *smoke compartments*. Egress to the exterior is impeded by locked *exits*.

308.5.3 Condition 3

This occupancy condition shall include buildings in which free movement is allowed within individual *smoke compartments*, such as within a residential unit comprised of individual *sleeping units* and group activity spaces, where egress is impeded by remote-controlled release of *means of egress* from such a *smoke compartment* to another *smoke compartment*.

308.5.4 Condition 4

This occupancy condition shall include buildings in which free movement is restricted from an occupied space. Remote-controlled release is provided to permit movement from *sleeping units*, activity spaces and other occupied areas within the *smoke compartment* to other *smoke compartments*.

308.5.5 Condition 5

This occupancy condition shall include buildings in which free movement is restricted from an occupied space. Staff-controlled manual release is provided to permit movement from *sleeping units*, activity spaces and other occupied areas within the *smoke compartment* to other *smoke compartments*.

308.6 Institutional Group I-4, Day Care Facilities

Institutional Group I-4 occupancy shall include buildings and structures occupied by more than five persons of any age who receive *custodial care* for fewer than 24 hours per day by persons other than parents or guardians, relatives by blood, marriage or adoption, and in a place other than the home of the person cared for. This group shall include, but not be limited to, the following:

Adult day care

Child day care

308.6.1 Classification as Group E

A child day care facility that provides care for more than five but not more than 100 children $2\frac{1}{2}$ years or less of age, where the rooms in which the children are cared for are located on a *level of exit discharge* serving such rooms and each of these child care rooms has an *exit door* directly to the exterior, shall be classified as Group E.

308.6.2 Within a Place of Religious Worship

Rooms and spaces within *places of religious worship* providing such care during religious functions shall be classified as part of the primary occupancy.

308.6.3 Five or Fewer Persons Receiving Care

A facility having five or fewer persons receiving *custodial care* shall be classified as part of the primary occupancy.

308.6.4 Five or Fewer Persons Receiving Care in a Dwelling Unit

A facility such as the above within a *dwelling unit* and having five or fewer persons receiving *custodial care* shall be classified as a Group R-3 occupancy or shall comply with the *Florida Building Code, Residential*.

Section 309 Mercantile Group M

309.1 Mercantile Group M

Mercantile Group M occupancy includes, among others, the use of a building or structure or a portion thereof for the display and sale of merchandise, and involves stocks of goods, wares or merchandise incidental to such purposes and accessible to the public. Mercantile occupancies shall include, but not be limited to, the following:

Department stores

Drug stores

Markets

Motor fuel-dispensing facilities

Retail or wholesale stores

Sales rooms

309.2 Quantity of Hazardous Materials

The aggregate quantity of nonflammable solid and nonflammable or noncombustible liquid hazardous materials stored or displayed in a single *control area* of a Group M occupancy shall not exceed the quantities in Table 414.2.5(1).

Section 310 Residential Group R**310.1 Residential Group R**

Residential Group R includes, among others, the use of a building or structure, or a portion thereof, for sleeping purposes when not classified as an Institutional Group I or when not regulated by the *Florida Building Code, Residential*.

310.2 Definitions

The following terms are defined in Chapter 2:

BOARDING HOUSE.

CONGREGATE LIVING FACILITIES.

DORMITORY.

GROUP HOME.

GUEST ROOM.

LODGING HOUSE.

PERSONAL CARE SERVICE.

TRANSIENT.

310.3 Residential Group R-1

Residential Group R-1 occupancies containing *sleeping units* where the occupants are primarily *transient* in nature, including:

Boarding houses (transient) with more than 10 occupants

Congregate living facilities (transient) with more than 10 occupants

Hotels (transient)

Motels (transient)

310.4 Residential Group R-2

Residential Group R-2 occupancies containing *sleeping units* or more than two *dwelling units* where the occupants are primarily permanent in nature, including:

Apartment houses

Boarding houses (nontransient)

Congregate living facilities (nontransient) with more than 16 occupants

Convents

Dormitories

Fraternities and sororities

Hotels (nontransient)

Live/work units

Monasteries

Motels (nontransient)

Vacation timeshare properties

310.5 Residential Group R-3

Residential Group R-3 occupancies where the occupants are primarily permanent in nature and not classified as Group R-1, R-2, R-4 or I, including:

Buildings that do not contain more than two *dwelling units*

Boarding houses (nontransient) with 16 or fewer occupants

Boarding houses (*transient*) with 10 or fewer occupants

Care facilities that provide accommodations for five or fewer persons receiving care

Congregate living facilities (nontransient) with 16 or fewer occupants

Congregate living facilities (*transient*) with 10 or fewer occupants

Owner-occupied *lodging houses* with five or fewer *guest rooms* and 10 or fewer occupants

310.5.1 Care Facilities Within a Dwelling

Care facilities for five or fewer persons receiving care that are within a single-family dwelling are permitted to comply with the *Florida Building Code, Residential* provided an *automatic sprinkler system* is installed in accordance with Section 903.3.1.3 or Section P2904 of the *Florida Building Code, Residential*.

310.5.2 Lodging Houses

Owner-occupied *lodging houses* with five or fewer *guest rooms* and 10 or fewer occupants shall be permitted to be constructed in accordance with the *Florida Building Code, Residential*, provided that an automatic sprinkler system is installed in accordance with Section 903.3.1.3 or Section P2904 of the *Florida Building Code, Residential*.

310.6 Residential Group R-4

Residential Group R-4 occupancy shall include buildings, structures or portions thereof for more than five but not more than 16 persons, excluding staff, who reside on a 24-hour basis in a supervised residential environment and receive *custodial care*. Buildings of Group R-4 shall be classified as one of the occupancy conditions specified in Section 310.6.1 or 310.6.2. This group shall include, but not be limited to, the following:

Alcohol and drug centers

Assisted living facilities

Congregate care facilities

Group homes

Halfway houses

Residential board and *custodial* care facilities

Social rehabilitation facilities

Group R-4 occupancies shall meet the requirements for construction as defined for Group R-3, except as otherwise provided for in this code or shall comply with the *Florida Building Code, Residential* provided the building is protected by an automatic sprinkler system installed in accordance with Section 903.2.8.

310.6.1 Condition 1

This occupancy condition shall include buildings in which all persons receiving custodial care, without any assistance, are capable of responding to an emergency situation to complete building evacuation.

310.6.2 Condition 2

This occupancy condition shall include buildings in which there are any persons receiving custodial care who require limited verbal or

physical assistance while responding to an emergency situation to complete building evacuation.

Section 311 Storage Group S

311.1 Storage Group S

Storage Group S occupancy includes, among others, the use of a building or structure, or a portion thereof, for storage that is not classified as a hazardous occupancy.

311.1.1 Accessory Storage Spaces

A room or space used for storage purposes that is accessory to another occupancy shall be classified as part of that occupancy.

311.2 Moderate-Hazard Storage, Group S-1

Storage Group S-1 occupancies are buildings occupied for storage uses that are not classified as Group S-2, including, but not limited to, storage of the following:

Aerosol products, Levels 2 and 3

Aircraft hangar (storage and repair)

Bags: cloth, burlap and paper

Bamboos and rattan

Baskets

Belting: canvas and leather

Books and paper in rolls or packs

Boots and shoes

Buttons, including cloth covered, pearl or bone

Cardboard and cardboard boxes

Clothing, woolen wearing apparel

Cordage

Dry boat storage (indoor)

Furniture

Furs

Glues, mucilage, pastes and size

Grains

Horns and combs, other than celluloid

Leather

Linoleum

Lumber

Motor vehicle repair garages complying with the maximum allowable quantities of hazardous materials listed in Table 307.1(1) (see Section 406.8)

Photo engravings

Resilient flooring

Silks

Soaps

Sugar

Tires, bulk storage of

Tobacco, cigars, cigarettes and snuff

Upholstery and mattresses

Wax candles

311.3 Low-Hazard Storage, Group S-2

Storage Group S-2 occupancies include, among others, buildings used for the storage of noncombustible materials such as products on wood pallets or in paper cartons with or without single thickness divisions; or in paper wrappings. Such products are permitted to have a negligible amount of plastic *trim*, such as knobs, handles or film wrapping. Group S-2 storage uses shall include, but not be limited to, storage of the following:

Asbestos

Beverages up to and including 16-percent alcohol in metal, glass or ceramic containers

Cement in bags

Chalk and crayons

Dairy products in nonwaxed coated paper containers

Dry cell batteries

Electrical coils

Electrical motors

Empty cans

Food products

Foods in noncombustible containers

Fresh fruits and vegetables in nonplastic trays or containers

Frozen foods

Glass

Glass bottles, empty or filled with noncombustible liquids

Gypsum board

Inert pigments

Ivory

Meats

Metal cabinets

Metal desks with plastic tops and *trim*

Metal parts

Metals

Mirrors

Oil-filled and other types of distribution transformers

Parking garages, open or enclosed

Porcelain and pottery

Stoves

Talc and soapstones

Washers and dryers

Section 312 Utility and Miscellaneous Group U

312.1 General

Buildings and structures of an accessory character and miscellaneous structures not classified in any specific occupancy shall be constructed, equipped and maintained to conform to the requirements of this code commensurate with the fire and life hazard incidental to their occupancy. Group U shall include, but not be limited to, the following:

Agricultural buildings

Aircraft hangars, accessory to a one- or two-family residence (see Section 412.5)

Barns

Carports

Communication equipment structures with a *gross floor area* of less than 1,500 square feet (139 m²).

Fences more than 6 feet (1829 mm) in height

Grain silos, accessory to a residential occupancy

Greenhouses Livestock shelters

Private garages

Retaining walls

Sheds

Stables

Tanks

Towers

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Chapter 4 Special Detailed Requirements Based on Occupancy and Use

Section 401 Scope

401.1 Detailed Occupancy and Use Requirements

In addition to the occupancy and construction requirements in this code, the provisions of this chapter apply to the occupancies and uses described herein.

401.2 Additional Design Criteria

401.2.1 Scope

In addition to the provisions of this chapter, the following special occupancies, standards, requirements and codes shall conform to the following sections:

Section 449:	Hospitals
Section 450:	Nursing homes
Section 451:	Ambulatory surgical centers
Section 452:	Birthing centers
Section 453:	State requirements for educational facilities
Section 454:	Swimming pools and bathing places
Section 455:	Public lodging establishments
Section 456:	Public food service establishments
Section 457:	Mental health programs
Section 458:	Manufactured buildings
Section 459:	Boot camps for children
Section 460:	Mausoleums and columbariums
Section 461:	Transient public lodging establishments
Section 462:	Use of asbestos in new public buildings or buildings newly constructed for lease to government entities—prohibition
Section 463:	Adult day care
Section 464:	Assisted living facilities
Section 465:	Control of radiation hazards
Section 466:	Day care occupancies
Section 467:	Hospice inpatient facilities and units and hospice residences.
Section 468:	Schools, colleges and universities
Section 469:	Office surgery suite
Chapter 30:	Elevators and conveying systems

Section 3109:	Structures seaward of a coastal construction control line
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401.2.2 General

Where in any specific case, Sections 449 through 469 specify different materials, methods of construction, design criteria or other requirements than found in this code, the requirements of Sections 449 through 469 shall be applicable.

401.2.3 Referenced Standards

Further information concerning the requirements for licensing, maintenance, equipment or other items not related to design and construction may be obtained for all state codes, rules and standards from the State of Florida Bureau of Administrative Codes.

Section 402 Covered Mall and Open Mall Buildings

402.1 Applicability

The provisions of this section shall apply to buildings or structures defined herein as *covered or open mall buildings* not exceeding three floor levels at any point nor more than three *stories above grade plane*. Except as specifically required by this section, *covered and open mall buildings* shall meet applicable provisions of this code.

Exceptions:

1. Foyers and lobbies of Groups B, R-1 and R-2 are not required to comply with this section.
2. Buildings need not comply with the provisions of this section where they totally comply with other applicable provisions of this code.

402.1.1 Open Space

A *covered mall building* and attached *anchor buildings* and parking garages shall be surrounded on all sides by a permanent open space or not less than 60 feet (18 288 mm). An *open mall building* and *anchor buildings* and parking garages adjoining the perimeter line shall be surrounded on all sides by a permanent open space of not less than 60 feet (18 288 mm).

Exception: The permanent open space of 60 feet (18 288 mm) shall be permitted to be reduced to not less than 40 feet (12 192 mm), provided the following requirements are met:

1. The reduced open space shall not be allowed for more than 75 percent of the perimeter of the *covered or open mall building* and *anchor buildings*;
2. The *exterior wall* facing the reduced open space shall have a *fire-resistance rating* of not less than 3 hours;
3. Openings in the *exterior wall* facing the reduced open space shall have opening protectives with a *fire protection rating* of not less than 3 hours; and
4. Group E, H, I or R occupancies are not located within the *covered or open mall building* or *anchor buildings*.

402.1.2 Open Mall Building Perimeter Line

For the purpose of this code, a perimeter line shall be established. The perimeter line shall encircle all buildings and structures that comprise the *open mall building* and shall encompass any open-air interior walkways, open-air courtyards or similar open-air spaces. The perimeter line shall define the extent of the *open mall building*. *Anchor buildings* and parking structures shall be outside of the perimeter line and are not considered as part of the *open mall building*.

402.2 Definitions

The following terms are defined in Chapter 2:

ANCHOR BUILDING.

COVERED MALL BUILDING.

Mall.

Open mall.

Open mall building.

FOOD COURT.**GROSS LEASABLE AREA.****402.3 Lease Plan**

Each owner of a *covered mall building* or of an *open mall building* shall provide both the building and fire departments with a lease plan showing the location of each occupancy and its *exits* after the certificate of occupancy has been issued. No modifications or changes in occupancy or use shall be made from that shown on the lease plan without prior approval of the *building official*.

402.4 Construction

The construction of *covered and open mall buildings*, *anchor buildings* and parking garages associated with a *mall building* shall comply with Sections 402.4.1 through 402.4.3.

402.4.1 Area and Types of Construction

The *building area* and type of construction of *covered mall* or *open mall buildings*, *anchor buildings* and parking garages shall comply with this section.

402.4.1.1 Covered and Open Mall Buildings

The *building area* of any *covered mall* or *open mall building* shall not be limited provided the *covered mall* or *open mall building* does not exceed three floor levels at any point nor three *stories above grade plane*, and is of Type I, II, III or IV construction.

402.4.1.2 Anchor Buildings

The *building area* and *building height* of any *anchor building* shall be based on the type of construction as required by Section 503 as modified by Sections 504 and 506.

Exception: The *building area* of any *anchor building* shall not be limited provided the *anchor building* is not more than three *stories above grade plane*, and is of Type I, II, III or IV construction.

402.4.1.3 Parking Garage

The *building area* and *building height* of any parking garage, open or enclosed, shall be based on the type of construction as required by Sections 406.5 and 406.6, respectively.

402.4.2 Fire-Resistance-Rated Separation

Fire-resistance-rated separation is not required between tenant spaces and the *mall*. Fire-resistance-rated separation is not required between a *food court* and adjacent tenant spaces or the *mall*.

402.4.2.1 Tenant Separations

Each tenant space shall be separated from other tenant spaces by a *fire partition* complying with Section 708. A tenant separation wall is not required between any tenant space and the *mall*.

402.4.2.2 Anchor Building Separation

An *anchor building* shall be separated from the *covered or open mall building* by *fire walls* complying with Section 706.

Exceptions:

1. *Anchor buildings* of not more than three *stories above grade plane* that have an occupancy classification the same as that permitted for tenants of the *mall building* shall be separated by 2-hour fire-resistance-rated *fire barriers* complying with Section 707.

2. The exterior walls of *anchor buildings* separated from an *open mall building* by an *open mall* shall comply with Table 705.5.

402.4.2.2.1 Openings Between Anchor Building and Mall

Except for the separation between Group R-1 *sleeping units* and the *mall*, openings between *anchor buildings* of Type IA, IB, IIA or IIB construction and the *mall* need not be protected.

402.4.2.3 Parking Garages

An attached garage for the storage of passenger vehicles having a capacity of not more than nine persons and *open parking garages* shall be considered as a separate building where it is separated from the *covered or open mall building* or *anchor building* by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

Parking garages, open or enclosed, which are separated from *covered mall buildings*, *open mall buildings* or *anchor buildings*, shall comply with the provisions of Table 705.5.

Pedestrian walkways and tunnels that connect garages to *mall buildings* or *anchor buildings* shall be constructed in accordance with Section 3104.

402.4.3 Open Mall Construction

Floor assemblies in, and *roof assemblies* over, the *open mall* of an *open mall building* shall be open to the atmosphere for not less than 20 feet (6096 mm), measured perpendicular from the face of the tenant spaces on the lowest level, from edge of balcony to edge of balcony on upper floors and from edge of roof line to edge of roof line. The openings within, or the unroofed area of, an *open mall* shall extend from the lowest/grade level of the open mall through the entire *roof assembly*. Balconies on upper levels of the *mall* shall not project into the required width of the opening.

402.4.3.1 Pedestrian Walkways

Pedestrian walkways connecting balconies in an *open mall* shall be located not less than 20 feet (6096 mm) from any other *pedestrian walkway*.

[F] 402.5 Automatic Sprinkler System

Covered and open mall buildings and buildings connected shall be equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, which shall comply with all of the following:

1. The *automatic sprinkler system* shall be complete and operative throughout occupied space in the *mall building* prior to occupancy of any of the tenant spaces. Unoccupied tenant spaces shall be similarly protected unless provided with *approved alternative protection*.
2. Sprinkler protection for the *mall* of a *covered mall building* shall be independent from that provided for tenant spaces or *anchor buildings*.
3. Sprinkler protection for the tenant spaces of an *open mall building* shall be independent from that provided for *anchor buildings*.
4. Sprinkler protection shall be provided beneath exterior circulation balconies located adjacent to an *open mall*.
5. Where tenant spaces are supplied by the same system, they shall be independently controlled.

Exception: An *automatic sprinkler system* shall not be required in spaces or areas of *open parking garages* separated from the *covered or open mall building* in accordance with Section 402.4.2.3 and constructed in accordance with Section 406.5.

402.6 Interior Finishes and Features

Interior finishes within the *mall* and installations within the *mall* shall comply with Sections 402.6.1 through 402.6.4.

402.6.1 Interior Finish

Interior wall and ceiling finishes within the *mall* of a *covered mall building* and within the *exits* of *covered or open mall buildings* shall have a minimum *flame spread index* and smoke-developed index of Class B in accordance with Chapter 8. *Interior floor finishes* shall meet the requirements of Section 804.

402.6.2 Kiosks

Kiosks and similar structures (temporary or permanent) located within the *mall* of a *covered mall building* or within the perimeter line of an *open mall building* shall meet the following requirements:

1. Combustible kiosks or other structures shall not be located within a *covered or open mall* unless constructed of any of the following materials:
 - 1.1. *Fire-retardant-treated wood* complying with Section 2303.2.
 - 1.2. Foam plastics having a maximum heat release rate not greater than 100 kW (105 Btu/h) when tested in accordance with the exhibit booth protocol in UL 1975 or when tested in accordance with NFPA 289 using the 20 kW ignition source.
 - 1.3. Aluminum composite material (ACM) meeting the requirements of Class A *interior finish* in accordance with Chapter 8 when tested as an assembly in the maximum thickness intended.
2. Kiosks or similar structures located within the *mall* shall be provided with *approved automatic sprinkler system* and detection devices.
3. The horizontal separation between kiosks or groupings thereof and other structures within the *mall* shall be not less than 20 feet (6096 mm).
4. Each kiosk or similar structure or groupings thereof shall have an area not greater than 300 square feet (28 m²).

402.6.3 Play Structures

Play structures located within a *building* or within the perimeter line of an *open mall building* shall comply with Section 424. The horizontal separation between play structures, kiosks and similar structures within the *mall* shall be not less than 20 feet (6096 mm).

402.6.4 Plastic Signs

Plastic signs affixed to the storefront of any tenant space facing a *mall* or *open mall* shall be limited as specified in Sections 402.6.4.1 through 402.6.4.5.

402.6.4.1 Area

Plastic signs shall be not more than 20 percent of the wall area facing the *mall*.

402.6.4.2 Height and Width

Plastic signs shall be not greater than 36 inches (914 mm) in height, except that where the sign is vertical, the height shall be not greater than 96 inches (2438 mm) and the width shall be not greater than 36 inches (914 mm).

402.6.4.3 Location

Plastic signs shall be located not less than 18 inches (457 mm) from adjacent tenants.

402.6.4.4 Plastics Other Than Foam Plastics

Plastics other than foam plastics used in signs shall be light-transmitting plastics complying with Section 2606.4 or shall have a self-ignition temperature of 650°F (343°C) or greater when tested in accordance with ASTM D1929, and a *flame spread index* not greater than 75 and smoke-developed index not greater than 450 when tested in the manner intended for use in accordance with ASTM E84 or UL 723 or meet the acceptance criteria of Section 803.1.2.1 when tested in accordance with NFPA 286.

402.6.4.4.1 Encasement

Edges and backs of plastic signs in the *mall* shall be fully encased in metal.

402.6.4.5 Foam Plastics

Foam plastics used in signs shall have flame-retardant characteristics such that the sign has a maximum heat-release rate of 150 kilowatts when tested in accordance with UL 1975 or when tested in accordance with NFPA 289 using the 20 kW ignition source, and the foam plastics shall have the physical characteristics specified in this section. Foam plastics used in signs installed in accordance with Section 402.6.4 shall not be required to comply with the *flame spread* and smoke-developed indices specified in Section 2603.3.

402.6.4.5.1 Density

The density of foam plastics used in signs shall be not less than 20 pounds per cubic foot (pcf) (320 kg/m³).

402.6.4.5.2 Thickness

The thickness of foam plastic signs shall not be greater than 1/2 inch (12.7 mm).

402.7 Emergency Systems

Covered and open mall buildings, anchor buildings and associated parking garages shall be provided with emergency systems complying with Sections 402.7.1 through 402.7.5.

[F] 402.7.1 Standpipe System

Covered and open mall buildings shall be equipped throughout with a standpipe system as required by Section 905.3.3.

[F] 402.7.2 Smoke Control

Atriums connecting three or more stories in covered mall buildings shall be provided with a smoke control system in accordance with Section 909.

[F] 402.7.3 Emergency Power

Covered mall buildings greater than 50,000 square feet (4645 m²) in area and *open mall buildings* greater than 50,000 square feet (4645 m²) within the established perimeter line shall be provided with emergency power that is capable of operating the *emergency voice/alarm communication system* in accordance with Section 2702.

[F] 402.7.4 Emergency Voice/Alarm Communication System

Where the total floor area is greater than 50,000 square feet (4645 m²) within either a *covered mall building* or within the perimeter line of an *open mall building*, an *emergency voice/alarm communication system* shall be provided.

Emergency voice/alarm communication systems serving a *mall*, required or otherwise, shall be accessible to the fire department. The systems shall be provided in accordance with Section 907.5.2.2.

[F] 402.7.5 Fire Department Access to Equipment

Rooms or areas containing controls for air-conditioning systems, *automatic fire-extinguishing systems*, *automatic sprinkler systems* or other detection, suppression or control elements shall be identified for use by the fire department.

402.8 Means of Egress

Covered mall buildings, open mall buildings and each tenant space within a mall building shall be provided with *means of egress* as required by this section and this code. Where there is a conflict between the requirements of this code and the requirements of Sections 402.8.1 through 402.8.8, the requirements of Sections 402.8.1 through 402.8.8 shall apply.

402.8.1 Mall Width

For the purpose of providing required egress, *malls* are permitted to be considered as *corridors* but need not comply with the requirements of Section 1005.1 of this code where the width of the *mall* is as specified in this section.

402.8.1.1 Minimum Width

The aggregate clear egress width of the *mall* in either a *covered or open mall building* shall be not less than 20 feet (6096 mm). The *mall* width shall be sufficient to accommodate the *occupant load* served. No portion of the minimum required aggregate egress width shall be less than 10 feet (3048 mm) measured to a height of 8 feet (2438 mm) between any projection of a tenant space bordering the *mall* and the nearest kiosk, vending machine, bench, display opening, *food court* or other obstruction to *means of egress* travel.

402.8.2 Determination of Occupant Load

The *occupant load* permitted in any individual tenant space in a *covered or open mall building* shall be determined as required by this code. *Means of egress* requirements for individual tenant spaces shall be based on the *occupant load* thus determined.

402.8.2.1 Occupant Formula

In determining required *means of egress* of the *mall*, the number of occupants for whom *means of egress* are to be provided shall be based on *gross leasable area* of the *covered or open mall building* (excluding *anchor buildings*) and the *occupant load* factor as determined by Equation 4-1.

$$OLF = (0.00007)(GLA) + 25$$

(Equation 4-1)

where:

OLF = The *occupant load* factor (square feet per person).

GLA = The *gross leasable area* (square feet).

Exception: Tenant spaces attached to a *covered or open mall building* but with a *means of egress* system that is totally independent of the open mall of an *open mall building* or of a *covered mall building* shall not be considered as *gross leasable area* for determining the required *means of egress* for the *mall building*.

402.8.2.2 OLF Range

The *occupant load* factor (*OLF*) is not required to be less than 30 and shall not exceed 50.

402.8.2.3 Anchor Buildings

The *occupant load* of *anchor buildings* opening into the *mall* shall not be included in computing the total number of occupants for the *mall*.

402.8.2.4 Food Courts

The *occupant load* of a *food court* shall be determined in accordance with Section 1004. For the purposes of determining the *means of egress* requirements for the *mall*, the *food court occupant load* shall be added to the *occupant load* of the *covered or open mall building* as calculated above.

402.8.3 Number of Means of Egress

Wherever the distance of travel to the *mall* from any location within a tenant space used by persons other than employees is greater than 75 feet (22 860 mm) or the tenant space has an *occupant load* of 50 or more, no fewer than two *means of egress* shall be provided.

402.8.4 Arrangements of Means of Egress

Assembly occupancies with an *occupant load* of 500 or more located within a *covered mall building* shall be so located such that their entrance will be immediately adjacent to a principal entrance to the *mall* and shall have not less than one-half of their required *means of egress* opening directly to the exterior of the *covered mall building*. Assembly occupancies located within the perimeter line of an *open mall building* shall be permitted to have their main *exit* open to the *open mall*.

402.8.4.1 Anchor Building Means of Egress

Required *means of egress* for *anchor buildings* shall be provided independently from the *mall means of egress* system. The *occupant load* of *anchor buildings* opening into the *mall* shall not be included in determining *means of egress* requirements for the *mall*. The path of egress travel of *mall*s shall not exit through *anchor buildings*. *Mall*s terminating at an *anchor building* where no other *means of egress* has been provided shall be considered as a dead-end *mall*.

402.8.5 Distance to Exits

Within each individual tenant space in a *covered or open mall building*, the distance of travel from any point to an *exit* or entrance to the *mall* shall be not greater than 200 feet (60 960 mm).

The distance of travel from any point within a *mall* of a *covered mall building* to an *exit* shall be not greater than 200 feet (60 960 mm). The maximum distance of travel from any point within an *open mall* to the perimeter line of the *open mall building* shall be not greater than 200 feet (60 960 mm).

402.8.6 Access to Exits

Where more than one *exit* is required, they shall be so arranged that it is possible to travel in either direction from any point in a *mall* of a *covered mall building* to separate exits or from any point in an *open mall* of an *open mall building* to two separate locations on the perimeter line, provided neither location is an exterior wall of an *anchor building* or parking garage. The width of an *exit passageway* or *corridor* from a *mall* shall be not less than 66 inches (1676 mm).

Exception: Access to exits is permitted by way of a dead-end *mall* that does not exceed a length equal to twice the width of the *mall* measured at the narrowest location within the dead-end portion of the *mall*.

402.8.6.1 Exit Passageways

Where *exit passageways* provide a secondary *means of egress* from a tenant space, the exit passageways shall be constructed in accordance with Section 1024.

402.8.7 Service Areas Fronting on Exit Passageways

Mechanical rooms, electrical rooms, building service areas and service elevators are permitted to open directly into *exit passageways*, provided the *exit passageway* is separated from such rooms with not less than 1-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. The *fire protection rating* of openings in the *fire barriers* shall be not less than 1 hour.

402.8.8 Security Grilles and Doors

Horizontal sliding or vertical security grilles or doors that are a part of a required *means of egress* shall conform to the following:

1. Doors and grilles shall remain in the full open position during the period of occupancy by the general public.
2. Doors or grilles shall not be brought to the closed position when there are 10 or more persons occupying spaces served by a single *exit* or 50 or more persons occupying spaces served by more than one *exit*.
3. The doors or grilles shall be openable from within without the use of any special knowledge or effort where the space is occupied.
4. Where two or more *exits* are required, not more than one-half of the *exits* shall be permitted to include either a horizontal sliding or vertical rolling grille or door.

Section 403 High-Rise Buildings

403.1 Applicability

High-rise buildings shall comply with Sections 403.2 through 403.6.

Exception: The provisions of Sections 403.2 through 403.6 shall not apply to the following buildings and structures:

1. Airport traffic control towers in accordance with Section 412.3.
2. *Open parking garages* in accordance with Section 406.5.
3. The portion of a building containing a Group A-5 occupancy in accordance with Section 303.6.
4. Special industrial occupancies in accordance with Section 503.1.1.
5. Buildings with:
 - 5.1. A Group H-1 occupancy;
 - 5.2. A Group H-2 occupancy in accordance with Section 415.8, 415.9.2, 415.9.3 or 426.1; or,
 - 5.3. A Group H-3 occupancy in accordance with Section 415.8.

403.2 Construction

The construction of *high-rise buildings* shall comply with the provisions of Sections 403.2.1 through 403.2.4.

403.2.1 Reduction in Fire-Resistance Rating

The *fire-resistance-rating* reductions listed in Sections 403.2.1.1 and 403.2.1.2 shall be allowed in buildings that have sprinkler control valves equipped with supervisory initiating devices and water-flow initiating devices for each floor.

403.2.1.1 Type of Construction

The following reductions in the minimum *fire-resistance rating* of the building elements in Table 601 shall be permitted as follows:

1. For buildings not greater than 420 feet (128 000 mm) in *building height*, the *fire-resistance rating* of the building elements in Type IA construction shall be permitted to be reduced to the minimum *fire-resistance ratings* for the building elements in Type IB.

Exception: The required *fire-resistance rating* of columns supporting floors shall not be reduced.

2. In other than Group F-1, M and S-1 occupancies, the *fire-resistance rating* of the building elements in Type IB construction shall be permitted to be reduced to the *fire-resistance ratings* in Type IIA.
3. The *building height* and *building area* limitations of a building containing building elements with reduced *fire-resistance ratings* shall be permitted to be the same as the building without such reductions.

403.2.1.2 Shaft Enclosures

For buildings not greater than 420 feet (128 000 mm) in *building height*, the required *fire-resistance rating* of the *fire barriers* enclosing vertical *shafts*, other than *interior exit stairway* and elevator hoistway enclosures, is permitted to be reduced to 1 hour where automatic sprinklers are installed within the *shafts* at the top and at alternate floor levels.

403.2.2 Seismic Considerations

Reserved.

403.2.3 Structural Integrity of Interior Exit Stairways and Elevator Hoistway Enclosures

For *high-rise buildings* of *Risk Category III* or *IV* in accordance with Section 1604.5, and for all buildings that are more than 420 feet (128 000 mm) in *building height*, enclosures for *interior exit stairways* and elevator hoistway enclosures shall comply with Sections 403.2.3.1 through 403.2.3.4.

403.2.3.1 Wall Assembly Materials—Soft Body Impact

The panels making up the enclosures for *interior exit stairways* and elevator hoistway enclosures shall meet or exceed Soft Body Impact Classification Level 2 as measured by the test method described in ASTM C1629/C1629M when tested from the exterior side of the enclosures.

403.2.3.2 Wall Assembly Materials—Hard Body Impact

The panels making up the enclosures for *interior exit stairways* and elevator hoistway enclosures that are not exposed to the interior of the enclosures shall be in accordance with one of the following:

1. The wall assembly shall incorporate no fewer than two layers of impact-resistant panels, each of which meets or exceeds Hard Body Impact Classification Level 2 as measured by the test method described in ASTM C1629/C1629M.
2. The wall assembly shall incorporate no fewer than one layer of impact-resistant panels that meets or exceeds Hard Body Impact Classification Level 3 as measured by the test method described in ASTM C1629/C1629M.
3. The wall assembly incorporates multiple layers of any material, tested in tandem, that meets or exceeds Hard Body Impact Classification Level 3 as measured by the test method described in ASTM C1629/C1629M.

403.2.3.3 Concrete and Masonry Walls

Concrete or masonry walls shall be deemed to satisfy the requirements of Sections 403.2.3.1 and 403.2.3.2.

403.2.3.4 Other Wall Materials

Any other wall materials that provide impact resistance equivalent to that required by Sections 403.2.3.1 for Soft Body Impact Classification Level 2 and 403.2.3.2 for Hard Body Impact Classification Level 3, as measured by the test method described in ASTM C1629/C1629M, shall be permitted.

403.2.4 Sprayed Fire-Resistive Materials (SFRM)

The bond strength of the SFRM installed throughout the building shall be in accordance with Table 403.2.4.

TABLE 403.2.4

MINIMUM BOND STRENGTH

HEIGHT OF BUILDING^a	SFRM MINIMUM BOND STRENGTH
Up to 420 feet	430 psf
Greater than 420 feet	1,000 psf

For SI: 1 foot = 304.8 mm, 1 pound per square foot (psf) = 0.0479 kW/m².

a. Above the lowest level of fire department vehicle access.

[F] 403.3 Automatic Sprinkler System

Buildings and structures shall be equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

Exception: An *automatic sprinkler system* shall not be required in spaces or areas of:

1. *Open parking garages* in accordance with Section 406.5.
2. Telecommunications equipment buildings used exclusively for telecommunications equipment, associated electrical power distribution equipment, batteries and standby engines, provided that those spaces or areas are equipped throughout with an automatic fire detection system in accordance with Section 907.2 and are separated from the remainder of the building by not less than 1-hour *fire barriers* constructed in accordance with Section 707 or not less than 2-hour *horizontal assemblies* constructed in accordance with Section 711, or both.

[F] 403.3.1 Number of Sprinkler Risers and System Design

Each sprinkler system zone in buildings that are more than 420 feet (128 000 mm) in *building height* shall be supplied by no fewer than two risers. Each riser shall supply sprinklers on alternate floors. If more than two risers are provided for a zone, sprinklers on adjacent floors shall not be supplied from the same riser.

[F] 403.3.1.1 Riser Location

Sprinkler risers shall be placed in *interior exit stairways* and ramps that are remotely located in accordance with Section 1007.1.

[F] 403.3.2 Water Supply to Required Fire Pumps

In buildings that are more than 420 feet (128 000 mm) in *building height*, required fire pumps shall be supplied by connections to no fewer than two water mains located in different streets. Separate supply piping shall be provided between each connection to the water main and the pumps. Each connection and the supply piping between the connection and the pumps shall be sized to supply the flow and pressure required for the pumps to operate.

Exception: Two connections to the same main shall be permitted provided the main is valved such that an interruption can be isolated so that the water supply will continue without interruption through no fewer than one of the connections.

[F] 403.3.3 Secondary Water Supply

Reserved.

[F] 403.3.4 Fire Pump Room

Fire pumps shall be located in rooms protected in accordance with Section 913.2.1.

[F] 403.4 Emergency Systems

The detection, alarm and emergency systems of *high-rise buildings* shall comply with Sections 403.4.1 through 403.4.8.

[F] 403.4.1 Smoke Detection

Smoke detection shall be provided in accordance with Section 907.2.13.

[F] 403.4.2 Fire Alarm System

A *fire alarm system* shall be provided in accordance with Section 907.2.13.

[F] 403.4.3 Standpipe System

A *high-rise building* shall be equipped with a standpipe system as required by Section 905.3.

[F] 403.4.4 Emergency Voice/Alarm Communication System

An *emergency voice/alarm communication system* shall be provided in accordance with Section 907.5.2.2.

[F] 403.4.5 Emergency Responder Radio Coverage

Emergency responder radio coverage shall be provided in accordance with the *Florida Fire Prevention Code*.

[F] 403.4.6 Fire Command

A *fire command center* complying with Section 911 shall be provided in a location *approved* by the fire department.

403.4.7 Smoke Removal

To facilitate smoke removal in post-fire salvage and overhaul operations, buildings and structures shall be equipped with natural or mechanical *ventilation* for removal of products of combustion in accordance with one of the following:

1. Easily identifiable, manually operable windows or panels shall be distributed around the perimeter of each floor at not more than 50-foot (15 240 mm) intervals. The area of operable windows or panels shall be not less than 40 square feet (3.7 m^2) per 50 linear feet (15 240 mm) of perimeter.

Exceptions:

1. In Group R-1 occupancies, each *sleeping unit* or suite having an *exterior wall* shall be permitted to be provided with 2 square feet (0.19 m^2) of venting area in lieu of the area specified in Item 1.
2. Windows shall be permitted to be fixed provided that glazing can be cleared by fire fighters.
2. Mechanical air-handling equipment providing one exhaust air change every 15 minutes for the area involved. Return and exhaust air shall be moved directly to the outside without recirculation to other portions of the building.
3. Any other *approved* design that will produce equivalent results.

[F] 403.4.8 Standby and Emergency Power

A standby power system complying with Section 2702 and Section 3003 shall be provided for the standby power loads specified in Section 403.4.8.3. An emergency power system complying with Section 2702 shall be provided for the emergency power loads specified in Section 403.4.8.4.

[F] 403.4.8.1 Equipment Room

If the standby or emergency power system includes a generator set inside a building, the system shall be located in a separate room enclosed with 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. System supervision with manual start and transfer features shall be provided at the *fire command center*.

Exception: In Group I-2, Condition 2, manual start and transfer features for the critical branch of the emergency power are not required to be provided at the *fire command center*.

[F] 403.4.8.2 Fuel Line Piping Protection

Fuel lines supplying a generator set inside a building shall be separated from areas of the building other than the room the generator is located in by an approved method or assembly that has a fire-resistance rating of not less than 2 hours. Where the building is protected throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2, the required fire-resistance rating shall be reduced to 1 hour.

[F] 403.4.8.3 Standby Power Loads

The following are classified as standby power loads:

1. *Ventilation* and automatic fire detection equipment for *smokeproof enclosures*.
2. Elevators.
3. Where elevators are provided in a *high-rise building* for *accessible means of egress*, fire service access or occupant self-evacuation, the standby power system shall also comply with Sections 1009, 3007 or 3008, as applicable.

[F] 403.4.8.4 Emergency Power Loads

The following are classified as emergency power loads:

1. Exit signs and *means of egress* illumination required by Chapter 10.
2. Elevator car lighting.
3. *Emergency voice/alarm communications systems*.
4. Automatic fire detection systems.
5. *Fire alarm systems*.
6. Electrically powered fire pumps.
7. Power and lighting for the *fire command center* required by Section 403.4.6.

403.5 Means of Egress and Evacuation

The *means of egress* in *high-rise buildings* shall comply with Sections 403.5.1 through 403.5.6.

403.5.1 Remoteness of Interior Exit Stairways

Required *interior exit stairways* shall be separated by a distance not less than 30 feet (9144 mm) or not less than one-fourth of the length of the maximum overall diagonal dimension of the building or area to be served, whichever is less. The distance shall be measured in a

straight line between the nearest points of the enclosure surrounding the *interior exit stairways*. In buildings with three or more *interior exit stairways*, no fewer than two of the *interior exit stairways* shall comply with this section. Interlocking or scissor *stairways* shall be counted as one *interior exit stairway*.

403.5.2 Additional Interior Exit Stairway

For buildings other than Group R-2 that are more than 420 feet (128 000 mm) in *building height*, one additional *interior exit stairway* meeting the requirements of Sections 1011 and 1023 shall be provided in addition to the minimum number of *exits* required by Section 1006.3. The total width of any combination of remaining *interior exit stairways* with one *interior exit stairway* removed shall be not less than the total width required by Section 1005.1. *Scissor stairways* shall not be considered the additional *interior exit stairway* required by this section.

Exception: An additional *interior exit stairway* shall not be required to be installed in buildings having elevators used for occupant self-evacuation in accordance with Section 3008.

403.5.3 Stairway Door Operation

Stairway doors other than the *exit discharge doors* shall be permitted to be locked from the *stairway side*. *Stairway doors* that are locked from the *stairway side* shall be capable of being unlocked simultaneously without unlatching upon a signal from the *fire command center*.

403.5.3.1 Stairway Communication System

A telephone or other two-way communications system connected to an *approved constantly attended station* shall be provided at not less than every fifth floor in each *stairway* where the doors to the *stairway* are locked.

403.5.4 Smokeproof Enclosures

Every required *interior exit stairway* serving floors more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access shall be a *smokeproof enclosure* in accordance with Sections 909.20 and 1023.11.

403.5.5 Luminous Egress Path Markings

Luminous egress path markings shall be provided in accordance with Section 1025.

403.5.6 Emergency Escape and Rescue

Emergency escape and rescue openings specified in Section 1030 are not required.

403.6 Elevators

Elevator installation and operation in *high-rise buildings* shall comply with Chapter 30 and Sections 403.6.1 and 403.6.2.

403.6.1 Fire Service Access Elevator

In buildings with an occupied floor more than 120 feet (36 576 mm), measured from the elevation of street-level access to the level of the highest occupiable floor, no fewer than two fire service access elevators shall be provided in accordance with Section 3007. All remaining elevators, if any, shall be provided with Phase I and II emergency operation. Each fire service access elevator shall have a capacity of not less than 3,500 pounds (1588 kg).

403.6.2 Occupant Evacuation Elevators

Where installed in accordance with Section 3008, passenger elevators for general public use shall be permitted to be used for occupant self-evacuation.

Section 404 Atriums

404.1 General

In other than Group H occupancies, the provisions of Sections 404.1 through 404.11 shall apply to buildings or structures containing vertical openings defined as "Atriums."

Exception: Vertical openings that comply with Sections 712.1.1 through 712.1.3 and Sections 712.1.9 through 712.1.14.

404.1.1 Definition

The following term is defined in Chapter 2:

atrium.**404.2 Use**

The floor of the *atrium* shall not be used for other than low fire hazard uses and only *approved* materials and decorations in accordance with the *Florida Fire Prevention Code* shall be used in the *atrium* space.

Exception: The *atrium* floor area is permitted to be used for any *approved* use where the individual space is provided with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

[F] 404.3 Automatic Sprinkler Protection

An *approved automatic sprinkler system* shall be installed throughout the entire building.

Exceptions:

1. That area of a building adjacent to or above the *atrium* need not be sprinklered provided that portion of the building is separated from the *atrium* portion by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.
2. Where the ceiling of the *atrium* is more than 55 feet (16 764 mm) above the floor, sprinkler protection at the ceiling of the *atrium* is not required.

[F] 404.4 Fire Alarm System

A *fire alarm* system shall be provided in accordance with Section 907.2.14.

404.5 Smoke Control

A smoke control system shall be installed in accordance with Section 909.

Exceptions:

1. In other than Group I-2, and Group I-1, Condition 2, smoke control is not required for *atriums* that connect only two *stories*.
2. A smoke control system is not required for atriums connecting more than two stories when all of the following are met:
 - 2.1. Only the two lowest stories shall be permitted to be open to the atrium.
 - 2.2. All stories above the lowest two stories shall be separated from the atrium in accordance with the provision for a shaft in Section 713.4.

404.6 Enclosure of Atriums

Atrium spaces shall be separated from adjacent spaces by a 1-hour *fire barrier* constructed in accordance with Section 707 or a *horizontal assembly* constructed in accordance with Section 711, or both.

Exceptions:

1. A *fire barrier* is not required where a glass wall forming a smoke partition is provided. The glass wall shall comply with all of the following:
 - 1.1. Automatic sprinklers are provided along both sides of the separation wall and doors, or on the room side only if there is not a walkway on the *atrium* side. The sprinklers shall be located between 4 inches and 12 inches (102 mm and 305 mm) away from the glass and at intervals along the glass not greater than 6 feet (1829 mm). The sprinkler system shall be designed so that the entire surface of the glass is wet upon activation of the sprinkler system without obstruction;
 - 1.2. The glass wall shall be installed in a gasketed frame in a manner that the framing system deflects without breaking (loading) the glass before the sprinkler system operates; and

- 1.3. Where glass doors are provided in the glass wall, they shall be either *self-closing* or automatic-closing.

2. A *fire barrier* is not required where a glass-block wall assembly complying with Section 2110 and having a $\frac{3}{4}$ -hour *fire protection rating* is provided.

3. A *fire barrier* is not required between the *atrium* and the adjoining spaces of any three floors of the *atrium* provided such spaces are accounted for in the design of the smoke control system.

4. A horizontal assembly is not required between the atrium and openings for escalators complying with Section 712.1.3.

5. A horizontal assembly is not required between the atrium and openings for exit access stairways and ramps complying with Item 4 of Section 1019.3.

[F] 404.7 Standby Power

Equipment required to provide smoke control shall be provided with standby power in accordance with Section 909.11.

404.8 Interior Finish

The *interior finish* of walls and ceilings of the *atrium* shall be not less than Class B with no reduction in class for sprinkler protection.

404.9 Exit Access Travel Distance

Exit access travel distance for areas open to an *atrium* shall comply with the requirements of this section.

404.9.1 Egress Not Through the Atrium

Where required access to the *exits* is not through the *atrium*, *exit access* travel distance shall comply with Section 1017.

404.9.2 Exit Access Travel Distance at the Level of Exit Discharge

Where the path of egress travel is through an *atrium* space, *exit access* travel distance at the *level of exit discharge* shall be determined in accordance with Section 1017.

404.9.3 Exit Access Travel Distance at Other Than the Level of Exit Discharge

Where the path of egress travel is not at the *level of exit discharge* from the *atrium*, that portion of the total permitted *exit access* travel distance that occurs within the *atrium* shall be not greater than 200 feet (60 960 mm).

404.10 Exit Stairways in an Atrium

Where an *atrium* contains an *interior exit stairway* all the following shall be met:

1. The entry to the exit stairway is the edge of the closest riser of the exit stairway.

2. The entry of the exit stairway shall have access from a minimum of two directions.

3. The distance between the entry to an exit stairway in an atrium and the entrance to a minimum of one exit stairway enclosed in accordance with Section 1023.2 shall comply with the separation required by Section 1007.1.1.

4. Exit access travel distance shall be measured to the closest riser of the exit stairway.

5. Not more than 50 percent of the exit stairways shall be located in the same atrium.

404.11 Interior Exit Stairways Discharge

A maximum of 50 percent of *interior exit stairways* are permitted to egress through an *atrium* on the *level of exit discharge* in accordance with Section 1028.

Section 405 Underground Buildings

405.1 General

The provisions of Sections 405.2 through 405.9 apply to building spaces having a floor level used for human occupancy more than 30 feet (9144 mm) below the finished floor of the lowest *level of exit discharge*.

Exceptions: The provisions of Section 405 are not applicable to the following buildings or portions of buildings:

1. One- and two-family *dwellings*, sprinklered in accordance with Section 903.3.1.3.
2. Parking garages provided with *automatic sprinkler systems* in compliance with Section 405.3.
3. Fixed guideway transit systems.
4. *Grandstands, bleachers, stadiums, arenas and similar facilities*.
5. Where the lowest story is the only story that would qualify the building as an underground building and has an area not greater than 1,500 square feet (139 m²) and has an *occupant load* less than 10.
6. Pumping stations and other similar mechanical spaces intended only for limited periodic use by service or maintenance personnel.

405.2 Construction Requirements

The underground portion of the building shall be of Type I construction.

[F] 405.3 Automatic Sprinkler System

The highest *level of exit discharge* serving the underground portions of the building and all levels below shall be equipped with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1. Water-flow switches and control valves shall be supervised in accordance with Section 903.4.

405.4 Compartmentation

Compartmentation shall be in accordance with Sections 405.4.1 through 405.4.3.

405.4.1 Number of Compartments

A building having a floor level more than 60 feet (18 288 mm) below the finished floor of the lowest *level of exit discharge* shall be divided into no fewer than two compartments of approximately equal size. Such compartmentation shall extend through the highest *level of exit discharge* serving the underground portions of the building and all levels below.

Exception: The lowest story need not be compartmented where the area is not greater than 1,500 square feet (139 m²) and has an *occupant load* of less than 10.

405.4.2 Smoke Barrier Penetration

The compartments shall be separated from each other by a *smoke barrier* in accordance with Section 709. Penetrations between the two compartments shall be limited to plumbing and electrical piping and conduit that are firestopped in accordance with Section 714. Doorways shall be protected by *fire door assemblies* that comply with Section 716 and shall be automatic-closing by smoke detection in accordance with Section 716.5.9.4 and are installed in accordance with NFPA 105 and Section 716.5.3. Where provided, each compartment shall have an air supply and an exhaust system independent of the other compartments.

405.4.3 Elevators

Where elevators are provided, each compartment shall have direct access to an elevator. Where an elevator serves more than one compartment, an elevator lobby shall be provided and shall be separated from each compartment by a *smoke barrier* in accordance with Section 709. Doorways in the smoke barrier shall be protected by fire door assemblies that comply with Section 716, shall comply with the smoke and draft control assembly requirements of Section 716.5.3 with the UL 1784 test conducted without an artificial bottom seal, and shall be automatic-closing by smoke detection in accordance with Section 716.5.9.4.

405.5 Smoke Control System

A smoke control system shall be provided in accordance with Sections 405.5.1 and 405.5.2.

405.5.1 Control System

A smoke control system is required to control the migration of products of combustion in accordance with Section 909 and the provisions of this section. Smoke control shall restrict movement of smoke to the general area of fire origin and maintain *means of egress* in a usable condition.

405.5.2 Compartment Smoke Control System

Where compartmentation is required, each compartment shall have an independent smoke control system. The system shall be automatically activated and capable of manual operation in accordance with Sections 907.2.18 and 907.2.19.

[F] 405.6 Fire Alarm Systems

A *fire alarm system* shall be provided where required by Sections 907.2.18 and 907.2.19.

405.7 Means of Egress

Means of egress shall be in accordance with Sections 405.7.1 and 405.7.2.

405.7.1 Number of Exits

Each floor level shall be provided with no fewer than two *exits*. Where compartmentation is required by Section 405.4, each compartment shall have no fewer than one *exit* and shall also have no fewer than one *exit access doorway* into the adjoining compartment.

405.7.2 Smokeproof Enclosure

Every required *stairway* serving floor levels more than 30 feet (9144 mm) below the finished floor of its *level of exit discharge* shall comply with the requirements for a *smokeproof enclosure* as provided in Section 1023.11.

[F] 405.8 Standby and Emergency Power

A standby power system complying with Section 2702 shall be provided for the standby power loads specified in Section 405.8.1. An emergency power system complying with Section 2702 shall be provided for the emergency power loads specified in Section 405.8.2.

[F] 405.8.1 Standby Power Loads

The following loads are classified as standby power loads:

1. Smoke control system.
2. *Ventilation* and automatic fire detection equipment for *smokeproof enclosures*.
3. Elevators, as required in Section 3003.

[F] 405.8.2 Emergency Power Loads

The following loads are classified as emergency power loads:

1. *Emergency voice/alarm communications systems*.
2. *Fire alarm* systems.
3. Automatic fire detection systems.
4. Elevator car lighting.
5. *Means of egress* and exit sign illumination as required by Chapter 10.

6. Fire pumps.

[F] 405.9 Standpipe System

The underground building shall be equipped throughout with a standpipe system in accordance with Section 905.

Section 406 Motor-Vehicle-Related Occupancies

406.1 General

All motor-vehicle-related occupancies shall comply with Sections 406.1.1 through 406.1.9.3. Private garages and carports shall also comply with Section 406.3. Open public parking garages shall also comply with Sections 406.4 and 406.5. Enclosed public parking garages shall also comply with Sections 406.4 and 406.6. Motor fuel-dispensing facilities shall also comply with Section 406.7. Repair garages shall also comply with Section 406.8.

406.1.1 Automatic Garage Door Openers and Vehicular Gates

Where provided, automatic garage door openers shall be listed and labeled in accordance with UL 325. Where provided, automatic vehicular gates shall comply with Section 3110.

406.1.2 Clear Height

The clear height of each floor level in vehicle and pedestrian traffic areas shall be not less than 7 feet (2134 mm). Canopies under which fuels are dispensed shall have a clear height in accordance with Section 406.7.2.

Exception: A lower clear height is permitted for a parking tier in mechanical-access *open parking garages* where approved by the *building official*.

406.1.3 Accessible Parking Spaces

Where parking is provided, accessible parking spaces shall be provided in accordance with Chapter 11.

406.1.4 Floor Surfaces

Floor surfaces shall be of concrete or similar approved noncombustible and nonabsorbent materials. The area of floor used for the parking of automobiles or other vehicles shall be sloped to facilitate the movement of liquids to a drain or toward the main vehicle entry doorway. The surface of vehicle fueling pads in motor fuel-dispensing facilities shall be in accordance with Section 406.7.1.

Exceptions:

1. Asphalt parking surfaces shall be permitted at ground level for public parking garages and private carports.
2. Floors of Group S-2 parking garages shall not be required to have a sloped surface.
3. Slip-resistant, nonabsorbent, interior floor finishes having a critical radiant flux not more than 0.45 W/cm^2 , as determined by ASTM E648 or NFPA 253, shall be permitted in repair garages.

406.1.5 Sleeping Rooms

Openings between a motor vehicle-related occupancy and a room used for sleeping purposes shall not be permitted.

406.1.6 Fuel Dispensing

The dispensing of fuel shall only be permitted in motor fuel-dispensing facilities in accordance with Section 406.7.

406.1.7 Electric Vehicle Charging Stations

Where provided, electric vehicle charging stations shall be installed in accordance with NFPA 70. Electric vehicle charging system equipment shall be listed and labeled in accordance with UL 2202. Electric vehicle supply equipment shall be listed and labeled in

accordance with UL 2594. Accessibility to electric vehicle charging stations shall be provided in accordance with Chapter 11.

406.1.8 Mixed Occupancies and Separation

Mixed uses shall be allowed in the same building as public parking garages and repair garages in accordance with Section 508.1. Mixed uses in the same building as an *open parking garage* are subject to Sections 402.4.2.3, 406.5.11, 508.1, 510.3, 510.4 and 510.7.

406.1.9 Equipment and Appliances

Equipment and appliances shall be installed in accordance with Sections 406.1.9.1 through 406.1.9.3 and the *Florida Building Code, Mechanical, Florida Building Code, Fuel Gas* and NFPA 70.

406.1.9.1 Elevation of Ignition Sources

Equipment and appliances having an ignition source and located in hazardous locations and public garages, private garages, repair garages, automotive motor fuel-dispensing facilities and parking garages shall be elevated such that the source of ignition is not less than 18 inches (457 mm) above the floor surface on which the equipment or appliance rests. For the purpose of this section, rooms or spaces that are not part of the living space of a dwelling unit and that communicate directly with a private garage through openings shall be considered to be part of the private garage.

Exception: Elevation of the ignition source is not required for appliances that are listed as flammable vapor ignition resistant.

406.1.9.1.1 Parking Garages

Connection of a parking garage with any room in which there is a fuel-fired appliance shall be by means of a vestibule providing a two-doorway separation, except that a single door is permitted where the sources of ignition in the appliance are elevated in accordance with Section 406.1.9.1.

Exception: This section shall not apply to appliance installations complying with Section 406.1.9.2 or 406.1.9.3.

406.1.9.2 Public Garages

Appliances located in public garages, motor fuel-dispensing facilities, repair garages or other areas frequented by motor vehicles shall be installed not less than 8 feet (2438 mm) above the floor. Where motor vehicles are capable of passing under an appliance, the appliance shall be installed at the clearances required by the appliance manufacturer and not less than 1 foot (305 mm) higher than the tallest vehicle garage door opening.

Exception: The requirements of this section shall not apply where the appliances are protected from motor vehicle impact and installed in accordance with Section 406.1.9.1 and NFPA 30A.

406.1.9.3 Private Garages

Appliances located in private garages and carports shall be installed with a minimum clearance of 6 feet (1829 mm) above the floor.

Exception: The requirements of this section shall not apply where the appliances are protected from motor vehicle impact and installed in accordance with Section 406.1.9.1.

406.2 Definitions

The following terms are defined in Chapter 2:

MECHANICAL-ACCESS OPEN PARKING GARAGES.

OPEN PARKING GARAGE.

PRIVATE GARAGE.

RAMP-ACCESS OPEN PARKING GARAGES.

406.3 Private Garages and Carports

Private garages and carports shall comply with Sections 406.1.1 through 406.1.9.3.

406.3.1 Classification

Private garages and carports shall be classified as Group U occupancies. Each private garage shall be not greater than 1,000 square feet (93 m²) in area. Multiple private garages are permitted in a building where each private garage is separated from the other private

406.3.2 Separation

For other than private garages adjacent to dwelling units, the separation of private garages from other occupancies shall comply with Section 508. Separation of private garages from *dwelling units* shall comply with Sections 406.3.2.1 and 406.3.2.2.

406.3.2.1 Dwelling Unit Separation

The private garage shall be separated from the *dwelling unit* and its *attic* area by means of gypsum board, not less than $\frac{1}{2}$ inch (12.7 mm) in thickness, applied to the garage side. Garages beneath habitable rooms shall be separated from all habitable rooms above by not less than a $\frac{5}{8}$ -inch (15.9 mm) Type X gypsum board or equivalent and $\frac{1}{2}$ -inch (12.7 mm) gypsum board applied to structures supporting the separation from habitable rooms above the garage. Door openings between a private garage and the *dwelling unit* shall be equipped with either solid wood doors or solid or honeycomb core steel doors not less than $1\frac{3}{8}$ inches (34.9 mm) in thickness, or doors in compliance with Section 716.5.3 with a fire protection rating of not less than 20 minutes. Doors shall be *self-closing* and self-latching.

406.3.2.2 Ducts

Ducts in a private garage and ducts penetrating the walls or ceilings separating the *dwelling unit* from the garage, including its *attic* area, shall be constructed of sheet steel of not less than 0.019 inch (0.48 mm) in thickness and shall have no openings into the garage.

406.3.3 Carports

Carports shall be open on at least two sides. Carports not open on at least two sides shall be considered a garage and shall comply with the requirements for private garages.

The area of floor used for parking of automobiles or other vehicles shall be sloped to facilitate the movement of liquids to a drain or toward the main vehicle entry doorway.

406.3.3.1 Carport Separation

A separation is not required between a Group R-3 and U carport, provided the carport is entirely open on two or more sides and there are not enclosed areas above.

406.4 Public Parking Garages

Parking garages, other than *private garages*, shall be classified as public parking garages and shall comply with the provisions of Sections 406.1.1 through 406.1.9.3 and shall be classified as either an *open parking garage* or an enclosed parking garage. *Open parking garages* shall also comply with Section 406.5. Enclosed parking garages shall also comply with Section 406.6. See Section 510 for special provisions for parking garages.

406.4.1 Guards

Guards shall be provided in accordance with Section 1015. Guards serving as *vehicle barriers* shall comply with Sections 406.4.2 and 1015.

406.4.2 Vehicle Barriers

Vehicle barriers not less than 2 feet 9 inches (835 mm) in height shall be placed where the vertical distance from the floor of a drive lane or parking space to the ground or surface directly below is greater than 1 foot (305 mm). *Vehicle barriers* shall comply with the loading requirements of Section 1607.9.3.

Exception: *Vehicle barriers* are not required in vehicle storage compartments in a mechanical access parking garage.

406.4.3 Ramps

Vehicle ramps shall not be considered as required *exits* unless pedestrian facilities are provided. Vehicle ramps that are utilized for vertical circulation as well as for parking shall not exceed a slope of 1:15 (6.67 percent).

406.5 Open Parking Garages

Open parking garages shall comply with Sections 406.1.1 through 406.1.9.3, 406.4 and 406.5.

406.5.1 Construction

Open parking garages shall be of Type I, II or IV construction. *Open parking garages* shall meet the design requirements of Chapter 16. For vehicle barriers, see Section 406.4.2.

406.5.2 Openings

For natural *ventilation* purposes, the exterior side of the structure shall have uniformly distributed openings on two or more sides. The area of such openings in *exterior walls* on a tier shall be not less than 20 percent of the total perimeter wall area of each tier. The aggregate length of the openings considered to be providing natural *ventilation* shall be not less than 40 percent of the perimeter of the tier. Interior walls shall be not less than 20 percent open with uniformly distributed openings.

Exception: Openings are not required to be distributed over 40 percent of the building perimeter where the required openings are uniformly distributed over two opposing sides of the building.

406.5.2.1 Openings Below Grade

Where openings below grade provide required natural *ventilation*, the outside horizontal clear space shall be one and one-half times the depth of the opening. The width of the horizontal clear space shall be maintained from grade down to the bottom of the lowest required opening.

406.5.3 Uses

Mixed uses shall be allowed in the same building as an open parking garage subject to the provisions of Sections 402.4.2.3, 406.5.11, 508.1, 510.3, 510.4 and 510.7.

406.5.4 Area and Height

Area and height of *open parking garages* shall be limited as set forth in Chapter 5 for Group S-2 occupancies and as further provided for in Section 508.1.

TABLE 406.5.4

OPEN PARKING GARAGES AREA AND HEIGHT

TYPE OF CONSTRUCTION	AREA PER TIER (square feet)	HEIGHT (in tiers)		
		Ramp access	Mechanical access	
			Automatic sprinkler system	
			No	Yes
IA	Unlimited	Unlimited	Unlimited	Unlimited
IB	Unlimited	12 tiers	12 tiers	18 tiers
IIA	50,000	10 tiers	10 tiers	15 tiers
IIB	50,000	8 tiers	8 tiers	12 tiers
IV	50,000	4 tiers	4 tiers	4 tiers

For SI: 1 square foot = 0.0929 m².

406.5.4.1 Single Use

Where the *open parking garage* is used exclusively for the parking or storage of private motor vehicles, with no other uses in the building, the area and height shall be permitted to comply with Table 406.5.4, along with increases allowed by Section 406.5.5.

Exception: The grade-level tier is permitted to contain an office, waiting and toilet rooms having a total combined area of not more than 1,000 square feet (93 m²). Such area need not be separated from the *open parking garage*.

In *open parking garages* having a spiral or sloping floor, the horizontal projection of the structure at any cross section shall not exceed the allowable area per parking tier. In the case of an *open parking garage* having a continuous spiral floor, each 9 feet 6 inches (2896 mm) of height, or portion thereof, shall be considered a tier.

406.5.5 Area and Height Increases

The allowable area and height of *open parking garages* shall be increased in accordance with the provisions of this section. Garages with sides open on three-fourths of the building's perimeter are permitted to be increased by 25 percent in area and one tier in height. Garages with sides open around the entire building's perimeter are permitted to be increased by 50 percent in area and one tier in height. For a side to be considered open under the above provisions, the total area of openings along the side shall not be less than 50 percent of the interior area of the side at each tier and such openings shall be equally distributed along the length of the tier. For purposes of calculating the interior area of the side, the height shall not exceed 7 feet (2134 mm).

Allowable tier areas in Table 406.5.4 shall be increased for *open parking garages* constructed to heights less than the table maximum. The gross tier area of the garage shall not exceed that permitted for the higher structure. No fewer than three sides of each such larger tier shall have continuous horizontal openings not less than 30 inches (762 mm) in clear height extending for not less than 80 percent of the length of the sides and no part of such larger tier shall be more than 200 feet (60 960 mm) horizontally from such an opening. In addition, each such opening shall face a street or *yard* accessible to a street with a width of not less than 30 feet (9144 mm) for the full length of the opening, and standpipes shall be provided in each such tier.

Open parking garages of Type II construction, with all sides open, shall be unlimited in allowable area where the *building height* does not exceed 75 feet (22 860 mm). For a side to be considered open, the total area of openings along the side shall be not less than 50 percent of the interior area of the side at each tier and such openings shall be equally distributed along the length of the tier. For purposes of calculating the interior area of the side, the height shall not exceed 7 feet (2134 mm). All portions of tiers shall be within 200 feet (60 960 mm) horizontally from such openings or other natural *ventilation* openings as defined in Section 406.5.2. These openings shall be permitted to be provided in *courts* with a minimum dimension of 20 feet (6096 mm) for the full width of the openings.

406.5.6 Fire Separation Distance

Exterior walls and openings in *exterior walls* shall comply with Tables 601 and 705.5. The distance to an adjacent *lot line* shall be determined in accordance with Table 705.5 and Section 705.

406.5.7 Means of Egress

Where persons other than parking attendants are permitted, *open parking garages* shall meet the *means of egress* requirements of Chapter 10. Where no persons other than parking attendants are permitted, there shall be no fewer than two *exit stairways*. Each *exit stairway* shall be not less than 36 inches (914 mm) in width. Lifts shall be permitted to be installed for use of employees only, provided they are completely enclosed by noncombustible materials.

[F] 406.5.8 Standpipe System

An *open parking garage* shall be equipped with a standpipe system as required by Section 905.3.

406.5.9 Enclosure of Vertical Openings

Enclosure shall not be required for vertical openings except as specified in Section 406.5.7.

406.5.10 Ventilation

Ventilation, other than the percentage of openings specified in Section 406.5.2, shall not be required.

406.5.11 Prohibitions

The following uses and alterations are not permitted:

1. Vehicle repair work.
2. Parking of buses, trucks and similar vehicles.
3. Partial or complete closing of required openings in exterior walls by tarpaulins or any other means.
4. Dispensing of fuel.

406.6 Enclosed Parking Garages

Enclosed parking garages shall comply with Sections 406.1.1 through 406.1.9.3, 406.4 and 406.6.

406.6.1 Heights and Areas

Enclosed vehicle parking garages and portions thereof that do not meet the definition of *open parking garages* shall be limited to the allowable heights and areas specified in Sections 504 and 506 as modified by Section 507. Roof parking is permitted.

406.6.2 Ventilation

A mechanical *ventilation* system shall be provided in accordance with the *Florida Building Code, Mechanical*.

[F] 406.6.3 Automatic Sprinkler System

An enclosed parking garage shall be equipped with an *automatic sprinkler system* in accordance with Section 903.2.10.

406.6.4 Mechanical-Access Enclosed Parking Garages

Mechanical-access enclosed parking garages shall be in accordance with Sections 406.6.4.1 through 406.6.4.4.

406.6.4.1 Separation

Mechanical-access enclosed parking garages shall be separated from other occupancies and accessory uses by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or by not less than 2-hour *horizontal assemblies* constructed in accordance with Section 711, or both.

406.6.4.2 Smoke Removal

A mechanical smoke removal system, installed in accordance with Section 910.4, shall be provided for all areas containing a *mechanical-access enclosed parking garage*.

406.6.4.3 Fire Control Equipment Room

Fire control equipment, consisting of the fire alarm control unit, mechanical *ventilation* controls and an emergency shutdown switch, shall be provided in a room located where the equipment is able to be accessed by the fire service from a secured exterior door of the building. The room shall be not less than 50 square feet (4.65 m^2) in area and shall be in a location that is approved by the fire code official.

406.6.4.3.1 Emergency Shutdown Switch

The mechanical parking system shall be provided with a manually activated emergency shutdown switch for use by emergency personnel. The switch shall be clearly identified and shall be in a location approved by the fire code official.

406.6.4.4 Fire Department Access Doors

Access doors shall be provided in accordance with the *Florida Fire Prevention Code*.

406.7 Motor Fuel-Dispensing Facilities

Motor fuel-dispensing facilities shall comply with the *Florida Fire Prevention Code* and Sections 406.1.1 through 406.1.9.3 and 406.7.

406.7.1 Vehicle Fueling Pad

The vehicle shall be fueled on noncoated concrete or other *approved* paving material having a resistance not exceeding 1 megohm as determined by the methodology in EN 1081.

406.7.2 Canopies

Canopies under which fuels are dispensed shall have a clear, unobstructed height of not less than 13 feet 6 inches (4115 mm) to the lowest projecting element in the vehicle drive-through area. Canopies and their supports over pumps shall be of noncombustible materials, *fire-retardant-treated wood* complying with Chapter 23, heavy timber complying with Section 2304.11, or of construction providing 1-hour *fire resistance*. Combustible materials used in or on a *canopy* shall comply with one of the following:

1. Shielded from the pumps by a noncombustible element of the *canopy*, or heavy timber complying with Section 2304.11;
2. Plastics covered by aluminum facing having a thickness of not less than 0.010 inch (0.30 mm) or corrosion-resistant steel having a base metal thickness of not less than 0.016 inch (0.41 mm). The plastic shall have a *flame spread index* of 25 or less and a smoke-developed index of 450 or less when tested in the form intended for use in accordance with ASTM E84 or UL 723 and a self-ignition temperature of 650°F (343°C) or greater when tested in accordance with ASTM D1929; or

3. Panels constructed of light-transmitting plastic materials shall be permitted to be installed in *canopies* erected over motor vehicle fuel-dispensing station fuel dispensers, provided the panels are located not less than 10 feet (3048 mm) from any building on the same *lot* and face *yards* or streets not less than 40 feet (12 192 mm) in width on the other sides. The aggregate areas of plastics shall be not greater than 1,000 square feet (93 m²). The maximum area of any individual panel shall be not greater than 100 square feet (9.3 m²).

406.7.2.1 Canopies Used to Support Gaseous Hydrogen Systems

Canopies that are used to shelter dispensing operations where flammable compressed gases are located on the roof of the *canopy* shall be in accordance with the following:

1. The *canopy* shall meet or exceed Type I construction requirements.
2. Operations located under *canopies* shall be limited to refueling only.
3. The *canopy* shall be constructed in a manner that prevents the accumulation of hydrogen gas.

406.8 Repair Garages

Repair garages shall be constructed in accordance with the *Florida Fire Prevention Code* and Sections 406.1.1 through 406.1.9.3 and 406.8. This occupancy shall not include motor fuel-dispensing facilities, as regulated in Section 406.7.

406.8.1 Ventilation

Repair garages shall be mechanically ventilated in accordance with the *Florida Building Code, Mechanical*. The *ventilation system* shall be controlled at the entrance to the garage.

[F] 406.8.2 Gas Detection System

Repair garages used for repair of vehicles fueled by nonodorized gases, including but not limited to hydrogen and nonodorized LNG, shall be provided with a gas detection system that complies with Section 916. The gas detection system shall be designed to detect leakage of nonodorized gaseous fuel. Where lubrication or chassis service pits are provided in garages used for repairing nonodorized LNG-fueled vehicles, gas sensors shall be provided in such pits.

[F] 406.8.2.1 System Activation

Activation of a gas detection alarm shall result in all of the following:

1. Initiation of distinct audible and visual alarm signals in the repair garage, where the ventilation system is interlocked with gas detection.
2. Deactivation of all heating systems located in the repair garage.
3. Activation of the mechanical *ventilation system*, where the system is interlocked with gas detection.

[F] 406.8.2.2 Failure of the Gas Detection System

Failure of the *gas detection system* shall automatically deactivate the heating system, activate the mechanical *ventilation system* where the system is interlocked with the gas detection system and cause a trouble signal to sound at an *approved* location.

[F] 406.8.3 Automatic Sprinkler System

A repair garage shall be equipped with an *automatic sprinkler system* in accordance with Section 903.2.9.1.

Section 407 Group I-2

407.1 General

Occupancies in Group I-2 shall comply with the provisions of Sections 407.1 through 407.10 and other applicable provisions of this code.

407.2 Corridors Continuity and Separation

Corridors in occupancies in Group I-2 shall be continuous to the *exits* and shall be separated from other areas in accordance with Section 407.3 except spaces conforming to Sections 407.2.1 through 407.2.6.

407.2.1 Waiting and Similar Areas

Waiting areas and similar spaces constructed as required for *corridors* shall be permitted to be open to a *corridor*, only where all of the following criteria are met:

1. The spaces are not occupied as care recipient's sleeping rooms, treatment rooms, incidental uses in accordance with Section 509, or hazardous uses.
2. The open space is protected by an automatic fire detection system installed in accordance with Section 907.
3. The *corridors* onto which the spaces open, in the same *smoke compartment*, are protected by an automatic fire detection system installed in accordance with Section 907, or the *smoke compartment* in which the spaces are located is equipped throughout with quick-response sprinklers in accordance with Section 903.3.2.
4. The space is arranged so as not to obstruct access to the required *exits*.

407.2.2 Care Providers' Stations

Spaces for care providers', supervisory staff, doctors' and nurses' charting, communications and related clerical areas shall be permitted to be open to the *corridor*, where such spaces are constructed as required for *corridors*.

407.2.3 Psychiatric Treatment Areas

Areas wherein psychiatric care recipients who are not capable of self-preservation are housed, or group meeting or multipurpose therapeutic spaces other than incidental uses in accordance with Section 509, under continuous supervision by facility staff, shall be permitted to be open to the *corridor*, where the following criteria are met:

1. Each area does not exceed 1,500 square feet (140 m^2).
2. The area is located to permit supervision by the facility staff.
3. The area is arranged so as not to obstruct any access to the required *exits*.
4. The area is equipped with an automatic fire detection system installed in accordance with Section 907.2.
5. Not more than one such space is permitted in any one *smoke compartment*.
6. The walls and ceilings of the space are constructed as required for *corridors*.

407.2.4 Gift Shops

Gift shops and associated storage that are less than 500 square feet (455 m^2) in area shall be permitted to be open to the *corridor* where such spaces are constructed as required for *corridors*.

407.2.5 Nursing Home Housing Units

In Group I-2, Condition 1, occupancies, in areas where nursing home residents are housed, shared living spaces, group meeting or multipurpose therapeutic spaces shall be permitted to be open to the *corridor*, where all of the following criteria are met:

1. The walls and ceilings of the space are constructed as required for *corridors*.
2. The spaces are not occupied as resident sleeping rooms, treatment rooms, incidental uses in accordance with Section 509, or hazardous uses.
3. The open space is protected by an automatic fire detection system installed in accordance with Section 907.
4. The *corridors* onto which the spaces open, in the same *smoke compartment*, are protected by an automatic fire detection system installed in accordance with Section 907, or the *smoke compartment* in which the spaces are located is equipped throughout with quick-response sprinklers in accordance with Section 903.3.2.
5. The space is arranged so as not to obstruct access to the required *exits*.

407.2.6 Nursing Home Cooking Facilities

In Group I-2, Condition 1 occupancies, rooms or spaces that contain a cooking facility with domestic cooking appliances shall be permitted to be open to the corridor where all of the following criteria are met:

1. The number of care recipients housed in the smoke compartment is not greater than 30.
2. The number of care recipients served by the cooking facility is not greater than 30.
3. Only one cooking facility area is permitted in a smoke compartment.
4. The corridor is a clearly identified space delineated by construction or floor pattern, material or color.
5. The space containing the domestic cooking facility shall be arranged so as not to obstruct access to the required exit.
6. The cooking appliances shall comply with Section 407.2.7

407.2.7 Domestic Cooking Appliances

In Group I-2, Condition 1 occupancies, installation of cooking appliances used in domestic cooking facilities shall comply with all of the following:

1. The types of domestic cooking appliances permitted are limited to ovens, cooktops, ranges, warmers and microwaves.
2. A domestic cooking hood installed and constructed in accordance with Section 505 of the *Florida Building Code, Mechanical* is provided over the cooktop or range.
3. The domestic cooking hood provided over the cooktop or range shall be equipped with an automatic fire-extinguishing system of a type recognized for protection of domestic cooking equipment. Preengineered automatic extinguishing systems shall be tested in accordance with UL 300A and *listed* and *labeled* for the intended application. The system shall be installed in accordance with this code, its listing and the manufacturer's instructions.
4. A manual actuation device for the hood suppression system shall be installed in accordance with Sections 904.12.1 and 904.12.2.
5. An interlock device shall be provided such that upon activation of the hood suppression system, the power or fuel supply to the cooktop or range will be turned off.
6. A shut-off for the fuel and electrical power supply to the cooking equipment shall be provided in a location that is accessible only to staff.

7. A timer shall be provided that automatically deactivates the cooking appliances within a period of not more than 120 minutes.

8. A portable fire extinguisher shall be installed in accordance with the *Florida Fire Prevention Code*.

407.3 Corridor Wall Construction

Corridor walls shall be constructed as smoke partitions in accordance with Section 710.

407.3.1 Corridor Doors

Corridor doors, other than those in a wall required to be rated by Section 509.4 or for the enclosure of a vertical opening or an *exit*, shall not have a required *fire protection rating* and shall not be required to be equipped with *self-closing* or automatic-closing devices, but shall provide an effective barrier to limit the transfer of smoke and shall be equipped with positive latching. Roller latches are not permitted. Other doors shall conform to Section 716.

407.4 Means of Egress

Group I-2 occupancies shall be provided with means of egress complying with Chapter 10 and Sections 407.4.1 through 407.4.4. The fire safety and evacuation plans provided in accordance with Section 1001.4 shall identify the building components necessary to support a *defend-in-place* emergency response in accordance with the *Florida Fire Prevention Code*.

407.4.1 Direct Access to a Corridor

Habitable rooms in Group I-2 occupancies shall have an *exit access* door leading directly to a *corridor*.

Exceptions:

1. Rooms with *exit* doors opening directly to the outside at ground level.
2. Rooms arranged as *care suites* complying with Section 407.4.4.

407.4.1.1 Locking Devices

Locking devices that restrict access to a care recipient's room from the *corridor* and that are operable only by staff from the *corridor* side shall not restrict the *means of egress* from the care recipient's room.

Exceptions:

1. This section shall not apply to rooms in psychiatric treatment and similar care areas.
2. Locking arrangements in accordance with Section 1010.2.14.

407.4.2 Distance of Travel

The distance of travel between any point in a Group I-2 occupancy sleeping room, not located in a *care suite*, and an *exit access* door in that room shall be not greater than 50 feet (15 240 mm).

407.4.3 Projections in Nursing Home Corridors

In Group I-2, Condition 1, occupancies, where the corridor width is a minimum of 96 inches (2440 mm), projections shall be permitted for furniture where all of the following criteria are met:

1. The furniture is attached to the floor or to the wall.
2. The furniture does not reduce the clear width of the corridor to less than 72 inches (1830 mm) except where other encroachments are permitted in accordance with Section 1005.7.

3. The furniture is positioned on only one side of the *corridor*.
4. Each arrangement of furniture is 50 square feet (4.6 m^2) maximum in area.
5. Furniture arrangements are separated by 10 feet (3048 mm) minimum.
6. Placement of furniture is considered as part of the fire and safety plans in accordance with Section 1001.4.

407.4.4 Group I-2 Care Suites

Care suites in Group I-2 shall comply with Sections 407.4.4.1 through 407.4.4.4 and either Section 407.4.4.5 or 407.4.4.6.

407.4.4.1 Exit Access Through Care Suites

Exit access from all other portions of a building not classified as a *care suite* shall not pass through a *care suite*.

407.4.4.2 Separation

Care suites shall be separated from other portions of the building, including other care suites, by a smoke partition complying with Section 710.

407.4.4.3 Access to Corridor

Every care suite shall have a door leading directly to an exit access corridor or horizontal exit. Movement from habitable rooms within the care suite shall not require more than 100 feet (30 480 mm) of travel within the care suite to a door leading to the exit access corridor or horizontal exit. Where a care suite is required to have more than one exit access door by Section 407.4.4.5.2 or 407.4.4.6.2, the additional door shall lead directly to an exit access corridor, exit or an adjacent suite.

407.4.4.4 Doors Within Care Suites

Doors in care suites serving habitable rooms shall be permitted to comply with one of the following:

1. Manually operated horizontal sliding doors permitted in accordance with Exception 9 to Section 1010.1.2.
2. Power-operated doors permitted in accordance with Exception 7 to Section 1010.1.2.
3. Means of egress doors complying with Section 1010.

407.4.4.5 Care Suites Containing Sleeping Room Areas

Sleeping rooms shall be permitted to be grouped into care suites where one of the following criteria is met:

1. The *care suite* is not used as an *exit access* for more than eight care recipient beds.
2. The arrangement of the *care suite* allows for direct and constant visual supervision into the sleeping rooms by care providers.
3. An automatic smoke detection system is provided in the sleeping rooms and installed in accordance with NFPA 72.

407.4.4.5.1 Area

Care suites containing sleeping rooms shall be not greater than 7,500 square feet (696 m^2) in area.

Exception: *Care suites* containing sleeping rooms shall be permitted to be not greater than 10,000 square feet (929 m^2) in area where an automatic smoke detection system is provided throughout the *care suite* and installed in accordance with NFPA 72.

407.4.4.5.2 Exit Access

Any sleeping room, or any *care suite* that contains sleeping rooms, of more than 1,000 square feet (93 m^2) shall have no fewer than two exit access doors from the *care suite* located in accordance with Section 1007.

407.4.4.6 Care Suites Not Containing Sleeping Rooms

Areas not containing sleeping rooms, but only treatment areas and the associated rooms, spaces or circulation space, shall be permitted to be grouped into *care suites* and shall conform to the limitations in Sections 407.4.4.6.1 and 407.4.4.6.2.

407.4.4.6.1 Area

Care suites of rooms, other than sleeping rooms, shall have an area not greater than 12,500 square feet (1161 m^2).

Exception: *Care suites* not containing sleeping rooms shall be permitted to be not greater than 15,000 square feet (1394 m^2) in area where an automatic smoke detection system is provided throughout the *care suite* in accordance with Section 907.

407.4.4.6.2 Exit Access

Care suites, other than sleeping rooms, with an area of more than 2,500 square feet (232 m^2) shall have no fewer than two exit access doors from the *care suite* located in accordance with Section 1007.1.

407.5 Smoke Barriers

Smoke barriers shall be provided to subdivide every *story* used by persons receiving care, treatment or sleeping and to divide other *stories* with an *occupant load* of 50 or more persons, into no fewer than two *smoke compartments*. Such stories shall be divided into *smoke compartments* with an area of not more than 22,500 square feet (2092 m^2) in Group I-2, Condition 1, and not more than 40,000 square feet (3716 m^2) in Group I-2, Condition 2, and the distance of travel from any point in a *smoke compartment* to a *smoke barrier* door shall be not greater than 200 feet (60 960 mm). The *smoke barrier* shall be in accordance with Section 709.

407.5.1 Refuge Area

Refuge areas shall be provided within each *smoke compartment*. The size of the refuge area shall accommodate the occupants and care recipients from the adjoining smoke compartment. Where a *smoke compartment* is adjoined by two or more *smoke compartments*, the minimum area of the refuge area shall accommodate the largest *occupant load* of the adjoining compartments. The size of the refuge area shall provide the following:

1. Not less than 30 net square feet (2.8 m^2) for each care recipient confined to bed or stretcher.
2. Not less than 6 square feet (0.56 m^2) for each ambulatory care recipient not confined to bed or stretcher and for other occupants.

Areas or spaces permitted to be included in the calculation of refuge area are *corridors*, sleeping areas, treatment rooms, lounge or dining areas and other low-hazard areas.

407.5.2 Independent Egress

A *means of egress* shall be provided from each *smoke compartment* created by *smoke barriers* without having to return through the *smoke compartment* from which *means of egress* originated.

407.5.3 Horizontal Assemblies

Horizontal assemblies supporting *smoke barriers* required by this section shall be designed to resist the movement of smoke. Elevator lobbies shall be in accordance with Section 3006.2.

407.6 Automatic-Closing Doors

Automatic-closing doors with hold-open devices shall comply with Sections 709.5 and 716.5.

407.6.1 Activation of Automatic-Closing Doors

Automatic-closing doors on hold-open devices in accordance with Section 716.5.9.4 shall also close upon activation of a fire alarm system, an automatic sprinkler system, or both. The automatic release of the hold open device on one door shall release all such doors within the same *smoke compartment*.

[F] 407.7 Automatic Sprinkler System

Smoke compartments containing sleeping rooms shall be equipped throughout with an *automatic sprinkler* system in accordance with Sections 903.3.1.1 and 903.3.2.

[F] 407.8 Fire Alarm System

A fire alarm system shall be provided in accordance with Section 907.2.6.

[F] 407.9 Automatic Fire Detection

Corridors in Group I-2, Condition 1 occupancies and spaces permitted to be open to the *corridors* by Section 407.2 shall be equipped with an automatic fire detection system.

Group I-2, Condition 2 occupancies shall be equipped with smoke detection as required in Section 407.2.

Exceptions:

1. *Corridor* smoke detection is not required where sleeping rooms are provided with *smoke detectors* that comply with UL 268. Such detectors shall provide a visual display on the *corridor* side of each sleeping room and an audible and visual alarm at the care provider's station attending each unit.
2. *Corridor* smoke detection is not required where sleeping room doors are equipped with automatic door-closing devices with integral *smoke detectors* on the unit sides installed in accordance with their listing, provided that the integral detectors perform the required alerting function.

407.10 Secured Yards

Grounds are permitted to be fenced and gates therein are permitted to be equipped with locks, provided that safe dispersal areas having 30 net square feet (2.8 m^2) for bed and stretcher care recipients and 6 net square feet (0.56 m^2) for ambulatory care recipients and other occupants are located between the building and the fence. Such provided safe dispersal areas shall be located not less than 50 feet (15 240 mm) from the building they serve.

407.11 Electrical Systems

In Group I-2 occupancies, the essential electrical system for electrical components, equipment and systems shall be designed and constructed in accordance with the provisions of Chapter 27 and NFPA 99.

Section 408 Group I-3

408.1 General

Occupancies in Group I-3 shall comply with the provisions of Sections 408.1 through 408.11 and other applicable provisions of this code (see Section 308.5).

408.1.1 Definitions

The following terms are defined in Chapter 2:

CELL.

CELL TIER.

HOUSING UNIT.

SALLYPORT.

408.2 Other Occupancies

Buildings or portions of buildings in Group I-3 occupancies where security operations necessitate the locking of required *means of egress* shall be permitted to be classified as a different occupancy. Occupancies classified as other than Group I-3 shall meet the applicable requirements of this code for that occupancy where provisions are made for the release of occupants at all times.

Means of egress from detention and correctional occupancies that traverse other use areas shall, as a minimum, conform to requirements for detention and correctional occupancies.

Exception: It is permissible to exit through a *horizontal exit* into other contiguous occupancies that do not conform to detention and correctional occupancy egress provisions but that do comply with requirements set forth in the appropriate occupancy, as long as the occupancy is not a Group H use.

408.3 Means of Egress

Except as modified or as provided for in this section, the *means of egress* provisions of Chapter 10 shall apply.

408.3.1 Door Width

Doors to resident *sleeping units* shall have a clear width of not less than 28 inches (711 mm).

408.3.2 Sliding Doors

Where doors in a *means of egress* are of the horizontal-sliding type, the force to slide the door to its fully open position shall be not greater than 50 pounds (220 N) with a perpendicular force against the door of 50 pounds (220 N).

408.3.3 Guard Tower Doors

A hatch or trap door not less than 16 square feet (610 m^2) in area through the floor and having dimensions of not less than 2 feet (610 mm) in any direction shall be permitted to be used as a portion of the *means of egress* from guard towers.

408.3.4 Spiral Stairways

Spiral stairways that conform to the requirements of Section 1011.10 are permitted for access to and between staff locations.

408.3.5 Ship's Ladders

Ship's ladders shall be permitted for egress from control rooms or elevated facility observation rooms in accordance with Section 1011.15.

408.3.6 Exit Discharge

Exits are permitted to discharge into a fenced or walled courtyard. Enclosed *yards* or *courts* shall be of a size to accommodate all occupants, be located not less than 50 feet (15 240 mm) from the building and have an area of not less than 15 square feet (1.4 m^2) per person.

408.3.7 Sallyports

A *sallyport* shall be permitted in a *means of egress* where there are provisions for continuous and unobstructed passage through the *sallyport* during an emergency egress condition.

408.3.8 Interior Exit Stairway and Ramp Construction

One *interior exit stairway* or *ramp* in each building shall be permitted to have glazing installed in doors and interior walls at each landing level providing access to the *interior exit stairway* or *ramp*, provided that the following conditions are met:

1. The *interior exit stairway* or *ramp* shall not serve more than four floor levels.
2. *Exit* doors shall be not less than $\frac{3}{4}$ -hour *fire door assemblies* complying with Section 716.
3. The total area of glazing at each floor level shall not exceed 5,000 square inches (3.2 m^2) and individual panels of glazing shall not exceed 1,296 square inches (0.84 m^2).
4. The glazing shall be protected on both sides by an *automatic sprinkler system*. The sprinkler system shall be designed to wet completely the entire surface of any glazing affected by fire when actuated.
5. The glazing shall be in a gasketed frame and installed in such a manner that the framing system will deflect without breaking (loading) the glass before the sprinkler system operates.
6. Obstructions, such as curtain rods, drapery traverse rods, curtains, drapes or similar materials shall not be installed between the automatic sprinklers and the glazing.

408.4 Locks

Egress doors are permitted to be locked in accordance with the applicable use condition. Doors from a refuge area to the outside are permitted to be locked with a key in lieu of locking methods described in Section 408.4.1. The keys to unlock the exterior doors shall be available at all times and the locks shall be operable from both sides of the door.

408.4.1 Remote Release

Remote release of locks on doors in a *means of egress* shall be provided with reliable means of operation, remote from the resident living areas, to release locks on all required doors. In Occupancy Condition 3 or 4, the arrangement, accessibility and security of the release mechanisms required for egress shall be such that with the minimum available staff at any time, the lock mechanisms are capable of being released within 2 minutes.

Exception: Provisions for remote locking and unlocking of occupied rooms in Occupancy Condition 4 are not required provided that not more than 10 locks are necessary to be unlocked in order to move occupants from one smoke compartment to a refuge area within 3 minutes. The opening of necessary locks shall be accomplished with not more than two separate keys.

[F] 408.4.2 Power-Operated Doors and Locks

Power-operated sliding doors or power-operated locks for swinging doors shall be operable by a manual release mechanism at the door. Emergency power shall be provided for the doors and locks in accordance with Section 2702.

Exceptions:

1. Emergency power is not required in facilities with 10 or fewer locks complying with the exception to Section 408.4.1.
2. Emergency power is not required where remote mechanical operating releases are provided.

408.4.3 Redundant Operation

Remote release, mechanically operated sliding doors or remote release, mechanically operated locks shall be provided with a mechanically operated release mechanism at each door, or shall be provided with a redundant remote release control.

408.4.4 Relock Capability

Doors remotely unlocked under emergency conditions shall not automatically relock when closed unless specific action is taken at the remote location to enable doors to relock.

408.5 Protection of Vertical Openings

Any vertical opening shall be protected by a *shaft enclosure* in accordance with Section 713, or shall be in accordance with Section 408.5.1.

408.5.1 Floor Openings

Openings in floors within a *housing unit* are permitted without a *shaft enclosure*, provided all of the following conditions are met:

1. The entire normally occupied areas so interconnected are open and unobstructed so as to enable observation of the areas by supervisory personnel;
2. *Means of egress* capacity is sufficient for all occupants from all interconnected *cell tiers* and areas;
3. The height difference between the floor levels of the highest and lowest *cell tiers* shall not exceed 23 feet (7010 mm); and
4. Egress from any portion of the *cell tier* to an *exit* or *exit access* door shall not require travel on more than one additional floor level within the *housing unit*.

408.5.2 Shaft Openings in Communicating Floor Levels

Where a floor opening is permitted between communicating floor levels of a *housing unit* in accordance with Section 408.5.1, plumbing

chases serving vertically stacked individual *cells* contained within the *housing unit* shall be permitted without a *shaft enclosure*.

408.6 Smoke Barrier

Occupancies in Group I-3 shall have *smoke barriers* complying with Sections 408.7 and 709 to divide every *story* occupied by residents for sleeping, or any other *story* having an *occupant load* of 50 or more persons, into no fewer than two *smoke compartments*.

Exception: Spaces having a direct *exit* to one of the following, provided that the locking arrangement of the doors involved complies with the requirements for doors at the *smoke barrier* for the use condition involved:

1. A *public way*.
2. A building separated from the resident housing area by a 2-hour fire-resistance-rated assembly or 50 feet (15 240 mm) of open space.
3. A secured *yard* or *court* having a holding space 50 feet (15 240 mm) from the housing area that provides 6 square feet (0.56 m²) or more of refuge area per occupant, including residents, staff and visitors.

408.6.1 Smoke Compartments

The number of residents in any *smoke compartment* shall be not more than 200. The distance of travel to a door in a *smoke barrier* from any room door required as exit access shall be not greater than 150 feet (45 720 mm). The distance of travel to a door in a *smoke barrier* from any point in a room shall be not greater than 200 feet (60 960 mm).

408.6.2 Refuge Area

Not less than 6 net square feet (0.56 m²) per occupant shall be provided on each side of each *smoke barrier* for the total number of occupants in adjoining *smoke compartments*. This space shall be readily available wherever the occupants are moved across the *smoke barrier* in a fire emergency.

408.6.3 Independent Egress

A means of egress shall be provided from each *smoke compartment* created by *smoke barriers* without having to return through the *smoke compartment* from which means of egress originates.

408.7 Security Glazing

In occupancies in Group I-3, windows and doors in 1-hour *fire barriers* constructed in accordance with Section 707, *fire partitions* constructed in accordance with Section 708 and *smoke barriers* constructed in accordance with Section 709 shall be permitted to have security glazing installed provided that the following conditions are met.

1. Individual panels of glazing shall not exceed 1,296 square inches (0.84 m²).
2. The glazing shall be protected on both sides by an *automatic sprinkler system*. The sprinkler system shall be designed to, when actuated, wet completely the entire surface of any glazing affected by fire.
3. The glazing shall be in a gasketed frame and installed in such a manner that the framing system will deflect without breaking (loading) the glass before the sprinkler system operates.
4. Obstructions, such as curtain rods, drapery traverse rods, curtains, drapes or similar materials shall not be installed between the automatic sprinklers and the glazing.

408.8 Subdivision of Resident Housing Areas

Sleeping areas and any contiguous day room, group activity space or other common spaces where residents are housed shall be separated from other spaces in accordance with Sections 408.8.1 through 408.8.4.

408.8.1 Occupancy Conditions 3 and 4

Each sleeping area in Occupancy Conditions 3 and 4 shall be separated from the adjacent common spaces by a smoke-tight partition where the distance of travel from the sleeping area through the common space to the *corridor* exceeds 50 feet (15 240 mm).

408.8.2 Occupancy Condition 5

Each sleeping area in Occupancy Condition 5 shall be separated from adjacent sleeping areas, *corridors* and common spaces by a smoke-tight partition. Additionally, common spaces shall be separated from the *corridor* by a smoke-tight partition.

408.8.3 Openings in Room Face

The aggregate area of openings in a solid sleeping room face in Occupancy Conditions 2, 3, 4 and 5 shall not exceed 120 square inches (0.77 m²). The aggregate area shall include all openings including door undercuts, food passes and grilles. Openings shall be not more than 36 inches (914 mm) above the floor. In Occupancy Condition 5, the openings shall be closeable from the room side.

408.8.4 Smoke-Tight Doors

Doors in openings in partitions required to be smoke tight by Section 408.8 shall be substantial doors, of construction that will resist the passage of smoke. Latches and door closures are not required on *cell* doors.

408.9 Windowless Buildings

For the purposes of this section, a windowless building or portion of a building is one with nonopenable windows, windows not readily breakable or without windows. Windowless buildings shall be provided with an engineered smoke control system to provide a tenable environment for exiting from the *smoke compartment* in the area of fire origin in accordance with Section 909 for each windowless *smoke compartment*.

[F] 408.10 Fire Alarm System

A *fire alarm* system shall be provided in accordance with Section 907.2.6.3.

[F] 408.11 Automatic Sprinkler System

Group I-3 occupancies shall be equipped throughout with an *automatic sprinkler system* in accordance with Section 903.2.6.

Section 409 Motion Picture Projection Rooms

409.1 General

The provisions of Sections 409.1 through 409.5 shall apply to rooms in which ribbon-type cellulose acetate or other safety film is utilized in conjunction with electric arc, xenon or other light-source projection equipment that develops hazardous gases, dust or radiation. Where cellulose nitrate film is utilized or stored, such rooms shall comply with NFPA 40.

409.1.1 Projection Room Required

Every motion picture machine projecting film as mentioned within the scope of this section shall be enclosed in a projection room. Appurtenant electrical equipment, such as rheostats, transformers and generators, shall be within the projection room or in an adjacent room of equivalent construction.

409.2 Construction of Projection Rooms

Every projection room shall be of permanent construction consistent with the construction requirements for the type of building in which the projection room is located. Openings are not required to be protected.

The room shall have a floor area of not less than 80 square feet (7.44 m²) for a single machine and not less than 40 square feet (3.7 m²) for each additional machine. Each motion picture projector, floodlight, spotlight or similar piece of equipment shall have a clear working space of not less than 30 inches by 30 inches (762 mm by 762 mm) on each side and at the rear thereof, but only one such space shall be required between two adjacent projectors. The projection room and the rooms appurtenant thereto shall have a ceiling height of not less than 7 feet 6 inches (2286 mm). The aggregate of openings for projection equipment shall not exceed 25 percent of the area of the wall between the projection room and the auditorium. Openings shall be provided with glass or other *approved* material, so as to close completely the opening.

409.3 Projection Room and Equipment Ventilation

Ventilation shall be provided in accordance with the *Florida Building Code, Mechanical*.

409.3.1 Supply Air

Each projection room shall be provided with adequate air supply inlets so arranged as to provide well-distributed air throughout the room. Air inlet ducts shall provide an amount of air equivalent to the amount of air being exhausted by projection equipment. Air is permitted to be taken from the outside; from adjacent spaces within the building, provided the volume and infiltration rate is sufficient; or from the building air-conditioning system, provided it is so arranged as to provide sufficient air when other systems are not in operation.

409.3.2 Exhaust Air

Projection rooms are permitted to be exhausted through the lamp exhaust system. The lamp exhaust system shall be positively interconnected with the lamp so that the lamp will not operate unless there is the required airflow. Exhaust air ducts shall terminate at the exterior of the building in such a location that the exhaust air cannot be readily recirculated into any air supply system. The projection room *ventilation* system is permitted to also serve appurtenant rooms, such as the generator and rewind rooms.

409.3.3 Projection Machines

Each projection machine shall be provided with an exhaust duct that will draw air from each lamp and exhaust it directly to the outside of the building. The lamp exhaust is permitted to serve to exhaust air from the projection room to provide room air circulation. Such ducts shall be of rigid materials, except for a flexible connector *approved* for the purpose. The projection lamp or projection room exhaust system, or both, is permitted to be combined but shall not be interconnected with any other exhaust or return system, or both, within the building.

409.4 Lighting Control

Provisions shall be made for control of the auditorium lighting and the *means of egress* lighting systems of theaters from inside the projection room and from not less than one other convenient point in the building.

409.5 Miscellaneous Equipment

Each projection room shall be provided with rewind and film storage facilities.

Section 410 Stages, Platforms and Technical Production Areas

410.1 Applicability

The provisions of Sections 410.1 through 410.8 shall apply to all parts of buildings and structures that contain *stages* or *platforms* and similar appurtenances as herein defined.

410.2 Definitions

The following terms are defined in Chapter 2:

PLATFORM.

PROSCENIUM WALL.

STAGE.

TECHNICAL PRODUCTION AREA.

410.3 Stages

Stage construction shall comply with Sections 410.3.1 through 410.3.7.

410.3.1 Stage Construction

Stages shall be constructed of materials as required for floors for the type of construction of the building in which such *stages* are located.

Exception: *Stages* need not be constructed of the same materials as required for the type of construction provided the construction complies with one of the following:

1. *Stages* of Type IIB or IV construction with a nominal 2-inch (51 mm) wood deck, provided that the *stage* is separated from other areas in accordance with Section 410.3.4.
2. In buildings of Type IIA, IIIA and VA construction, a fire-resistance-rated floor is not required, provided the space below the *stage*

is equipped with an *automatic sprinkler system or fire-extinguishing system* in accordance with Section 903 or 904.

3. In all types of construction, the finished floor shall be constructed of wood or *approved* noncombustible materials. Openings through stage floors shall be equipped with tight-fitting, solid wood trap doors with *approved* safety locks.

410.3.1.1 Stage Height and Area

Stage areas shall be measured to include the entire performance area and adjacent backstage and support areas not separated from the performance area by fire-resistance-rated construction. Stage height shall be measured from the lowest point on the stage floor to the highest point of the roof or floor deck above the stage.

410.3.2 Technical Production Areas: Galleries, Gridirons and Catwalks

Beams designed only for the attachment of portable or fixed theater equipment, gridirons, galleries and catwalks shall be constructed of *approved* materials consistent with the requirements for the type of construction of the building; and a *fire-resistance rating* shall not be required. These areas shall not be considered to be floors, stories, mezzanines or levels in applying this code.

Exception: Floors of fly galleries and catwalks shall be constructed of any *approved* material.

410.3.3 Exterior Stage Doors

Where protection of openings is required, exterior exit doors shall be protected with *fire door assemblies* that comply with Section 716. Exterior openings that are located on the stage for *means of egress* or loading and unloading purposes, and that are likely to be open during occupancy of the theater, shall be constructed with vestibules to prevent air drafts into the auditorium.

410.3.4 Proscenium Wall

Where the stage height is greater than 50 feet (15 240 mm), all portions of the stage shall be completely separated from the seating area by a proscenium wall with not less than a 2-hour *fire-resistance rating* extending continuously from the foundation to the roof.

410.3.5 Proscenium Curtain

Where a proscenium wall is required to have a *fire-resistance rating*, the stage opening shall be provided with a fire curtain complying with NFPA 80, horizontal sliding doors complying with Section 716 having a fire protection rating of at least 1 hour, or an *approved* water curtain complying with Section 903.3.1.1 or, in facilities not utilizing the provisions of smoke-protected assembly seating in accordance with Section 1029.6.2, a smoke control system complying with Section 909 or natural *ventilation* designed to maintain the smoke level not less than 6 feet (1829 mm) above the floor of the *means of egress*.

410.3.6 Scenery

Combustible materials used in sets and scenery shall meet the fire propagation performance criteria of Test Method 1 or Test Method 2, as appropriate, of NFPA 701, in accordance with Section 806 and the *Florida Fire Prevention Code*. Foam plastics and materials containing foam plastics shall comply with Section 2603 and the *Florida Fire Prevention Code*.

410.3.7 Stage Ventilation

Emergency *ventilation* shall be provided for stages larger than 1,000 square feet (93 m^2) in floor area, or with a stage height greater than 50 feet (15 240 mm). Such *ventilation* shall comply with Section 410.3.7.1 or 410.3.7.2.

410.3.7.1 Roof Vents

Two or more vents constructed to open automatically by *approved* heat-activated devices and with an aggregate clear opening area of not less than 5 percent of the area of the stage shall be located near the center and above the highest part of the stage area. Supplemental means shall be provided for manual operation of the ventilator. Curbs shall be provided as required for skylights in Section 2610.2. Vents shall be *labeled*.

[F] 410.3.7.2 Smoke Control

Smoke control in accordance with Section 909 shall be provided to maintain the smoke layer interface not less than 6 feet (1829 mm) above the highest level of the assembly seating or above the top of the proscenium opening where a proscenium wall is provided in compliance with Section 410.3.4.

410.4 Platform Construction

Permanent *platforms* shall be constructed of materials as required for the type of construction of the building in which the permanent *platform* is located. Permanent *platforms* are permitted to be constructed of *fire-retardant-treated wood* for Types I, II and IV construction where the *platforms* are not more than 30 inches (762 mm) above the main floor, and not more than one-third of the room floor area and not more than 3,000 square feet (279 m²) in area. Where the space beneath the permanent *platform* is used for storage or any purpose other than equipment, wiring or plumbing, the floor assembly shall be not less than 1-hour fire-resistance-rated construction. Where the space beneath the permanent *platform* is used only for equipment, wiring or plumbing, the underside of the permanent *platform* need not be protected.

410.4.1 Temporary Platforms

Platforms installed for a period of not more than 30 days are permitted to be constructed of any materials permitted by this code. The space between the floor and the *platform* above shall only be used for plumbing and electrical wiring to *platform* equipment.

410.5 Dressing and Appurtenant Rooms

Dressing and appurtenant rooms shall comply with Sections 410.5.1 and 410.5.2.

410.5.1 Separation From Stage

The *stage* shall be separated from dressing rooms, scene docks, property rooms, workshops, storerooms and compartments appurtenant to the *stage* and other parts of the building by *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. The *fire-resistance rating* shall be not less than 2 hours for *stage* heights greater than 50 feet (15 240 mm) and not less than 1 hour for *stage* heights of 50 feet (15 240 mm) or less.

410.5.2 Separation From Each Other

Dressing rooms, scene docks, property rooms, workshops, storerooms and compartments appurtenant to the *stage* shall be separated from each other by not less than 1-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

410.6 Means of Egress

Except as modified or as provided for in this section, the provisions of Chapter 10 shall apply.

410.6.1 Arrangement

Where two or more *exits* or *exit access doorways* from the *stage* are required in accordance with Section 1006.2, no fewer than one *exit* or *exit access doorway* shall be provided on each side of a *stage*.

410.6.2 Stairway and Ramp Enclosure

Exit access stairways and *ramps* serving a *stage* or *platform* are not required to be enclosed. *Exit access stairways* and *ramps* serving *technical production areas* are not required to be enclosed.

410.6.3 Technical Production Areas

Technical production areas shall be provided with means of egress and means of escape in accordance with Sections 410.6.3.1 through 410.6.3.5.

410.6.3.1 Number of Means of Egress

No fewer than one *means of egress* shall be provided from *technical production areas*.

410.6.3.2 Exit Access Travel Distance

The *exit access* travel distance shall be not greater than 300 feet (91 440 mm) for buildings without a sprinkler system and 400 feet (121 900 mm) for buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

410.6.3.3 Two Means of Egress

Where two *means of egress* are required, the *common path of travel* shall be not greater than 100 feet (30 480 mm).

Exception: A means of escape to a roof in place of a second *means of egress* is permitted.

410.6.3.4 Path of Egress Travel

The following *exit access* components are permitted where serving *technical production areas*:

1. Stairways.
2. Ramps.
3. Spiral stairways.
4. Catwalks.
5. Alternating tread devices.
6. Permanent ladders.

410.6.3.5 Width

The path of egress travel within and from technical support areas shall be not less than 22 inches (559 mm).

[F] 410.7 Automatic Sprinkler System

Stages shall be equipped with an *automatic sprinkler system* in accordance with Section 903.3.1.1. Sprinklers shall be installed under the roof and gridiron and under all catwalks and galleries over the stage. Sprinklers shall be installed in dressing rooms, performer lounges, shops and storerooms accessory to such *stages*.

Exceptions:

1. Sprinklers are not required under *stage* areas less than 4 feet (1219 mm) in clear height that are utilized exclusively for storage of tables and chairs, provided the concealed space is separated from the adjacent spaces by Type X gypsum board not less than $\frac{5}{8}$ -inch (15.9 mm) in thickness.
2. Sprinklers are not required for *stages* 1,000 square feet (93 m^2) or less in area and 50 feet (15 240 mm) or less in height where curtains, scenery or other combustible hangings are not retractable vertically. Combustible hangings shall be limited to a single main curtain, borders, legs and a single backdrop.
3. Sprinklers are not required within portable orchestra enclosures on *stages*.

[F] 410.8 Standpipes

Standpipe systems shall be provided in accordance with Section 905.

Section 411 Special Amusement Buildings

411.1 General

Special amusement buildings having an *occupant load* of 50 or more shall comply with the requirements for the appropriate Group A occupancy and Sections 411.1 through 411.8. *Special amusement buildings* having an *occupant load* of less than 50 shall comply with the requirements for a Group B occupancy and Sections 411.1 through 411.8.

Exception: *Special amusement buildings* or portions thereof that are without walls or a roof and constructed to prevent the accumulation of smoke need not comply with this section.

For flammable *decorative materials*, see the *Florida Fire Prevention Code*.

411.2 Definition

The following term is defined in Chapter 2:

SPECIAL AMUSEMENT BUILDING.

[F] 411.3 Automatic Fire Detection

Special amusement buildings shall be equipped with an automatic fire detection system in accordance with Section 907.

[F] 411.4 Automatic Sprinkler System

Special amusement buildings shall be equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1. Where the *special amusement building* is temporary, the sprinkler water supply shall be of an *approved* temporary means.

Exception: Automatic sprinklers are not required where the total floor area of a temporary *special amusement building* is less than 1,000 square feet (93 m^2) and the exit access travel distance from any point to an exit is less than 50 feet (15 240 mm).

[F] 411.5 Alarm

Actuation of a single *smoke detector*, the *automatic sprinkler system* or other automatic fire detection device shall immediately sound an alarm at the building at a *constantly attended location* from which emergency action can be initiated including the capability of manual initiation of requirements in Section 907.2.12.2.

[F] 411.6 Emergency Voice/Alarm Communications System

An *emergency voice/alarm communications system* shall be provided in accordance with Sections 907.2.12 and 907.5.2.2, which is also permitted to serve as a public address system and shall be audible throughout the entire *special amusement building*.

411.7 Exit Marking

Exit signs shall be installed at the required *exit* or *exit access doorway* of amusement buildings in accordance with this section and Section 1013. *Approved* directional exit markings shall also be provided. Where mirrors, mazes or other designs are utilized that disguise the path of egress travel such that they are not apparent, *approved* and *listed* low-level exit signs that comply with Section 1013.5, and directional path markings *listed* in accordance with UL 1994, shall be provided and located not more than 8 inches (203 mm) above the walking surface and on or near the path of egress travel. Such markings shall become visible in an emergency. The directional exit marking shall be activated by the automatic fire detection system and the *automatic sprinkler system* in accordance with Section 907.2.12.2.

411.7.1 Photoluminescent Exit Signs

Where *photoluminescent exit signs* are installed, activating light source and viewing distance shall be in accordance with the listing and markings of the signs.

411.8 Interior Finish

The *interior finish* shall be Class A in accordance with Section 803.1.

Section 412 Aircraft-Related Occupancies**412.1 General**

Aircraft-related occupancies shall comply with Sections 412.1 through 412.8 and the *Florida Fire Prevention Code*.

412.2 Definitions

The following terms are defined in Chapter 2:

FIXED BASE OPERATOR (FBO).

HELIPORT.

HELISTOP.

RESIDENTIAL AIRCRAFT HANGAR.

TRANSIENT AIRCRAFT.

412.3 Airport Traffic Control Towers

The provisions of Sections 412.3.1 through 412.3.8 shall apply to airport traffic control towers occupied only for the following uses:

1. Airport traffic control cab.
2. Electrical and mechanical equipment rooms.

3. Airport terminal radar and electronics rooms.
4. Office spaces incidental to the tower operation.
5. Lounges for employees, including sanitary facilities.

412.3.1 Construction

The construction of airport traffic control towers shall comply with the provisions of Sections 412.3.1.1 through 412.3.1.3.

412.3.1.1 Type of Construction

Airport traffic control towers shall be constructed to comply with the height limitations of Table 412.3.1.1.

TABLE 412.3.1.1

HEIGHT LIMITATIONS FOR AIRPORT TRAFFIC CONTROL TOWERS

TYPE OF CONSTRUCTION	HEIGHT^a (feet)
IA	Unlimited
IB	240
IIA	100
IIB	85
IIIA	65

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m².

a. Height to be measured from grade plane to cab floor.

[BS] 412.3.1.2 Structural Integrity of Interior Exit Stairways and Elevator Hoistway Enclosures

Enclosures for *interior exit stairways* and elevator hoistway enclosures shall comply with Section 403.2.3 in airport traffic control towers where the control cab is located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access.

412.3.1.3 Sprayed Fire-Resistive Materials (SFRM)

The bond strength of the SFRM installed in airport traffic control towers shall be in accordance with Section 403.2.4 where the control cab is located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access.

412.3.2 Means of Egress and Evacuation

The *means of egress* in airport traffic control towers shall comply with Sections 412.3.2.1 through 412.3.2.3.

412.3.2.1 Stairways

Stairways in airport traffic control towers shall be in accordance with Section 1011. *Exit stairways* shall be smokeproof enclosures complying with one of the alternatives provided in Section 909.20.

Exception: Stairways in airport traffic control towers are not required to comply with Section 1011.12.

412.3.2.2 Exit Access

From observation levels, airport traffic control towers shall be permitted to have a single means of exit access for a distance of travel not greater than 100 feet (30 480 mm). Exit access stairways from the observation level need not be enclosed.

412.3.2.3 Number of Exits

Not less than one *exit stairway* shall be permitted for airport traffic control towers of any height provided that the *occupant load* per floor is not greater than 15 and the area per floor does not exceed 1,500 square feet (140 m^2).

412.3.2.3.1 Interior Finish

Where an airport traffic control tower is provided with only one exit stairway, interior wall and ceiling finishes shall be either Class A or Class B.

412.3.3 Emergency Systems

The detection, alarm and emergency systems of airport traffic control towers shall comply with Sections 412.3.3.1 through 412.3.3.3.

[F] 412.3.3.1 Automatic Smoke Detection Systems

Airport traffic control towers shall be provided with an automatic smoke detection system installed in accordance with Section 907.2.22.

[F] 412.3.3.2 Fire Command Center

A fire command center shall be provided in airport traffic control towers where the control cab is located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access. The fire command center shall comply with Section 911.

Exceptions:

1. The fire command center shall be located in the airport control tower or an adjacent contiguous building where building functions are interdependent.
2. The room shall be not less than 150 square feet (14 m^2) in area with a minimum dimension of 10 feet (3048 mm).
3. The following features shall not be required in an airport traffic control tower fire command center.
 - 3.1. Emergency voice/alarm control unit.
 - 3.2. Public address system.
 - 3.3. Status indicators and controls for the air distributions centers.
 - 3.4. Generator supervision devices, manual start and transfer features.
 - 3.5. Elevator emergency or standby power switches where emergency or standby power is provided.

412.3.3.3 Smoke Removal

Smoke removal in airport traffic control towers shall be provided in accordance with Section 403.4.7.

412.3.4 Automatic Sprinkler System

Where an occupied floor is located more than 35 feet (10 668 mm) above the lowest level of fire department vehicle access, airport traffic control towers shall be equipped with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

412.3.4.1 Fire Pump Room

Fire pumps shall be located in rooms that are separated from all other areas of the building by 2-hour fire barriers constructed in accordance with Section 707 or 2-hour horizontal assemblies constructed in accordance with Section 711, or both.

Exception: Separation is not required for fire pumps physically separated in accordance with NFPA 20.

412.3.5 Protection of Elevator Wiring and Cables

Cables serving elevators in airport traffic control towers shall be protected in accordance with Section 3007.8.1.

412.3.5.1 Elevators for Occupant Evacuation

Where provided in addition to an exit stairway, occupant evacuation elevators shall be in accordance with Section 3008.

412.3.6 Accessibility

Airport traffic control towers shall be *accessible* except as specified in the *Florida Building Code, Accessibility*.

412.4 Aircraft Hangars

Aircraft hangars shall be in accordance with Sections 412.4.1 through 412.4.6.

412.4.1 Exterior Walls

Exterior walls located less than 30 feet (9144 mm) from *lot lines* or a *public way* shall have a *fire-resistance rating* not less than 2 hours.

412.4.2 Basements

Where hangars have *basements*, floors over *basements* shall be of Type IA construction and shall be made tight against seepage of water, oil or vapors. There shall be no opening or communication between *basements* and the hangar. Access to *basements* shall be from outside only.

412.4.3 Floor Surface

Floors shall be graded and drained to prevent water or fuel from remaining on the floor. Floor drains shall discharge through an oil separator to the sewer or to an outside vented sump.

Exception: Aircraft hangars with individual lease spaces not exceeding 2,000 square feet (186 m^2) each in which servicing, repairing or washing is not conducted and fuel is not dispensed shall have floors that are graded toward the door, but shall not require a separator.

412.4.4 Heating Equipment

Heating equipment shall be placed in another room separated by 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. Entrance shall be from the outside or by means of a vestibule providing a two-doorway separation.

Exceptions:

1. Unit heaters and vented infrared radiant heating equipment suspended not less than 10 feet (3048 mm) above the upper surface of wings or engine enclosures of the highest aircraft that are permitted to be housed in the hangar need not be located in a separate room provided they are mounted not less than 8 feet (2438 mm) above the floor in shops, offices and other sections of the hangar communicating with storage or service areas.

2. Entrance to the separated room shall be permitted by a single interior door provided the sources of ignition in the appliances are not less than 18 inches (457 mm) above the floor.

412.4.5 Finishing

The process of "doping," involving use of a volatile flammable solvent, or of painting, shall be carried on in a separate *detached building* equipped with *automatic fire-extinguishing equipment* in accordance with Section 903.

[F] 412.4.6 Fire Suppression

Aircraft hangars shall be provided with a fire suppression system designed in accordance with NFPA 409, based upon the classification for the hangar given in Table 412.4.6.

Exception: Where a *fixed base operator* has separate repair facilities on site, Group II hangars operated by a *fixed base operator* used for storage of *transient aircraft* only shall have a fire suppression system, but the system is exempt from foam requirements.

[F] TABLE 412.4.6

HANGAR FIRE SUPPRESSION REQUIREMENTS^{a, b, c}

MAXIMUM SINGLE FIRE AREA	TYPE OF CONSTRUCTION
--------------------------	----------------------

(square feet)	IA	IB	IIA	IIB	III A	IIIB	IV	VA	VB
≥ 40,001	Group I								
40,000	Group II								
30,000	Group III	Group II							
20,000	Group III	Group III	Group II						
15,000	Group III	Group III	Group III	Group II	Group III	Group II	Group III	Group II	Group II
12,000	Group III	Group II	Group II						
8,000	Group III	Group II							
5,000	Group III								

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m².

- a. Aircraft hangars with a door height greater than 28 feet shall be provided with fire suppression for a Group I hangar regardless of maximum fire area.
- b. Groups shall be as classified in accordance with NFPA 409.
- c. Membrane structures complying with Section 3102 shall be classified as a Group IV hangar.

[F] 412.4.6.1 Hazardous Operations

Any Group III aircraft hangar according to Table 412.4.6 that contains hazardous operations including, but not limited to, the following shall be provided with a Group I or II fire suppression system in accordance with NFPA 409 as applicable:

1. Doping.
2. Hot work including, but not limited to, welding, torch cutting and torch soldering.
3. Fuel transfer.
4. Fuel tank repair or maintenance not including defueled tanks in accordance with NFPA 409, inerted tanks or tanks that have never been fueled.
5. Spray finishing operations.
6. Total fuel capacity of all aircraft within the unsprinklered single *fire area* in excess of 1,600 gallons (6057 L).
7. Total fuel capacity of all aircraft within the maximum single *fire area* in excess of 7,500 gallons (28 390 L) for a hangar with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

[F] 412.4.6.2 Separation of Maximum Single Fire Areas

Maximum single *fire areas* established in accordance with hangar classification and construction type in Table 412.4.6 shall be separated by 2-hour *fire walls* constructed in accordance with Section 706. In determining the maximum single *fire area* as set forth in Table 412.4.6, ancillary uses that are separated from aircraft servicing areas by a *fire barrier* of not less than 1 hour, constructed in accordance with Section 707, shall not be included in the area.

412.5 Residential Aircraft Hangars

Residential aircraft hangars shall comply with Sections 412.5.1 through 412.5.5.

412.5.1 Fire Separation

A hangar shall not be attached to a *dwelling* unless separated by a *fire barrier* having a *fire-resistance rating* of not less than 1 hour. Such separation shall be continuous from the foundation to the underside of the roof and unpierced except for doors leading to the *dwelling unit*. Doors into the *dwelling unit* shall be equipped with *self-closing* devices and conform to the requirements of Section 716 with a noncombustible raised sill not less than 4 inches (102 mm) in height. Openings from a hangar directly into a room used for sleeping purposes shall not be permitted.

412.5.2 Egress

A hangar shall provide two *means of egress*. One of the doors into the dwelling shall be considered as meeting only one of the two *means of egress*.

[F] 412.5.3 Smoke Alarms

Smoke alarms shall be provided within the hangar in accordance with Section 907.2.21.

412.5.4 Independent Systems

Electrical, mechanical and plumbing drain, waste and vent (DWV) systems installed within the hangar shall be independent of the systems installed within the dwelling. Building sewer lines shall be permitted to be connected outside the structures.

Exception: *Smoke detector* wiring and feed for electrical subpanels in the hangar.

412.5.5 Height and Area Limits

Residential aircraft hangars shall be not greater than 2,000 square feet (186 m²) in area and 20 feet (6096 mm) in *building height*.

[F] 412.6 Aircraft Paint Hangars

Aircraft painting operations where flammable liquids are used in excess of the maximum allowable quantities per *control area* listed in Table 307.1(1) shall be conducted in an aircraft paint hangar that complies with the provisions of Sections 412.6.1 through 412.6.6.

[F] 412.6.1 Occupancy Group

Aircraft paint hangars shall be classified as Group H-2. Aircraft paint hangars shall comply with the applicable requirements of this code and the *Florida Fire Prevention Code* for such occupancy.

412.6.2 Construction

The aircraft paint hangar shall be of Type I or II construction.

[F] 412.6.3 Operations

Only those flammable liquids necessary for painting operations shall be permitted in quantities less than the maximum allowable quantities per *control area* in Table 307.1(1). Spray equipment cleaning operations exceeding the maximum allowable quantities per control area in Table 307.1(1) shall be conducted in a liquid use, dispensing and mixing room.

[F] 412.6.4 Storage

Storage of flammable or combustible liquids exceeding the maximum allowable quantities per *control area* in Table 307.1(1) shall be in a liquid storage room.

[F] 412.6.5 Fire Suppression

Aircraft paint hangars shall be provided with fire suppression as required by NFPA 409.

[F] 412.6.6 Ventilation

Aircraft paint hangars shall be provided with *ventilation* as required in the *Florida Building Code, Mechanical*.

412.7 Aircraft Manufacturing Facilities

In buildings used for the manufacturing of aircraft, exit access travel distances indicated in Section 1017.1 shall be increased in accordance with the following:

1. The building shall be of Type I or II construction.
2. Exit access travel distance shall not exceed the distances given in Table 412.7.

TABLE 412.7
AIRCRAFT MANUFACTURING EXIT ACCESS TRAVEL DISTANCE

HEIGHT (feet) ^b	MANUFACTURING AREA (sq. ft.) ^a					
	≥ 150,000	≥ 200,000	≥ 250,000	≥ 500,000	≥ 750,000	≥ 1,000,000
≥ 25	400	450	500	500	500	500
≥ 50	400	500	600	700	700	700
≥ 75	400	500	700	850	1,000	1,000
≥ 100	400	500	750	1,000	1,250	1,500

For SI: 1 foot = 304.8 mm.

a. Contiguous floor area of the aircraft manufacturing facility having the indicated height.

b. Minimum height from finished floor to bottom of ceiling or roof slab or deck.

412.7.1 Ancillary Areas

Rooms, areas and spaces ancillary to the primary manufacturing area shall be permitted to egress through such area having a minimum height as indicated in Table 412.7. Exit access travel distance within the ancillary room, area or space shall not exceed that indicated in Table 1017.2 based on the occupancy classification of that ancillary area. Total exit access travel distance shall not exceed that indicated in Table 412.7.

[F] 412.8 Heliports and Helistops

Heliports and helistops shall be permitted to be erected on buildings or other locations where they are constructed in accordance with Sections 412.8.1 through 412.8.5.

[F] 412.8.1 Size

The landing area for helicopters less than 3,500 pounds (1588 kg) shall be not less than 20 feet (6096 mm) in length and width. The landing area shall be surrounded on all sides by a clear area having a minimum average width at roof level of 15 feet (4572 mm) but with no width less than 5 feet (1524 mm).

[F] 412.8.2 Design

Helicopter landing areas and the supports thereof on the roof of a building shall be noncombustible construction. Landing areas shall be designed to confine any flammable liquid spillage to the landing area itself and provisions shall be made to drain such spillage away from any *exit* or *stairway* serving the helicopter landing area or from a structure housing such *exit* or *stairway*. For structural design requirements, see Section 1607.6.

[F] 412.8.3 Means of Egress

The *means of egress* from heliports and helistops shall comply with the provisions of Chapter 10. Landing areas located on buildings or structures shall have two or more exits or access to exits. For landing areas less than 60 feet (18 288 mm) in length or less than 2,000 square feet (186 m²) in area, the second *means of egress* is permitted to be a fire escape, *alternating tread device* or ladder leading to the floor below.

[F] 412.8.4 Rooftop Heliports and Helistops

Rooftop heliports and helistops shall comply with NFPA 418.

[F] 412.8.5 Standpipe System

In buildings equipped with a standpipe system, the standpipe shall extend to the roof level in accordance with Section 905.3.6.

Section 413 Combustible Storage**413.1 General**

High-piled stock or rack storage in any occupancy group shall comply with the *Florida Fire Prevention Code*.

413.2 Attic, Under-Floor and Concealed Spaces

Attic, under-floor and concealed spaces used for storage of combustible materials shall be protected on the storage side as required for 1-hour fire-resistance-rated construction. Openings shall be protected by assemblies that are *self-closing* and are of noncombustible construction or solid wood core not less than 1 $\frac{3}{4}$ inch (45 mm) in thickness.

Exception: Neither fire-resistance-rated construction nor opening protectives are required in any of the following locations:

1. Areas protected by *approved automatic sprinkler systems*.
2. Group R-3 and U occupancies.

Section 414 Hazardous Materials**[F] 414.1 General**

The provisions of Sections 414.1 through 414.6 shall apply to buildings and structures occupied for the manufacturing, processing, dispensing, use or storage of hazardous materials.

[F] 414.1.1 Other Provisions

Buildings and structures with an occupancy in Group H shall comply with this section and the applicable provisions of Section 415 and the *Florida Fire Prevention Code*.

[F] 414.1.2 Materials

The safe design of hazardous material occupancies is material dependent. Individual material requirements are also found in Sections 307 and 415, and in the *Florida Building Code, Mechanical* and the *Florida Fire Prevention Code*.

[F] 414.1.2.1 Aerosol Products

Level 2 and 3 aerosol products shall be stored and displayed in accordance with the *Florida Fire Prevention Code*. See Section 311.2 and the *Florida Fire Prevention Code* for occupancy group requirements.

[F] 414.1.3 Information Required

A report shall be submitted to the *building official* identifying the maximum expected quantities of hazardous materials to be stored, used in a *closed system* and used in an *open system*, and subdivided to separately address hazardous material classification categories based on Tables 307.1(1) and 307.1(2). The methods of protection from such hazards, including but not limited to *control areas*, fire protection systems and Group H occupancies shall be indicated in the report and on the *construction documents*. The opinion and report shall be prepared by a qualified person, firm or corporation *approved* by the *building official* and provided without charge to the enforcing agency.

For buildings and structures with an occupancy in Group H, separate floor plans shall be submitted identifying the locations of anticipated contents and processes so as to reflect the nature of each occupied portion of every building and structure.

[F] 414.2 Control Areas

Control areas shall comply with Sections 414.2.1 through 414.2.5 and the *Florida Fire Prevention Code*.

[F] 414.2.1 Construction Requirements

Control areas shall be separated from each other by *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

[F] 414.2.2 Percentage of Maximum Allowable Quantities

The percentage of maximum allowable quantities of hazardous materials per *control area* permitted at each floor level within a building shall be in accordance with Table 414.2.2.

[F] TABLE 414.2.2

DESIGN AND NUMBER OF CONTROL AREAS

FLOOR LEVEL		PERCENTAGE OF THE MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA ^a	NUMBER OF CONTROL AREAS PER FLOOR	FIRE-RESISTANCE RATING FOR FIRE BARRIERS IN HOURS ^b
Above grade plane	Higher than 9	5	1	2
	7-9	5	2	2
	6	12.5	2	2
	5	12.5	2	2
	4	12.5	2	2
	3	50	2	1
	2	75	3	1
	1	100	4	1
Below grade plane	1	75	3	1
	2	50	2	1
	Lower than 2	Not Allowed	Not Allowed	Not Allowed

a. Percentages shall be of the maximum allowable quantity per control area shown in Tables 307.1(1) and 307.1(2), with all increases allowed in the notes to those tables.

b. Separation shall include fire barriers and horizontal assemblies as necessary to provide separation from other portions of the building.

[F] 414.2.3 Number

The maximum number of *control areas* within a building shall be in accordance with Table 414.2.2. For the purposes of determining the number of control areas within a building, each portion of a building separated by one or more fire walls complying with Section 706 shall be considered a separate building.

[F] 414.2.4 Fire-Resistance-Rating Requirements

The required *fire-resistance rating* for *fire barriers* shall be in accordance with Table 414.2.2. The floor assembly of the *control area* and the construction supporting the floor of the *control area* shall have a *fire-resistance rating* of not less than 2 hours.

Exception: The floor assembly of the *control area* and the construction supporting the floor of the *control area* are allowed to be 1-hour fire-resistance rated in buildings of Types IIA, IIIA, IV and VA construction, provided that both of the following conditions exist:

1. The building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1; and

2. The building is three or fewer *stories above grade plane*.

[F] 414.2.5 Hazardous Material in Group M Display and Storage Areas and in Group S Storage Areas

The aggregate quantity of nonflammable solid and nonflammable or noncombustible liquid hazardous materials permitted within a single *control area* of a Group M display and storage area, a Group S storage area or an outdoor *control area* is permitted to exceed the maximum allowable quantities per *control area* specified in Tables 307.1(1) and 307.1(2) without classifying the building or use as a Group H occupancy, provided that the materials are displayed and stored in accordance with the *Florida Fire Prevention Code* and quantities do not exceed the maximum allowable specified in Table 414.2.5(1).

In Group M occupancy wholesale and retail sales uses, indoor storage of flammable and combustible liquids shall not exceed the maximum allowable quantities per *control area* as indicated in Table 414.2.5(2), provided that the materials are displayed and stored in accordance with the *Florida Fire Prevention Code*.

The maximum quantity of aerosol products in Group M occupancy retail display areas, storage areas adjacent to retail display areas and retail storage areas shall be in accordance with the *Florida Fire Prevention Code*.

[F] TABLE 414.2.5(1)

MAXIMUM ALLOWABLE QUANTITY PER INDOOR AND OUTDOOR CONTROL AREA IN GROUP M AND S OCCUPANCIES NONFLAMMABLE SOLIDS AND NONFLAMMABLE AND NONCOMBUSTIBLE LIQUIDS^{d, e, f}

CONDITION		MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA	
Material^a	Class	Solids pounds	Liquids gallons
A. Health-hazard materials—nonflammable and noncombustible solids and liquids			
1. Corrosives ^{b,c}	Not Applicable	9,750	975
2. Highly toxics	Not Applicable	20 ^{b,c}	2 ^{b,c}
3. Toxics ^{b,c}	Not Applicable	1,000 ^k	100
B. Physical-hazard materials—nonflammable and noncombustible solids and liquids			
1. Oxidizers ^{b,c}	4	Not Allowed	Not Allowed
	3	1,150 ^g	115
	2	2,250 ^h	225
	1	18,000 ^{i,j}	1,800 ^{i,j}
2. Unstable (reactives) ^{b,c}	4	Not Allowed	Not Allowed
	3	550	55
	2	1,150	115
	1	Not Limited	Not Limited
3. Water reactives	3 ^{b,c}	550	55
	2 ^{b,c}	1,150	115
	1	Not Limited	Not Limited

For SI: 1 pound = 0.454 kg, 1 gallon = 3.785 L.

- a. Hazard categories are as specified in the *Florida Fire Prevention Code*.
- b. Maximum allowable quantities shall be increased 100 percent in buildings that are sprinklered in accordance with Section 903.3.1.1. When Note c also applies, the increase for both notes shall be applied accumulatively.
- c. Maximum allowable quantities shall be increased 100 percent when stored in approved storage cabinets, in accordance with the *Florida Fire Prevention Code*. When Note b also applies, the increase for both notes shall be applied accumulatively.
- d. See Table 414.2.2 for design and number of control areas.
- e. Allowable quantities for other hazardous material categories shall be in accordance with Section 307.
- f. Maximum quantities shall be increased 100 percent in outdoor control areas.
- g. Maximum amounts shall be increased to 2,250 pounds when individual packages are in the original sealed containers from the manufacturer or packager and do not exceed 10 pounds each.
- h. Maximum amounts shall be increased to 4,500 pounds when individual packages are in the original sealed containers from the manufacturer or packager and do not exceed 10 pounds each.
- i. The permitted quantities shall not be limited in a building equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.
- j. Quantities are unlimited in an outdoor control area.
- k. Maximum allowable quantity of consumer products shall be increased to 10,000 pounds where individual packages are in the original sealed containers from the manufacturer and the toxic classification is exclusively based on the LC50 threshold and no other hazardous materials classifications apply.

[F] TABLE 414.2.5(2)

**MAXIMUM ALLOWABLE QUANTITY OF FLAMMABLE AND COMBUSTIBLE LIQUIDS IN WHOLESALE AND RETAIL SALES
OCCUPANCIES PER CONTROL AREA^a**

TYPE OF LIQUID	MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA (gallons)		
	Sprinklered in accordance with note b densities and arrangements	Sprinklered in accordance with the <i>Florida Fire Prevention Code</i>	Nonsprinklered
Class IA	60	60	30
Class IB, IC, II and IIIA	7,500 ^c	15,000 ^c	1,600
Class IIIB	Unlimited	Unlimited	13,200

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m², 1 gallon = 3.785 L, 1 gallon per minute per square foot = 40.75 L/min/m².

- a. Control areas shall be separated from each other by not less than a 1-hour fire barrier wall.

b. To be considered as sprinklered, a building shall be equipped throughout with an approved automatic sprinkler system with a design providing minimum densities as follows:

1. For uncartoned commodities on shelves 6 feet or less in height where the ceiling height does not exceed 18 feet, quantities are those permitted with a minimum sprinkler design density of Ordinary Hazard Group 2.

2. For cartoned, palletized or racked commodities where storage is 4 feet 6 inches or less in height and where the ceiling height does not exceed 18 feet, quantities are those permitted with a minimum sprinkler design density of 0.21 gallon per minute per square foot over the most remote 1,500-square-foot area.

c. Where wholesale and retail sales or storage areas exceed 50,000 square feet in area, the maximum allowable quantities are allowed to be increased by 2 percent for each 1,000 square feet of area in excess of 50,000 square feet, up to a maximum of 100 percent of the table amounts. A control area separation is not required. The cumulative amounts, including amounts attained by having an additional control area, shall not exceed 30,000 gallons.

[F] 414.3 Ventilation

Rooms, areas or spaces in which explosive, corrosive, combustible, flammable or highly toxic dusts, mists, fumes, vapors or gases are or may be emitted due to the processing, use, handling or storage of materials shall be mechanically ventilated where required by this code, the *Florida Fire Prevention Code* or the *Florida Building Code, Mechanical*.

Emissions generated at workstations shall be confined to the area in which they are generated as specified in the *Florida Fire Prevention Code* and the *Florida Building Code, Mechanical*.

[F] 414.4 Hazardous Material Systems

Systems involving hazardous materials shall be suitable for the intended application. Controls shall be designed to prevent materials from entering or leaving process or reaction systems at other than the intended time, rate or path. Automatic controls, where provided, shall be designed to be fail safe.

[F] 414.5 Inside Storage, Dispensing and Use

The inside storage, dispensing and use of hazardous materials shall be in accordance with Sections 414.5.1 through 414.5.3 of this code and the *Florida Fire Prevention Code*.

[F] 414.5.1 Explosion Control

Explosion control shall be provided in accordance with the *Florida Fire Prevention Code* as required by Table 414.5.1 where quantities of hazardous materials specified in that table exceed the maximum allowable quantities in Table 307.1(1) or where a structure, room or space is occupied for purposes involving explosion hazards as required by Section 415 or the *Florida Fire Prevention Code*.

TABLE 414.5.1

EXPLOSION CONTROL REQUIREMENTS^{a, h}

MATERIAL	CLASS	EXPLOSION CONTROL METHODS	
		Barricade construction	Explosion (deflagration) venting or explosion (deflagration) prevention systems^b
HAZARD CATEGORY			
Combustible dusts ^c	—	Not Required	Required
Cryogenic flammables	—	Not Required	Required
Explosives	Division 1.1	Required	Not Required

	Division 1.2	Required	Not Required
	Division 1.3	Not Required	Required
	Division 1.4	Not Required	Required
	Division 1.5	Required	Not Required
	Division 1.6	Required	Not Required
Flammable gas	Gaseous	Not Required	Required
	Liquefied	Not Required	Required
Flammable liquid	IA ^d	Not Required	Required
	IB ^e	Not Required	Required
Organic peroxides	U	Required	Not Permitted
	I	Required	Not Permitted
Oxidizer liquids and solids	4	Required	Not Permitted
Pyrophoric gas	—	Not Required	Required
Unstable (reactive)	4	Required	Not Permitted
	3 Detonable	Required	Not Permitted
	3 Nondetonable	Not Required	Required
Water-reactive liquids and solids	3	Not Required	Required
	2 ^g	Not Required	Required
SPECIAL USES			
Acetylene generator rooms	—	Not Required	Required
Energy Storage Systems ⁱ		Not Required	Required
Grain processing	—	Not Required	Required
Liquefied petroleum gas-distribution facilities	—	Not Required	Required
Where explosion hazards exist ^f	Detonation	Required	Not Permitted
	Deflagration	Not Required	Required

a. See Section 414.1.3.

b. See the *Florida Fire Prevention Code*.

c. Combustible dusts where manufactured, generated or used in such a manner that the concentration and conditions create a fire or explosion hazard based on information prepared in accordance with the *Florida Fire Prevention Code*. See definition of "Combustible dust" in Chapter 2.

d. Storage or use.

e. In open use or dispensing.

- f. Rooms containing dispensing and use of hazardous materials when an explosive environment can occur because of the characteristics or nature of the hazardous materials or as a result of the dispensing or use process.
- g. A method of explosion control shall be provided when Class 2 water-reactive materials can form potentially explosive mixtures.
- h. Explosion venting is not required for Group H-5 fabrication areas complying with Section 415.11.1 and the *Florida Fire Prevention Code*.
- i. Where explosion control is required in the *Florida Fire Prevention Code*.

[F] 414.5.2 Emergency or Standby Power

Where required by the *Florida Fire Prevention Code* or this code, mechanical ventilation, treatment systems, temperature control, alarm, detection or other electrically operated systems shall be provided with emergency or standby power in accordance with Section 2702. For storage and use areas for highly toxic or toxic materials, see the *Florida Fire Prevention Code*.

[F] 414.5.2.1 Exempt Applications

Emergency or standby power is not required for the mechanical ventilation systems provided for any of the following:

1. Storage of Class IB and IC flammable and combustible liquids in closed containers not exceeding 6.5 gallons (25 L) capacity.
2. Storage of Class 1 and 2 oxidizers.
3. Storage of Class II, III, IV and V organic peroxides.
4. Storage of asphyxiant, irritant and radioactive gases.

[F] 414.5.2.2 Fail-Safe Engineered Systems

Standby power for mechanical ventilation, treatment systems and temperature control systems shall not be required where an approved fail-safe engineered system is installed.

[F] 414.5.3 Spill Control, Drainage and Containment

Rooms, buildings or areas occupied for the storage of solid and liquid hazardous materials shall be provided with a means to control spillage and to contain or drain off spillage and fire protection water discharged in the storage area where required in the *Florida Fire Prevention Code*. The methods of spill control shall be in accordance with the *Florida Fire Prevention Code*.

[F] 414.6 Outdoor Storage, Dispensing and Use

The outdoor storage, dispensing and use of hazardous materials shall be in accordance with the *Florida Fire Prevention Code*.

[F] 414.6.1 Weather Protection

Where weather protection is provided for sheltering outdoor hazardous material storage or use areas, such areas shall be considered outdoor storage or use when the weather protection structure complies with Sections 414.6.1.1 through 414.6.1.3.

[F] 414.6.1.1 Walls

Walls shall not obstruct more than one side of the structure.

Exception: Walls shall be permitted to obstruct portions of multiple sides of the structure, provided that the obstructed area is not greater than 25 percent of the structure's perimeter.

[F] 414.6.1.2 Separation Distance

The distance from the structure to buildings, *lot lines*, *public ways* or *means of egress* to a *public way* shall be not less than the distance required for an outside hazardous material storage or use area without weather protection.

[F] 414.6.1.3 Noncombustible Construction

The overhead structure shall be of *approved* noncombustible construction with a maximum area of 1,500 square feet (140 m²).

Exception: The maximum area is permitted to be increased as provided by Section 506.

Section 415 Groups H-1, H-2, H-3, H-4 and H-5

[F] 415.1 Scope

The provisions of Sections 415.1 through 415.11 shall apply to the storage and use of hazardous materials in excess of the maximum allowable quantities per *control area* listed in Section 307.1. Buildings and structures with an occupancy in Group H shall also comply with the applicable provisions of Section 414 and the *Florida Fire Prevention Code*.

[F] 415.2 Definitions

The following terms are defined in Chapter 2:

DETACHED BUILDING.

EMERGENCY CONTROL STATION.

EXHAUSTED ENCLOSURE.

FABRICATION AREA.

FLAMMABLE VAPORS OR FUMES.

GAS CABINET.

GAS DETECTION SYSTEM.

GAS ROOM.

HAZARDOUS PRODUCTION MATERIAL (HPM).

HPM FLAMMABLE LIQUID.

HPM ROOM.

IMMEDIATELY DANGEROUS TO LIFE AND HEALTH (IDLH).

LIQUID.

LIQUID STORAGE ROOM.

LIQUID USE, DISPENSING AND MIXING ROOM.

LOWER FLAMMABLE LIMIT (LFL).

NORMAL TEMPERATURE AND PRESSURE (NTP).

PHYSIOLOGICAL WARNING THRESHOLD LEVEL.

SERVICE CORRIDOR.

SOLID.

STORAGE, HAZARDOUS MATERIALS.

USE (MATERIAL).

WORKSTATION.

[F] 415.3 Automatic Fire Detection Systems

Group H occupancies shall be provided with an automatic fire detection system in accordance with Section 907.2.

[F] 415.4 Automatic Sprinkler System

Group H occupancies shall be equipped throughout with an *automatic sprinkler system* in accordance with Section 903.2.5.

[F] 415.5 Emergency Alarms

Emergency alarms for the detection and notification of an emergency condition in Group H occupancies shall be provided as set forth herein.

[F] 415.5.1 Storage

An approved manual emergency alarm system shall be provided in buildings, rooms or areas used for storage of hazardous materials. Emergency alarm-initiating devices shall be installed outside of each interior exit or exit access door of storage buildings, rooms or areas. Activation of an emergency alarm-initiating device shall sound a local alarm to alert occupants of an emergency situation involving hazardous materials.

[F] 415.5.2 Dispensing, Use and Handling

Where hazardous materials having a hazard ranking of 3 or 4 in accordance with NFPA 704 are transported through corridors, interior exit stairways or ramps, or exit passageways, there shall be an emergency telephone system, a local manual alarm station or an approved alarm-initiating device at not more than 150-foot (45 720 mm) intervals and at each exit and exit access doorway throughout the transport route. The signal shall be relayed to an approved central, proprietary or remote station service or constantly attended on-site location and shall initiate a local audible alarm.

[F] 415.5.3 Supervision

Emergency alarm systems required by Section 415.5.1 or 415.5.2 shall be electrically supervised and monitored by an approved central, proprietary or remote station service or shall initiate an audible and visual signal at a constantly attended on-site location.

[F] 415.5.4 Emergency Alarm Systems

Emergency alarm systems required by Section 415.5.1 or 415.5.2 shall be provided with emergency or standby power in accordance with Section 2702.2.

[F] 415.6 Fire Separation Distance

Group H occupancies shall be located on property in accordance with the other provisions of this chapter. In Groups H-2 and H-3, not less than 25 percent of the perimeter wall of the occupancy shall be an *exterior wall*.

[F] 415.6.1 Rooms for Flammable or Combustible Liquid Use, Dispensing or Mixing in Open Systems

Rooms for *flammable or combustible liquid use*, dispensing or mixing in open systems having a floor area of not more than 500 square feet (46.5 m²) need not be located on the outer perimeter of the building where they are in accordance with the *Florida Fire Prevention Code* and NFPA 30.

[F] 415.6.2 Liquid Storage Rooms and Rooms for Flammable or Combustible Liquid Use in Closed Systems

Liquid storage rooms and rooms for *flammable or combustible liquid use* in closed systems, having a floor area of not more than 1,000 square feet (93 m²) need not be located on the outer perimeter where they are in accordance with the *Florida Fire Prevention Code* and NFPA 30.

[F] 415.6.3 Spray Paint Booths

Spray paint booths that comply with the *Florida Fire Prevention Code* need not be located on the outer perimeter.

[F] 415.6.4 Group H Occupancy Minimum Fire Separation Distance

Regardless of any other provisions, buildings containing Group H occupancies shall be set back to the minimum *fire separation distance* as set forth in Sections 415.6.4.1 through 415.6.4.4. Distances shall be measured from the walls enclosing the occupancy to *lot lines*, including those on a public way. Distances to assumed *lot lines* established for the purpose of determining exterior wall and opening protection are not to be used to establish the minimum *fire separation distance* for buildings on sites where explosives are manufactured or used when separation is provided in accordance with the quantity distance tables specified for explosive materials in the *Florida Fire Prevention Code*.

[F] 415.6.4.1 Group H-1

Group H-1 occupancies shall be set back not less than 75 feet (22 860 mm) and not less than required by the *Florida Fire Prevention Code*.

Exception: Fireworks manufacturing buildings separated in accordance with NFPA 1124.

[F] 415.6.4.2 Group H-2

Group H-2 occupancies shall be set back not less than 30 feet (9144 mm) where the area of the occupancy is greater than 1,000 square feet (93 m^2) and it is not required to be located in a *detached building*.

[F] 415.6.4.3 Groups H-2 and H-3

Group H-2 and H-3 occupancies shall be set back not less than 50 feet (15 240 mm) where a *detached building* is required (see Table 415.6.5).

[F] 415.6.4.4 Explosive Materials

Group H-2 and H-3 occupancies containing materials with explosive characteristics shall be separated as required by the *Florida Fire Prevention Code*. Where separations are not specified, the distances required shall be determined by a technical report issued in accordance with Section 414.1.3.

[F] 415.6.5 Detached Buildings for Group H-1, H-2 or H-3 Occupancy

The storage or use of hazardous materials in excess of those amounts listed in Table 415.6.5 shall be in accordance with the applicable provisions of Sections 415.7 and 415.8.

[F] TABLE 415.6.5

DETACHED BUILDING REQUIRED

A DETACHED BUILDING IS REQUIRED WHEN THE QUANTITY OF MATERIAL EXCEEDS THAT LISTED HEREIN			
Material	Class	Solids and Liquids (tons) ^{a, b}	Gases (cubic feet) ^{a, b}
Explosives	Division 1.1	Maximum Allowable Quantity	Not Applicable
	Division 1.2	Maximum Allowable Quantity	
	Division 1.3	Maximum Allowable Quantity	
	Division 1.4	Maximum Allowable Quantity	
	Division 1.4 ^c	1	
	Division 1.5	Maximum Allowable Quantity	
	Division 1.6	Maximum Allowable Quantity	
Oxidizers	Class 4	Maximum Allowable Quantity	Maximum Allowable Quantity
Unstable (reactives) detonable	Class 3 or 4	Maximum Allowable Quantity	Maximum Allowable Quantity
Oxidizer, liquids and solids	Class 3	1,200	Not Applicable
	Class 2	2,000	Not Applicable
Organic peroxides	Detonable	Maximum Allowable Quantity	Not Applicable
	Class I	Maximum Allowable Quantity	Not Applicable
	Class II	25	Not Applicable
	Class III	50	Not Applicable
Unstable (reactives) nondetonable	Class 3	1	2,000

	Class 2	25	10,000
Water reactives	Class 3	1	Not Applicable
	Class 2	25	Not Applicable
Pyrophoric gases ^d	Not Applicable	Not Applicable	2,000

For SI: 1 ton = 906 kg, 1 cubic foot = 0.02832 m³, 1 pound = 0.454 kg.

- a. For materials that are detonable, the distance to other buildings or lot lines shall be in accordance with the *Florida Fire Prevention Code* based on trinitrotoluene (TNT) equivalence of the material. For materials classified as explosives, see the *Florida Fire Prevention Code*.
- b. "Maximum Allowable Quantity" means the maximum allowable quantity per control area set forth in Table 307.1(1).
- c. Limited to Division 1.4 materials and articles, including articles packaged for shipment, that are not regulated as an explosive under Bureau of Alcohol, Tobacco, Firearms and Explosives (BATF) regulations or unpackaged articles used in process operations that do not propagate a detonation or deflagration between articles, provided the net explosive weight of individual articles does not exceed 1 pound.
- d. Detached buildings are not required, for gases in gas rooms that support H-5 fabrication facilities where the gas room is separated from other areas by a fire barrier with a fire-resistance rating of not less than 2 hours and the gas is located in a gas cabinet that is internally sprinklered, equipped with continuous leak detection, automatic shutdown and is not manifolded upstream of pressure controls. Additionally, the gas supply is limited to cylinders that do not exceed 125-pound (57 kg) water capacity in accordance with 49 CFR 173.192 for Hazard Zone A toxic gases.

[F] 415.6.5.1 Wall and Opening Protection

Where a *detached building* is required by Table 415.6.5, there are no requirements for wall and opening protection based on *fire separation distance*.

[F] 415.7 Special Provisions for Group H-1 Occupancies

Group H-1 occupancies shall be in detached buildings used for no other purpose. Roofs shall be of lightweight construction with suitable thermal insulation to prevent sensitive material from reaching its decomposition temperature. Group H-1 occupancies containing materials that are in themselves both physical and health hazards in quantities exceeding the maximum allowable quantities per *control area* in Table 307.1(2) shall comply with requirements for both Group H-1 and H-4 occupancies.

[F] 415.7.1 Floors in Storage Rooms

Floors in storage areas for organic peroxides, pyrophoric materials and unstable (reactive) materials shall be of liquid-tight, noncombustible construction.

[F] 415.8 Special Provisions for Group H-2 and H-3 Occupancies

Group H-2 and H-3 occupancies containing quantities of hazardous materials in excess of those set forth in Table 415.6.2 shall be in *detached buildings* used for manufacturing, processing, dispensing, use or storage of hazardous materials. Materials listed for Group H-1 occupancies in Section 307.3 are permitted to be located within Group H-2 or H-3 *detached buildings* provided the amount of materials per *control area* do not exceed the maximum allowed quantity specified in Table 307.1(1).

[F] 415.8.1 Multiple Hazards

Group H-2 or H-3 occupancies containing materials that are in themselves both physical and health hazards in quantities exceeding the maximum allowable quantities per *control area* in Table 307.1(2) shall comply with requirements for Group H-2, H-3 or H-4 occupancies as applicable.

[F] 415.8.2 Separation of Incompatible Materials

Hazardous materials other than those listed in Table 415.6.5 shall be allowed in manufacturing, processing, dispensing, use or storage areas when separated from incompatible materials in accordance with the provisions of the *Florida Fire Prevention Code*.

[F] 415.8.3 Water Reactives

Group H-2 and H-3 occupancies containing water-reactive materials shall be resistant to water penetration. Piping for conveying liquids shall not be over or through areas containing water reactives, unless isolated by *approved* liquid-tight construction.

Exception: Fire protection piping shall be permitted over or through areas containing water reactives without isolating it with liquid-tight construction.

[F] 415.8.4 Floors in Storage Rooms

Floors in storage areas for organic peroxides, oxidizers, pyrophoric materials, unstable (reactive) materials and water-reactive solids and liquids shall be of liquid-tight, noncombustible construction.

[F] 415.8.5 Waterproof Room

Rooms or areas used for the storage of water-reactive solids and liquids shall be constructed in a manner that resists the penetration of water through the use of waterproof materials. Piping carrying water for other than *approved automatic sprinkler systems* shall not be within such rooms or areas.

[F] 415.9 Group H-2

Occupancies in Group H-2 shall be constructed in accordance with Sections 415.9.1 through 415.9.3 and the *Florida Fire Prevention Code*.

[F] 415.9.1 Flammable and Combustible Liquids

The storage, handling, processing and transporting of flammable and combustible liquids in Group H-2 and H-3 occupancies shall be in accordance with Sections 415.9.1.1 through 415.9.1.9, the *Florida Building Code, Mechanical* and the *Florida Fire Prevention Code*.

[F] 415.9.1.1 Mixed Occupancies

Where the storage tank area is located in a building of two or more occupancies and the quantity of liquid exceeds the maximum allowable quantity for one *control area*, the use shall be completely separated from adjacent occupancies in accordance with the requirements of Section 508.4.

[F] 415.9.1.1.1 Height Exception

Where storage tanks are located within a building no more than one story above grade plane, the height limitation of Section 504 shall not apply for Group H.

[F] 415.9.1.2 Tank Protection

Storage tanks shall be noncombustible and protected from physical damage. *Fire barriers or horizontal assemblies* or both around the storage tanks shall be permitted as the method of protection from physical damage.

[F] 415.9.1.3 Tanks

Storage tanks shall be *approved* tanks conforming to the requirements of the *Florida Fire Prevention Code*.

[F] 415.9.1.4 Leakage Containment

A liquid-tight containment area compatible with the stored liquid shall be provided. The method of spill control, drainage control and secondary containment shall be in accordance with the *Florida Fire Prevention Code*.

Exception: Rooms where only double-wall storage tanks conforming to Section 415.9.1.3 are used to store Class I, II and IIIA flammable and combustible liquids shall not be required to have a leakage containment area.

[F] 415.9.1.5 Leakage Alarm

An *approved* automatic alarm shall be provided to indicate a leak in a storage tank and room. The alarm shall sound an audible signal, 15 dBA above the ambient sound level, at every point of entry into the room in which the leaking storage tank is located. An *approved* sign shall be posted on every entry door to the tank storage room indicating the potential hazard of the interior room environment, or the sign shall state: WARNING, WHEN ALARM SOUNDS, THE ENVIRONMENT WITHIN THE ROOM MAY BE HAZARDOUS. The leakage alarm shall also be supervised in accordance with Chapter 9 to transmit a trouble signal.

[F] 415.9.1.6 Tank Vent

Storage tank vents for Class I, II or IIIA liquids shall terminate to the outdoor air in accordance with the *Florida Fire Prevention Code*.

[F] 415.9.1.7 Room Ventilation

Storage tank areas storing Class I, II or IIIA liquids shall be provided with mechanical *ventilation*. The mechanical *ventilation* system shall be in accordance with the *Florida Building Code, Mechanical* and the *Florida Fire Prevention Code*.

[F] 415.9.1.8 Explosion Venting

Where Class I liquids are being stored, explosion venting shall be provided in accordance with the *Florida Fire Prevention Code*.

[F] 415.9.1.9 Tank Openings Other Than Vents

Tank openings other than vents from tanks inside buildings shall be designed to ensure that liquids or vapor concentrations are not released inside the building.

[F] 415.9.2 Liquefied Petroleum Gas Facilities

The construction and installation of liquefied petroleum gas facilities shall be in accordance with the requirements of this code, the *Florida Fire Prevention Code*, the *Florida Building Code, Mechanical*, the *Florida Building Code, Fuel Gas* and NFPA 58.

[F] 415.9.3 Dry Cleaning Plants

The construction and installation of dry cleaning plants shall be in accordance with the requirements of this code, the *Florida Building Code, Mechanical*, the *Florida Building Code, Plumbing* and NFPA 32. Dry cleaning solvents and systems shall be classified in accordance with the *Florida Fire Prevention Code*.

[F] 415.10 Groups H-3 and H-4

Groups H-3 and H-4 shall be constructed in accordance with the applicable provisions of this code and the *Florida Fire Prevention Code*.

[F] 415.10.1 Flammable and Combustible Liquids

The storage, handling, processing and transporting of flammable and combustible liquids in Group H-3 occupancies shall be in accordance with Section 415.9.1.

[F] 415.10.2 Gas Rooms

Where gas rooms are provided, such rooms shall be separated from other areas by not less than 1-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

[F] 415.10.3 Floors in Storage Rooms

Floors in storage areas for corrosive liquids and highly toxic or toxic materials shall be of liquid-tight, noncombustible construction.

[F] 415.10.4 Separation-Highly Toxic Solids and Liquids

Highly toxic solids and liquids not stored in *approved* hazardous materials storage cabinets shall be isolated from other hazardous materials storage by not less than 1-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

[F] 415.11 Group H-5

In addition to the requirements set forth elsewhere in this code, Group H-5 shall comply with the provisions of Sections 415.11.1 through 415.11.12 and the *Florida Fire Prevention Code*.

[F] 415.11.1 Fabrication Areas

Fabrication areas shall comply with Sections 415.11.1.1 through 415.11.1.8.

[F] 415.11.1.1 Hazardous Materials

Hazardous materials and hazardous production materials (HPM) shall comply with Sections 415.11.1.1.1 and 415.11.1.1.2.

[F] 415.11.1.1.1 Aggregate Quantities

The aggregate quantities of hazardous materials stored and used in a single *fabrication area* shall not exceed the quantities set forth in Table 415.11.1.1.1.

Exception: The quantity limitations for any hazard category in Table 415.11.1.1 shall not apply where the *fabrication area* contains quantities of hazardous materials not exceeding the maximum allowable quantities per *control area* established by Tables 307.1(1) and 307.1(2).

[F] TABLE 415.11.1.1

QUANTITY LIMITS FOR HAZARDOUS MATERIALS IN A SINGLE FABRICATION AREA IN GROUP H-5^a

HAZARD CATEGORY		SOLIDS (pounds per square foot)	LIQUIDS (gallons per square foot)	GAS (cubic feet @ NTP/square foot)
PHYSICAL-HAZARD MATERIALS				
Combustible dust		Note b	Not Applicable	Not Applicable
Combustible fiber	Loose	Note b	Not Applicable	Not Applicable
	Baled	Notes b, c		
Combustible liquid	II	Not Applicable	0.01	Not Applicable
	IIIA		0.02	
	IIIB		Not Limited	
Combination Class	I, II and IIIA		0.04	
Cryogenic gas	Flammable	Not Applicable	Not Applicable	Note d
	Oxidizing			1.25
Explosives		Note b	Note b	Note b
Flammable gas	Gaseous	Not Applicable	Not Applicable	Note d
	Liquefied			Note d
Flammable liquid	IA	Not Applicable	0.0025	Not Applicable
	IB		0.025	
	IC		0.025	
Combination Class	IA, IB and IC		0.025	
Combination Class	I, II and IIIA		0.04	
Flammable solid		0.001	Not Applicable	Not Applicable
Organic peroxide	Unclassified detonable	Note b	Not Applicable	Not Applicable
	Class I	Note b		
	Class II	0.025		
	Class III	0.1		
	Class IV	Not Limited		

	Class V	Not Limited		
Oxidizing gas	Gaseous	Not Applicable	Not Applicable	1.25
	Liquefied			1.25
Combination of gaseous and liquefied				1.25
Oxidizer	Class 4	Note b	Note b	Not Applicable
	Class 3	0.003	0.03	
	Class 2	0.003	0.03	
	Class 1	0.003	0.03	
Combination Class	1, 2, 3	0.003	0.03	
Pyrophoric materials		0.01	0.00125	Notes d and e
Unstable (reactive)	Class 4	Note b	Note b	Note b
	Class 3	0.025	0.0025	Note b
	Class 2	0.1	0.01	Note b
	Class 1	Not Limited	Not Limited	Not Limited
Water reactive	Class 3	Note b	0.00125	Not Applicable
	Class 2	0.25	0.025	
	Class 1	Not Limited	Not Limited	
HEALTH-HAZARD MATERIALS				
Corrosives		Not Limited	Not Limited	Not Limited
Highly toxic		Not Limited	Not Limited	Note d
Toxics		Not Limited	Not Limited	Note d

For SI: 1 pound = 0.454 kg, 1 pound per square foot = 4.882 kg/m², 1 gallon per square foot = 40.7 L/m², 1 cubic foot @ NTP/square foot = 0.305 m³@ NTP/m², 1 cubic foot = 0.02832 m³.

- a. Hazardous materials within piping shall not be included in the calculated quantities.
- b. Quantity of hazardous materials in a single fabrication shall not exceed the maximum allowable quantities per control area in Tables 307.1(1) and 307.1(2).
- c. Densely packed baled cotton that complies with the packing requirements of ISO 8115 shall not be included in this material class.
- d. The aggregate quantity of flammable, pyrophoric, toxic and highly toxic gases shall not exceed 9,000 cubic feet at NTP.
- e. The aggregate quantity of pyrophoric gases in the building shall not exceed the amounts set forth in Table 415.6.5.

- f. Quantity of Class 3 water reactive solids in a single tool shall not exceed 1 pound.

[F] 415.11.1.2 Hazardous Production Materials

The maximum quantities of hazardous production materials (HPM) stored in a single *fabrication area* shall not exceed the maximum allowable quantities per *control area* established by Tables 307.1(1) and 307.1(2).

[F] 415.11.1.2 Separation

Fabrication areas, whose sizes are limited by the quantity of hazardous materials allowed by Table 415.11.1.1, shall be separated from each other, from *corridors* and from other parts of the building by not less than 1-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

Exceptions:

1. Doors within such *fire barrier* walls, including doors to *corridors*, shall be only *self-closing fire door assemblies* having a *fire protection rating* of not less than $\frac{3}{4}$ hour.
2. Windows between *fabrication areas* and *corridors* are permitted to be fixed glazing *listed* and labeled for a *fire protection rating* of not less than $\frac{3}{4}$ hour in accordance with Section 716.

[F] 415.11.1.3 Location of Occupied Levels

Occupied levels of *fabrication areas* shall be located at or above the first story *above grade plane*.

[F] 415.11.1.4 Floors

Except for surfacing, floors within *fabrication areas* shall be of noncombustible construction.

Openings through floors of *fabrication areas* are permitted to be unprotected where the interconnected levels are used solely for mechanical equipment directly related to such *fabrication areas* (see also Section 415.11.1.6).

Floors forming a part of an occupancy separation shall be liquid tight.

[F] 415.11.1.5 Shafts and Openings Through Floors

Elevator hoistways, vent *shafts* and other openings through floors shall be enclosed where required by Sections 712 and 713. Mechanical, duct and piping penetrations within a *fabrication area* shall not extend through more than two floors. The *annular space* around penetrations for cables, cable trays, tubing, piping, conduit or ducts shall be sealed at the floor level to restrict the movement of air. The *fabrication area*, including the areas through which the ductwork and piping extend, shall be considered a single conditioned environment.

[F] 415.11.1.6 Ventilation

Mechanical exhaust *ventilation* at the rate of not less than 1 cubic foot per minute per square foot [$0.0051 \text{ m}^3/(\text{s} \cdot \text{m}^2)$] of floor area shall be provided throughout the portions of the *fabrication area* where HPM are used or stored. The exhaust air duct system of one *fabrication area* shall not connect to another duct system outside that *fabrication area* within the building.

A *ventilation* system shall be provided to capture and exhaust gases, fumes and vapors at workstations.

Two or more operations at a workstation shall not be connected to the same exhaust system where either one or the combination of the substances removed could constitute a fire, explosion or hazardous chemical reaction within the exhaust duct system.

Exhaust ducts penetrating *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711 shall be contained in a *shaft* of equivalent fire-resistance-rated construction. Exhaust ducts shall not penetrate *fire walls*.

Fire dampers shall not be installed in exhaust ducts.

[F] 415.11.1.7 Transporting Hazardous Production Materials to Fabrication Areas

HPM shall be transported to *fabrication areas* through enclosed piping or tubing systems that comply with Section 415.11.7, through *service corridors* complying with Section 415.11.3, or in *corridors* as permitted in the exception to Section 415.11.2. The handling or transporting of HPM within *service corridors* shall comply with the *Florida Fire Prevention Code*.

[F] 415.11.1.8 Electrical

Electrical equipment and devices within the *fabrication area* shall comply with NFPA 70. The requirements for hazardous locations need not be applied where the average air change is at least four times that set forth in Section 415.11.1.7 and where the number of air changes at any location is not less than three times that required by Section 415.11.1.7. The use of recirculated air shall be permitted.

[F] 415.11.1.8.1 Workstations

Workstations shall not be energized without adequate exhaust *ventilation*. See Section 415.11.1.6 for workstation exhaust *ventilation* requirements.

[F] 415.11.2 Corridors

Corridors shall comply with Chapter 10 and shall be separated from *fabrication areas* as specified in Section 415.11.1.2. *Corridors* shall not contain HPM and shall not be used for transporting such materials except through closed piping systems as provided in Section 415.11.7.4.

Exception: Where existing *fabrication areas* are altered or modified, HPM is allowed to be transported in existing *corridors*, subject to the following conditions:

1. Nonproduction HPM is allowed to be transported in *corridors* if utilized for maintenance, lab work and testing.
2. Where existing *fabrication areas* are altered or modified, HPM is allowed to be transported in existing *corridors*, subject to the following conditions:
 - 2.1. Corridors. *Corridors* adjacent to the *fabrication area* where the alteration work is to be done shall comply with Section 1020 for a length determined as follows:
 - 2.1.1. The length of the common wall of the *corridor* and the *fabrication area*; and
 - 2.1.2. For the distance along the *corridor* to the point of entry of HPM into the *corridor* serving that *fabrication area*.
 - 2.2. *Emergency alarm system*. There shall be an emergency telephone system, a local manual alarm station or other *approved* alarm-initiating device within *corridors* at not more than 150-foot (45 720 mm) intervals and at each *exit* and doorway. The signal shall be relayed to an *approved* central, proprietary or remote station service or the emergency control station and shall also initiate a local audible alarm.
 - 2.3. Pass-throughs. *Self-closing* doors having a *fire protection rating* of not less than 1 hour shall separate pass-throughs from existing *corridors*. Pass-throughs shall be constructed as required for the *corridors* and protected by an *approved automatic sprinkler system*.

[F] 415.11.3 Service Corridors

Service corridors within a Group H-5 occupancy shall comply with Sections 415.11.3.1 through 415.11.3.4.

[F] 415.11.3.1 Use Conditions

Service corridors shall be separated from *corridors* as required by Section 415.11.1.2. *Service corridors* shall not be used as a required *corridor*.

[F] 415.11.3.2 Mechanical Ventilation

Service corridors shall be mechanically ventilated as required by Section 415.11.1.6 or at not less than six air changes per hour.

[F] 415.11.3.3 Means of Egress

The distance of travel from any point in a *service corridor* to an *exit*, *exit access corridor* or door into a *fabrication area* shall be not greater than 75 feet (22 860 mm). Dead ends shall be not greater than 4 feet (1219 mm) in length. There shall be not less than two *exits*, and not more than onehalf of the required *means of egress* shall require travel into a *fabrication area*. Doors from *service corridors* shall swing in the direction of egress travel and shall be *self-closing*.

[F] 415.11.3.4 Minimum Width

The clear width of a *service corridor* shall be not less than 5 feet (1524 mm), or 33 inches (838 mm) wider than the widest cart or truck used in the *service corridor*, whichever is greater.

[F] 415.11.4 Emergency Alarm System

Emergency alarm systems shall be provided in accordance with this section and Sections 415.5.1 and 415.5.2. The maximum allowable quantity per *control area* provisions shall not apply to *emergency alarm systems* required for HPM.

[F] 415.11.4.1 Service Corridors

An *emergency alarm system* shall be provided in *service corridors*, with no fewer than one alarm device in each *service corridor*.

[F] 415.11.4.2 Corridors and Interior Exit Stairways and Ramps

Emergency alarms for *corridors*, *interior exit stairways* and *ramps* and *exit passageways* shall comply with Section 415.5.2.

[F] 415.11.4.3 Liquid Storage Rooms, HPM Rooms and Gas Rooms

Emergency alarms for liquid storage rooms, HPM rooms and gas rooms shall comply with Section 415.5.1.

[F] 415.11.4.4 Alarm-Initiating Devices

An *approved* emergency telephone system, local alarm manual pull stations, or other *approved* alarm-initiating devices are allowed to be used as emergency alarm-initiating devices.

[F] 415.11.4.5 Alarm Signals

Activation of the *emergency alarm system* shall sound a local alarm and transmit a signal to the emergency control station.

[F] 415.11.5 Storage of Hazardous Production Materials

Storage of hazardous production materials (HPM) in *fabrication areas* shall be within *approved* or *listed* storage cabinets or gas cabinets or within a workstation. The storage of HPM in quantities greater than those listed in the *Florida Fire Prevention Code* shall be in liquid storage rooms, HPM rooms or gas rooms as appropriate for the materials stored. The storage of other hazardous materials shall be in accordance with other applicable provisions of this code and the *Florida Fire Prevention Code*.

[F] 415.11.6 HPM Rooms, Gas Rooms, Liquid Storage Room Construction

HPM rooms, gas rooms and liquid shall be constructed in accordance with Sections 415.11.6.1 through 415.11.6.9.

[F] 415.11.6.1 HPM Rooms and Gas Rooms

HPM rooms and gas rooms shall be separated from other areas by *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. The *fire-resistance rating* shall be not less than 2 hours where the area is 300 square feet (27.9 m^2) or more and not less than 1 hour where the area is less than 300 square feet (27.9 m^2).

[F] 415.11.6.2 Liquid Storage Rooms

Liquid storage rooms shall be constructed in accordance with the following requirements:

1. Rooms greater than 500 square feet (46.5 m^2) in area, shall have no fewer than one exterior door *approved* for fire department access.
2. Rooms shall be separated from other areas by *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. The *fire-resistance rating* shall be not less than 1 hour for rooms up to 150 square feet (13.9 m^2) in area and not less than 2 hours where the room is more than 150 square feet (13.9 m^2) in area.
3. Shelving, racks and wainscotting in such areas shall be of noncombustible construction or wood of not less than 1-inch (25 mm) nominal thickness or fire-retardant-treated wood complying with Section 2303.2.

4. Rooms used for the storage of Class I flammable liquids shall not be located in a *basement*.

[F] 415.11.6.3 Floors

Except for surfacing, floors of HPM rooms and liquid storage rooms shall be of noncombustible liquid-tight construction. Raised grating over floors shall be of noncombustible materials.

[F] 415.11.6.4 Location

Where HPM rooms, liquid storage rooms and gas rooms are provided, they shall have no fewer than one *exterior wall* and such wall shall be not less than 30 feet (9144 mm) from *lot lines*, including *lot lines* adjacent to *public ways*.

[F] 415.11.6.5 Explosion Control

Explosion control shall be provided where required by Section 414.5.1.

[F] 415.11.6.6 Exits

Where two *exits* are required from HPM rooms, liquid storage rooms and gas rooms, one shall be directly to the outside of the building.

[F] 415.11.6.7 Doors

Doors in a *fire barrier wall*, including doors to *corridors*, shall be *self-closing fire door assemblies* having a *fire protection rating* of not less than $\frac{3}{4}$ hour.

[F] 415.11.6.8 Ventilation

Mechanical exhaust ventilation shall be provided in liquid storage rooms, HPM rooms and gas rooms at the rate of not less than 1 cubic foot per minute per square foot (0.044 L/s/m^2) of floor area or six air changes per hour.

Exhaust ventilation for gas rooms shall be designed to operate at a negative pressure in relation to the surrounding areas and direct the exhaust ventilation to an exhaust system.

[F] 415.11.6.9 Emergency Alarm System

An *approved emergency alarm system* shall be provided for HPM rooms, liquid storage rooms and gas rooms.

Emergency alarm-initiating devices shall be installed outside of each interior *exit* door of such rooms.

Activation of an emergency alarm-initiating device shall sound a local alarm and transmit a signal to the emergency control station.

An *approved emergency telephone system*, local alarm manual pull stations or other *approved* alarm-initiating devices are allowed to be used as emergency alarm-initiating devices.

[F] 415.11.7 Piping and Tubing

Hazardous production materials piping and tubing shall comply with this section and ASME B31.3.

[F] 415.11.7.1 HPM Having a Health-Hazard Ranking of 3 or 4

Systems supplying HPM liquids or gases having a health-hazard ranking of 3 or 4 shall be welded throughout, except for connections, to the systems that are within a ventilated enclosure if the material is a gas, or an *approved* method of drainage or containment is provided for the connections if the material is a liquid.

[F] 415.11.7.2 Location in Service Corridors

Hazardous production materials supply piping or tubing in *service corridors* shall be exposed to view.

[F] 415.11.7.3 Excess Flow Control

Where HPM gases or liquids are carried in pressurized piping above 15 pounds per square inch gauge (psig) (103.4 kPa), excess flow control shall be provided. Where the piping originates from within a liquid storage room, HPM room or gas room, the excess flow control shall be located within the liquid storage room, HPM room or gas room. Where the piping originates from a bulk source, the excess flow control shall be located as close to the bulk source as practical.

[F] 415.11.7.4 Installations in Corridors and Above Other Occupancies

The installation of HPM piping and tubing within the space defined by the walls of *corridors* and the floor or roof above, or in concealed spaces above other occupancies, shall be in accordance with Sections 415.11.7.1 through 415.11.7.3 and the following conditions:

1. Automatic sprinklers shall be installed within the space unless the space is less than 6 inches (152 mm) in the least dimension.
2. *Ventilation* not less than six air changes per hour shall be provided. The space shall not be used to convey air from any other area.
3. Where the piping or tubing is used to transport HPM liquids, a receptor shall be installed below such piping or tubing. The receptor shall be designed to collect any discharge or leakage and drain it to an *approved* location. The 1-hour enclosure shall not be used as part of the receptor.
4. HPM supply piping and tubing and nonmetallic waste lines shall be separated from the corridor and from occupancies other than Group H-5 by fire barriers or by an approved method or assembly that has a fire-resistance rating of not less than 1 hour. Access openings into the enclosure shall be protected by approved fire-protection-rated assemblies.
5. Readily accessible manual or automatic remotely activated fail-safe emergency shutoff valves shall be installed on piping and tubing other than waste lines at the following locations:
 - 5.1. At branch connections into the *fabrication area*.
 - 5.2. At entries into *corridors*.

Exception: Transverse crossings of the *corridors* by supply piping that is enclosed within a ferrous pipe or tube for the width of the *corridor* need not comply with Items 1 through 5.

[F] 415.11.7.5 Identification

Piping, tubing and HPM waste lines shall be identified in accordance with ANSI A13.1 to indicate the material being transported.

[F] 415.11.8 Gas Detection Systems

A gas detection system complying with Section 916 shall be provided for HPM gases where the physiological warning threshold level of the gas is at a higher level than the accepted permissible exposure limit (PEL) for the gas and for flammable gases in accordance with Sections 415.11.8.1 through 415.11.8.2.

[F] 415.11.8.1 Where Required

A *gas detection system* shall be provided in the areas identified in Sections 415.11.8.1.1through 415.11.8.1.4.

[F] 415.11.8.1.1 Fabrication Areas

A *gas detection system* shall be provided in *fabrication areas* where HPM gas is used in the *fabrication area*.

[F] 415.11.8.1.2 HPM Rooms

A *gas detection system* shall be provided in HPM rooms where HPM gas is used in the room.

[F] 415.11.8.1.3 Gas Cabinets, Exhausted Enclosures and Gas Rooms

A *gas detection system* shall be provided in gas cabinets and exhausted enclosures for HPM gas. A *gas detection system* shall be provided in gas rooms where HPM gases are not located in gas cabinets or exhausted enclosures.

[F] 415.11.8.1.4 Corridors

Where HPM gases are transported in piping placed within the space defined by the walls of a *corridor* and the floor or roof above the *corridor*, a *gas detection system* shall be provided where piping is located and in the *corridor*.

Exception: A *gas detection system* is not required for occasional transverse crossings of the *corridors* by supply piping that is enclosed in a ferrous pipe or tube for the width of the *corridor*.

[F] 415.11.8.2 Gas Detection System Operation

The *gas detection system* shall be capable of monitoring the room, area or equipment in which the HPM gas is located at or below all the following gas concentrations:

1. Immediately dangerous to life and health (IDLH) values where the monitoring point is within an exhausted enclosure, ventilated enclosure or gas cabinet.
2. Permissible exposure limit (PEL) levels where the monitoring point is in an area outside an exhausted enclosure, ventilated enclosure or gas cabinet.
3. For flammable gases, the monitoring detection threshold level shall be vapor concentrations in excess of 25 percent of the lower flammable limit (LFL) where the monitoring is within or outside an exhausted enclosure, ventilated enclosure or gas cabinet.
4. Except as noted in this section, monitoring for highly toxic and toxic gases shall also comply with the *Florida Fire Prevention Code*.

[F] 415.11.8.2.1 Alarms

The gas detection system shall initiate a local alarm and transmit a signal to the emergency control station when a short-term hazard condition is detected. The alarm shall be both visual and audible and shall provide warning both inside and outside the area where the gas is detected. The audible alarm shall be distinct from all other alarms.

[F] 415.11.8.2.2 Shutoff of Gas Supply

The gas detection system shall automatically close the shutoff valve at the source on gas supply piping and tubing related to the system being monitored for which gas is detected when a short-term hazard condition is detected. Automatic closure of shutoff valves shall comply with the following:

1. Where the gas detection sampling point initiating the gas detection system alarm is within a gas cabinet or exhausted enclosure, the shutoff valve in the gas cabinet or exhausted enclosure for the specific gas detected shall automatically close.
2. Where the gas detection sampling point initiating the gas detection system alarm is within a room and compressed gas containers are not in gas cabinets or an exhausted enclosure, the shutoff valves on all gas lines for the specific gas detected shall automatically close.
3. Where the gas detection sampling point initiating the gas detection system alarm is within a piping distribution manifold enclosure, the shutoff valve supplying the manifold for the compressed gas container of the specific gas detected shall automatically close.

Exception: Where the gas detection sampling point initiating the gas detection system alarm is at the use location or within a gas valve enclosure of a branch line downstream of a piping distribution manifold, the shutoff valve for the branch line located in the piping distribution manifold enclosure shall automatically close.

[F] 415.11.9 Manual Fire Alarm System

An *approved manual fire alarm* system shall be provided throughout buildings containing Group H-5. Activation of the alarm system shall initiate a local alarm and transmit a signal to the emergency control station. The *fire alarm* system shall be designed and installed in accordance with Section 907.

[F] 415.11.10 Emergency Control Station

An emergency control station shall be provided in accordance with Sections 415.11.10.1 through 415.11.10.3.

[F] 415.11.10.1 Location

The emergency control station shall be located on the premises at an *approved* location outside the *fabrication area*.

[F] 415.11.10.2 Staffing

Trained personnel shall continuously staff the emergency control station.

[F] 415.11.10.3 Signals

The emergency control station shall receive signals from emergency equipment and alarm and detection systems. Such emergency equipment and alarm and detection systems shall include, but not be limited to, the following where such equipment or systems are required to be provided either in this chapter or elsewhere in this code:

1. *Automatic sprinkler system* alarm and monitoring systems.
2. Manual *fire alarm* systems.
3. *Emergency alarm systems*.
4. *Gas detection systems*.
5. Smoke detection systems.
6. Emergency power system.
7. Automatic detection and alarm systems for pyrophoric liquids and Class 3 water-reactive liquids required in the *Florida Fire Prevention Code*.
8. Exhaust *ventilation* flow alarm devices for pyrophoric liquids and Class 3 water-reactive liquids cabinet exhaust *ventilation* systems required in the *Florida Fire Prevention Code*.

[F] 415.11.11 Emergency Power System

An emergency power system shall be provided in Group H-5 occupancies in accordance with Section 2702. The emergency power system shall supply power automatically to the electrical systems specified in Section 415.11.11.1 when the normal electrical supply system is interrupted.

[F] 415.11.11.1 Required Electrical Systems

Emergency power shall be provided for electrically operated equipment and connected control circuits for the following systems:

1. HPM exhaust *ventilation* systems.
2. HPM gas cabinet *ventilation* systems.
3. HPM exhausted enclosure *ventilation* systems.
4. HPM gas room *ventilation* systems.
5. HPM gas detection systems.
6. *Emergency alarm systems*.
7. Manual and automatic *fire alarm* systems.
8. *Automatic sprinkler system* monitoring and alarm systems.
9. Automatic alarm and detection systems for pyrophoric liquids and Class 3 water-reactive liquids required in the *Florida Fire Prevention Code*.

10. Flow alarm switches for pyrophoric liquids and Class 3 water-reactive liquids cabinet exhaust *ventilation* systems required in the *Florida Fire Prevention Code*.
11. Electrically operated systems required elsewhere in this code or in the *Florida Fire Prevention Code* applicable to the use, storage or handling of HPM.

[F] 415.11.11.2 Exhaust Ventilation Systems

Exhaust *ventilation* systems are allowed to be designed to operate at not less than one-half the normal fan speed on the emergency power system where it is demonstrated that the level of exhaust will maintain a safe atmosphere.

[F] 415.11.12 Automatic Sprinkler System Protection in Exhaust Ducts for HPM

An *approved automatic sprinkler system* shall be provided in exhaust ducts conveying gases, vapors, fumes, mists or dusts generated from HPM in accordance with Sections 415.11.12.1 through 415.10.12.3 and the *Florida Building Code, Mechanical*.

[F] 415.11.12.1 Metallic and Noncombustible Nonmetallic Exhaust Ducts

An *approved automatic sprinkler system* shall be provided in metallic and noncombustible nonmetallic exhaust ducts where all of the following conditions apply:

1. Where the largest cross-sectional diameter is equal to or greater than 10 inches (254 mm).
2. The ducts are within the building.
3. The ducts are conveying flammable gases, vapors or fumes.

[F] 415.11.12.2 Combustible Nonmetallic Exhaust Ducts

Automatic sprinkler system protection shall be provided in combustible nonmetallic exhaust ducts where the largest cross-sectional diameter of the duct is equal to or greater than 10 inches (254 mm).

Exception: Ducts need not be provided with automatic sprinkler protection as follows:

1. Ducts *listed* or *approved* for applications without *automatic sprinkler system* protection.
2. Ducts not more than 12 feet (3658 mm) in length installed below ceiling level.

[F] 415.11.12.3 Automatic Sprinkler Locations

Sprinkler systems shall be installed at 12-foot (3658 mm) intervals in horizontal ducts and at changes in direction. In vertical ducts, sprinklers shall be installed at the top and at alternate floor levels.

Section 416 Application of Flammable Finishes

[F] 416.1 General

The provisions of this section shall apply to the construction, installation and use of buildings and structures, or parts thereof, for the application of flammable finishes. Such construction and equipment shall comply with the *Florida Fire Prevention Code*.

[F] 416.2 Spray Rooms

Spray rooms shall be enclosed with not less than 1-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. Floors shall be waterproofed and drained in an *approved* manner.

[F] 416.2.1 Surfaces

The interior surfaces of spray rooms shall be smooth and shall be so constructed to permit the free passage of exhaust air from all parts of the interior and to facilitate washing and cleaning, and shall be so designed to confine residues within the room. Aluminum shall not be used.

[F] 416.2.2 Ventilation

Mechanical *ventilation* and interlocks with the spraying operation shall be in accordance with the *Florida Building Code, Mechanical*.

[F] 416.3 Spraying Spaces

Spraying spaces shall be ventilated with an exhaust system to prevent the accumulation of flammable mist or vapors in accordance with the *Florida Building Code, Mechanical*. Where such spaces are not separately enclosed, noncombustible spray curtains shall be provided to restrict the spread of flammable vapors.

[F] 416.3.1 Surfaces

The interior surfaces of spraying spaces shall be smooth and continuous without edges; shall be so constructed to permit the free passage of exhaust air from all parts of the interior and to facilitate washing and cleaning; and shall be so designed to confine residues within the spraying space. Aluminum shall not be used.

[F] 416.4 Spray Booths

Spray booths shall be designed, constructed and operated in accordance with the *Florida Fire Prevention Code*.

[F] 416.5 Fire Protection

An *automatic sprinkler system* or *fire-extinguishing system* shall be provided in all spray, dip and immersing spaces and storage rooms and shall be installed in accordance with Chapter 9.

Section 417 Drying Rooms

[F] 417.1 General

A drying room or dry kiln installed within a building shall be constructed entirely of *approved* noncombustible materials or assemblies of such materials regulated by the *approved* rules or as required in the general and specific sections of this chapter for special occupancies and where applicable to the general requirements of the *Florida Building Code, Mechanical*.

[F] 417.2 Piping Clearance

Overhead heating pipes shall have a clearance of not less than 2 inches (51 mm) from combustible contents in the dryer.

[F] 417.3 Insulation

Where the operating temperature of the dryer is 175°F (79°C) or more, metal enclosures shall be insulated from adjacent combustible materials by not less than 12 inches (305 mm) of airspace, or the metal walls shall be lined with $\frac{1}{4}$ -inch (6.4 mm) insulating mill board or other *approved* equivalent insulation.

[F] 417.4 Fire Protection

Drying rooms designed for high-hazard materials and processes, including special occupancies as provided for in Chapter 4, shall be protected by an *approved automatic fire-extinguishing system* complying with the provisions of Chapter 9.

Section 418 Organic Coatings

[F] 418.1 Building Features

Manufacturing of organic coatings shall be done only in buildings that do not have pits or *basements*.

[F] 418.2 Location

Organic coating manufacturing operations and operations incidental to or connected therewith shall not be located in buildings having other occupancies.

[F] 418.3 Process Mills

Mills operating with close clearances and that process flammable and heat-sensitive materials, such as nitrocellulose, shall be located in a *detached building* or noncombustible structure.

[F] 418.4 Tank Storage

Storage areas for flammable and combustible liquid tanks inside of structures shall be located at or above grade and shall be separated from the processing area by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

[F] 418.5 Nitrocellulose Storage

Nitrocellulose storage shall be located on a detached pad or in a separate structure or a room enclosed with not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

[F] 418.6 Finished Products

Storage rooms for finished products that are flammable or combustible liquids shall be separated from the processing area by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

Section 419 Artificial Decorative Vegetation**419.1 Artificial Decorative Vegetation**

Artificial decorative vegetation exceeding 6 feet (1830 mm) in height and permanently installed outdoors within 5 feet (1524 mm) of a building, or on the roof of a building, shall comply with the *Florida Fire Prevention Code*.

Exception: Artificial decorative vegetation located more than 30 feet (9144 mm) from the exterior wall of a building.

Section 420 Groups I-1, R-1, R-2, R-3 and R-4**420.1 General**

Occupancies in Groups I-1, R-1, R-2, R-3 and R-4 shall comply with the provisions of Sections 420.1 through 420.6 and other applicable provisions of this code.

420.2 Separation Walls

Walls separating *dwelling units* in the same building, walls separating *sleeping units* in the same building and walls separating *dwelling* or *sleeping units* from other occupancies contiguous to them in the same building shall be constructed as *fire partitions* in accordance with Section 708.

420.3 Horizontal Separation

Floor assemblies separating *dwelling units* in the same buildings, floor assemblies separating *sleeping units* in the same building and floor assemblies separating *dwelling* or *sleeping units* from other occupancies contiguous to them in the same building shall be constructed as *horizontal assemblies* in accordance with Section 711.

420.4 Smoke Barriers in Group I-1, Condition 2

Smoke barriers shall be provided in Group I-1, Condition 2, to subdivide every story used by persons receiving care, treatment or sleeping and to provide other stories with an occupant load of 50 or more persons, into no fewer than two smoke compartments. Such stories shall be divided into smoke compartments with an area of not more than 22,500 square feet (2092 m^2) and the distance of travel from any point in a smoke compartment to a smoke barrier door shall not exceed 200 feet (60 960 mm). The smoke barrier shall be in accordance with Section 709.

420.4.1 Refuge Area

Refuge areas shall be provided within each smoke compartment. The size of the refuge area shall accommodate the occupants and care recipients from the adjoining smoke compartment. Where a smoke compartment is adjoined by two or more smoke compartments, the minimum area of the refuge area shall accommodate the largest occupant load of the adjoining compartments. The size of the refuge area shall provide the following:

1. Not less than 15 net square feet (1.4 m^2) for each care recipient.
2. Not less than 6 net square feet (0.56 m^2) for other occupants.

Areas or spaces permitted to be included in the calculation of the refuge area are corridors, lounge or dining areas and other low-hazard areas.

[F] 420.5 Automatic Sprinkler System

Group R occupancies shall be equipped throughout with an *automatic sprinkler system* in accordance with Section 903.2.8. Group I-1 occupancies shall be equipped throughout with an *automatic sprinkler system* in accordance with Section 903.2.6. Quick-response or residential automatic sprinklers shall be installed in accordance with Section 903.3.2.

[F] 420.6 Fire Alarm Systems and Smoke Alarms

Fire alarm systems and smoke alarms shall be provided in Group I-1, R-1, R-2 and R-4 occupancies in accordance with Sections 907.2.6, 907.2.8, 907.2.9 and 907.2.10, respectively. Single-or multiple- station smoke alarms shall be provided in Groups I-1, R-2, R-3 and R-4 in accordance with Section 907.2.11.

420.7 Assisted Living Housing Units

In Group I-1 occupancies, where a fire resistance corridor is provided, in areas where assisted living residents are housed, shared living spaces, group meeting or multipurpose therapeutic spaces open to the corridor shall be in accordance with all of the following criteria:

1. The walls and ceilings of the space are constructed as required for corridors.
2. The spaces are not occupied as resident sleeping rooms, treatment rooms, incidental uses in accordance with Section 509 or hazardous uses.
3. The open space is protected by an automatic fire detection system installed in accordance with Section 907.
4. In Group I-1, Condition 1, the corridors onto which the spaces open are protected by an automatic fire detection system installed in accordance with Section 907, or the spaces are equipped throughout with quick-response sprinklers in accordance with Section 903.3.2.
5. In Group I-1, Condition 2, the corridors onto which the spaces open, in the same smoke compartment, are protected by an automatic fire detection system installed in accordance with Section 907, or the smoke compartment in which the spaces are located is equipped throughout with quick-response sprinklers in accordance with Section 903.3.2.
6. The space is arranged so as not to obstruct access to the required exits.

Section 421 Hydrogen Fuel Gas Rooms

[F] 421.1 General

Where required by the *Florida Fire Prevention Code*, hydrogen fuel gas rooms shall be designed and constructed in accordance with Sections 421.1 through 421.7.

[F] 421.2 Definitions

The following terms are defined in Chapter 2:

GASEOUS HYDROGEN SYSTEM.

HYDROGEN FUEL GAS ROOM.

[F] 421.3 Location

Hydrogen fuel gas rooms shall not be located below grade.

[F] 421.4 Design and Construction

Hydrogen fuel gas rooms not classified as Group H shall be separated from other areas of the building in accordance with Section 509.1.

[F] 421.4.1 Pressure Control

Hydrogen fuel gas rooms shall be provided with a ventilation system designed to maintain the room at a negative pressure in relation to surrounding rooms and spaces.

[F] 421.4.2 Windows

Operable windows in interior walls shall not be permitted. Fixed windows shall be permitted where in accordance with Section 716.

[F] 421.5 Exhaust Ventilation

Hydrogen fuel gas rooms shall be provided with mechanical exhaust ventilation in accordance with the applicable provisions of Section 502.16.1 of the *Florida Building Code, Mechanical*.

[F] 421.6 Gas Detection System

Hydrogen fuel gas rooms shall be provided with a *gas detection system* that complies with Sections 916 and 421.6.1 through 421.6.2.

[F] 421.6.1 System Activation

Activation of a gas detection alarm shall result in both of the following:

1. Initiation of distinct audible and visible alarm signals both inside and outside of the hydrogen fuel gas room.
2. Automatic activation of the mechanical exhaust ventilation system.

[F] 421.6.2 Failure of the Gas Detection System

Failure of the *gas detection system* shall automatically activate the mechanical exhaust ventilation system, stop hydrogen generation and cause a trouble signal to sound at an approved location.

[F] 421.7 Explosion Control

Explosion control shall be provided where required by Section 414.5.1.

[F] 421.8 Standby Power

Mechanical *ventilation* and gas detection systems shall be provided with a standby power system in accordance with Section 2702.

Section 422 Ambulatory Care Facilities

422.1 General

Occupancies classified as *ambulatory care facilities* shall comply with the provisions of Sections 422.1 through 422.6 and other applicable provisions of this code.

422.2 Separation

Ambulatory care facilities where the potential for four or more care recipients are to be *incapable of self-preservation* at any time, whether rendered incapable by staff or staff accepted responsibility for a care recipient already incapable, shall be separated from adjacent spaces, corridors or tenants with a *fire partition* installed in accordance with Section 708.

422.3 Smoke Compartments

Where the aggregate area of one or more *ambulatory care facilities* is greater than 10,000 square feet (929 m^2) on one *story*, the *story* shall be provided with a *smoke barrier* to subdivide the *story* into no fewer than two *smoke compartments*. The area of any one such *smoke compartment* shall be not greater than 22,500 square feet (2092 m^2). The distance of travel from any point in a *smoke compartment* to a *smoke barrier* door shall be not greater than 200 feet (60 960 mm). The *smoke barrier* shall be installed in accordance with Section 709 with the exception that *smoke barriers* shall be continuous from outside wall to an outside wall, a floor to a floor, or from a *smoke barrier* to a *smoke barrier* or a combination thereof.

422.3.1 Means of Egress

Where ambulatory care facilities require smoke compartmentation in accordance with Section 422.3, the fire safety evacuation plans provided in accordance with Section 1001.4 shall identify the building components necessary to support a *defend-in-place* emergency response in accordance with the *Florida Fire Prevention Code*.

422.3.2 Refuge Area

Not less than 30 net square feet (2.8 m^2) for each nonambulatory care recipient shall be provided within the aggregate area of *corridors*, care recipient rooms, treatment rooms, lounge or dining areas and other low-hazard areas within each *smoke compartment*. Each occupant of an *ambulatory care facility* shall be provided with access to a refuge area without passing through or utilizing adjacent tenant spaces.

422.3.3 Independent Egress

A *means of egress* shall be provided from each *smoke compartment* created by smoke barriers without having to return through the *smoke compartment* from which *means of egress* originated.

[F] 422.4 Automatic Sprinkler Systems

Automatic sprinkler systems shall be provided for *ambulatory care facilities* in accordance with Section 903.2.2.

[F] 422.5 Fire Alarm Systems

A *fire alarm system* shall be provided for *ambulatory care facilities* in accordance with Section 907.2.2.

422.6 Electrical Systems

In ambulatory care facilities, the essential electrical system for electrical components, equipment and systems shall be designed and constructed in accordance with the provisions of Chapter 27 and NFPA 99.

Section 423 Storm Shelters**423.1 General**

In addition to other applicable requirements in this code, storm shelters shall be constructed in accordance with ICC 500. Buildings or structures that are also designated as emergency shelters shall also comply with Table 1604.5 as Risk Category IV structures.

423.1.1 Scope

This section applies to the construction of storm shelters constructed as separate detached buildings or constructed as safe rooms within buildings for the purpose of providing safe refuge from storms that produce high winds, such as tornados and hurricanes. Such structures shall be designated to be hurricane shelters, tornado shelters, or combined hurricane and tornado shelters. Design of facilities for use as emergency shelters after the storm is outside the scope of ICC 500 and shall comply with Table 1604.5 as a Risk Category IV structure.

423.2 Definitions

The following terms are defined in Chapter 2:

STORM SHELTER.

Community storm shelter.

Residential storm shelter.

Shelters built for protection during wind storms in accordance with ICC 500 are not emergency shelters that are required to be designed as Risk Category IV structures in accordance with Section 1604.5.

423.3 Critical Emergency Operations

In areas where the shelter design wind speed for tornados in accordance with Figure 304.2(1) of ICC 500 is 250 mph, 911 call stations, emergency operation centers and fire, rescue, ambulance and police stations shall comply with Table 1604.5 as a Risk Category IV structure and shall be provided with a storm shelter constructed in accordance with ICC 500.

423.4 Group E Occupancies

In areas where the shelter design wind speed for tornados is 250 mph in accordance with Figure 304.2(1) of ICC 500, all Group E occupancies with an aggregate occupant load of 50 or more shall have a storm shelter constructed in accordance with ICC 500. The shelter shall be capable of housing the total occupant load of the Group E occupancy.

Exceptions:

1. Group E day care facilities.
2. Group E occupancies accessory to places of religious worship.
3. Buildings meeting the requirements for shelter design in ICC 500.

Section 424 Play Structures

424.1 Play Structures

Play structures installed inside all occupancies covered by this code that exceed 10 feet (3048 mm) in height and 150 square feet (14 m^2) in area shall comply with Sections 424.2 through 424.5.

424.2 Materials

Play structures shall be constructed of noncombustible materials or of combustible materials that comply with the following:

1. *Fire-retardant-treated* wood complying with Section 2303.2.
2. Light-transmitting plastics complying with Section 2606.
3. Foam plastics (including the pipe foam used in soft-contained play equipment structures) having a maximum heat-release rate not greater than 100 kilowatts when tested in accordance with UL 1975 or when tested in accordance with NFPA 289, using the 20 kW ignition source.
4. Aluminum composite material (ACM) meeting the requirements of Class A *interior finish* in accordance with Chapter 8 when tested as an assembly in the maximum thickness intended for use.
5. Textiles and films complying with the fire propagation performance criteria contained in Test Method 1 or Test Method 2, as appropriate, of NFPA 701.
6. Plastic materials used to construct rigid components of soft-contained play equipment structures (such as tubes, windows, panels, junction boxes, pipes, slides and decks) exhibiting a peak rate of heat release not exceeding 400 kW/m^2 when tested in accordance with ASTM E1354 at an incident heat flux of 50 kW/m^2 in the horizontal orientation at a thickness of 6 mm.
7. Ball pool balls, used in soft-contained play equipment structures, having a maximum heat-release rate not greater than 100 kilowatts when tested in accordance with UL 1975 or when tested in accordance with NFPA 289, using the 20 kW ignition source. The minimum specimen test size shall be 36 inches by 36 inches (914 mm by 914 mm) by an average of 21 inches (533 mm) deep, and the balls shall be held in a box constructed of galvanized steel poultry netting wire mesh.
8. Foam plastics shall be covered by a fabric, coating or film meeting the fire propagation performance criteria contained in Test Method 1 or Test Method 2, as appropriate, of NFPA 701.
9. The floor covering placed under the children's play structure shall exhibit a Class I interior floor finish classification, as described in Section 804, when tested in accordance with ASTM E648 or NFPA 253.

424.3 Fire Protection

Play structures shall be provided with the same level of *approved* fire suppression and detection devices required for other structures in the same occupancy.

424.4 Separation

Play structures shall have a horizontal separation from building walls, partitions and from elements of the *means of egress* of not less than

5 feet (1524 mm). Playground structures shall have a horizontal separation from other play structures of not less than 20 feet (6090 mm).

424.5 Area Limits

Play structures shall be not greater than 600 square feet (56 m^2) in area, unless a special investigation, acceptable to the building official, has demonstrated adequate fire safety.

Section 425 Hyperbaric Facilities

425.1 Hyperbaric Facilities

Hyperbaric facilities shall meet the requirements contained in Chapter 14 of NFPA 99.

[F] Section 426 Combustible Dusts, Grain Processing and Storage

426.1 Combustible Dusts, Grain Processing and Storage

The provisions of Sections 426.1.1 through 426.1.7 shall apply to buildings in which materials that produce combustible dusts are stored or handled. Buildings that store or handle combustible dusts shall comply with the applicable provisions of NFPA 61, NFPA 85, NFPA 120, NFPA 484, NFPA 654, NFPA 655 and NFPA 664 and the *Florida Fire Prevention Code*.

[F] 426.1.1 Type of Construction and Height Exceptions

Buildings shall be constructed in compliance with the height, number of stories and area limitations specified in Sections 504 and 506; except that where erected of Type I or II construction, the heights and areas of grain elevators and similar structures shall be unlimited, and where of Type IV construction, the maximum building height shall be 65 feet (19 812 mm) and except further that, in isolated areas, the maximum building height of Type IV structures shall be increased to 85 feet (25 908 mm).

[F] 426.1.2 Grinding Rooms

Every room or space occupied for grinding or other operations that produce combustible dusts in such a manner that the room or space is classified as a Group H-2 occupancy shall be enclosed with fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 711, or both. The fire-resistance rating of the enclosure shall be not less than 2 hours where the area is not more than 3,000 square feet (279 m^2), and not less than 4 hours where the area is greater than 3,000 square feet (279 m^2).

[F] 426.1.3 Conveyors

Conveyors, chutes, piping and similar equipment passing through the enclosures of rooms or spaces shall be constructed dirt tight and vapor tight, and be of *approved* noncombustible materials complying with Chapter 30.

[F] 426.1.4 Explosion Control

Explosion control shall be provided as specified in the *Florida Fire Prevention Code*, or spaces shall be equipped with the equivalent mechanical *ventilation* complying with the *Florida Building Code, Mechanical*.

[F] 426.1.5 Grain Elevators

Grain elevators, malt houses and buildings for similar occupancies shall not be located within 30 feet (9144 mm) of interior *lot lines* or structures on the same *lot*, except where erected along a railroad right-of-way.

[F] 426.1.6 Coal Pockets

Coal pockets located less than 30 feet (9144 mm) from interior lot lines or from structures on the same lot shall be constructed of not less than Type IB construction. Where more than 30 feet (9144 mm) from interior *lot lines*, or where erected along a railroad right-of-way, the minimum type of construction of such structures not more than 65 feet (19 812 mm) in *building height* shall be Type IV.

[F] 426.1.7 Tire Rebuilding

Buffing operations shall be located in a room separated from the remainder of the building housing the tire rebuilding or tire recapping operation by a 1-hour *fire barrier*.

Exception: Buffing operations are not required to be separated where all of the following conditions are met:

1. Buffing operations are equipped with an *approved* continuous automatic water-spray system directed at the point of cutting action.

2. Buffing machines are connected to particle-collecting systems providing a minimum air movement of 1,500 cubic feet per minute (cfm) (0.71 m³/s) in volume and 4,500 feet per minute (fpm) (23 m/s) in-line velocity.
3. The collecting system shall discharge the rubber particles to an *approved* outdoor noncombustible or fire-resistant container, which is emptied at frequent intervals to prevent overflow.

[F] Section 427 Through 448**RESERVED****Section 449 Hospitals****449.1 Scope****449.1.1**

All newly licensed hospitals, including conversions of existing buildings or newly constructed hospitals, all hospital outpatient facilities and hospital owned or leased mobile and transportable units unless exempted by Chapter 395.0163, *Florida Statutes* or modified by Chapter 59A-3 *Florida Administrative Code*, and all additions, alterations or renovations to an existing licensed hospital shall comply with all applicable requirements of this code and the minimum standards of design, construction and specified minimum essential utilities and facilities of this section and shall have plans reviewed and construction surveyed by the state agency authorized to do so by Chapter 553.80(1)(c), *Florida Statutes* to assure compliance with all applicable requirements of this code.

449.1.2

The following are exempt from review under this part:

449.1.2.1

Change of ownership of an existing licensed hospital.

449.1.2.2

Change to an existing hospital's license type that has no additional physical plant requirements.

449.1.2.3

Change of the functional use of a space, room, or area when no physical plant revisions are made or are required to be made by this code.

449.1.3

The Florida Building Code, Existing Building, Section 101.2, Scope exempts state licensed facilities such as hospitals from compliance with that code. Any repair, alteration, change of occupancy, addition or relocation of an existing state licensed hospital shall comply with the applicable requirements of this code and this section.

449.1.4

For project submission and fee requirements, and other administrative, licensure, and programmatic provisions for hospitals, see Agency for Health Care Administration (AHCA) Chapter 59A-3 *Florida Administrative Code* and Chapter 395, *Florida Statutes*.

449.1.5

For state licensure purposes, these codes and standards shall be applicable to the project on the effective date of this code at the time of Stage II preliminary plan approval by the Agency for Health Care Administration (the Agency) as described in Chapter 59A-3 *Florida Administrative Code* or at the first Stage III construction document review if there has been no previous Stage II preliminary plan approval for that project.

449.2 Additional Codes and Standards for the Design and Construction of General, Rehabilitative, and Psychiatric Hospitals, Including Intensive Residential Treatment Facilities (IRTFs) for Children and Adolescents, That Are Located Inside of Buildings or Structures, and Unless Exempted by Chapter 395.0163, Florida Statutes, All Hospital Outpatient Facilities and Hospital Owned or Leased Mobile and Transportable Units

In addition to the minimum standards required by Section 449 of this code, Chapter 59A-3 *Florida Administrative Code*, or by Chapter 395, *Florida Statutes*, all new hospital facilities and all additions, alterations or renovations to an existing licensed hospital, as listed in Section 449.2 of this code shall also be in compliance with the following codes and standards on the effective date of this code, as described in Section 449.1.5 of this code.

449.2.1

The fire codes described in Chapter 69A-53, Uniform Fire Safety Standards for Hospitals and Nursing Homes, *Florida Administrative Code*. The National Fire Protection Association (NFPA) 101A, *Alternate Approaches to Life Safety* shall not apply to new construction.

449.2.2

The Guidelines for Design and Construction of Hospitals (The Guidelines), as referenced in Chapter 35 of this code.

449.3 Additional Physical Plant Requirements for General, Rehabilitation, and Psychiatric Hospitals, Including Intensive Residential Treatment Facilities (IRTFs) for Children and Adolescents, and Unless Exempted by Chapter 395.0163, Florida Statutes, All Hospital Outpatient Facilities and Hospital Mobile and Transportable Units

In addition to the codes and standards referenced in Section 449.2 of this code, the following minimum standards of construction and specified minimum essential facilities, shall apply to all new hospitals and all additions, alterations or renovations to an existing licensed hospital, as described in Section 449.1 of this code and listed in Section 449.3 of this code. Where there are conflicting specific requirements between *The Guidelines* and this code, the requirements of this code shall take precedence.

449.3.1 Critical Care Units

Reference *The Guidelines* for other requirements.

449.3.1.1

Sliding doors used for access to critical care rooms may be either manual or power operated and shall meet the requirements of Section 449.3.4.10.

449.3.2 Newborn Intensive Care Units

Reference *The Guidelines* for other requirements.

449.3.2.1

General categories of neonatal services in the State of Florida are Level I, newborn nursery; Level II, intermediate care unit; and Level III, intensive care unit. Facilities which offer obstetrical services shall provide at a minimum a Level I newborn nursery or a holding nursery that shall meet the requirements of *The Guidelines*, and facilities that offer neonatal care for Level II and Level III neonatal services shall meet the requirements of *The Guidelines* for a newborn intensive care unit.

449.3.3 Mobile/Transportable Medical Units

Reference *The Guidelines* for other requirements.

449.3.3.1

In addition to any other state of Florida required permits, mobile and transportable units shall be approved in advance by the Agency for Health Care Administration (Agency) before they may be utilized for patient services. Except as approved by the Agency, use of these units shall be limited to 6 months during a 12-month period. Usage may include temporary facilities during repair/replacement of equipment or intermittent use as needed in underserved communities or due to seasonal fluctuation.

449.3.3.2

The mobile facility shall comply with the applicable requirements of the *Florida Building Code, Building*, *The Guidelines*, including Part 1 General and Part 2, Chapter 2.7 Specific Requirements for Mobile/Transportable Medical Units.

449.3.3.3

This section shall apply to all mobile/transportable units regardless of the number of hours they are on-site.

449.3.4 Architectural Details, Surfaces, and Furnishings

Reference *The Guidelines* for other requirements.

449.3.4.1

Each patient sleeping room, except for special nursing care units or rooms, newborn nurseries and neonatal intensive care units or rooms, shall have a window(s) with a view, visible from the patient's bed, to the exterior of the building or to an atrium that is visually open to the exterior of the building. The clear opening of the patient room window's width and height shall have a minimum of 20 feet (6.10 m) unobstructed vista to any permanent structure or equipment, and a minimum of 15 feet (4.57 m) unobstructed vista to any vehicular parking area or to the property line measured horizontally from the plane of the window. The sill height of the window(s) shall be a maximum of 36 inches (0.914 m). Special nursing care units or rooms shall have a window(s) as required by this section and *The Guidelines*, except the sill height shall be a maximum of 60 inches (1.524 m).

449.3.4.2

Ceilings in patient care areas or rooms with ceiling-mounted surgical light fixtures, tracks, rails or pipes and in the centralized kitchens shall be a minimum height of 9 feet (2.7 m).

Where a pair of double doors opening to a room or closet, are located on the exit access corridor and are not required to be equipped with closers, a door coordinator is not required.

449.3.4.4

Toilet compartment partitions and urinal screens shall be constructed of products that do not rust, corrode or delaminate.

449.3.4.5

All fire walls, fire barriers, smoke barriers, horizontal exits and exit passageway partitions shall be constructed prior to the construction of all intervening walls. Where rated walls, barriers or partitions intersect, the continuity of the higher priority wall, barrier, or partition shall be maintained through the intersection.

449.3.4.6

Smoke barriers shall be constructed so as to provide a continuous smoke-tight membrane from exterior wall to exterior wall and from the floor to the underside of the floor or roof deck above. This includes interstitial space and the area above monolithic fire-rated ceiling membranes. Roof trusses shall be permitted to penetrate portions of the smoke barrier located above the fire-rated ceiling membrane where the annular space between the penetrating truss member and the smoke barrier is sealed to limit the transfer of smoke.

449.3.4.7

Where it is not possible to visually inspect a fire-rated partition, wall or barrier or a smoke barrier that extends through the attic or interstitial space to the roof or floor deck above because of the location of a monolithic ceiling membrane, ceiling access panel(s) shall be installed adjacent to each side of the partition, wall or barrier at intervals not exceeding 30 feet (9.00 m) and in such locations as necessary to view all surfaces of the partition, wall or barrier. Other ceiling access panels shall only be installed as required by other sections of the code. Partitions, walls and barriers requiring protected openings or penetrations shall be identified in accordance with Section 703 of this code.

449.3.4.8

Where electrical conduits, cable trays, ducts and utility pipes pass through the smoke barrier, the utilities shall be located so that access is maintained to adjacent wall surfaces and to all damper access panels. The details shall show the studs and reinforcing half studs so that proper support is provided for the wall surfacing material. There shall be a minimum clearance of 4 inches (102 mm) between all conduits, piping and duct work insulation that are located parallel or adjacent to a fire-rated wall or to a smoke barrier to facilitate the inspection of these walls.

449.3.4.9

The use of pocket sliding or folding doors to any occupiable room shall not be permitted. A sliding door equipped with sliding door hardware located outside of the room and not equipped with a bottom door track shall be permitted.

449.3.4.10

A sliding door used for access to any room located on the exit access corridor may be manual or power operated and shall be smoke resistive and have latching hardware or other mechanism that prevents the door from rebounding to a partially open position if the door is forcefully closed.

449.3.4.10.1

A sliding door used to access an airborne infection isolation room or a protective environment room shall be equipped with an

automatic closer that will close and latch when released.

449.3.4.11

The use of fire shutters to meet the requirements of opening protection required by other sections of this code shall not be permitted.

449.3.4.12

Shutters in openings of smoke partitions to rooms and areas that are permitted to be open to other areas in accordance with Section 407 shall be permitted without automatic closing of the shutter.

449.3.5 Elevators Where Required

(Reference *The Guidelines* for other requirements.)

449.3.5.1

All elevators shall be in compliance with the requirements of Chapter 30 of the *Florida Building Code, Building* and Chapter 69A-47, *Florida Administrative Code*, "Uniform Fire Safety Standards for Elevators."

449.3.6 Heating, Ventilating and Air-Conditioning Systems

Reference *The Guidelines* for other requirements.

449.3.6.1

Air-handling equipment shall be installed exterior of the building, to include the roof, in a designated equipment room(s), in an open space(s) of an attic(s) or interstitial space(s) located inside the conditioned envelope of the building, or in an enclosed space located in an unconditioned attic(s). If the equipment serves only one room, it may be located above the ceiling and shall be accessible through an access opening in accordance with the requirements of such openings in this code. Access panels are not required for lay-in ceiling installations, provided the service functions are not obstructed by other above-ceiling construction, such as electrical conduits, piping, audio visual cabling and like equipment components or supports.

449.3.6.2

All new hospital, outpatient surgery and cardiac catheterization facility construction, for both inpatients and outpatients, shall have completely ducted air supply, return, outside air and exhaust systems. In hospital buildings with multiple uses, tenants or occupancies, located on a separate floor or floors within the building, or located in a medical office building, only the licensed health care areas where invasive procedures, as defined by *The Guidelines*, are performed shall be required to be served by separate ducted mechanical air-supply, return and exhaust systems.

449.3.6.3

In new construction, horizontal offsets of duct system risers penetrating more than one floor shall not be allowed.

449.3.6.4

Flexible ducts shall be listed and labeled to the UL181 *Standard for Factory-Made Air Ducts and Air Connectors* and shall be Class 0 or Class 1. Flexible ducts shall meet the following additional performance rating criteria:

449.3.6.4.1

The duct shall have a minimum rated air velocity of 4,000 feet per minute, a minimum positive pressure rating of 4 inches water gauge, and a minimum negative pressure rating of 1 inch water gauge.

449.3.6.4.2

The outer vapor barrier shall have a perm rating not greater than 0.05 perms when tested in accordance with ASTM E96, Procedure A.

449.3.6.4.3

Flexible air connectors shall be limited to 14 feet (4267mm) maximum installed length and shall not pass through any wall, partition, or enclosure of a vertical shaft that is required to have a fire-resistance rating of 1 hour or more. Flexible air ducts shall not be limited in length.

449.3.6.4.4

Air ducts and exhaust duct systems shall not be constructed of fiberglass duct board.

449.3.6.5**Reserved.****449.3.6.6**

Filter housing frame blank-off panels shall be permanently attached to the frame, constructed of rigid materials and have sealing surfaces equal to or greater than the filter media installed in the filter frame. All joints between the blank-off panels, filter housing frames and filter support structure shall be caulked airtight.

449.3.7 Fan and Damper Control During Fire Alarm**449.3.7.1**

During an automatic fire alarm activation or the activation of a duct smoke detector, fan systems and fan equipment serving more than one room shall be stopped to prevent the movement of smoke by mechanical means from the zone in alarm to adjacent smoke zones. Air movement across smoke barriers shall be permitted when the area is not in automatic fire alarm activation.

449.3.7.2

Fan control shall be designed so as to minimize the interruption of heating, ventilating and air conditioning in compartments remote from the compartment in alarm.

449.3.7.3

Fan control shall not interfere with the continuous operation of exhaust systems conveying ethylene oxide or other hazardous chemicals and fumes or systems required to operate continuously for the health and safety of occupants. Such systems shall include fume hood exhaust deemed by the governing body of the hospital to present a hazard to occupants if exhaust airflow is stopped. Air-handling systems shall be designed to allow for continuous operation of all such systems and to minimize movement of smoke by mechanical means from the zone in alarm.

449.3.8 Carbon Monoxide Detector

See Section 915 of this code.

449.3.9 Plumbing

Reference *The Guidelines* for other requirements.

449.3.9.1

All plumbing systems shall be designed and installed in accordance with the *Florida Building Code, Plumbing*.

449.3.10 Fire Pump

Where a fire pump is required by another section of this code, a new electric motor-driven fire pump shall be connected to the Emergency Power Supply System (EPSS) of the hospital. Where connection to existing EPSS equipment is technically infeasible, replacement fire pumps shall be exempt from this requirement. A fire pump that is not electric motor-driven shall meet the requirements of NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*, alternative power.

449.3.11 Electrical Requirements

Reference *The Guidelines* for other requirements.

449.3.11.1

All material, including equipment, conductors, controls, and signaling devices, shall be installed to provide a complete electrical system with the necessary characteristics and capacity to supply the electrical facility requirements as shown in the specifications and as indicated on the plans.

449.3.11.2

All materials and equipment shall be factory listed as complying with applicable standards of Underwriter's Laboratories, Inc., or other similarly established standards of a nationally recognized testing laboratory (NRTL) that has been certified by the Occupational Safety and Health Administration (OSHA) for that referenced standard.

449.3.11.3

Field labeling of equipment and materials shall be permitted only when provided by a nationally recognized testing laboratory that has been certified by the Occupational Safety and Health Administration (OSHA) for that referenced standard.

449.3.11.4

Nonmetallic sheathed cable or similar systems are not permitted for power and lighting wiring in any facility.

449.3.11.5

Panel boards located in spaces subject to storage shall have the clear working space in accordance with Chapter 27, *Florida Building Code, Building*. "ELECTRICAL ACCESS - NOT FOR STORAGE" shall be permanently marked on the floor and wall about the panel. Panel boards shall not be located in an exit access corridor or in an unenclosed space or area that is open to an exit access corridor. Panel boards may be located inside of a room or closet that opens into an exit access corridor only when the room or closet is separated from the exit access corridor by a partition and door that comply with this code.

449.3.11.6

There shall be documentation for grounding system testing of voltage and impedance measurements in all patient care areas, building service ground electrode systems, lightning protection ground terminals and special systems such as fire alarm, nurse call, paging, generator, emergency power, fault analysis and breaker coordination.

449.3.11.7

All spaces occupied by people, machinery and equipment within buildings and approaches to buildings shall have electric lighting.

449.3.11.8

Operating rooms and delivery rooms shall have general lighting for the room in addition to local high intensity, specialized lighting provided by special fixtures at the surgical and obstetrical tables. Each special lighting unit for local lighting at the tables shall be connected to an independent circuit and shall be powered from the critical branch. A minimum of one general purpose lighting fixture shall be powered from a normal circuit in an operating room, delivery or similar room.

449.3.11.9

There shall be a maximum of six duplex receptacles on a circuit in general patient care areas.

449.3.11.10

The circuitry of all receptacles required by *The Guidelines* and NFPA 99 in critical care areas, in all emergency treatment rooms or areas, and other areas including Class II and Class III imaging rooms, coronary care units, human physiology laboratories, critical care units and phase I postoperative recovery rooms, shall be provided as follows:

449.3.11.10.1

All electrical receptacles at the head of the bed shall be connected to the critical branch of the essential electrical system, except two of the required number shall be connected to a normal power circuit or to a critical branch circuit from a different transfer switch.

449.3.11.10.2

There shall be no more than two duplex or four single receptacles per circuit.

449.3.11.11

All receptacles shall have engraved cover plates to indicate the panel board and circuit numbers powering the device.

449.3.11.12

Branch circuit over-current devices shall be readily accessible to nursing staff and other authorized personnel.

449.3.11.13

The electrical system shall have coordinated short circuit protection.

449.3.11.14

Provide color coding for the junction boxes for the branches of the essential electrical system.

449.3.12 Fire Alarm Systems

Reference *The Guidelines* for other requirements.

449.3.12.1 Fire Alarm Systems

A fire alarm annunciator panel shall be provided at a 24-hour monitored location. The panel shall indicate visually the zone of actuation of the alarm, and there shall be a system trouble signal indicator. Each smoke compartment shall be annunciated as a separate fire alarm zone. A fire alarm system zone shall not include rooms or spaces in other smoke compartments. A fire alarm zone location map to quickly locate alarm condition shall be provided at the fire alarm control panel.

449.3.12.2

In all inpatient and outpatient care rooms, spaces and areas, including sleeping, treatment, diagnostic, and therapeutic, the private operating mode as permitted and described in NFPA 72, *National Fire Alarm and Signaling Code*, shall be required. Only the attendants and other personnel required to evacuate occupants from a zone, area, room, floor, or building shall be required to be notified. Audible and visual notification devices shall only be permitted to be located at the care providers' stations, the soiled workroom, soiled holding room, clean workroom, staff lounge, medication preparation room, and nurse or supervisor's office, and other staff rooms or areas as determined by the governing body of the facility.

449.3.13 Nurse Call System

Reference *The Guidelines* for other requirements. The requirements for nurse call systems as described in NFPA 99 shall not apply.

449.3.13.1

In addition to the requirements of radiofrequency systems described in *The Guidelines*, wireless-type nurse call systems shall be permitted if they have been tested and approved by a national recognized testing laboratory (NRTL) to meet the requirements of UL 1069, 7th edition, Section 49, Wireless Systems published October 12, 2007 as referenced in Chapter 35 of this code.

449.3.13.2

In addition to the areas required by *The Guidelines*, an emergency resuscitation alarm (Code Blue) calling station shall be provided for staff use in each operating and cesarean delivery room.

449.3.13.3

An emergency staff assistance station shall be located within each psychiatric seclusion room and shall be of hands-free operation.

449.3.14 Emergency Electric Service

Reference *The Guidelines* for other requirements.

449.3.14.1

A Type 1 essential electrical system shall be provided in all hospitals as described in NFPA 99, *Health Care Facilities*. The emergency power for this system shall meet the requirements of a Level 1, Type 10, Class 48 generator as described in NFPA 110, *Standard for Emergency and Standby Power Systems*.

449.3.14.2

In new facility construction, the normal main service equipment shall be separated from the emergency distribution equipment by locating it in a separate room. Transfer switches shall be considered emergency distribution equipment for this purpose.

449.3.14.3

There shall be a generator remote alarm annunciator in accordance with the requirements of NFPA 110 located at a designated on-site 24-hour staffed location.

449.3.14.4

There shall be illumination of the means of egress in accordance with NFPA 101 and designed for automatic dusk-to-dawn operation. Such illumination shall continue to the public way or to a safe area(s) located at a minimum of 30 feet (9.144 m) from the building and large enough to accommodate the required occupant load of the exit discharge.

449.3.14.5

A minimum of one elevator per bank serving any patient use floor shall be connected to the equipment branch of the essential

449.3.14.6

If a day tank is provided, it shall be equipped with a dedicated low-level fuel alarm and a manual pump. The alarm shall be located at the generator remote alarm annunciation as described in Section 449.3.14.3.

449.3.14.7

Outpatient surgery facilities, cardiac catheterization facilities, or pain management facilities that utilize intravenous (IV) drip sedation located in a separate building or on another campus shall have a Type 1 essential electrical system in compliance with NFPA 99, *Health Care Facilities*. The emergency power for this system shall meet the requirements of a Level 1, Type 10, Class 8 generator as described in NFPA 110, *Standard for Emergency and Standby Power Systems*.

449.3.15 Lightning Protection

449.3.15.1

A lightning protection system shall be provided for all new buildings and additions in accordance with NFPA 780, *Installation of Lightning Protection Systems*.

449.3.15.2

Where additions are constructed to existing buildings, the existing building's lightning protection system, if connected to the new lightning protection system, shall be inspected and brought into compliance with current standards.

449.3.15.3

A lightning protection system shall be installed on all buildings in which outpatient surgical procedures, cardiac catheterization procedures, or pain management procedures that utilize I.V. drip sedation are provided.

449.3.15.4

There shall be surge protection for all normal and emergency electrical services.

449.3.15.5

Additional surge protection shall be provided for all low voltage and power connections to all electronic equipment in critical care areas and life safety systems and equipment such as fire alarm, nurse call and other critical systems. Protection shall be in accordance with appropriate IEEE Standards for the type of equipment protected.

449.3.15.6

All low-voltage system main or branch circuits entering or exiting the structure shall have surge suppressors installed for each pair of conductors and shall have visual indication for protector failure to the maximum extent feasible.

449.3.16 Inpatient Room Dialysis

449.3.16.1

If an inpatient requires dialysis due to a chronic condition, it may be accomplished inside the inpatient sleeping room when all of the following are provided:

449.3.16.1.1

A portable dialysis machine with portable reverse osmosis.

449.3.16.1.2

Dedicated closed connections to a water supply and waste water drain. These connections are permitted to be shared with the water supply and waste water drain of the handwashing facility located inside the inpatient room or inside the inpatient toilet room only when the use of the handwashing facility is unimpeded at all times.

449.3.16.1.3

Sufficient electrical circuits and outlets to operate the portable dialysis equipment without overloading the electrical circuit.

449.3.16.1.4

A dedicated equipment room for the cleaning and disinfection of the dialysis equipment.

449.3.16.1.5

A written hospital protocol for the use and maintenance of the inpatient room dialysis equipment signed by the medical director of acute dialysis services.

449.4 Physical Plant Requirements for Disaster Preparedness of New Hospital Construction

449.4.1 Definitions

The following definitions shall apply specifically to all new facilities as used herein:

449.4.1.1 New Facility

A hospital which has not received a Stage II Preliminary Plan approval from the Agency for Health Care Administration pursuant to this section.

449.4.1.2 Net Square Footage

The clear floor space of an area excluding cabinetry and other fixed furniture or equipment;

449.4.1.3 During and Immediately Following

A period of 72 hours following the loss of normal support utilities to the facility.

449.4.1.4 Occupied Patient Area(s)

The location of patients inside of the new facility or in the addition of a wing or floor to an existing facility during and immediately following a disaster. If these patients are to be relocated into an area of the existing facility during and immediately following a disaster, then for purposes of this code, that location will be defined as the "occupied patient area."

449.4.1.5 Patient Support Area(s)

The area(s) required to ensure the health, safety and well-being of patients during and immediately following a disaster, such as a nursing station, clean and soiled utility areas, food preparation area, and other areas as determined by the facility to be kept operational during and immediately following a disaster.

449.4.1.6 On-Site

Either in, immediately adjacent to, or on the campus of the facility, or addition of a wing or floor to an existing facility.

449.4.2 Disaster Preparedness Construction Standards

The following construction standards are in addition to the physical plant requirements described in Sections 449.2 through 449.3. These minimum standards are intended to increase the ability of the facility to be structurally capable of serving as a shelter for patients, staff and the family of patients and staff, equipped to be self-supporting during and immediately following a disaster, and to be protected from damage so the facility can be reoccupied and used for its intended purpose immediately after any required building evacuation.

449.4.2.1 Space Standards

449.4.2.1.1

For planning purposes, each new facility shall provide a minimum of 30 net square feet (2.79 m^2) per patient served in the occupied patient area(s). The number of patients to be served is to be determined by the facility administrator.

449.4.2.1.2

As determined by the facility, space for administrative and support activities shall be provided for use by facility staff to allow for care of patients in the occupied patient area(s).

449.4.2.1.3

As determined by the facility, space shall be provided for staff and family members of patients and staff.

449.4.2.2 Site Standards

449.4.2.2.1

Except as permitted by Section 1612 of this code, the lowest floor of all new facilities shall be elevated to the base flood elevation as defined in Section 1612 of this code, plus 2 feet, or to the height of hurricane Category 3 (Saffir-Simpson scale) surge inundation elevation, as described by the Sea, Lake, and Overland Surge (SLOSH) from Hurricanes model developed by the Federal Emergency Management Agency (FEMA), United States Army Corps of Engineers (USACE), and the National Weather Service (NWS), whichever is higher.

449.4.2.2.2

For all existing facilities, the lowest floor elevations of all additions, and all patient support areas including food service, and all patient support utilities, including mechanical, and electrical (except fuel storage as noted in Section 449.4.2.9.3 of this code) for the additions shall be at or above the elevation of the existing building, if the existing building was designed and constructed to comply with either the site standards of Section 449.4 of this code or local flood-resistant requirements, in effect at the time of construction, whichever requires the higher elevation, unless otherwise permitted by Section 1612 of this code. If the existing building was constructed prior to the adoption of either the site standards of Section 449.4 of this code or local flood-resistant requirements, then the addition and all patient support areas and utilities for the addition as described in this section shall either be designed and constructed to meet the requirements of Section 449.4.2.2.1 of this code or be designed and constructed to meet the dry flood proofing requirements of Section 1612 of this code.

449.4.2.2.3

Substantial improvement, as defined by Section 1612 of this code, to all existing facilities located within flood areas as defined in Section 1612 of this code or within a Category 3 surge inundation zone as described in Section 449.4.2.2.1 of this code, shall be designed and constructed in compliance with Section 1612 of this code.

449.4.2.2.4

Where an off-site public access route is available to the new facility at or above the base flood elevation, a minimum of one on-site emergency access route shall be provided that is located at the same elevation as the public access route.

449.4.2.2.5

New landscaping elements shall be located so if damaged they will not block the on-site emergency access route to the facility. Outdoor signs and their foundations shall be designed to meet the wind load criteria of the *Florida Building Code, Building*.

449.4.2.2.6

New light standards and their foundations used for lighting the on-site emergency access route shall be designed to meet the wind load criteria of ASCE 7 with wind speeds determined from Figure 26.5-1B with appropriate exposure category dependent on site location.

449.4.2.3 Structural Standards

Wind load design of the building structure and exterior envelope including exterior wall systems shall be designed in accordance with the code.

449.4.2.4 Roofing Standards**449.4.2.4.1**

Loose-laid ballasted roofs shall not be permitted.

449.4.2.4.2

All new roof appendages such as ducts, tanks, ventilators, receivers, dx condensing units and decorative mansard roofs and their attachment systems shall be structurally engineered to meet the wind load requirements of the applicable building code.

449.4.2.5 Debris Impact Protection Standards**449.4.2.5.1**

All exterior window units, skylights, exterior louvers and exterior door units including vision panels and their anchoring systems shall be impact resistant or protected with an impact-resistant covering meeting the requirements of the Testing Application Standards (TAS) 201, 202, and 203 of this code in accordance with the requirements of Sections 1626.2 through 1626.4 of this code or the debris impact requirements of ASTM E1996 as described in Section 1609.1.2.2. For the purposes of this requirement, facilities located in areas where the ultimate design wind speeds are 130 mph or less as described in Figure 1609.3(2) of this code,

shall meet the requirements for Wind Zone 1. The impact-resistant coverings may be either permanently attached or may be removable if stored on site of the facility. Facilities located in the high velocity hurricane zone (HVHZ) shall comply with Sections 1626.2 through 1626.4.

449.4.2.5.2

The location or application of exterior impact protective systems shall not prevent required exit egress from the building.

449.4.2.5.3

When not being utilized to protect the windows, the permanently attached impact-resistant coverings shall not reduce the percentage of the clear window opening below that required by this code for the patient room.

449.4.2.5.4

Systems and utilities identified in Section 449.4.2 shall be protected from debris impact by an equipment housing or a screening enclosure complying with the impact protection standards in accordance with Section 1626 when located at or below 30 feet above the finished grade of the building. Where screening enclosures are used, the height of the enclosure shall be not less than the height of the protected equipment and shall provide clearances required for the maintenance and continuous operation of the equipment. Where the housing and louvers are designed to provide the required equipment protection, sufficient standoff shall be provided to prevent damage to internal components from deflection of the cladding as a result of impact. Roof mounted equipment shall have fastening systems designed to meet the wind load requirements of the *Florida Building Code, Building*.

449.4.2.6 Heating, Ventilation and Air-Conditioning (HVAC) Standards**449.4.2.6.1**

All new and replacement air-moving equipment, dx condensing units, through-wall units and other HVAC equipment located outside of, partially outside of, or on the roof of the facility at or below 30 feet above the finished grade of the building and providing service to the facility shall be permitted only when either of the following are met:

449.4.2.6.1.1

They are located inside a penthouse designed to meet the wind load requirements of the *Florida Building Code, Building*; or

449.4.2.6.1.2

They are protected in accordance with Section 449.4.2.5.4.

449.4.2.6.2

As determined by the facility, occupied patient areas and patient support areas shall be supplied with temperature and humidity control during and immediately following a disaster.

449.4.2.6.3

Ventilation air change rates in occupied patient areas shall be maintained as specified in this section during and immediately following a disaster by connection to the essential electrical system. The fan systems necessary to provide this service shall receive their power from the emergency power supply system and shall be protected from horizontal impact in accordance with Section 449.4.2.6.1.

449.4.2.7 Plumbing Standards**449.4.2.7.1**

There shall be an independent on-site supply (i.e., water well) or on-site storage capability (i.e., empty water storage containers or bladders) of potable water at a minimum quantity of 3 gallons (14 L) per in-patient and one gallon (3.7 L) per facility staff and other personnel in the new facility or wing or floor addition to an existing facility per day during and immediately following a disaster. For planning purposes, the number of in-patients, staff and other personnel shall be determined in writing by the facility and submitted to AHCA. Hot water in boilers or tanks shall not be counted to meet this requirement.

449.4.2.7.2

The facility shall determine what amount of water will be sufficient to provide for patient services, and shall maintain an on-site supply or on-site storage of the determined amount.

449.4.2.7.3

When utilized to meet the minimum requirements of this rule, selected system appurtenances such as water pressure maintenance house pumps, and emergency water supply well pumps shall take power from the emergency power supply system(s).

449.4.2.8 Medical Gas Systems Standards

The storage, distribution piping system and appurtenances serving the occupied patient area(s) and patient support area(s) shall be contained within a protected area(s) designed and constructed to meet the structural requirements of the code and debris impact requirements as specified by Sections 1626.2 through 1626.4.

449.4.2.9

Emergency electrical generator and essential electrical system standards for hurricane protection.

449.4.2.9.1

In addition to the requirements of NFPA 99 *Health Care Facilities Code* and NFPA 70 *National Electrical Code*, the on-site Level 1 emergency power supply system shall provide electrical power to the occupied patient area(s) and patient support area(s) for the following additional equipment:

449.4.2.9.1.1

Ice-making equipment to produce ice, or freezer storage equipment for the storage of ice.

449.4.2.9.1.2

If required by the emergency food plan, refrigerator unit(s) food service equipment, range hood exhaust fans and selected lighting within the kitchen and dry storage areas.

449.4.2.9.1.3

Selected heating or air conditioning systems as determined by the facility and ventilation systems as required by this code.

449.4.2.9.1.4

Electric lighting required to provide care and service to the patient occupied areas and the necessary patient support areas as defined by this section.

449.4.2.9.2

The emergency power system shall be fueled by a fuel supply stored on-site sized to fuel the generator for 100-percent load for 64 hours or for 72 hours of actual demand load of the occupied patient area(s) and patient support area(s) and patient support utilities during and immediately following a disaster, whichever is greater.

449.4.2.9.3

The fuel supply and all fuel lines of the emergency power system generator shall either be located below ground or protected in accordance with Section 449.4.2.5.4.

449.4.2.9.4

All panel boards, transfer switches, disconnect switches, enclosed circuit breakers or emergency system raceway systems required to support the occupied patient area(s), patient support area(s) or support utilities shall be protected in accordance with Section 449.4.2.5.4, and shall not rely on systems or devices outside of this protected area(s) for their reliability or continuation of service. The equipment system shall be kept entirely independent of all other wiring and equipment and shall not enter the same raceways, boxes, or cabinets with other wiring.

449.4.2.9.5

The emergency generator(s) shall be air or self-contained liquid cooled and it and other essential electrical equipment shall be protected in accordance with Section 449.4.2.5.4.

449.4.2.9.6

A new facility shall be equipped with either a permanent on-site optional standby generator to operate at least the nonessential loads of the electrical system or the entire normal branch of the electrical system, or there shall be a permanently installed predesigned electrical service entry for the electrical system that will allow a quick connection to a temporary electrical generator to operate at least the nonessential loads of the electrical system or the entire normal branch of the electrical system. This quick

connection shall be installed inside of a permanent metal enclosure rated for this purpose and may be located on the exterior of the building.

Section 450 Nursing Homes

450.1 Scope

All newly licensed nursing homes, including conversions of existing buildings or newly constructed nursing homes, and all additions, alterations or renovations to an existing licensed nursing home shall comply with all applicable requirements of this code and the minimum standards of design, construction and specified minimum essential utilities and facilities of this section and shall have plans reviewed and construction surveyed by the state agency authorized to do so by Chapter 553.80(1)(c), *Florida Statutes* to assure compliance with all applicable requirements of this code.

450.1.1

The following are exempt from review under this part:

450.1.1.1

Change of ownership of an existing licensed nursing home.

450.1.1.2

Change to an existing nursing home's license type that has no additional physical plant requirements

450.1.1.3

Change of the functional use of a space, room, or area when no physical plant revisions are made or are required to be made by this code

450.1.2

A facility licensed as a nursing home that only admits children 0 years through 20 years of age shall meet these minimum standards as they are required by the functional program of the facility.

450.1.3

The *Florida Building Code, Existing Building*, Section 101.2, Scope exempts state licensed facilities such as nursing homes from compliance with that code. Any repair, alteration, change of occupancy, addition or relocation of an existing state licensed nursing home shall comply with the applicable requirements of this code and this section.

450.1.4

For project submission and fee requirements, and other administrative, licensure, and programmatic provisions for nursing homes, see Agency for Health Care Administration (AHCA) Chapter 59A-4 *Florida Administrative Code* and Chapter 400 Part II, *Florida Statutes*.

450.1.5

For state licensure purposes, these codes and standards shall be applicable to the project on the effective date of this code at the time of Stage II preliminary plan approval by the Agency for Health Care Administration (the Agency) as described in Chapter 59A-4 *Florida Administrative Code* or at the first Stage III construction document review if there has been no previous Stage II preliminary plan approval for that project.

450.2 Additional Codes and Standards for the Design and Construction of Nursing Homes

In addition to the minimum design and construction standards required by Section 450 of this code, Chapter 59A-4, Minimum Standards for Nursing Homes, *Florida Administrative Code* or by Chapter 400 Part II, *Florida Statutes*, the following codes and standards shall also be met on the effective date of this code as described in Section 450.1.5 of this code:.

450.2.1

The fire codes described in Chapter 69A-53, Uniform Fire Safety Standards for Hospitals and Nursing Homes, *Florida Administrative Code*.

450.2.2

The Guidelines for Design and Construction of Residential Health, Care, and Support Facilities (The Guidelines), including Chapter 3.2 Specific Requirements for Nursing Homes as referenced in Chapter 35 of this code.

450.3 Additional Physical Plant Requirements for Nursing Homes

In addition to the codes and standards referenced in Section 450.2 the following minimum standards of construction and specified minimum essential facilities shall apply to all new nursing homes, and all additions, alterations or renovations to an existing licensed nursing home, as described in Section 450.1 and listed in this section.

450.3.1 Special Considerations:**450.3.1.1**

Nursing homes designed to serve only for children 0 through 20 years of age may have a maximum room capacity of four persons.

450.3.1.2

Skilled nursing units that are part of a hospital and licensed as a hospital bed but certified as a skilled nursing bed shall meet the requirements for an in-hospital skilled nursing patient care unit in the *FGI Guidelines for Design and Construction of Hospitals* as referenced in Chapter 35 of this code.

450.3.2 Resident Rooms

In addition to the requirements of *The Guidelines*, Chapter 3.1, each resident room shall meet the following minimum standards:

450.3.2.1

In new construction and additions, the maximum room capacity of each resident room shall be two persons. In double occupancy resident rooms, sleeping areas shall be separated from each other by a full-height wall or full-height rigid sliding or foldable partition to increase acoustic and visual privacy. Each person lying in bed shall have direct visual access to an exterior window at all times. Either doors or cubicle curtains from the entry vestibule to these individual resident sleeping areas shall be provided.

450.3.2.2

The clear floor area excludes either the space for the room entrance door swing into the room or the space for vestibule entry, whichever is greater. For the purpose of determining the minimum clear floor area, the vestibule entry is defined as that floor area located between the room entrance door and the room floor area containing the resident bed(s).

450.3.2.3

Where renovation work is undertaken that alters the room configuration, every effort shall be made to meet these minimum space standards. When this is not possible due to existing physical conditions or constraints, and with the approval of the Agency, a resident room shall have no less than 80 square feet (7.43 m^2) of clear floor area per bed in a double occupancy resident room and 100 square feet (9.29 m^2) of clear floor area in a single occupancy resident room.

450.3.2.4

The design for privacy shall not restrict resident access at any time to the room entrance, resident armchair, toilet or bathroom, wardrobe, exterior window or closet.

450.3.2.5

Each new resident room, and each individual resident sleeping area, as described in Section 450.3.2.1, shall have an exterior window(s) to the outside that is physically accessible to each resident at all times and visible from the resident's bed. The window shall be sized with a clear opening of 8 percent of the gross square footage of the resident sleeping room or individual resident sleeping area as described in Section 450.3.2.1. The clear opening of the resident room window width and height shall have a minimum of 20 feet (6.10 m) unobstructed vista to any permanent structure, or equipment, and 15 feet (4.57 m) unobstructed vista to any vehicular parking areas or property line measured horizontally from the plane of the window.

450.3.3 Resident Support Areas and Services

See *The Guidelines* for requirements.

450.3.4 Resident Living, Social, and Treatment Areas

See *The Guidelines* for additional requirements.

450.3.4.1

Dining, lounges, recreation areas, and social areas for residents shall be provided. The total area of these spaces shall be a minimum of 35 square feet (3.25 m^2) per bed with a minimum total area of 225 square feet (20.90 m^2). At least 20 square feet (1.86 m^2) per

resident shall be available for dining. Additional space may be required for resident day care programs. Storage for supplies and equipment shall be provided in the recreation area.

450.3.4.2

Storage for supplies, and resident needs, shall be provided. Storage shall be on site but not necessarily in the same building as the resident rooms, provided access is convenient. The minimum required area shall be 5 square feet (0.46 m^2) per resident up to 600 square feet (55.74 m^2). See *The Guidelines* for additional requirements.

450.3.4.3

Outdoor area(s) shall be provided for the use of all residents and shall include walking paths of durable materials, benches, shaded areas, and visual focusing element(s) such as landscaping, sculpture, or fountain(s). Security fencing if used shall be of a residential design and provide some visual connection to the exterior of the secured area. If an exterior visual connection is not possible or desirable then the interior of the outside area shall be landscaped to be visually interesting. See *The Guidelines* for additional requirements.

450.3.4.4

A barber/beauty room shall be provided with facilities and equipment for resident hair care and grooming. The area of the room shall be a minimum of 120 square feet (11.15 m^2) with the least dimension of 10 feet (3.05 m). See *The Guidelines* for additional requirements.

450.3.5 Details and Finishes

See *The Guidelines* for additional requirements.

450.3.5.1

Doors to all rooms containing bathtubs, showers and water closets for resident use located in double occupancy rooms shall be equipped with privacy hardware that permits emergency access without the use of keys. When such room has only one entrance and is equipped with a swing door, the door shall open outward, or be equipped with emergency release hardware. When emergency release hardware is utilized on a swing door located in a public area, it shall provide visual privacy for the resident and if required by other sections of this code, be smoke resistant. The toilet room door that swings open into the resident room shall not impede the swing of any other door that opens into the resident room.

450.3.5.2

Interior corridor doors, except those to small closets, janitor's closets, electrical or mechanical rooms, housekeeping closets and other small rooms not subject to occupancy, shall not swing into the corridor. A door located on the exit access corridor, and required to swing outward, shall open into an alcove.

450.3.5.3

The use of pocket sliding or folding doors to any occupiable room shall not be permitted. A sliding door equipped with sliding hardware located outside of the room and without a bottom track shall be permitted. If a sliding door is used on a resident toilet or bathroom, a D-shaped handle at least 4 inches (10.16 cm) long shall be provided to open the door. A sliding door used for access to any room located on the exit access corridor may be manual or power operated and shall be smoke resistive and have latching hardware or other mechanism that prevents the door from rebounding to a partially open position if the door is forcefully closed.

450.3.5.4

Door thresholds, except where required at exterior doors, and expansion joint covers shall be designed to facilitate use of wheelchairs and carts and to prevent tripping and shall provide a smooth and level transition from surface-to-surface.

450.3.5.5

Towel bars shall be provided at each bathing facility.

450.3.5.6

Toilet compartment partitions and urinal screens shall be constructed of a product that does not rust, corrode or delaminate.

450.3.5.7

A minimum of one electric drinking fountain or water and cup dispenser shall be provided per resident floor unless drinking water is available from the resident dietary area.

450.3.5.8

Wall coverings that promote the growth of mold and mildew shall be avoided on exterior walls or on walls that are located in normally wet locations.

450.3.5.9

All fire walls, fire barriers, smoke barriers, horizontal exits and exit passageway partitions shall be constructed prior to the construction of all intervening walls. Where rated walls, barriers or partitions intersect, the continuity of the higher priority wall, barrier, or partition shall be maintained through the intersection.

450.3.5.10

Smoke barriers shall be constructed to provide a continuous smoke-tight membrane from exterior wall to exterior wall and from the floor to the underside of the floor or roof deck above. This includes interstitial space and the area above monolithic fire-rated ceiling membranes. Roof trusses shall be permitted to penetrate portions of the smoke barrier located above the fire-rated ceiling membrane where the annular space between the penetrating truss member and the smoke barrier is sealed to limit the transfer of smoke.

450.3.5.11

Where it is not possible to visually inspect a fire-rated partition, wall or barrier or a smoke barrier that extends through the attic or interstitial space to the roof or floor deck above because of the location of a monolithic ceiling membrane, ceiling access panel(s) shall be installed adjacent to each side of the partition, wall or barrier at intervals not exceeding 30 feet (9.0 m) and in such locations as necessary to view all surfaces of the partition, fire wall or smoke barrier. Other ceiling access panels shall only be installed as required by other sections of the code. Partitions, walls and barriers requiring protected openings or penetrations shall be identified in accordance with Section 703 of this code.

450.3.5.12

Where electrical conduits, cable trays, ducts and utility pipes pass through the smoke partition, the utilities shall be located so that access is maintained to adjacent wall surfaces and to all damper access panels. The details shall show the studs and reinforcing half studs so that proper support is provided for the wall surfacing material. There shall be a minimum clearance of 4 inches (102 mm) between all conduits, piping, and duct work insulation that are located parallel or adjacent to a fire wall or to a smoke barrier to facilitate the inspection of these walls.

450.3.5.13

The use of fire shutters to meet the requirements of opening protection required by other sections of this code shall not be permitted.

450.3.5.14

Shutters in openings of smoke partitions to rooms and areas that are permitted to be open to other areas in accordance with Section 407 shall be permitted without automatic closing of the shutter.

450.3.6 Elevators

All buildings having resident use areas on more than one floor shall have hospital-type electric or hydraulic elevator(s) that shall be in compliance with the requirements of Chapter 30 of this code and Chapter 69A-47, *Florida Administrative Code*, Uniform Fire Safety Standards for Elevators. See *The Guidelines* for additional requirements.

450.3.7 Heating, Ventilating and Air-Conditioning (HVAC) Systems

See *The Guidelines* for additional requirements.

450.3.7.1

Air-handling equipment shall be installed exterior of the building, to include the roof, in a designated equipment room(s), in an open space(s) of an attic(s) or interstitial space(s) located inside the conditioned envelop of the building, or in an enclosed space located in an unconditioned attic(s). If the equipment serves only one room, it may be located above the ceiling and shall be accessible through an access opening in accordance with the requirements of such openings in this code. Access panels are not required for lay-in ceiling installations, provided the service functions are not obstructed by other above-ceiling construction, such as electrical conduits, piping, audio visual cabling and like equipment components or supports.

450.3.7.2

All outdoor air intakes shall be located a minimum of 3 feet (0.91 m) above surrounding surfaces and a minimum of 10 feet (3.05 m) horizontally from any exhaust air or plumbing vent. This requirement shall take priority over referenced standards.

450.3.7.3

The transfer of air quantities through one space to an adjacent space is not permitted except that the transfer of air to maintain space relative pressure by the under cutting of doors is permitted. The maximum allowable air quantity for door undercuts shall be 75 cfm (35.38 L/s) for single door widths up to 44 inches (1117 mm).

450.3.7.4

All supply, return and exhaust ventilation fans shall operate continuously. Dietary hood, laundry area, administrative areas that are separated from all resident areas and support areas and maintenance area supply and exhaust fans shall be exempted from continuous operation.

450.3.7.5

Cooling coil condensate shall be piped to a roof drain, floor drain or other approved location.

450.3.7.6

Each new resident sleeping room or resident sleeping area that is separated by a permanent partition and door shall be provided with a separate thermostat to provide individual adjustment of room or area temperature.

450.3.8 Exhaust

See *The Guidelines* for additional requirements.

450.3.8.1

Exhaust fans and other fans operating in conjunction with a negative duct system pressure shall be located at the discharge end of the system. Fans located immediately within the building located at the end of all exhaust ducts shall be permitted. Existing, nonconforming systems need not be brought into compliance when equipment is replaced due to equipment failure.

450.3.8.2

Exhaust hoods in food preparation areas shall be listed or certified by a nationally recognized testing laboratory (NRTL).

450.3.9 Ducts

See *The Guidelines* for additional requirements.

450.3.9.1

All new facility construction shall have totally ducted supply, return, exhaust and outside air systems including areas of all occupancy classifications.

450.3.9.2

In new construction, duct system risers penetrating more than one floor shall be installed in vertical fire-rated shafts. Horizontal offsets of the risers shall not be allowed. Fire/smoke dampers shall be installed at duct penetrations of the chase. Existing nonconforming systems shall be brought into compliance when remodel or renovation work is proposed.

450.3.10 Fan and Damper Control During Fire Alarm

See *The Guidelines* for additional requirements.

450.3.10.1

During an automatic fire alarm or the activation of a duct smoke detector, fan systems and fan equipment serving more than one room shall be stopped to prevent the movement of smoke by mechanical means from the zone in alarm to adjacent smoke zones.

450.3.10.2

Air-handling and fan coil units serving exit access corridors for the zone in alarm shall shut down upon fire alarm.

450.3.10.3

Smoke or fire/smoke dampers shall close upon fire alarm and upon manual shutdown of the associated supply, return or exhaust

fan.

450.3.11 Plumbing

See *The Guidelines* for additional requirements.

450.3.11.1

Grease interceptors shall be located outside of the building.

450.3.11.2

Provide deep seal traps for floor drains in resident showers.

450.3.11.3

Food preparation sinks, pot washing, dishwashers, janitor sinks, floor drains, and cart and can wash drains shall run through the grease trap. Garbage disposers shall not run through the grease trap.

450.3.11.4

Ice machines, rinse sinks, dishwashers, and beverage dispenser drip receptacles shall be indirectly wasted.

450.3.11.5

A backflow preventer shall be installed on the facility main water source(s).

450.3.11.6

All piping, except control-line tubing, shall be identified. All valves shall be tagged, and a valve schedule shall be provided to the facility owner for permanent record and reference.

450.3.11.7

If eye wash stations are provided, they shall be installed in accordance with American National Standards Institute (ANSI) Standard Z358.1 for Emergency Eyewash and Shower Equipment as referenced in Chapter 35 of this code.

450.3.12 Medical Gas and Vacuum Systems

If provided, a medical gas and vacuum system shall be in conformance with the requirements for a Category 2 Building System as described in NFPA 99, *Health Care Facilities Code*. See *The Guidelines* for additional requirements.

450.3.13 Fire Pump

450.3.13.1

Where required by another section of this code, a new fire pump, except for a replacement fire pump, that is electric motor-driven shall be connected to the Emergency Power Supply System (EPSS) of the nursing home. A fire pump(s) that is not electric motor-driven shall meet the requirements of NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection alternative power.

450.3.14 Electrical Requirements

See *The Guidelines* for additional requirements.

450.3.14.1

All material, including equipment, conductors, controls, and signaling devices, shall be installed to provide a complete electrical system with the necessary characteristics and capacity to supply the electrical facility requirements as shown in the specifications and as indicated on the plans. All materials and equipment shall be listed as complying with applicable standards of Underwriter's Laboratories, Inc., or other nationally recognized testing facilities. Field labeling of equipment and materials will be permitted only when provided by a nationally recognized testing laboratory (NRTL) that has been certified by the Occupational Safety and Health Administration (OSHA) for that referenced standard.

450.3.14.2

Nonmetallic sheathed cable or similar systems are not permitted for power and lighting wiring in any facility.

450.3.14.3

For purposes of electrical requirements, a resident room, a resident therapy area or an examination room that is not equipped with a piped medical gas or vacuum system shall be reviewed as a Category 3 space as defined in NFPA 99 *Health Care Facilities Code*. A resident room, a resident therapy area or an examination room that is equipped with a piped medical gas or vacuum system shall be reviewed as a Category 2 space as defined in NFPA 99 *Health Care Facilities Code*, and Chapter 27, Electrical Systems, of this code.

450.3.14.4

There shall be at least one duplex receptacle located at the head of the resident bed connected to the critical branch of the essential electrical system.

450.3.14.5

Panels may be located in spaces subject to storage and shall have the clear working space in accordance with Chapter 27, permanently marked "ELECTRICAL—NOT FOR STORAGE" with a line outlining the required clear working space on the floor and wall.

450.3.14.6

Panel boards shall not be located in an exit access corridor or in an unenclosed space or area that is open to an exit access corridor. Panel boards may be located inside of a room or closet that opens into an exit access corridor only when the room or closet is separated from the exit access corridor by a partition and door that comply with this code.

450.3.14.7

There shall be documentation for grounding system testing of voltage and impedance measurements only in areas defined as Risk Category 1 or 2 in resident care areas.

450.3.15 Lighting

See *The Guidelines* for additional requirements.

450.3.15.1

All spaces occupied by people, machinery and equipment within buildings, approaches to buildings and parking lots shall have electric lighting.

450.3.15.2

Resident bedrooms shall have general lighting from ceiling mounted fixtures, floor lamp fixtures or table mounted fixtures. Separate fixed night lighting shall be provided. The night-light shall have a switch at the entrance to each resident's room or separate sleeping area. A reading light shall be provided for each resident. Resident reading lights and other fixed lights not switched at the door shall have switch controls convenient for use at the luminaire. Wall-mounted switches for control of lighting in resident areas shall be of quiet operating type.

450.3.15.3

All indoor lighting in the resident use areas including corridors, shared spaces, treatment areas, sleeping areas, social/recreational areas and living areas shall be designed and constructed to meet Table A-1 of ANSI/IES RP-28, *Recommended Practice: Lighting and the Visual Environment for Older Adults and the Visually Impaired*, as referenced in *The Guidelines*.

450.3.15.4

All general resident room lighting and all corridor lighting used by residents shall be designed to minimize glare such as indirect lighting.

450.3.16 Fire Alarm Systems

450.3.16.1

A fire alarm annunciator panel shall be provided at a single designated 24-hour monitored location. The panel shall indicate visually, the zone of actuation of the alarm and audibly and visually system trouble. Each smoke compartment shall be annunciated as a separate fire alarm zone. A fire alarm system zone shall not include rooms or spaces in other smoke compartments. A zone location map to quickly locate alarm condition shall be provided at the fire alarm control panel.

450.3.16.2

In all resident care rooms, spaces and areas, including sleeping, treatment, diagnostic and therapeutic, the design and installation of the private operating mode fire alarm as permitted and described in NFPA 72, *National Fire Alarm and Signaling Code*, shall be required. Only the attendants and other personnel required to evacuate occupants from a zone, area, room, floor or building shall

be required to be notified. Audible and visual notification devices shall only be permitted to be located at the care providers' stations, the soiled workroom, soiled holding room, clean workroom, staff lounge, medication preparation room, nurse or supervisor's office, and other staff rooms or areas as determined by the governing body of the facility. (SP7954-R1)

450.3.16.3 Carbon Monoxide Detector

See Section 915 of this code for requirements.

450.3.17 Nurse Call Systems

Reference *The Guidelines* only for requirements not specifically described in this section. Nurse call systems as described in NFPA 99 shall not apply.

450.3.17.1

Wired- or wireless-type nurse call systems shall be permitted if they have been tested and approved by a national recognized testing laboratory (NRTL) to meet the requirements of UL 1069, 7th edition, published October 12, 2007, as referenced in Chapter 35 of this code. All wireless systems shall have been tested and approved by a nationally recognized testing laboratory (NRTL) to meet the requirements of Section 49, Wireless Systems of UL 1069, 7th edition as referenced in Chapter 35 of this code. All nurse call systems whether wired or wireless shall have electronically supervised visual and audible annunciation in accordance with the supervision criteria of UL 1069, 7th edition for nurse call systems and tested and approved by a nationally recognized testing laboratory (NRTL) to meet those requirements.

450.3.17.2

A nurse call system shall be provided that will register a call from a call button from each resident bed to the related staff work area(s) by activating a visual signal at the resident room door or wireless pager and activating a visual and audible signal in the clean utility, soiled utility, nourishment station, medication prep or mobile nurse station receiver and the master station of the resident. If a mobile nurse station receiver is utilized to receive the resident call, it will be worn by all staff who are assigned to the resident unit and shall identify the specific resident and or room from which the call was placed.

450.3.17.3

Audible signals may be temporarily silenced, provided subsequent calls automatically reactivate the audible signal. In rooms containing two or more calling stations, indicating lights shall be provided for each calling station. In multicorridor nursing units, corridor zone lights shall be installed at corridor intersections in the vicinity of staff work areas.

450.3.17.4 Emergency Call System

An emergency call station of the pull cord-type shall be provided for resident use at each exam room (if provided), resident toilet, bath or shower room. The cord shall hang to within 2 to 6 inches (5.08—15.24 cm) of the floor for use by a resident lying on the floor. A portable wireless device shall satisfy this requirement.

1. One emergency call station shall be installed in each separated room or area. Additional emergency call stations shall be located as determined by the facility in its Functional Program.
2. If the emergency calling station is located inside of the shower it shall be listed for wet locations.
3. The call signal shall be the highest priority and shall be cancelled only at the emergency call station.
4. The emergency call station shall activate distinctive audible and visual signals immediately at the resident room door or wireless pager, and activate a visual and audible signal in the clean utility, soiled utility, nourishment station, medication prep or mobile nurse station receiver and the master station of the resident unit. If a mobile nurse station receiver is utilized to receive the resident call, it will be worn by all staff who are assigned to the resident unit and shall identify the specific resident and or room from which the call was placed.

450.3.17.5

Activation of an emergency call shall not cancel a normal call from the same room.

450.3.18 Essential Electrical System

450.3.18.1

A Type 1 essential electrical system shall be provided in all new nursing homes as described in NFPA 99, *Health Care Facilities Code*. The emergency power for this system shall meet the requirements of a Level 1, Type 10, Class 54 generator as described in NFPA 110, Standard for Emergency and Standby Power Systems.

450.3.18.2

In new facility construction, the normal main service equipment shall be separated from the emergency distribution equipment by locating it in a separate room. Transfer switches shall be considered emergency distribution equipment for this purpose.

450.3.18.3

There shall be a generator remote alarm annunciation in accordance with the requirements of NFPA 110 located at a designated on-site 24-hour staffed location.

450.3.18.4

A minimum of one elevator per bank serving any resident use floor shall be connected to the equipment branch of the essential electric system and arranged for manual or automatic operation during loss of normal power.

450.3.18.5

If a day tank is provided, it shall be equipped with a dedicated low-level fuel alarm and a manual pump. The alarm shall be located at the generator remote alarm annunciation as described in Section 450.3.18.3.

450.3.19 Lightning Protection**450.3.19.1**

A lightning protection system shall be provided for all new buildings and additions in accordance with NFPA 780, Installation of Lightning Protection Systems.

450.3.19.2

Where additions are constructed to existing buildings, the existing building's lightning protection system, if connected to the new lightning protection system, shall be inspected and brought into compliance with current standards.

450.3.19.3

There shall be surge protection for all normal and emergency electrical services.

450.3.19.4

Additional surge protection shall be provided for all low-voltage and power connections to all electronic equipment in critical care areas and life safety systems and equipment such as fire alarm, nurse call and other critical systems. Protection shall be in accordance with appropriate IEEE Standards for the type of equipment protected.

450.3.19.5

All low-voltage system main or branch circuits entering or exiting the structure shall have surge suppressors installed for each pair of conductors and shall have visual indication for protector failure to the maximum extent feasible.

450.4 Physical Plant Requirements for Disaster Preparedness of New Nursing Home Construction**450.4.1 Definitions**

The following definitions shall apply specifically to this section:

450.4.1.1 New Facility

A nursing home which has not received a Stage II preliminary plan approval from the Agency for Health Care Administration pursuant to this section.

450.4.1.2 Net Square Footage

The clear floor space of an area excluding cabinetry and other fixed furniture or equipment.

450.4.1.3 During and Immediately Following

A period of 96 hours following the loss of normal support utilities to the facility that are necessary to support the health, safety and welfare of the residents and staff. These support utilities include but are not limited to normal electrical power, potable water supply, sewer and telecommunications.

450.4.1.4 Occupied Resident Area(s)

The location of residents inside of the new facility or in the addition of a wing or floor to an existing facility during and immediately following a disaster. If these residents are to be relocated into an area of the existing facility during and immediately following a disaster, then for these purposes, that location will be defined as the "occupied resident area."

450.4.1.5 Resident Support Area(s)

The area(s) required to ensure the health, safety and well-being of residents during and immediately following a disaster, such as a staff work area, clean and soiled utility areas, food preparation area and other areas as determined by the facility to be kept operational during and immediately following a disaster.

450.4.1.6 On Site

Either in, immediately adjacent to, or on the campus of the facility, or addition of a wing or floor to an existing facility.

450.4.1.7 Residents Served

The number of residents as determined by the facility that will be served in the occupied resident area(s) during and immediately following a disaster.

450.4.2 Disaster Preparedness Construction Standards

The following construction standards are in addition to the physical plant requirements described in Sections 450.2 through 450.3. These minimum standards are intended to increase the ability of the facility to be structurally capable of serving as a shelter for residents, staff and the family of residents and staff and equipped to be self-supporting during and immediately following a disaster:

450.4.2.1 Space Standards**450.4.2.1.1**

For planning purposes, each new facility shall provide a minimum of 30 net square feet (2.79 m^2) per resident served in the occupied resident area(s). The number of residents to be served is to be determined by the facility administration.

450.4.2.1.2

As determined by the facility, space for administrative and support activities shall be provided for use by facility staff to allow for care of residents in the occupied resident area(s).

450.4.2.1.3

As determined by the facility, space shall be provided for all staff and family members of residents and staff.

450.4.2.2 Site Standards**450.4.2.2.1**

Except as permitted by Section 1612 of this code, the lowest floor of all new facilities shall be elevated to the base flood elevation as defined in Section 1612 of this code, plus 2 feet, or to the height of hurricane Category 3 (Saffir-Simpson scale) surge inundation elevation, as described by the Sea, Lake, and Overland Surge (SLOSH) from Hurricanes model developed by the Federal Emergency Management Agency (FEMA), United States Army Corps of Engineers (USACE), and the National Weather Service (NWS), whichever is higher.

450.4.2.2.2

For all existing facilities, the lowest floor elevations of all additions, and all resident support areas including food service, and all resident support utilities, including mechanical, and electrical (except fuel storage as noted in Section 450.4.2.9.3 of this code) for the additions shall be at or above the elevation of the existing building, if the existing building was designed and constructed to comply with either the site standards of Section 450.4 of this code or local flood-resistant requirements in effect at the time of construction, whichever requires the higher elevation, unless otherwise permitted by Section 1612 of this code. If the existing building was constructed prior to the adoption of either the site standards of Section 450.4 of this code or local flood-resistant requirements, then the addition and all resident support areas and utilities for the addition as described in this section shall

either be designed and constructed to meet the requirements of Section 450.4.2.2.1 of this code or be designed and constructed to meet the dry flood proofing requirements of Section 1612 of this code.

450.4.2.2.3

Substantial improvement, as defined by Section 1612 of this code, to all existing facilities located within flood areas as defined in Section 1612 of this code or within a Category 3 surge inundation zone as described in Section 450.4.2.2.1 of this code, shall be designed and constructed in compliance with Section 1612 of this code.

450.4.2.2.4

Where an off-site public access route is available to the new facility at or above the base flood elevation, a minimum of one on-site emergency access route shall be provided that is located at the same elevation as the public access route.

450.4.2.2.5

New landscaping elements shall be located so if damaged they will not block the on-site emergency access route to the facility. Outdoor signs and their foundations shall be designed to meet the wind load criteria of this code.

450.4.2.2.6

New light standards and their foundations used for lighting the on-site emergency access route shall be designed to meet the wind load criteria of ASCE 7 with wind speeds determined from Figure 26.5-1B with appropriate exposure category dependent on site location.

450.4.2.3 Structural Standards

Wind load design of the building structure and exterior envelope including exterior wall systems shall be designed in accordance with this code.

450.4.2.4 Roofing Standards

450.4.2.4.1

Loose-laid ballasted roofs shall not be permitted.

450.4.2.4.2

All new roof appendages such as ducts, tanks, ventilators, receivers, dx condensing units and decorative mansard roofs and their attachment systems shall be structurally engineered to meet the wind load requirements of the applicable building code.

450.4.2.5 Debris Impact Protection Standards

450.4.2.5.1

All exterior window units, skylights, exterior louvers and exterior door units including vision panels and their anchoring systems shall be impact resistant or protected with an impact-resistant covering meeting the requirements of the Testing Application Standards (TAS) 201, 202, and 203 of this code in accordance with the requirements of Sections 1626.2 through 1626.4 of this code or the debris impact requirements of ASTM E1996 as described in Section 1609.1.2.2. For the purposes of this requirement, facilities located where the ultimate design wind speeds are 130 mph or less, as described in Figure 1609.3(2) of this code, shall meet the requirements for Wind Zone 1. The impact-resistant coverings may be either permanently attached or may be removable if stored on site of the facility. Facilities located in the high velocity hurricane zone (HVHZ) shall comply with Sections 1626.2. through 1626.4.

450.4.2.5.2

The location or application of exterior impact protective systems shall not prevent required exit egress from the building.

450.4.2.5.3

When not being utilized to protect the windows, the permanently attached impact-resistant coverings shall not reduce the percentage of the clear window opening below what is required by this code for the patient room.

450.4.2.5.4

Critical systems and utilities identified in this section shall be protected from debris impact by a housing or enclosure complying with the impact protection standards in Sections 1626.2 through 16.26.4 when located at or below 30 feet above the finished

grade of the building. Roof mounted equipment shall have fastening systems designed to meet the wind load requirements of the *Florida Building Code*.

450.4.2.6 Heating, Ventilation and Air-Conditioning (HVAC) Standards

450.4.2.6.1

All new air-moving equipment, dx condensing units, through-wall units and other HVAC equipment located outside of, partially outside of, or on the roof of the facility at or below 30 feet above the finished grade of the building and providing service to the new facility shall be permitted only when either of the following are met:

450.4.2.6.1.1

They are located inside a penthouse designed to meet the wind load requirements of the *Florida Building Code, Building*; or

They are protected in accordance with Section 450.4.2.5.4.

450.4.2.6.2

As determined by the governing body of the facility, occupied resident areas and resident support areas shall be supplied with temperature and humidity control during and immediately following loss of normal utilities. At a minimum, these areas shall be maintained at a dry-bulb temperature at or below 81°F (27.2°C). Vulnerable components of new mechanical equipment necessary to maintain safe indoor air temperature shall be protected from horizontal impact in accordance with Section 450.4.2.5.4 and shall be connected to the facility's essential electrical system described in Section 450.3.18.1 or connected to the optional standby generator described in 450.4.2.9.6.

450.4.2.6.3

Ventilation air change rates in occupied patient areas shall be maintained as specified in this section during and immediately following a disaster by connection to the essential electrical system. The fan systems necessary to provide this service shall receive their power from the emergency power supply system and shall be protected from horizontal impact in accordance with Section 450.4.2.6.1.

450.4.2.7 Plumbing Standards

450.4.2.7.1

There shall be an independent on-site supply (i.e., water well) or on-site storage capability (i.e., empty water storage containers or bladders) of potable water at a minimum quantity of 3 gallons (11 L) per resident served per day during and immediately following a disaster. For planning purposes the number of in-patients shall be determined in writing by the facility. Hot water in boilers or tanks shall not be counted to meet this requirement.

450.4.2.7.2

There shall be an independent on-site supply or storage capability of potable water at a minimum quantity of 1 gallon (4 L) per facility staff, and other personnel in the facility per day during and immediately following a disaster. For planning purposes, the number of these personnel shall be estimated by the facility. Hot water in boilers or tanks shall not be counted to meet this requirement.

450.4.2.7.3

The facility shall determine what amount of water will be sufficient to provide for resident services, and shall maintain an on-site supply or on-site storage of the determined amount.

450.4.2.7.4

When used to meet the minimum requirements of this rule, selected system appurtenances such as water pressure maintenance house pumps and emergency water supply well pumps shall take power from the emergency power supply system(s).

450.4.2.8 Medical Gas Systems Standards

The storage, distribution piping system and appurtenances shall be contained within a protected area(s) designed and constructed to meet the structural requirements of this code and debris impact requirements as specified by Sections 1626.2 through 1626.4.

450.4.2.9

Emergency electrical generator and essential electrical system standards for hurricane protection.

450.4.2.9.1

In addition to the requirements of NFPA 99 *Health Care Facilities Code* and NFPA 70 *National Electrical Code*, the on-site Level 1 emergency electrical power supply system shall provide electrical power to the occupied patient area(s) and patient support area(s) for the following additional equipment:

450.4.2.9.1.1

Ice-making equipment to produce ice or freezer storage equipment for the storage of ice.

450.4.2.9.1.2

If required by the emergency food plan, refrigerator unit(s) food service equipment, range hood exhaust fans and selected lighting within the kitchen and dry storage areas.

450.4.2.9.1.3

At a minimum, there shall be one clothes washer and one clothes dryer for laundry service.

450.4.2.9.1.4

Selected heating or air conditioning systems as determined by the facility, and ventilation systems as required by this code.

450.4.2.9.1.5

Electric lighting required to provide care and service to the patient occupied areas and the necessary patient support areas as defined by this section.

450.4.2.9.2

The emergency power supply (EPS) shall be fueled by fuel stored on-site. The fuel supply shall be sized to fuel the generator for 100-percent load for 72 hours or for 96 hours of actual demand load of the occupied resident area(s) and resident support area(s) and resident support utilities during and immediately following a disaster, whichever is greater. Where used to meet the requirements of Section 450.4.2.6.2, the fuel calculation must include the cooling demand.

450.4.2.9.3

The fuel supply and all fuel lines of the emergency power supply shall either be located below ground or protected in accordance with Section 450.4.2.5.4.

450.4.2.9.4

All panel boards, transfer switches, disconnect switches, enclosed circuit breakers or emergency system raceway systems required to support the occupied patient area(s), patient support area(s) or support utilities shall be protected in accordance with Section 450.4.2.5.4 and shall not rely on systems or devices outside of this protected area(s) for their reliability or continuation of service. The equipment system shall be kept entirely independent of all other wiring and equipment and shall not enter the same raceways, boxes, or cabinets with other wiring.

450.4.2.9.5

The emergency generator(s) shall be air or self-contained liquid cooled and it and other essential electrical equipment shall be protected in accordance with Section 450.4.2.5.4.

450.4.2.9.6

A new facility shall be equipped with either a permanent on-site optional standby system to operate at least the nonessential loads of the electrical system or the entire normal branch of the electrical system for a period of 96 hours for the demand load of the generator.

Exception: An optional standby system shall not be required where the essential electrical system provided in accordance with Section 450.3.18.1 is designed to operate the facility's entire electrical system and sufficient on-site fuel storage is provided to maintain resident occupied areas for a minimum of 96 hours for the demand load on the system.

450.4.2.9.6.1

The fuel for this generator may be natural gas, diesel or propane. Gasoline shall not be permitted as a fuel source. On-site fuel

reserves shall not be required for the optional standby system if the generator is fueled by piped natural gas.

450.4.2.9.6.2

The generator, panel boards, switchgear, fuel lines and other vulnerable system components shall be protected from debris impact in accordance with Section 450.4.2.5.4.

450.4.2.9.6.3

The system shall be protected from flooding in accordance with Section 450.4.2.2.1.

450.4.2.9.6.4

This system shall meet the requirements of NFPA 70 Article 702 and it shall be tested and maintained in accordance with the manufacturer's instructions.

450.4.2.9.6.5

See 59A-4.1265 Emergency Environmental Control for Nursing Homes, F.A.C. for additional operational requirements.

450.4.2.9.7

Existing facilities that are not required to have an emergency power supply system shall be permitted to renovate existing utility systems without having to add an emergency power supply system.

450.4.2.10 External Emergency Communications Standards

Reference Chapter 59A-4, *Florida Administrative Code* for requirements.

Section 451 Ambulatory Surgical Centers

451.1 Scope**451.1.1**

All newly licensed or newly constructed ambulatory surgical centers, including conversions of existing buildings, all ambulatory surgical center outpatient facilities and ambulatory surgical center mobile and transportable units, unless exempted by Chapter 395.0163, *Florida Statutes* and all additions, alterations or renovations to an existing licensed ambulatory surgical center shall comply with all applicable requirements of this code and the minimum standards of design, construction and specified minimum essential utilities and facilities of this section and shall have plans reviewed and construction surveyed by the state agency authorized to do so by Chapter 553.80(1)(c), *Florida Statutes* to assure compliance with all applicable requirements of this code.

451.1.2

The following are exempt from review under this part:

451.1.2.1

Change of ownership of an existing licensed ambulatory surgical center.

451.1.2.2

Change to an existing ambulatory surgical center's license type that has no additional physical plant requirements.

451.1.2.3

Change of the functional use of a space, room, or area when no physical plant revisions are made or are required to be made by this code.

451.1.3

The *Florida Building Code, Existing Building*, Section 101.2, Scope exempts state licensed facilities such as ambulatory surgical centers from compliance with that code. Any repair, alteration, change of occupancy, addition or relocation of an existing state licensed ambulatory surgical center shall comply with the applicable requirements of this code and this section.

451.1.4

For project submission and fee requirements, and other administrative, licensure, and programmatic provisions for ambulatory surgical centers, see Agency for Health Care Administration (AHCA) Chapter 59A-5 *Florida Administrative Code* (F.A.C.) and Chapter 395, *Florida*

Statutes.

451.1.5

For state licensure purposes, these codes and standards shall be applicable to the project on the effective date of this code at the time of Stage II preliminary plan approval by the Agency for Health Care Administration (the Agency) as described in Chapter 59A-5 *Florida Administrative Code* or at the first Stage III construction document review if there has been no previous Stage II preliminary plan approval for that project.

451.2

Additional codes and standards for the design and construction of ambulatory surgical centers and, unless exempted by Chapter 395.0163, *Florida Statutes*, all ambulatory surgical center outpatient facilities and ambulatory surgical center owned or leased mobile and transportable units. In addition to the minimum standards required by Section 451 of this code, Chapter 59A-5, *Florida Administrative Code* or by Chapter 395, *Florida Statutes*, all new ambulatory surgical centers and all additions, alterations or renovations to existing ambulatory surgical centers shall also be in compliance with the following codes and standards on the effective date of this code as described in Section 451.1.5 of this code:

451.2.1

The *Florida Fire Prevention Code* as described in Chapter 633.208 *Florida Statutes*, Minimum fire safety standards.

451.2.2

The Guidelines for Design and Construction of Outpatient Facilities (The Guidelines), including Part 1 General, and Part 2 Outpatient Facility Types, Chapter 2.7 Specific Requirements for Outpatient Surgery Facilities as referenced in Chapter 35 of this code.

451.3 Additional Physical Plant Requirements for Ambulatory Surgical Centers

451.3.1

In addition to the codes and standards referenced in Section 451.2 of this code, the minimum standards of construction and specified minimum essential facilities described in Section 451.3 of this code shall apply to all ambulatory surgical centers as described in Section 451.1 of this code and to all new additions, alterations or renovations to existing ambulatory surgical centers on the effective date of the code.

451.3.2 Outpatient Operating Room

All ambulatory surgical centers shall have at least one operating room that has a minimum clear floor area of 270 square feet (25.08 m^2) as described in *The Guidelines*. Every operating room that meets the requirements of an outpatient operating room, as described in *The Guidelines*, shall be counted as an operating room(s) for purposes of licensure.

451.3.2.1

If provided, all procedure, examination or treatment rooms shall meet the requirements for these rooms as described in *The Guidelines*. All procedure rooms shall be counted for purposes of licensure.

451.3.2.2

In lieu of audible alarm signals, visible alarm-indicating appliances shall be used in critical care areas, such as the operating room area and the Phase I recovery area.

451.3.3 Pre- And Post-Procedure Patient Care

Reference *The Guidelines* for other requirements not specifically described in this section.

451.3.3.1

All post-procedure patient care stations as described in *The Guidelines*, including Phase I PostAnesthesia Recovery, whether or not combined with pre-procedure positions, and if provided, Phase II Recovery will be counted as recovery positions for purposes of licensure.

451.3.3.2

A Phase II Recover Room or Area is not required.

451.3.4 Architectural Details, Surfaces, and Furnishings

Reference *The Guidelines* for other requirements.

451.3.4.1

No doors shall swing into the corridor except those to small closets or small mechanical or electrical rooms that cannot be usefully occupied with the doors in the closed position.

451.3.4.2

All exit access corridor doors must be equipped with automatic positive latching hardware.

451.3.4.3

The use of pocket sliding or folding doors to any occupiable room shall not be permitted. A sliding door equipped with sliding door hardware located outside of the room and not equipped with a bottom door track shall be permitted.

451.3.4.4

All fire walls, fire barriers, smoke barriers, horizontal exits and exit passageway partitions shall be constructed prior to the construction of all intervening walls. Where rated walls, barriers or partitions intersect, the continuity of the higher priority wall, barrier, or partition shall be maintained through the intersection.

451.3.4.5

Smoke barriers shall be constructed so as to provide a continuous smoke-tight membrane from exterior wall to exterior wall and from the floor to the underside of the floor or roof deck above. This includes interstitial space and the area above monolithic fire-rated ceiling membranes. Roof trusses shall be permitted to penetrate portions of the smoke barrier located above the fire-rated ceiling membrane where the annular space between the penetrating truss member and the smoke barrier is sealed to limit the transfer of smoke.

451.3.4.6

Where it is not possible to inspect a fire-rated partition, fire wall or a smoke barrier that extends through the attic or interstitial space to the roof or floor deck above because of the location of a monolithic ceiling membrane, ceiling access panel(s) shall be installed adjacent to each side of the partition, wall or barrier at intervals not exceeding 30 feet (9.00 m) and in such locations as necessary to view all surfaces of the partition, wall or barrier. Other ceiling access panels shall only be installed as required by other sections of the code. Partitions, walls and barriers requiring protected openings or penetrations shall be identified in accordance with Section 703 of this code.

451.3.4.7

Where a fully sprinklered ambulatory surgical center is located in a single-story unsprinklered building, a fire barrier designed and constructed in accordance with Section 707, Fire Barriers, and Section 707.3.10, Fire Areas, of this code, may be used to separate the sprinklered ambulatory surgical center fire area from the fire area of the remainder of the unsprinklered single-story building only when all exits from the ambulatory surgical center lead directly to the exterior of the building or to an exit passageway designed and constructed in accordance with Section 1024, Exit Passageways, of this code.

451.3.5 Elevators Where Required

Reference *The Guidelines* for other requirements.

451.3.5.1

All new ambulatory surgical centers located in multistory buildings where patient treatment areas are located on other than the exit floor shall have at least one 2,500 pound (933 kg) capacity elevator that shall be in compliance with the requirements of Section 451.3.13.5 of this code and the requirements of Chapter 30 of the code.

451.3.5.2

This required elevator shall be sized to accommodate an ambulance stretcher 76 inches (1931 mm) long and 24 inches (610 mm) wide in the horizontal position. This elevator shall be identified with a sign indicating it as the ambulance stretcher elevator.

451.3.6 Air-Conditioning, Heating and Ventilating Systems

Reference *The Guidelines* for other requirements.

451.3.6.1

Air-handling equipment shall be located either on the roof of the building it serves or in mechanical equipment rooms unless it serves only one room and is located in that room. In buildings with multiple uses, tenants or occupancies, the licensed health care areas required by this code to maintain filter efficiencies and relative air pressure relationships shall be served by separate ducted mechanical air supply, return and exhaust systems. This equipment may be located in other areas of the building or in the same room as the building air-handling equipment if access during normal business hours is available.

451.3.6.2

Variable volume systems shall not be permitted in surgical procedures rooms and recovery rooms.

451.3.6.3

Friable duct linings exposed to air movement shall not be used in ducts, terminal boxes or other systems supplying operating rooms and recovery rooms, unless terminal filters of at least 90-percent efficiency are installed downstream of linings. Flexible duct work shall have a continuous metal inner liner encased by insulating material with an outer vapor jacket conforming to UL 181 unless the flexible duct meets the following criteria:

451.3.6.3.1

The duct conforms to UL Class 1 Air Duct, Standard 181 with minimum rated air velocity of 4,000 feet per minute, and is pressure rated for a minimum of 4-inches water gage positive pressure and 1-inch water gage negative pressure.

451.3.6.3.2

The inner core of the duct is constructed of Chlorinated Polyethylene (CPE) material encircling a steel helix bonded to the CPE.

451.3.6.3.3

The duct has a fire-retardant metallized vapor barrier that is reinforced with crosshatched fiberglass scrim having a permanence of not greater than 0.05 perms when tested in accordance with ASTM E96 Procedure A.

451.3.6.3.4

The duct has passed an impact test similar to the UL 181 standard, conducted by a nationally recognized testing laboratory (NRTL) except it shall use a 25-pound weight dropped from a height of 10 feet. As a result of the test, the inner and outer surfaces of the sample shall not have ruptured, broken, torn, ripped, collapsed or separated in order for the duct to pass the test. In addition, the helix shall rebound to a cross-sectional elliptical area not less than 80 percent of the original test sample diameter. The use of flexible duct shall be limited to flexible air connector applications.

451.3.6.4

Filter housing frame blank-off panels shall be permanently attached to the frame, constructed of rigid materials and have sealing surfaces equal to or greater than the filter media installed in the filter frame. All joints between the blank-off panels, filter housing frames and filter support structure shall be caulked air tight.

451.3.6.5

Air ducts and exhaust systems shall not be constructed of fiberglass duct board.

451.3.6.6

Roof top mounted mechanical equipment including air handler units, condensers, vents, exhaust fans, and other such equipment are not required to meet the impact requirements of the code.

451.3.6.7

All new ambulatory surgical centers shall have completely ducted air-supply, return, outside air, and exhaust systems.

451.3.7 Fan and Damper Control During Fire Alarm

451.3.7.1

During an automatic fire alarm activation, fan systems and fan equipment serving more than one room shall be stopped to prevent the movement of smoke by mechanical means from the zone in alarm to adjacent smoke zones or to adjacent areas within the smoke zone if there is only one zone in the facility.

451.3.7.2

Fan control shall be designed so as to minimize the interruption of heating, ventilating and air conditioning in compartments remote from the compartment in alarm.

451.3.7.3

Fan control shall not interfere with the continuous operation of exhaust systems conveying ethylene oxide or other hazardous chemicals and fumes or systems required to operate continuously for the health and safety of occupants. Air-handling systems shall be designed to allow for continuous operation of all such systems and to minimize movement of smoke by mechanical means from the zone in alarm.

451.3.8 Plumbing Fixtures

Reference *The Guidelines* for other requirements.

451.3.8.1

Plumbing shall comply with the *Florida Building Code, Plumbing*.

451.3.9 Fire Pump

451.3.9.1

Where required by another section of this code, a new fire pump, except for a replacement fire pump, that is electric motor-driven shall be connected to the emergency power supply system (EPSS) of the ambulatory surgical center. A fire pump(s) that is not electric motor-driven shall meet the requirements of NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection alternative power.

451.3.10 Electrical Requirements

Reference *The Guidelines* for other requirements.

451.3.10.1

All material, including equipment, conductors, controls, and signaling devices, shall be installed to provide a complete electrical system with the necessary characteristics and capacity to supply the electrical facilities shown in the specifications or indicated on the plans.

451.3.10.2

All materials and equipment shall be factory listed as complying with applicable standards of Underwriter's Laboratories, Inc., or other similarly established standards of a nationally recognized testing laboratory (NRTL) that has been certified by the Occupational Safety and Health Administration (OSHA) for that referenced standard.

451.3.10.3

Field labeling of equipment and materials shall be permitted only when provided by a nationally recognized testing laboratory that has been certified by the Occupational Safety and Health Administration (OSHA) for that referenced standard.

451.3.10.4

There shall be documentation for equipotential grounding in all patient care areas, building service ground electrode systems, and special systems such as fire alarm, nurse call, paging, generator, emergency power and breaker coordination.

451.3.10.5

All spaces occupied by people, machinery and equipment within buildings, and the approaches thereto, and parking lots, shall have electric lighting.

451.3.10.6

Patients' recovery rooms shall have general lighting. Fixed lights not switched at the door shall have switch controls convenient for use at the luminaires. All switches for control of lighting in recovery areas shall be of the quiet operating type.

451.3.10.7

Operating rooms shall have general lighting for the room in addition to localized specialized lighting provided by a special lighting unit required at the surgical table. The type of special lighting unit shall be as specified by the functional program of the facility. Each special lighting unit for localized lighting at the surgical table shall be permanently installed and permanently connected to an

independent circuit that shall be powered from the critical branch. In addition, a minimum of one general purpose lighting fixture shall be powered from a normal circuit in all operating rooms.

451.3.10.8

The number and circuitry of all duplex receptacles in operating rooms, cardiac catheterization laboratories, and post-operative recovery rooms, shall be provided as follows:

451.3.10.8.1

A minimum of four duplex receptacles shall be connected to the critical branch of the essential electrical system.

451.3.10.8.2

A minimum of two duplex receptacles shall be connected to a normal power circuit or to a critical branch circuit from a different transfer switch.

451.3.10.8.3

There shall be no more than two duplex receptacles per circuit for all receptacles for the areas as listed.

451.3.10.9

All receptacles shall have engraved cover plates to indicate the panel board and circuit numbers powering the device.

451.3.10.10

Branch circuit over-current devices shall be readily accessible to nursing staff and other authorized personnel.

451.3.10.11

Nonmetallic sheathed cable or similar systems are not permitted for power and lighting wiring in any facility.

451.3.10.12

Panel boards located in spaces subject to storage shall have the clear working space in accordance with Chapter 27 of the *Florida Building Code, Building*. "ELECTRICAL ACCESS—NOT FOR STORAGE" shall be permanently marked on the floor and wall about the panel. Panel boards shall not be located in an exit access corridor or in an unenclosed space or area that is open to an exit access corridor. Panel boards may be located inside of a room or closet that opens into an exit access corridor only when the room or closet is separated from the exit access corridor by a partition and door that comply with this code.

451.3.10.13

The electrical system shall have coordinated short circuit protection.

451.3.10.14

Provide color coding for the junction boxes for the branches of the essential electrical system.

451.3.10.15

Duplex receptacles for general use shall be installed approximately 50 feet (15 240 mm) apart in all general purpose corridors and within 25 feet (7620 mm) of ends of corridors.

451.3.11 Nurses' Calling System**451.3.11.1**

Wired- or wireless-type nurse call systems shall be permitted if they have been tested and approved by a nationally recognized testing laboratory (NRTL) to meet the requirements of UL 1069, 7th edition, published October 12, 2007, as referenced in Chapter 35 of this code. All wireless systems shall be tested and approved by a nationally recognized testing laboratory (NRTL) to meet the requirements of Section 49, "Wireless Systems" of UL 1069, 7th edition as referenced in Chapter 35 of this code. All nurse call systems whether wired or wireless shall have electronically supervised visual and audible annunciation in accordance with the supervision criteria of UL 1069, 7th edition, for wireless nurse call systems and tested and approved by a nationally recognized testing laboratory (NRTL) to meet those requirements.

451.3.11.2

In facilities which contain more than eight recovery beds, or where recovery beds are not in view from the nurses' station, a nurses' calling system shall be provided. Each recovery bed shall be provided with a call button. Two call buttons serving adjacent beds may be served by one calling station. Call shall activate a visual and audible signal at the nurses' station and in the clean workroom and soiled workroom. Call shall also activate a corridor dome light located at each patient recovery position.

451.3.11.3

A nurses' call emergency system shall be provided at each patient toilet and dressing room. Activation shall be by a pull cord conveniently located for patient use. This system will activate distinct audible and visual signals in the recovery room nurses' station and in the surgical suite nurses' station. The emergency call system shall be designed so that signal light activation will remain lighted until turned off at patient's calling station.

451.3.11.4

A corridor dome light shall be located directly outside of any patient use area that is equipped with a nurse call system.

451.3.12 Fire Alarm Systems

451.3.12.1

A fire alarm annunciator panel shall be provided for each facility or building within the Ambulatory Surgical Center (ASC) at a location that is constantly attended during the facility's hours of operation and shall annunciate any fire alarm in the building from any manual or automatic fire alarm device. The panel shall indicate the zone of actuation of the alarm, and there shall be a trouble signal indicator.

451.3.12.2

A shared building fire alarm system shall be permitted.

451.3.12.3

Each smoke compartment shall be annunciated as a separate fire alarm zone. A fire alarm system zone shall not include rooms or spaces in other smoke compartments and shall be limited to a maximum area of 22,500 square feet (2090 m^2).

451.3.13 Emergency Electrical Service

Reference *The Guidelines* for other requirements.

451.3.13.1

A Type 1 essential electrical system shall be provided in ambulatory surgical centers as described in NFPA 99, *Health Care Facilities Code*. The emergency power for this system shall meet the requirements of a Level 1, Type 10, Class 8 generator as described in NFPA 110, Standard for Emergency and Standby Power Systems.

451.3.13.2

In new facility construction, the normal main service equipment shall be separated from the emergency distribution equipment by locating it in a separate room. Transfer switches shall be considered emergency distribution equipment for this purpose.

451.3.13.3

There shall be a generator remote alarm annunciator in accordance with the requirements of NFPA 110 located at a designated on-site staffed location during the hours of operation of the ambulatory surgical center.

451.3.13.4

Reserved.

451.3.13.5

There shall be illumination of the means of egress in accordance with NFPA 101 and designed for automatic dusk-to-dawn operation. Such illumination shall continue to the public way or to a safe area(s) located a minimum of 30 feet (9.144 m) from the building and large enough to accommodate the required occupant load of the exit discharge.

451.3.13.6

A minimum of one elevator serving any patient treatment floor shall be in compliance with Section 451.3.5 and shall be connected to

the equipment branch of the essential electric system and arranged for manual or automatic operation during loss of normal power.

451.3.13.7

If a day tank is provided, it shall be equipped with a dedicated low-level fuel alarm and a manual pump. The alarm shall be located at the generator remote alarm annunciation.

451.3.13.8

Reserved.

451.3.13.9

Electric lighting required to provide care and service to the patient treatment areas shall be connected to the essential electrical system.

451.3.14 Fire Protection

An ambulatory surgical center (ASC) located in a building containing a fire protection sprinkler system, shall be provided with a dedicated supply main serving only the space occupied by the ASC when the ASC is located on the same floor of the building with other building tenants. The supply main shall originate at the fire main piping riser serving the floor the ASC space is occupying. The ASC supply main shall be equipped with an indicating control valve containing a tamper switch installed at the tap to the building fire riser in a readily accessible location. The valve shall have a permanent tag identifying the supply main as that of the ASC.

451.3.15 Medical Gas

A piped oxygen and vacuum system shall be provided in the operating rooms, if required by *The Guidelines*, that comply with the requirements of NFPA 99, *Health Care Facilities Code*, for a Category 1 piped gas and vacuum system.

451.3.16

As required by *The Guidelines*, a waste anesthetic gas disposal (WAGD) system, in accordance with NFPA 99, *Health Care Facilities Code*, shall be provided in operating rooms where nitrous oxide and/or inhalation anesthesia gas is intended to be administered.

Section 452 Birthing Centers

452.1 Scope

All birthing centers shall comply with the following design and construction standards as described herein.

Note: Other administrative and programmatic provisions may apply. See Agency of Health Care Administration [AHCA] Rule 59A-11, *Florida Administrative Code* and Chapter 383, *Florida Statutes*.

452.2 Physical Environment, Water Supply and Fire Safety

452.2.1

At least one birthing room shall be maintained which is adequate and appropriate to provide for the equipment, staff, supplies and emergency procedures required for the physical and emotional care of a maternal client, her support person and the newborn during labor, birth, and the recovery period.

452.2.2

The birth center shall be designed to provide adequate space for the following:

452.2.2.1

Birth rooms shall be located to provide unimpeded, rapid access to an exit of the building which will accommodate emergency transportation vehicles.

452.2.2.2

Adequate fixed or portable work surface areas shall be maintained for use in the birth room.

452.2.2.3

A separate space for a clean area and a contaminated area; if it is not feasible to provide such separate areas, special procedures shall be established for the disposal of infectious waste. Sanitary waste containers, soiled linen containers, storage cabinets and an

autoclave, pressure cooker or other effective sterilization equipment shall be available.

452.2.2.4

Prenatal and postpartum examinations which will provide privacy for the patient, hand-washing facilities and the appropriate equipment for staff.

452.2.2.5

Medical record storage, client interviews, instruction and waiting rooms.

452.2.3 Toilet and Bathing Facilities**452.2.3.1**

A toilet and lavatory shall be maintained in the vicinity of the birth room.

452.2.3.2

Hand-washing facilities shall be in or immediately adjacent to the birth room.

452.2.3.3

A bathtub or shower shall be available for client use.

452.2.3.4

All floor surfaces, wall surfaces, water closets, lavatories, tubs, showers, shall be kept clean, and all appurtenances of the structures shall be of sound construction, properly maintained, in good repair and free from safety hazards.

452.2.4

There shall be provisions and facilities for secure storage of personal belongings and valuables of clients.

452.2.5

There shall be provisions for visual privacy for each maternal client and her support person.

452.2.6

Hallways and doors providing access and entry into the birth center and birth room shall be of adequate width and conformation to accommodate maneuvering of ambulance stretchers and wheelchairs.

452.2.7

All areas of the facility shall be well lighted and shall have light fixtures capable of providing at least 20 footcandles (200 lux) of illumination at 30 inches (762 mm) from the floor to permit observation, cleaning and maintenance. Light fixtures shall be properly maintained and kept clean.

452.2.8

All housing facilities shall have adequate ventilation and be kept free of offensive odors.

452.2.8.1

If natural ventilation is utilized, the opened window area for ventilation purposes shall be equal to one-tenth of the floor space in the residential area.

452.2.8.2

When mechanical ventilation or cooling systems are employed, the system shall be properly maintained and kept clean. Intake air ducts shall be designed and installed so that dust or filters can be readily removed. In residence areas and segregation rooms with solid doors, mechanical ventilation systems shall provide a minimum of 10 cubic feet (0.3 m^3) of fresh or filtered recirculated air per minute for each client occupying the area.

452.2.8.3

All toilet rooms shall be provided with direct openings to the outside or provided with mechanical ventilation to the outside.

452.2.9

Adequate heating and cooling facilities shall be provided to maintain a minimum temperature of 68°F (20°C) and maximum temperature of 78°F (26°C) at a point 20 inches (508 mm) above the floor.

452.2.10

All heating devices shall comply with fire prevention provisions found in Rule 69A-3, Fire Prevention, General Provision, *Florida Administrative Code*.

452.2.11 Laundry**452.2.11.1**

Where laundry facilities are provided, laundry facilities shall be of sound construction and shall be in good repair and clean. Adequate space shall be provided and areas shall be designated for the separation of clean and soiled clothing, linen and towels.

452.2.11.2

Laundry rooms shall be well lighted and properly ventilated. Clothes dryers shall be vented to the exterior.

452.2.12 Insect and Rodent Control

Facilities shall be kept free of all insects and rodents. All outside openings shall be effectively sealed or screened with 16 mesh screening or equivalent to prevent entry of insects or rodents.

452.2.13 Outdoor Areas

Outdoor areas shall be well drained. Indoor and outdoor recreational areas shall be provided with safeguards designed for the needs of the residents.

452.2.14 Water Supply**452.2.14.1**

Drinking water shall be accessible to all clients. When drinking fountains are available, the jet of the fountain shall issue from a nozzle of nonoxidizing impervious material set at an angle from the vertical. The nozzle and every other opening in the water pipe or conductor leading to the nozzle shall be above the edge of the bowl so that such nozzle or opening will not be flooded in case a drain from the bowl of the fountain becomes clogged. The end of the nozzle shall be protected by nonoxidizing guards to prevent persons using the fountain from coming into contact with the nozzle. Vertical or bubbler drinking fountains shall be replaced with approved-type water fountains or be disconnected. When no approved drinking fountains are available, clients shall be provided with single service cups which shall be stored and dispensed in a manner to prevent contamination. Common drinking cups are prohibited.

452.2.14.2

Hot and cold running water under pressure and at safe temperature, not to exceed 110°F (43°C) to prevent scalding, shall be provided to all restrooms, lavatories and bathing areas.

452.2.15 Sewage Disposal**452.2.15.1**

All sanitary facilities shall comply with the requirements of the *Florida Building Code, Plumbing*.

452.2.15.2

For facilities with nine or more birth rooms, mop sinks or curbed areas with floor drains shall be available in convenient locations throughout the facility to facilitate cleaning and for the proper disposal of cleaning water.

452.2.16 Fire Control

Each birth center shall provide fire protection through the elimination of fire hazards, the installation of necessary safeguards such as extinguishers and smoke alarms to insure rapid and effective fire control.

452.2.16.1

To safeguard all clients, the birth center shall have:

452.2.16.1.1

"No Smoking" signs prominently displayed in those areas where smoking is not permitted.

452.2.16.1.2

Fire regulations and evacuation route prominently posted.

452.2.16.2

The written fire control plan approved by the appropriate local fire authority shall contain provisions for prompt reporting of all fires, extinguishing fires, protection of personnel and guests, evacuation, and cooperation with fire-fighting authorities.

452.2.16.3

New centers' carpeting must comply with the maximum flame spread rating of 75 in accordance with ASTM E84 test as required under Chapter 69A-3.012 Standards of the National Fire Protection Association Adopted, *Florida Administrative Code*. Those existing centers not having affirmative evidence of complying with such flame spread rating shall establish fire control measures including the prohibition of smoking in carpeted areas. Such procedures shall be approved by the authority having jurisdiction.

Section 453 State Requirements for Educational Facilities

453.1 Scope: Public Educational Facilities

Public educational facilities shall comply with the *Florida Building Code* and the *Florida Fire Prevention Code* as adopted by the State Fire Marshal. These are minimum standards; boards may impose more restrictive requirements. Additional requirements for public educational facilities in Florida, including public schools and public Florida colleges, are found in these standards.

Note: Other administrative and programmatic provisions may apply. See Department of Education Rule 6A-2.0010 and Chapter 1013, *Florida Statutes*.

453.2 Public Schools and Florida Colleges General Requirements

453.2.1 Owner

Each school board and Florida college board of trustees is deemed to be the owner of facilities within its respective jurisdiction. Boards shall provide for enforcement of the *Florida Building Code* and the *Florida Fire Prevention Code* as adopted by the State Fire Marshal, including standards for health, sanitation, and others as required by law.

453.2.2 Exemption From Local Requirements

All public educational and ancillary plants constructed by a school board or a Florida college board are exempt from all other state, county, district, municipal, or local building codes, interpretations, building permits, and assessments of fees for building permits, ordinances, road closures, and impact fees or service availability fees as provided in Section 1013.371(1)(a), *Florida Statutes*.

453.3 Code Enforcement

453.3.1 School Boards and Florida College Boards

Section 553.80(6), *Florida Statutes*, provides options for plan review services and inspections by school boards and Florida college boards.

453.3.2 Owner Review and Inspection

A school board or Florida college board which undertakes the construction, remodeling, renovation, lease, or lease-purchase of any educational plant or ancillary facility, or day labor project, regardless of cost or fund source, shall review construction documents as required by law in Section 1013.38, *Florida Statutes*, and Section 553.80(6), *Florida Statutes*, and shall ensure compliance with requirements of law, rule, and the *Florida Building Code* and the *Florida Fire Prevention Code* as adopted by the State Fire Marshal. Section 553.80(6), *Florida Statutes*, states that district school boards and Florida college boards shall provide for plan review and inspections for their projects. They shall use personnel certified under Part XII of Chapter 468, *Florida Statutes*, to perform the plan reviews and inspections or use one of the options provided in Section 1013.38, *Florida Statutes*. Under this arrangement, school boards and Florida college boards are not subject to local government permitting, plan review, and inspection fees.

453.3.3 Local Government Review and Inspection

As an option to the owner providing plan review and inspection services, school boards and Florida college boards may use local government code enforcement officers who will not charge fees more than the actual labor and administrative costs for the plan review and inspections. Local government code enforcement offices shall expedite permitting. Any action by local government not in

compliance with Section 553.80(6), *Florida Statutes*, may be appealed to the Florida Building Commission, which may suspend the authority of that local government to enforce the *Florida Building Code* and the *Florida Fire Prevention Code* as adopted by the State Fire Marshal on the facilities of school boards and Florida college boards.

453.3.4 Other Regulatory Agencies

Boards shall coordinate the planning of projects with state and regional regulatory and permitting agencies, as applicable. Other state or local agencies may inspect new construction or existing facilities when required by law; however, such inspections shall be in conformance with the code as modified by this section.

453.3.5 Day Labor Projects

Any one construction project estimated to cost \$300,000 or less where bonafide board employees or contracted labor provide the work. Day labor projects are subject to the same *Florida Building Code* and the *Florida Fire Prevention Code* as adopted by the State Fire Marshal as new construction.

453.3.6 Routine Maintenance

Maintenance projects are subject to the same *Florida Building Code* and *Florida Fire Prevention Code* as adopted by the State Fire Marshal as new construction. Chapter 489, *Florida Statutes*, exempts boards from the use of a licensed general contractor for projects up to \$200,000 where bonafide board employees provide the work. Maintenance projects which include construction, renovation and/or remodeling, shall be reviewed for compliance with the code.

453.3.7 Certificate of Occupancy

New buildings, additions, renovations, and remodeling shall not be occupied until the building has received a certificate of occupancy for compliance with codes that were in effect on the date of permit application.

453.3.8

Reuse and prototype plans shall be code updated with each new project.

453.4 Reference Documents

School Boards and Florida College Boards of Trustees. In addition to complying with the *Florida Building Code* and the *Florida Fire Prevention Code* as adopted by the State Fire Marshal, and other adopted standards and this section, public educational facilities and sites shall comply with applicable federal and state laws and rules.

453.4.1 Rule 6A-2.00.10 [State Requirements for Educational Facilities (SREF)]

A Florida Department of Education document which includes required design standards, standards for rehabilitation of historical resources, capital outlay project process requirements, and various agencies having jurisdiction during project planning and construction.

453.4.2 Flood-Resistant Construction

Educational facilities in flood hazard areas shall comply with ASCE 24.

453.4.3 Florida Statutes and State Rules

Including, but not limited to, Chapters 255, 468, 471, 481, 489, 553, 633, 1013, and Section 287.055, *Florida Statutes*, and various state rules as applicable to specific projects.

453.4.4 Accessibility Requirements for Children's Environments

U.S. Department of Justice and the U.S. Architectural and Transportation Barriers Compliance Board.

453.4.5 Handbook for Public Playground Safety

Playgrounds and equipment shall be designed and installed using the *Public Playground Safety Handbook* by the U. S. Consumer Product Safety Commission, and the ASTM/CPSC *Playground Audit Guide* as applicable.

453.4.6 ANSI Z535.1

American National Standard Safety Color Code for marking physical hazards, is used in shops where machinery requires marking and safety zones.

453.4.7 ASCE 7

American Society of Civil Engineers.

453.4.8

Life Cycle Cost Guidelines for Materials and Building Systems for Florida's Public Educational Facilities, available from the Department of Education, Office of Educational Facilities, shall be considered.

453.5 Definitions

453.5.1 Assembly

Assembly occupancies are buildings or portions of buildings used for gatherings of 50 or more persons, such as auditoriums, gymnasiums, multipurpose rooms, classrooms and labs, cafeterias, stadiums, media centers and interior courtyards. Assembly occupancies include adjacent and related spaces to the main seating area, such as stages, dressing rooms, workshops, lobbies, rest rooms, locker rooms, and store rooms. School board and Florida college facilities shall follow the requirements of *Florida Fire Prevention Code* as adopted by the State Fire Marshal for assembly spaces.

453.5.2 Board

A district school board and a Florida college board of trustees.

453.5.3 Boiler

A fuel-fired, heat-producing appliance with a minimum input capacity of 60,000 Btu per hour and intended to supply hot water or steam. Boilers and the inspection of boilers shall comply with Section 554, *Florida Statutes*, the Boiler Safety Act.

453.5.4 Certificate of Occupancy

Documentation issued by an authority having jurisdiction which indicates inspection and approval of completion of a construction project pursuant to the requirements of Florida law.

453.5.5 Courtyard

A court or enclosure adjacent to, or surrounded by, a building(s) and/or walls.

453.5.5.1 "Exterior Courtyard"

is a courtyard that is not roofed, has a minimum width of 40 feet (1219 mm) and has an opening a minimum width of 40 feet (1219 mm) with no obstructions or fencing, on at least one end.

An exterior courtyard may be considered exterior space and used for exiting of adjacent spaces. For an exterior courtyard with an opening between 40 feet (1219 mm) and 60 feet wide (18 288 mm), the building walls and wall openings must meet the requirements of *Florida Building Code, Building Tables 601 and 602* and the maximum travel distance to the courtyard opening/exit shall not exceed 150 feet (45 720 mm) from any point within the courtyard. If the minimum courtyard width exceeds 60 feet (18 288 mm), the travel distance to a courtyard opening/exit may exceed 150 feet (945 720 mm).

453.5.5.2 "Enclosed Courtyard"

is a courtyard not roofed by more than 50 percent of the courtyard area and that is substantially surrounded by a building(s) on two sides or more, has a minimum width of 40 feet (1219 mm) and each opening to the exterior is less than 40 feet (1219 mm) in width. The courtyard area shall be calculated for maximum occupancy as an assembly space and the number and size of remotely located exits shall be calculated for the maximum possible load. The maximum possible load is the greater of the calculated capacity of the courtyard or the load imposed by the surrounding spaces. An enclosed courtyard may be used as a component of exit access provided that the walls and wall openings meet the requirements of *Florida Building Code, Building, Tables 601 and 602* and the maximum travel to the exit discharge does not exceed 150 feet (45 720 mm) from any point within the enclosed courtyard. If the minimum courtyard width exceeds 60 feet (18 288 mm), the travel distance to a courtyard opening/exit may exceed 150 feet (45 720 mm). An enclosed courtyard cannot serve as the exterior for exiting or for emergency rescue openings.

453.5.5.3 "Roofed Courtyard"

is a courtyard roofed by more than 50 percent of the courtyard area in any manner. Roofed courtyards may be used for assembly spaces and shall not be used as a component of exiting from adjacent spaces.

453.5.6 Facility

Additionally defined as follows:

453.5.6.1 "Ancillary Facility"

is a building or other facility necessary to provide district-wide support services, such as an energy plant, bus garage, warehouse, maintenance building, or administrative building.

453.5.6.2 "Ancillary Plant"

is buildings, site, and site improvements necessary to provide district-wide vehicle maintenance, storage, building maintenance activities, or administrative functions necessary to provide support services to an educational program.

453.5.6.3 "Auxiliary Facility"

consists of the support spaces located at educational facilities and plants which do not contain student stations but are used by students, such as libraries, administrative offices, and cafeterias.

453.5.6.4 "Educational Facility"

consists of buildings and equipment, structures, and special educational use areas that are built, installed, or established to serve primarily the educational purposes and secondarily the social and recreational purposes of the community.

453.5.6.5 "Educational Plant"

comprises the educational facilities, site, and site improvements necessary to accommodate students, faculty, administrators, staff, and the activities of the educational program.

453.5.6.6 "Existing Facility"

is a facility owned, rented or leased.

453.5.6.7 "Leased Facility"

is a facility not owned, but contracted for use.

453.5.6.8 "Permanent Facility"

is a facility designed for a fixed location.

453.5.6.9 "Relocatable/Portable Facility"

is a building which is designed with the capability of being moved to a new location.

453.5.6.10 "Modular Facility"

is a structure which, when combined with other modules and/or demountable roof and/or wall sections, forms a complete building. This facility may be relocatable.

453.5.7 Maintenance and Repair

The upkeep of educational and ancillary plants including, but not limited to, roof or roofing replacement, short of complete replacement of membrane or structure; repainting of interior or exterior surfaces; resurfacing of floors; repair or replacement of glass and hardware; repair or replacement of electrical and plumbing fixtures; repair of furniture and equipment; replacement of system equipment with equivalent items meeting current code requirements providing that the equipment does not place a greater demand on utilities, structural requirements are not increased, and the equipment does not adversely affect the function of life safety systems; traffic control devices and signage; and repair or resurfacing of parking lots, roads, and walkways. Does not include new construction, remodeling, or renovation, except as noted above.

453.5.8 New Construction

Any construction of a building or unit of a building in which the entire work is new. An addition connected to an existing building is considered new construction.

453.5.9 Open Plan Building

Any building which does not have corridors defined by permanent walls and is entirely open or divided by partitions which may be easily rearranged.

453.5.10 Open Plan Instructional Space

An arrangement of two or more class areas with no permanent partitions or wall separations.

453.5.11 Owner

Each school board and Florida college board of trustees is deemed to be the owner of facilities within its respective jurisdiction.

453.5.12 Permit for Construction

Documentation issued by an authority having jurisdiction which indicates approval of construction plans prepared pursuant to the requirements of Florida law.

453.5.13 Remodeling

The changing of existing facilities by rearrangement of space and/or change of use. Only that portion of the building being remodeled must be brought into compliance with the *Florida Building Code* and *Florida Fire Prevention Code* as adopted by the State Fire Marshal unless the remodeling adversely impacts the existing life safety systems of the building.

453.5.14 Renovation

The rejuvenating or upgrading of existing facilities by installation or replacement of materials and equipment. The use and occupancy of the spaces remain the same. Only that portion of the building being renovated must be brought into compliance with the *Florida Building Code* and *Florida Fire Prevention Code* as adopted by the State Fire Marshal unless the renovation adversely impacts the existing life safety systems of the building.

453.5.15 Separate Atmosphere

The individual volumes of air in a building which are divided by smoke proof barriers to limit contamination of the air by smoke and fumes during a fire.

453.5.16 Separate Building

The purpose of separate fire alarm systems or sprinkler systems, a separate building is a structure separated from other buildings by 60 feet (18 288 mm) or more, or as required by other sections of this code.

453.5.17 Florida College

A public community college, public college, state college, or public junior college.

453.5.18 Student-Occupied Space

Any area planned primarily for use by six or more students.

453.6 Administration of Public Education Projects**453.6.1 Occupancy During Construction**

School board and Florida college board facilities, or portions of facilities, shall not be occupied during construction unless exits, fire detection and early warning systems, fire protection, and safety barriers are continuously maintained and clearly marked at all times. Construction on an occupied school board site shall be separated from students and staff by secure barriers. Prior to issuance of the notice to proceed, a safety plan shall be provided by the contractor which clearly delineates areas for construction, safety barriers, exits, construction traffic during the various phases of the project and when conditions change. Where heavy machinery, as is used for earth moving or scraping, is required to work on a school board's occupied site, the work shall be separated from occupants by secure double barriers with a distance of 10 feet (3048 mm) in between. New construction, remodeling or renovations in existing facilities shall not reduce the means of egress below the requirements for new buildings; safe means of egress from a student-occupied space may be accomplished as authorized by NFPA 101, Florida edition as adopted by the *Florida Fire Prevention Code*. New construction (additions) shall not block or reduce safe means of egress.

453.6.2 Contractor Toxic Substance Safety Precautions

When hazardous chemicals as defined by 29 CFR 1910.1200, OSHA Hazard Communication Standard are to be used during the maintenance, renovation, remodeling, or addition to an existing facility, the contractor shall notify the administrator in writing at least three working days before any hazardous chemical is used. The notice shall indicate the name of each of the hazardous chemicals to be used, where and when they will be used, and a copy of a material safety data sheet (MSDS) for each hazardous chemical. The contractor shall comply with the safety precautions and handling instructions set forth in the MSDS. Copies of hazardous waste manifests documenting disposal shall be provided to the facility's administrator who will notify occupants of the anticipated presence of toxic substances during the maintenance, renovation, remodeling, or addition to an existing facility.

453.6.3 Flammable or Explosive Substances

No flammable or explosive substances or equipment shall be introduced during a remodeling or renovation project in a facility of normally low or ordinary hazard classification while the building is occupied.

453.7 Life Safety

453.7.1 Separate Exits

In assembly occupancies, each required exit from an assembly space must exit into a separate atmosphere or to the exterior, to be considered as a separate exit.

453.7.2 Exit Access

Exit access shall not be through a toilet room, storage room, or similar space, or any space subject to being locked.

453.7.3 Location of Fire Extinguishers and Blankets

Fire extinguishers may be located inside student-occupied spaces provided they are placed adjacent to the primary exit door, and the room door remains unlocked when the facility is occupied, and a permanently affixed sign, with a red background and white letters, reading "FIRE EXTINGUISHER INSIDE" is placed on the outside adjacent to the door. Fire extinguisher cabinets shall not be locked. Fire blankets shall be located in each laboratory and each shop where a fire hazard may exist. Fire extinguishers and fire blankets shall be readily accessible and suitable for the hazard present and shall not be obstructed or obscured from view. Extinguishers and blankets shall be on hangers or brackets, shelves or cabinets so that the top of the extinguisher or blanket is not more than 48 inches (1220 mm) above finish floor (AFF) and complies with state and federal accessibility requirements. All extinguishers shall be installed and maintained in accordance with NFPA. Extinguishers shall remain fully charged and operable at all times and have a current tag to indicate compliance.

453.7.4 Common Fire Alarm

Buildings within 60 feet (18,288 mm) of each other shall have a common fire alarm system. On an existing campus, structures that meet the 60 foot (18,288 mm) requirement, any new structure, remodeled facility, or renovated facility, such as classrooms, labs, shops and cafeterias, gymnasiums, auditoriums (separate or combination functions) with assembly occupancy less than 300, shall be connected to the campus existing fire alarm system. An existing system without the voice feature shall not be required to include the voice feature required by Sections 907.2 and 907.2.3 of this code. A new total school fire alarm system upgrade project for an existing campus shall include the voice feature. Emergency shelters shall have the fire alarm panel located in the space identified as the shelter manager's office.

453.7.5 Fire Alarm Sending Stations

Sending stations may be located inside student-occupied spaces, adjacent to the primary exit door only if the door to the occupied space is unlocked at all times while the facility is occupied. When located inside a student-occupied space, a permanently affixed sign reading "FIRE ALARM PULL STATION INSIDE" shall be placed outside that space adjacent to the door. This sign shall have a red background with white letters. Sending stations shall be mounted to meet accessibility requirements.

453.7.6 Automatic Shut Off

The fire alarm system shall shut off gas and fuel oil supplies which serve student-occupied spaces or pass through such spaces. The shutoff valve shall be located on the exterior at the service entrance to the building. The shutoff valve shall be of the manual reset type.

453.7.6.1 Kitchen Gas Supplies

Kitchen gas supplies shall be shutoff by activation of the kitchen hood fire suppression system. The shutoff valve shall be installed in accordance with the manufacturer's instructions and recommendations.

453.7.6.2 Emergency Power

The fire alarm system shall not shut off gas supplies which serve emergency power sources.

453.7.7 Unoccupied Rooms and Concealed Spaces

Rooms or spaces for storage, custodial closets, mechanical rooms, spaces under stages with wood structures and other unoccupied or unsupervised spaces in a building shall have automatic fire alarm system detector devices installed. Any concealed space with exposed materials having a flame spread rating greater than Class A, including crawl spaces under floors, interstitial spaces between ceiling and floor or roof above and attic spaces, shall be equipped with heat detector devices. Smoke and heat detector devices shall be installed in accordance with NFPA 72.

453.7.7.1 Fully Sprinklered Buildings

In fully sprinklered buildings, fire alarm detection devices are not required except where specified in the *Florida Fire Prevention Code*.

453.7.8 Boiler Rooms

Each boiler room shall be separated from the remainder of the building by one-hour fire-resistance-rated construction or shall be separate from other buildings by 60 feet (18 288 mm), and shall have an out-swinging door opening directly to the exterior. A fire door swinging into the boiler room shall also be provided for any opening into the interior of the building. There shall be no opening into any corridor or area designed for use by students.

453.7.9 Exit Passageways and Horizontal Exits

Exit passageways as referenced in Section 1024 and horizontal exits referenced in Section 1026 of this code shall be prohibited.

453.8 General Requirements for New Construction, Additions, Renovation, and Remodeling

453.8.1 Codes and Standards

Educational facilities owned by school boards and Florida college boards shall meet the construction requirements of the *Florida Building Code* and the *Florida Fire Prevention Code* as adopted by the State Fire Marshal, state and federal laws and rules, and this section for Florida's public educational facilities for new construction, remodeling and renovation of existing facilities. This is a minimum standard; boards may impose more restrictive safety and level of quality standards for educational, auxiliary, and ancillary facilities under their jurisdiction, provided they meet or exceed these minimum requirements.

453.8.1.1 Educational Occupancy

School board educational facility projects whether owned, lease-purchased or leased shall comply with the educational occupancy and assembly occupancy portions of the above referenced codes as applicable, except where in conflict with this section. The support spaces such as media centers, administrative offices, cafeterias and kitchens located within educational facilities are not separate occupancies.

453.8.1.2 Business Occupancy

Florida college board educational facility projects whether owned, lease-purchased or leased shall comply with the business occupancy and the assembly occupancy of the above referenced codes as applicable, except where in conflict with this section.

453.8.1.3 Ancillary Facility

School board and Florida college board ancillary facilities such as warehouses or maintenance buildings, shall use the applicable occupancy section of the *Florida Building Code* and the *Florida Fire Prevention Code* as adopted by the State Fire Marshal. Ancillary facilities on educational plant sites shall be separated from the educational facility as required by code.

453.8.2 Space Standards

School board and Florida college board facility sizes shall use standards in the "Size of Space and Occupant Design Criteria Table" found in the Department of Education document, "State Requirements for Educational Facilities (SREF)." Exiting from occupied spaces shall comply with Table 1004.5 of this code.

453.8.3 Construction Type

School board and Florida college buildings including auxiliary, ancillary and vocational facilities shall comply with the following:

453.8.3.1 Noncombustible Type I, II or IV

The minimum construction type for one- and two-story public educational facilities shall be noncombustible Type I, II or IV construction or better.

453.8.3.1.1

Interior nonload-bearing wood studs or partitions shall not be used in permanent educational and auxiliary facilities or relocatable buildings.

Exception: Historic buildings to maintain the fabric of the historic character of the building.

453.8.3.2 Type I

Facilities three stories or more shall be Type I construction.

453.8.3.3 Type IV

When Type IV construction is used, wood shall be exposed and not covered by ceilings or other construction.

453.8.3.4 Exceptions to Types of Construction:

1. Covered walkways open on all sides may be Type V construction.
2. Single story dugouts, press boxes, concession stands, related public toilet rooms, detached covered play areas, and nonflammable storage buildings that are detached from the main educational facility by at least 60 feet (1829 mm), may be Type V construction.

453.8.4 Standards for Remodeling and/or Renovation Projects

Portions of buildings being remodeled and/or renovated shall be brought into compliance with current required *Florida Building Code* and the *Florida Fire Prevention Code* as adopted by the State Fire Marshal as required by the plan review authority in its best judgment.

453.8.4.1

An automatic fire sprinkler system is not required in existing educational buildings unless 50 percent of the aggregate area of the building is being remodeled.

453.8.5 Leased Facilities

Leased facilities shall be brought into compliance with applicable occupancy requirements of the *Florida Building Code* and the *Florida Fire Prevention Code* as adopted by the State Fire Marshal prior to occupancy.

453.8.6 Asbestos Prohibited

The federal Asbestos Hazard Emergency Response Act, (AHERA) 40 CFR, Part 763, as revised July 1, 1995, prohibits the use of any asbestos containing materials in any public education construction project and requires certification of same by the architect of record.

453.8.7 Life Cycle Cost Guidelines for Materials and Building Systems

An analysis shall be included, as required by Section 1013.37(1), *Florida Statutes*, which evaluates building materials and systems, life cycle costs for maintenance, custodial, operating, and life expectancy against initial costs, as described in Section 1013.37(1)(e)4, *Florida Statutes*. Standards for evaluation of materials are available from the department in a publication entitled *Life Cycle Cost Guidelines for materials and Building Systems for Florida's Public Educational Facilities*.

453.8.8 Safe School Design

School boards shall design educational facilities and sites including pre-K through 12, vocational and Florida colleges to enhance security and reduce vandalism through the use of "safe school design" principles. Safe school design strategies are available from the Florida Department of Education, Office of Educational Facilities, in a publication titled *Florida Safe School Design Guidelines* and include but are not limited to the following:

453.8.8.1 Natural Access and Control of Schools and Campuses

453.8.8.2

Natural surveillance of schools and campuses both from within the facility and from adjacent streets by removing obstructions or trimming shrubbery.

453.8.8.3

School and campus territorial integrity; securing courtyards, site lighting, building lighting.

453.8.8.4

Audio and motion detection systems covering ground floor doors, stairwells, offices and areas where expensive equipment is stored.

453.8.8.5

Designs which will promote the prevention of school crime and violence. Exterior architectural features which do not allow footholds or handholds on exterior walls, tamperproof doors and locks, nonbreakable glass or shelter window protection system; also landscaping and tree placement should be designed so they do not provide access to roofs by unauthorized persons. Sections of

schools commonly used after hours should be separated by doors or other devices from adjacent areas to prevent unauthorized access. Install locks on roof hatches; apply slippery finishes to exterior pipes.

453.8.6

Exterior stairs, balconies, ramps, and upper level corridors around the perimeter of buildings should have open-type handrails or other architectural features to allow surveillance.

453.8.7

Open areas, such as plazas, the building's main entrance, parking lots, and bicycle compounds should be designed so they are visible by workers at workstations inside the buildings.

453.9 Structural Design

453.9.1 Loading Requirements

Structural design shall comply with code requirements and wind loads as stipulated by the *Florida Building Code* and the *Florida Fire Prevention Code* as adopted by the State Fire Marshal. Wind design shall be based on ASCE 7, with wind speeds determined from Figure 26.5-1C and ICC 500, as appropriate.

453.10 Site Requirements

453.10.1 Fencing

Fencing for school board educational plants shall be of a material which is nonflammable, safe, durable, and low maintenance, provides structural integrity, strength and aesthetics appropriate for the intended location. Fences shall have no jagged or sharp projections. Fence heights shall be in compliance with local zoning regulations. Access shall be provided for maintenance machinery. Prohibited materials for nonagricultural educational plants include razor wire, barbed wire and electrically charged systems.

453.10.1.1 Required Locations

Fencing is required to separate students from potential harm, and shall be provided in the following locations:

453.10.1.1.1 Kindergarten Through Grade 12

Exposed mechanical, plumbing, gas, or electrical equipment located on ground level.

453.10.1.1.2 Kindergarten Through Grade 5

Special hazards as identified by the authority having jurisdiction including retention ponds whose permanent water depth or whose water depth over a 24-hour period exceeds 1 foot (305 mm), deep drainage ditches, canals, highways, and play fields adjacent to roadways.

453.10.1.1.3 Kindergarten Through Grade 12

All child care and kindergarten play areas.

453.10.2 Walks, Roads, Drives, and Parking Areas

Walks, roads, drives, and parking areas on educational and ancillary sites shall be paved. Roads, drives, and parking areas shall be in compliance with Department of Transportation (DOT) road specifications and striped in compliance with DOT paint specifications. All paved areas shall have positive drainage.

453.10.2.1 Covered Walks

All buildings in K-12 educational facilities shall be connected by paved walks and accessible under continuous roof cover. New relocatable classroom buildings shall be connected to permanent buildings by paved covered walks where applicable. Roofs for covered walks shall extend 1 foot (305 mm) beyond each side of the designated walkway width. Gutters or other water funneling devices shall prevent storm water from pouring onto or draining across walks.

453.10.2.2 Accessible Walks and Bridges

Accessible walks shall connect building entrance(s) to accessible parking, public transportation stops, public streets, sidewalks, loading and drop-off zones, and other facilities within the site as required by the accessibility standards. School board sites where educational plants are separated by highways shall be connected by overhead pedestrian bridges.

453.10.2.3

Reserved.

453.10.2.4 Vertical Drops

Walls, railings, or other physical barriers which are at least a minimum 12 inches (305 mm) in height, shall define and protect any vertical drop between joining or abutting surfaces of more than 6 inches (152 mm) but less than 18 inches (457 mm) in height. Any vertical drop of 18 inches (457 mm) or more shall be protected by a wall or guardrail a minimum of 42 inches (1067 mm) in height.

Exceptions:

1. Guards are not required for the locations described in the exception to Section 1015.2.
2. In assembly seating where guards in accordance with Section 1029.17.3 are permitted and provided.

453.10.2.5 Roads and Streets

Educational and ancillary site access shall consist of a primary road and another means of access to be used in the event the primary road is blocked. Stabilized wide shoulders of the primary road, unobstructed by landscaping, planters, light fixtures, poles, benches, etc., which allow a third lane of traffic, may satisfy the requirement for the other means of access. Driveways shall not completely encircle a school plant, to allow student access to play areas without crossing roads; vehicular and pedestrian traffic shall not cross each other on the site; bus driveways and parent pick-up areas shall be separated.

453.10.2.6 Bus Drives

Bus drives on educational sites shall be designed so that buses do not have to back up. The minimum width shall be 24 feet (7315 mm) for two-lane traffic. The turning radius on educational and ancillary sites and for turning off public access streets shall be as follows: one-way traffic, 60 feet (18 288 mm) minimum measured to the outside curb or edge of the traffic lane; two-way traffic, 60 feet (18 288 mm) minimum measured to the centerline of the road.

453.10.2.7 Vehicle Parking Areas

Vehicle parking areas shall comply with minimum parking space requirements in this section. Except for parking space requirements to meet federal and state accessibility laws, where alternate transportation or parking arrangements are available the parking area requirements may be reduced from these standards if sufficient justification documentation is provided and if the review authority approves the reduction based on the justification. Overflow parking areas may utilize alternative parking surfaces which facilitate water absorption rather than runoff when approved for use by the review authority. This requirement usually applies to a percentage of the parking spaces, not all of them.

Exception: Accessible parking spaces shall be hard surface.

453.10.2.8 Minimum Parking Requirements**453.10.2.8.1 Faculty and Staff**

One space for each member.

453.10.2.8.2 Visitors

One space for every 100 students.

453.10.2.8.3 Community Clinics Where Provided

Ten spaces, including one accessible space.

453.10.2.8.4 High Schools

One space for every 10 students in grades 11 and 12.

453.10.2.8.5 Vocational Schools

One space for every two students.

453.10.2.8.6 Florida Colleges

One space for every two students.

453.10.2.8.7 Accessible Parking

Parking spaces designated for persons with disabilities shall comply with the ADA, *Florida Building Code, Accessibility*, and Section 316.1955, *Florida Statutes*.

453.10.3 Site Lighting Required

Design, construction, and installation of exterior security lighting for educational and ancillary facilities shall be provided for:

453.10.3.1 Auto, Bus, and Service Drives and Loading Areas

453.10.3.2 Parking Areas

453.10.3.3 Building Perimeter

453.10.3.4 Covered and Connector Walks Between Buildings and Between Buildings and Parking

453.10.3.5 Lighting for Parking Areas

Parking area lighting standards shall be designed to withstand appropriate wind loads. Parking areas shall be illuminated to an average maintained horizontal footcandle, measured at the surface as follows:

453.10.3.5.1

Parking areas—1 footcandle (10 lux).

453.10.3.5.2

Covered and connector walks—1 footcandle (10 lux).

453.10.3.5.3

Entrances/exits—2 footcandles (20 lux).

453.10.3.6 Building Exteriors

Building exteriors, perimeters, and entrances may be illuminated to the minimum number of footcandles, measured at the surface with a suggested uniformity ratio of 2:1 as follows:

453.10.3.6.1

Entrances—5 footcandles (50 lux).

453.10.3.6.2

Building surrounds—1 footcandle (10 lux).

453.10.3.7 Shielding

Exterior lighting shall be shielded from adjacent properties for all exterior lighting equipment as described in Sections 453.10.3.7.1 and 453.10.3.7.2.

Exception: Lighting used for the following exterior applications is exempt where equipped with a control device independent of the control of the nonexempt lighting:

1. Specialized signal, directional and marker lighting associated with transportation.
2. Advertising signage or directional signage.
3. Lighting integral to equipment or instrumentation and installed by its manufacturer.
4. Theatrical purposes, including performance, stage, film production and video production.

5. Temporary lighting.
6. Roadway lighting required by governmental authorities.
7. Lighting used to highlight features of public monuments and registered landmark structures.
8. Lighting classified for and used in hazardous areas.
9. Lighting for swimming pools, spas and water features.
10. Lighting for the national flag in light pollution zones B, C and D.

TABLE 453.10.3.7(1)**LIGHT POLLUTION ZONES**

LIGHT POLLUTION ZONE	DESCRIPTION
A	Rural and low-density residential areas such as, but not limited to: agricultural districts, one- and two-family residential communities, business parks, rural town centers, commercial or industrial areas with limited nighttime activity and the developed areas within parks and open space preserves
B	Light commercial business districts and high-density or mixed-use residential districts such as, but not limited to: neighborhood business districts, light industrial areas with moderate nighttime activity, multifamily residential uses, institutional residential uses, hospitals, hotels, motels, churches, schools and neighborhood recreation facilities
C	High-density commercial business districts, and heavy industrial or manufacturing areas such as, but not limited to: business districts in large cities, commercial corridors, high-density suburban commercial areas, town center mixed-use areas, industrial uses and shipping and rail yards with high nighttime activity, high-use recreation facilities, regional shopping malls, car dealerships, gas stations and other exterior retail areas with high nighttime activity
D	Areas such as, but not limited to: high-density entertainment districts and heavy industrial areas, where approved by the code official

TABLE 453.10.3.7(2)**MAXIMUM ALLOWABLE BACKLIGHT RATINGS^{a, b, c}**

HORIZONTAL DISTANCE TO LIGHTING BOUNDARY (HLB)	LIGHT POLLUTION ZONE (LPZ)			
	A	B	C	D
$H_{LB} > 2h_m$	B3	B4	B5	B5
$h_m < H_{LB} \leq 2h_m$	B2	B3	B4	B4
$0.5h_m \leq H_{LB} \leq h_m$	B1	B2	B3	B3
$H_{LB} < 0.5h_m$	B0	B0	B1	B2

h_m = Mounting Height: The distance above finished grade at which a luminaire is mounted, measured to the midpoint of the luminaire.

- a. Backlight (B) ratings are defined by ANSI/IESNA TM-15-11 Addendum A.
- b. Luminaires located two mounting heights or less from the lighting boundary shall be installed with backlight towards the nearest lighting boundary, unless lighting a roadway, bikeway or walkway that intersects a public roadway.
- c. The rating shall be determined by the actual photometric geometry in the specified mounting orientation.

453.10.3.7.1 Light Pollution Zones

The light pollution zone for the building site shall be determined from Table 453.10.3.7(1) unless otherwise specified by the authority having jurisdiction.

453.10.3.7.2 Light Trespass

Exterior luminaires shall not exceed the applicable backlight ratings specified in Table 453.10.3.7(2).

453.10.4 Building Setbacks

Building setbacks from the property line, including relocatables, shall, at a minimum, be 25 feet (7620 mm) or shall comply with local setback requirements if less than 25 feet (7620 mm).

453.10.5 School Board Playgrounds, Equipment, and Athletic Fields

Playgrounds, equipment, and athletic fields shall be accessible, compatible with the educational facility served and shall comply with the following:

453.10.5.1

Kindergarten play areas shall be separated from other play areas, fenced, and shall be directly accessed from the kindergarten classrooms.

453.10.5.2

Direct access from the school buildings shall be provided to play areas and athletic fields without crossing public roads, on-site traffic lanes, and parking lots.

453.10.5.3

Related facilities such as toilets, concessions, storage, shower and locker rooms, bleachers, press boxes, observation platforms, scoreboards, and dugouts shall be designed to meet code requirements and the occupant capacity anticipated for the program.

453.10.6 Exterior Signage

All permanent and free-standing exterior signs shall be designed to withstand appropriate wind loads. Illuminated signs shall comply with the electrical and installation requirements of the *Florida Building Code* the *Florida Fire Prevention Code* as adopted by the State Fire Marshal and ICC 500, as appropriate.

453.10.6.1

Site signage shall not create visual barriers at entrances, sidewalks, roads or road intersections.

453.10.6.2

Accessible routes, including parking, building directories, building identification, and accessible entrances shall be marked by exterior signage in conformance with federal and state accessibility laws.

453.10.7 Landscaping

Refer to Section 1013.64(5), *Florida Statutes*, for school board and Florida college requirements. Florida-friendly landscaping is defined in Section 373.185, *Florida Statutes*.

453.10.8 Water Irrigation Systems

Water irrigation systems shall be equipped with soil moisture sensors that will override the irrigation systems cycle when soil contains

sufficient moisture.

453.10.9 School Site Master Plan

New schools shall include, as applicable: facility design capacity; flood plain locations; covered accessible walks; infrastructure locations for, and extensions of, technology, telephone, electricity, fire alarm; and, where applicable, water and sewer utilities, and relocatables.

453.11 Wood: Fire-Retardant-Treated Wood (FRTW)

FRTW shall not be used in permanent educational facilities.

Exception: Only FRTW which does not contain ammonium phosphates, sulfates, or halides, may be used in roof structures of noncombustible Type II ancillary facilities as allowed by the *Florida Building Code* but only under the following conditions:

453.11.1 FRTW

All FRTW must meet the requirements of Section 2303.2.

453.11.2

Inspection access panels shall be provided for annual inspection of the condition of the structure and the connectors.

453.11.3

Evidence of compliance shall be provided.

453.12 Roofing

453.12.1 Class A Materials

All roofing materials shall be labeled Class A per ASTM E108 and shall be certified by a nationally recognized independent testing laboratory. All roofing systems shall be installed within the limitations of the test procedure for surfacing, deck cross slope, and combustibility.

453.12.2 Insulation and Moisture Protection

Insulation, moisture protection, roofing, thermal requirements, fireproofing and firestopping shall be designed and constructed in compliance with the *Florida Building Code* and *Florida Fire Prevention Code* as adopted by the State Fire Marshal. Cellulose insulation may only be used if it is treated with fire-retardant borate based chemicals; the contractor shall retain bag labels on site for review by building inspector.

453.12.3 Phased Installation Prohibited

All new installed materials shall be sealed from moisture penetration at the end of each day. The contractor shall provide the architect/engineer (A/E) of record a "final statement of compliance" for the board.

453.12.4 Manufacturer's One-Year Inspection

The roof shall be inspected by the manufacturer's representative within one year of acceptance by the board.

453.12.5 Exterior Stairways

Exterior stairways serving as a means of egress shall be roofed.

453.13 Doors and Windows

453.13.1 Doors

All spaces with an occupant load of six or more students, regardless of use, shall have a door opening directly to the exterior, or as required in the *Florida Fire Prevention Code* as adopted by the State Fire Marshal, in buildings of three stories or less shall have a rescue window opening directly to the exterior, or shall be fully sprinklered. All doors and gates from spaces with an occupant load of six or more students, regardless of use or location, shall swing in the direction of exit travel, shall be of the side-hinged type, and shall always be operable from the inside by a single operation and without a key.

453.13.1.1

Doors for steam rooms, locker rooms, shower rooms and group toilet rooms shall swing in the direction of exit travel, and shall

always be operable for exiting from the inside.

453.13.1.2

No mirrors, draperies, curtains, equipment, furnishings, decorations, or other objects which may confuse, obstruct, or conceal the exit or the direction of exit shall be placed to obstruct a means of egress.

453.13.2 Recessed

Doors when fully opened shall not extend into the required exit width of corridors, except for door thickness and required hardware. Doors may either be recessed and hinged to swing 90 degrees, or if flush with corridor wall shall contain a view panel and be hinged to swing 180 degrees.

453.13.3 Special Function Doors

Special function doors, including balanced doors and overhead doors, shall not be used in a means of egress.

453.13.4 Overhead and Sliding Security Grilles

Security grilles shall have an adjacent side-hinged door swinging in the direction of exit and readily opened from the inside.

453.13.5 Gates

Gates used to secure buildings or used for egress shall be side-hinged and readily opened from the side from which egress is to be made without the use of a key or special tool, or shall have an adjacent side-hinged door, or doors as required for occupant load, swinging in the direction of exit and readily opened from the inside without a key.

453.13.6 Hardware

Doors and gates shall be equipped with hardware which will allow egress at all times without assistance. No padlock, chain, hasp, lock, deadbolt, or other device shall be installed at any time on any door used for exiting. Doors which by code require closers and other doors subject to wind exposure shall be equipped with closers to prevent slamming and uncontrolled opening. All doors opening into smoke-tight exit access corridors shall be self-closing or automatic closing. Smoke doors in walls used to divide corridors into separate atmospheres shall be provided with push-pull plates and are not required to have positive latching. As an exception to Section 1010.2.13, delayed egress locks may be used in media centers, alternative education centers, and exceptional student education centers.

453.13.7 Safety Glazing: Panels and Storefronts

In addition to the requirements of Section 2406.4, the following is considered a hazardous location and requires safety glazing: glazed panels within 48 inches (1219 mm) of a door, excluding transoms or vertical panels above 6 feet 8 inches (2031 mm).

453.13.7.1

All glazing in hazardous locations shall be safety glazing meeting the requirements of the *Florida Building Code, Building*, Section 2406.

453.13.7.2

Large glass panels shall be subdivided by a built-in horizontal member or a permanent chair rail not less than 1 $\frac{1}{2}$ inches (38 mm) in width, located between 24 and 36 inches (610 and 914 mm) above the floor.

453.13.8 Windows

453.13.8.1 Natural Light and Ventilation

Natural light and ventilation requirements for new construction shall be satisfied by windows with operable glazing, providing a net free open area equivalent to 5 percent of the floor area, in all classrooms on the perimeter of buildings, where required by Chapter 1013, *Florida Statutes*. Auxiliary spaces, music rooms, gyms, locker and shower facilities, laboratories requiring special climate control, and large group instructional spaces having a capacity of more than 100 persons need not have operable windows for the purpose of providing natural light and ventilation. Emergency access, emergency rescue, and secondary means of egress windows maybe included in the calculation to comply with this requirement.

453.13.8.2 Projecting and Awning Windows

Projecting and awning windows shall not be located below door head height if in, or adjacent to, a play area, a corridor or walkway.

453.13.8.3 Security/Storm Screens or Grilles

If a security/storm screen or grille is installed on the outside of an emergency access, rescue or egress window assembly then that security/storm screen or grille together with the emergency rescue window assembly shall be operable from the inside by a single operation without the use of tools to allow for exit under emergency conditions. The emergency rescue window shall be identified by signage, and the release device shall be readily identifiable.

453.14 Special Safety Requirements

453.14.1 Master Control Switch

In addition to the regular main supply cut-off, each laboratory-type space (such as biology, industrial, chemistry, physics, home economics, and electronics labs) equipped with unprotected gas cocks, compressed air valves, water or electric services which are easily accessible to students, shall have master control valves or switches with permanently attached handles, located and accessible within 15 feet (4572 mm) of the instructor's station or adjacent to the primary egress door within that space to allow for emergency cut-off of services. The cut-offs shall be in a nonlockable place and the location and operation shall be clearly labeled. Valves shall completely shut off with a one-quarter turn. Computer labs are exempted from this requirement. (Also, see "Emergency shut off switches," and "Emergency disconnects" requirements under "Electrical.")

453.14.2 Interior Signage

Signage is required in educational and ancillary facilities. Design, construction, installation, and location of interior signage and graphics shall comply with the *Florida Building Code* and the *Florida Fire Prevention Code* as adopted by the State Fire Marshal and the following:

453.14.2.1 Emergency Rescue Windows

Windows for emergency rescue shall comply with NFPA 101 as adopted by the *Florida Fire Prevention Code*, shall be operable from the inside by a single operation, and shall be labeled "EMERGENCY RESCUE—KEEP AREA CLEAR." Hinged emergency rescue windows shall swing in the direction of egress.

453.14.2.2

Maximum capacity signs in each space with a capacity of 50 or more occupants. The signs shall be mounted adjacent to the main entrance door.

453.14.2.3

Room name, room number and, if different, FISH inventory numbers shall be provided for each space.

453.14.2.4

A graphic diagram of primary and emergency evacuation routes shall be posted adjacent to the primary exit door from each space occupied by six or more students. The diagram shall clearly indicate, by contrasting color and number, each route of evacuation.

453.14.2.5

Signs necessary to meet accessibility requirements shall be provided.

453.14.2.6

Hazardous work and storage areas shall be identified by appropriate caution signs.

453.14.3 Other Potential Hazards

Pipes, ductwork, fans, light fixtures, window projections, protruding sharp corners, or other potential hazards shall not be installed below 6 feet 8 inches (2031 mm) AFF. Audio/visual aids in classrooms may be mounted below 6 feet 8 inches (2031 mm) provided they are marked and padded in accordance with accepted safety standards or have permanent cabinets installed below them.

453.14.4 Storage Shelving

Shelving shall not have sharp corners, splinters, or any construction feature that would be hazardous to the occupants. Shelving shall be constructed to carry the loads imposed. Shelving in science labs, shop storage rooms, and other places which may contain hazardous materials shall have a $\frac{1}{2}$ inch (12.7 mm) lip on the front edge of each shelf and shall be constructed of noncorrosive material.

453.14.5 Vertical Platform Lifts and Inclined Wheelchair Lifts

The following standards are in addition to the other requirements of the *Florida Building Code* Florida law, and federal requirements:

453.14.5.1

Lifts shall not reduce the width of required means of egress.

453.14.5.2

Lifts shall have shielding devices to protect users from the machinery or other hazards and obstructions.

453.14.5.3

Lifts shall be key operated for attendant operation in all facilities housing kindergarten to grade 8.

453.14.5.4

Inclined wheelchair lifts may be installed in facilities provided:

453.14.5.4.1

The platform is equipped with bidirectional ramp sensing to stop travel if obstructions are encountered.

453.14.5.4.2

Guide rails are smooth and continuous with no sharp edges or obstructions, all drive system components contain safety features for protection of users, and cables and pulling devices are shielded.

453.14.6 Color Code Machinery

Working machinery with component parts shall be color-coded in accordance with ANSI Z535.1, *American National Standard Safety Color Code for Marking Physical Hazards*. Safety zone lines shall be marked on the floor areas surrounding working machinery.

453.14.7 Anchor Equipment

All equipment designed to be permanently mounted shall be securely anchored to its supporting surface.

453.14.8 Interior Finishes**453.14.8.1 Floors**

Floors in instructional spaces shall be covered with resilient material or carpet.

453.15 Mechanical**453.15.1 Gas and Fluid Piping****453.15.1.1 Flammable Liquids/Gases**

Piping systems for flammable liquids or gases shall not be installed in interior corridors or stairwells.

Exception: Piping may be located within corridors provided that they are enclosed in a minimum 1-hour fire-rated enclosure.

453.15.1.2 Piping Systems

Piping (fluid system) shall not be run where students can access the pipes, or in areas such as on roofs where they can be damaged by routine or periodic maintenance activities.

453.15.1.3 Main Supply Valve

The main supply cutoffs for flammable liquids or gases shall shut down upon activation of the fire alarm system. Refer to the automatic shutoff requirements of Section 453.7.6.

453.15.2 Air Plenums

Corridors shall not be used as a supply, return, exhaust, relief, or ventilation air plenum. The space between the corridor ceiling and the floor or roof structure above, if used as a plenum, shall be constructed with the ceiling, floor and walls as a minimum 1-hour fire-rated assembly or as a 1-hour fire-rated horizontal wall supported by the corridor walls.

Exception: A smoke-tight corridor with a solid ceiling may be used in a fully sprinklered building.

453.15.3 Residential Equipment

In home economics instructional spaces, faculty lounges, and similar areas where small residential-type ranges are installed for staff use or student education, residential-type hoods mechanically exhausted to the outside shall be used. Hood fire suppression systems are not required to be installed. A fire extinguisher shall be located within 15 feet (457 mm) of the range within the same room, and shall meet the type and size requirements of NFPA 10.

453.15.4

Reserved.

453.15.5 Ventilation Air Make-Up for HVAC Systems

The minimum outdoor airflow rate shall be determined in accordance with Section 403.3.1.1, *Florida Building Code, Mechanical*. Ventilation supply systems shall be designed to deliver the required rate of outdoor airflow to the breathing zone within each occupiable space. In accordance with Section 401.3, *Florida Building Code, Mechanical*, this ventilation shall be provided during the periods that the room or space is occupied.

Exceptions:

1. Where the registered design professional demonstrates that an engineered ventilation system design will prevent the maximum concentration of contaminants from exceeding that obtainable by the rate of outdoor air ventilation determined in accordance with Section 403.3.1.1, *Florida Building Code, Mechanical*, the minimum required rate of outdoor air shall be reduced in accordance with such engineered system design. In accordance with Section 401.3, *Florida Building Code, Mechanical*, this ventilation shall be provided during the periods that the room or space is occupied.
2. Where peak occupancies of less than 3 hours duration occur, the outdoor air flow may be determined on the basis of average occupancy for school buildings for the duration of operation of the air-conditioning system, provided the average occupancy used is not less than one-half the maximum.

453.16 Plumbing**453.16.1 Standards**

Educational and ancillary facilities shall be provided with toilets, hand washing facilities, and drinking fountains for all occupants, in ratios and accessible as required by the *Florida Building Code*, Florida law, and federal requirements.

453.16.1.1 Assembly Occupancies

Toilet facilities for assembly occupancies (i.e. media centers, gymnasiums, cafeterias, and auditoriums) are not required to be in addition to the overall required plumbing fixture count.

453.16.1.2 Location

Student toilets shall be distributed throughout the facility and located on each floor for convenient access and continuous supervision. The path of travel to the nearest toilet facility shall not exceed a distance of 200 feet (60 960 mm).

453.16.2 Public Shelter

Refer to the public shelter design criteria of Section 453.25.

453.16.3

Reserved.

453.16.4

Reserved.

453.16.5 Exterior Entries

Exterior entries to toilet rooms shall have outward swinging doors.

453.16.6

Reserved.

453.16.7 Delayed Closing Valves

Water supply at toilet room lavatories shall be controlled by delayed-closing valves.

453.16.8 Shower Facilities

Showers shall be provided only where required by the district's educational program and, where provided, shall utilize energy saving concepts for hot water as required by Section 1013.44(2), *Florida Statutes*. When provided, shower areas shall comply with the following:

453.16.8.1

Floor finish shall be slip resistant.

453.16.8.2

A master control valve shall be provided to control the shower heads. Showers shall be equipped with flow control devices to limit total flow to a maximum of 3 gpm (0.19 L/s) per shower head.

453.16.9 Kitchens

Kitchens and food service areas shall be provided with toilet and hand washing facilities for employees as required by code, state rule and statute.

453.16.9.1

A minimum of one water closet and one lavatory with hot and cold water shall be provided in each staff toilet.

453.16.10 Dousing Shower and Eye Wash

Every science lab, or shop shall be provided with a dousing shower and eye wash for emergency use, including a floor drain.

453.17 Electrical

453.17.1 Emergency Lighting

Emergency lighting shall be provided at internal and external means of egress, in student-occupied areas, in group toilets, and main electrical rooms.

453.17.2 Electrical Rooms and Closets

Main service panels and switches, electrical distribution panels, cabinets, and rooms shall be lockable and not readily accessible to teachers or students.

453.17.3 Spare Capacity

Lighting and power panels shall be provided with a minimum of 20-percent spare breakers and a minimum of 10-percent spare capacity in all main panels and switchboards.

453.17.4 Emergency Shutoff Switches

Every laboratory space which has electrical receptacles at student workstations shall have an emergency shutoff switch within 15 feet (4572 mm) of the instructor's workstation. The emergency shutoff switch shall be operable by a single motion and shall interrupt power to all receptacles in the room.

Exception: Emergency shutoff switches are not required in computer laboratories.

453.17.5 Emergency Disconnect

Each space equipped with electrically powered machinery accessible to students shall have a minimum of two master emergency disconnect switches at convenient locations within the space to shut off all power tool outlets, power to student accessible machines and receptacles in the shop. One emergency shutoff or disconnect switch shall be located near the machinery and one emergency shutoff or disconnect switch shall be located in the instructor's office if there is a clear view of the entire shop area, others may be required and located as determined by the authority having jurisdiction. The emergency disconnect or shutoff switch shall be operable by a single motion.

Exception: Ordinary office machines, computers, sewing machines, potter's wheels, residential cooking equipment in home economics labs and other nonhazardous machines do not require emergency disconnect devices.

453.17.6 Sauna and Steam Rooms

A "panic" switch to deactivate power to heating equipment shall be provided inside sauna and steam rooms. The panic switch shall also be tied into an alarm or other approved warning device in a supervised space in the area of the sauna and/or steam room. The operation of the switch shall be labeled to indicate the intended function.

453.17.7 Lightning

All facilities in high lightning risk areas shall be evaluated using the Risk Assessment Guide in NFPA 780 and other standards which address lightning protection, and shall be protected accordingly.

453.17.8 Ground-Fault Circuit-Interrupter (GFCI) Protection for Personnel

GFCI protection of receptacles shall be provided in accordance with NFPA 70, National Electrical Code and in the following locations:

1. All elementary special needs, prekindergarten and kindergarten classroom receptacles.
2. All building entry vestibule receptacles.
3. All mechanical, boiler and electrical room receptacles.

453.18 Assembly Occupancies in Public Educational Facilities

453.18.1

Occupant capacity for egress shall be in accordance with Table 1004.5 except as follows:

453.18.1.1 Dressing Rooms

Dressing rooms at 20 net square feet (1.86 m^2) per person.

453.18.1.2 Gymnasium

The number of fixed and telescopic bench-type bleacher seats —plus the main court area at 15 gross square feet (1.4 m^2) per person, plus locker rooms at 5 net square feet (0.5 m^2) per person.

453.18.1.3 Classrooms and Labs

If spaces are combined through the use of folding partitions, the capacity and exiting shall be based on the capacity of all the spaces joined.

453.18.1.4 Small Group Areas in Media Centers

Small group room or area (view and preview) in media centers at 5 net square feet (0.5 m^2) per person.

453.18.1.5 Closed Circuit Television Production, Distribution, and Control

The main floor area at 15 net square feet (1.4 m^2) per person.

453.18.1.6 Enclosed Courtyards

The enclosed courtyard area at 15 gross square feet (1.4 m^2) per person. Raised, dedicated landscape areas may be deducted.

453.19 Shade and Green Houses

453.19.1 General

Shade/green houses shall be of Type I or II construction (metal frame) capable of withstanding the appropriate wind load.

453.19.2 Unrestricted Exiting

The location of the shade/green house shall not hinder exiting from new and/or existing structures.

453.19.3 Required Doors

A minimum of two doors remotely located shall be provided. Doors shall be side hinged and shall swing in the direction of egress.

453.19.4 Accessibility

Green houses shall meet accessibility requirements. The accessible walkway shall be connected to doors leading to an accessible route to the permanent structure.

453.19.5 Shade Cloth

Shade cloth shall be tear-away fabric securely fastened to the structural frame.

453.19.6 Fire Extinguisher

A minimum of one Type 2A-10B:C fire extinguisher shall be provided per shade/green house.

453.19.7 Fire Alarm

Fire alarm pull stations shall be located within 200 feet (60 960 mm) of any shade or green house. Fire alarm notification appliances mounted on a permanent building must be audible inside the shade/green house.

453.19.8 Space Heaters

Space heaters, when provided, shall be mounted at least 6 feet 8 inches (2031 mm) AFF.

453.20 Storage

453.20.1 General Storage

Storage rooms and closets shall not be located over or under exit stairs and ramps whether interior or exterior. General storage space(s) shall be included in every educational facility for the bulk storage of materials, supplies, equipment, and books. Storage rooms shall be separated from mechanical and electrical spaces. Storage spaces shall be mechanically ventilated and conditioned as appropriate for the type of materials to be stored. Sinks located in general storage rooms shall not be used for custodial services.

453.20.2 Custodial Work Areas and Storage

Provide custodial work areas with well supported shelving for supplies, cleaning, and sanitation materials and an office area including male/female lockers and toilet facilities.

453.20.3 Custodial Closets and Storage

Custodial closets shall be provided with storage shelving and a service sink supplied with both hot and cold water. They shall be located to serve each instructional floor and wing regardless of floor area, and other areas such as stage, kitchen, gym, auditorium, clinic, offices and shops. The travel distance to the nearest custodial closet shall not exceed 150 feet (45.72 m).

453.20.4 Chemical and Hazardous Materials Storage

In addition to the requirements of the *Florida Building Code* and the *Florida Fire Prevention Code* as adopted by the State Fire Marshal for separation and protection, chemical and hazardous storage facilities shall also include:

453.20.4.1 Chemical Storage

Doors shall be lockable from the outside and operable at all times from the inside. Rooms shall be well illuminated. Cabinets shall have shelves with a $\frac{1}{2}$ inch (12.7 mm) lip on the front and shall be constructed of noncorrosive material.

453.20.4.2 Hazardous Materials Storage

Buildings and/or rooms used for the storage, handling and disposal of flammable, poisonous, or hazardous materials or liquids, and equipment powered by internal combustion engines and their fuels shall be separated from adjacent spaces by 1-hour fire-rated assemblies. These requirements also apply to completely detached buildings within 60 feet (18 288 mm) of student-occupied facilities. Doors shall have a C Label and open directly to the exterior. Storage buildings and/or rooms shall be mechanically ventilated. Electrical fixtures, switches, heat detectors and outlets installed in flammable storage rooms shall be explosion proof.

453.20.5 Custodial Receiving

Custodial receiving where chemicals that are dangerous to human tissue are stored, handled, or mixed shall be equipped with a dousing shower and eye wash, including a floor drain.

453.21 Child Care/Day Care/Prekindergarten Facilities

453.21.1

Child care/day care/prekindergarten facilities located on board-owned property shall comply with the *Florida Building Code* and the *Florida Fire Prevention Code* as adopted by the State Fire Marshal and the specific criteria in this section. Child care/day care/prekindergarten facilities requiring a license from another agency may also be required to comply with additional construction requirements imposed by that agency.

453.21.2

Toilet facilities shall meet accessibility requirements and should open into the instructional space. The toilet may be used by both sexes and shall contain a water closet, lavatory and related accessories.

453.21.3

If child care facilities are provided with a bathing area, it shall be within or adjacent to the child care area and shall contain either a shower with hand-held sprayer or a tub. The water temperature shall be controlled by a mixing valve and shall not exceed 110°F (43°C).

453.21.4

Toilet facilities shall have a nonslip impervious floor and 6-foot (1829 mm) impervious wainscot.

453.21.5

Drinking fountain(s) shall be provided for the children and be within close proximity of the child care facility.

453.21.6

A towel and soap dispenser shall be provided at each sink. Hand wash areas for adults shall be provided with warm water; the water temperature shall be controlled by a mixing valve and shall not exceed 110°F (43°C). All electrical receptacles shall be placed out of reach of the children.

453.21.7

When provided, a residential-type kitchen shall include a nonslip floor, a refrigerator, a residential range, a residential-type range hood mechanically exhausted to the outside, and a fire extinguisher located within 15 feet (457 mm) of the range within the same room.

453.21.8

Areas designated for children's sleeping mats, cots or cribs shall include a clearly marked exit passageway.

453.21.9

The child care facility shall not contain any storage of cleaning agents, chemicals, or other hazardous materials in student accessible areas.

453.21.10

Outdoor play areas shall be provided and shall be protected from access to streets or other dangers. The play area shall be fenced or walled to a minimum height of 4 feet (1219 mm) and any latches on maintenance gates shall be secured or beyond the reach of the children.

453.21.11

Shade shall be provided in the play area (a covered play area may be provided).

453.21.12

Play equipment shall be firmly anchored, free of sharp corners or pointed surfaces, and shall have cushioning surfaces such as mats or sand beneath.

453.21.13

The grounds shall be free of undergrowth or harmful plant material.

453.22 Clinics**453.22.1**

Clinics in kindergarten through grade 12 (K—12), vocational-technical centers (VTC), and full service schools shall comply with the general criteria found in the *Florida Building Code* and the *Florida Fire Prevention Code* as adopted by the State Fire Marshal, as well as the specific criteria found herein. Clinics shall be located and equipped to provide emergency aid to students. Closets and storage cabinets used for medications and bandages shall have locks, and shall be designed to be under constant supervision.

453.22.2

School clinics shall include locked storage, toilet room and shower, and bed space.

453.22.3

Sanitary facilities are required as follows:

453.22.3.1

Elementary school clinics, including kindergarten, shall include at a minimum one accessible toilet room, to serve male and female students, complete with a water closet, lavatory, accessible shower, changing table, and accessories.

453.22.3.2

Secondary and VTC school clinics shall include two accessible toilet rooms complete with water closet, lavatory, accessories and shower.

453.22.3.3

Toilet rooms in clinics shall include both hot and cold water at the showers and all lavatories. The water temperature shall be controlled by a mixing valve and shall not exceed 110°F (43°C).

453.22.3.4

Toilet rooms shall have exhaust fans vented to the exterior.

453.22.3.5

A working counter top with lavatory/sink and hot water shall be provided in each clinic.

453.22.4

The bed area shall be designed to maintain constant visual supervision from the office. Space for student beds shall be provided in each clinic at 50 square feet (4.6 m^2) per bed. Space for beds in secondary and VTC schools shall be equally divided for male and female students. Beds shall be provided based on student capacity in the following ratios:

453.22.4.1

Up to 500 students—three beds.

453.22.4.2

501 to 1,000 students—four beds.

453.22.4.3

1,001 to 2,000 students—five beds.

453.22.4.4

Over 2,000—six beds.

453.22.5 Full-Service School Health Clinics**453.22.5.1 Location**

Clinics shall be located to provide a direct accessible route from the exterior and from the interior or by a connecting covered walk.

453.22.5.2 Parking

Clinics shall be provided with 10 designated parking spaces immediately adjacent to the clinic, one of which shall be accessible to persons with disabilities.

453.22.5.3 Sanitary Facilities

Sanitary facilities are required as follows:

453.22.5.3.1

Full-service school clinics shall include one accessible toilet room for males and one for females or at least two accessible single-user unisex toilet rooms, complete with water closet, lavatory, accessories, and shower. Additional toilets may be required for a full-service school clinic depending on occupant load and program.

453.22.5.3.2

Hot and cold water shall be provided at the showers and lavatories. The water temperature shall be controlled by a mixing valve and shall not exceed 110°F (43°C).

453.22.5.3.3

Toilet rooms shall have exhaust fans vented to the exterior.

453.22.5.3.4

A nurses' station shall be provided with a working counter with lavatory/sink and be located so as to maintain visual supervision of the bed area.

453.22.5.4

Locked storage rooms shall be provided for a refrigerator, files, equipment, and supplies.

453.22.5.5

Data outlets shall be provided for computer hook-ups and computer networking and additional electric outlets shall be provided for hearing and vision testing machines.

453.23 Kilns

Kilns shall not be located near or adjacent to paths of egress or exit and shall be placed in separate rooms when serving students through grade 3. Kiln rooms shall be provided with appropriate smoke/heat detectors connected to the fire alarm system.

453.24 Open Plan Schools

An open plan building or portion of a building may be subdivided into smaller areas by use of low partitions [maximum 5 feet high (1524 mm)], movable partitions, or movable furnishings, which by location and type do not hinder or obstruct the ability of persons in one area of the plan to be immediately aware of an emergency condition in any other area of the plan. Corridors shall be identified with different color or type of flooring materials, by permanent low partitions or by other means to prevent blockage of the path of egress to exits by partitions or furniture. When open plan schools are partitioned, the work shall conform to the code requirements for new construction.

Demountable or movable partitions in open plan classroom areas shall be a maximum of 5 feet (1524 mm) in height and shall terminate a minimum of 5 feet (1524 mm) from any permanent wall. All circulation openings in open plan areas shall be a minimum of 5 feet (1524 mm) wide. Movable furnishings shall not exceed 5 feet (1524 mm) in height and shall have a stable base.

453.25 Public Shelter Design Criteria

453.25.1 New Facilities

New educational facilities for school boards and Florida college boards, unless specifically exempted by the board with the written concurrence of the applicable local emergency management agency or the Florida Division of Emergency Management (DEM), shall have appropriate areas designed as enhanced hurricane protection areas (EHPAs) in compliance with this section.

Exception: Facilities located, or proposed to be located, in a Category A, B or C evacuation zone shall not be subject to these requirements.

453.25.1.1 Enhanced Hurricane Protection Areas (EHPAs)

The EHPAs shall provide emergency shelter and protection for people for a minimum period of 24 hours during a hurricane.

453.25.1.1.1

The EHPA criteria applies only to the specific portions of (K—12) and Florida college educational facilities that are designated as EHPAs.

453.25.1.2

The EHPAs and related spaces shall serve the primary educational or auxiliary use during nonshelter occupancy.

453.25.2 Site

Factors such as low evacuation demand, size, location, accessibility and storm surge may be considered by the board, with written concurrence of the local emergency management agency or the DEM, in exempting a particular facility.

453.25.2.1 Emergency Access

EHPAs shall have at least one route for emergency vehicle access. The emergency route shall be above the 100-year flood plain. This requirement may be waived by the board, with concurrence of the local emergency management agency or the DEM.

453.25.2.2 Landscaping

Landscaping around the EHPAs shall be designed to preserve safety and emergency access. Trees shall not conflict with the functioning of overhead or underground utility lines, or cause laydown or impact hazard to the building envelope.

453.25.2.3 Parking

During an emergency condition, vehicle parking shall be prohibited within 50 feet (15 240 mm) of an EHPA. Designated EHPA parking areas may be unpaved.

453.25.2.4 Signage

Floor plans of the facility, indicating EHPAs, shall be mounted in the emergency manager's office/area.

453.25.3 Design

EHPAs may be above or below ground and may have more than one story, provided the design satisfies the wind load and missile impact criteria. Modular and open-plan buildings may serve as EHPAs provided the design satisfies the wind load and missile impact criteria.

453.25.3.1 Excluded Spaces

Spaces such as mechanical and electrical rooms, storage rooms, open corridors, kitchens, science rooms and labs, vocational shop areas and labs, computer rooms and labs, attic and crawl spaces shall be excluded from EHPA capacity calculations.

453.25.3.2 Capacity

Fifty percent of the net square feet of a designated educational facility shall be constructed as EHPAs. The net square feet shall be determined by subtracting from the gross square feet those spaces, such as mechanical and electrical rooms, storage rooms, open corridors, kitchens, science rooms and labs, vocational shop areas and labs, computer rooms, attic and crawl spaces, that shall be excluded from EHPA capacity calculations. The board, with concurrence of the applicable local emergency management agency or DEM, may adjust this requirement if it is determined to be in its best interest. The capacity of an EHPA shall be calculated at 20 square feet (1.86 m^2) per occupant (adults and children five years or older). The capacity of a special needs EHPA shall be calculated at 60 square feet (5.57 m^2) per occupant (adults and children five years or older).

453.25.3.3 Toilets

Toilet and hand-washing facilities should be located within the EHPAs and provided at one toilet and one sink per 40 occupants. These required toilet and hand-washing facilities are not in addition to those required for normal school occupancy and shall be included in the overall facility fixture count.

453.25.3.3.1

Support systems for the toilets, e.g., bladders, portable toilets, water storage tanks, etc., shall be capable of supplying water and containing waste, for the designed capacity of the EHPAs.

453.25.3.3.2

Plumbing and valve systems of "normal" toilets within the EHPAs may be designed for conversion to emergency operation to meet the required demand.

453.25.3.4 Food Service

Where feasible, include counter tops for food distribution functions in the EHPAs.

453.25.3.5 Manager's Office

An administration office normally used by a school administrator shall be identified as the EHPA manager's office and shall be located within the EHPA. The office shall have provisions for standby power, lighting, communications, main fire alarm control panel and storage for the manager's equipment.

453.25.4 Structural Standard for Wind Loads

At a minimum, EHPAs shall be designed for hurricane wind loads in accordance with ICC 500.

453.25.4.1 Enclosure Classifications

Enclosure classifications for EHPAs shall be determined in accordance with ASCE 7, Section 26.2.

453.25.4.2 Mechanical Ventilation

EHPAs shall have mechanical ventilation systems. Ventilation shall be provided at a minimum rate of 2 cfm per square foot (0.6 m³/min. per square meter) of EHPA floor area. The mechanical ventilation system shall be connected to the EHPA's emergency power.

453.25.4.3 Exterior Envelope

The exterior envelope, louvers over air intakes and vents, and gooseneck-type intakes and vents of EHPAs shall be designed and installed to meet the wind load and missile impact criteria in accordance with ICC 500.

453.25.4.3.1

HVAC equipment mounted on roofs and anchoring systems shall be designed and installed to meet the wind load criteria.

453.25.4.3.2

Roof-mounted HVAC equipment shall have a 12-inch-high (305 mm) curb around the roof opening and be designed to prevent the entry of rain water.

Exception: Exposed mechanical equipment or appliances fastened to a roof or installed on the ground in compliance with the code using rated stands, platforms, curbs, slabs, walls, or other means are deemed to comply with the wind-resistance requirements of the 2007 *Florida Building Code* as amended. Further support or enclosure of such mechanical equipment or appliances is not required by a state or local official having authority to enforce the *Florida Building Code*.

453.25.5 Electrical and Standby Emergency Power System

The EHPA shall be provided with a standby emergency electrical power system, per Chapter 27, NFPA 70 Articles 700 and 701, which shall have the capability of being connected to a backup generator or other optional power source. Where economically feasible, an equivalent photovoltaic system may be provided. The EHPA's emergency systems include, but are not limited to: (1) an emergency lighting system, (2) illuminated exit signs, (3) fire protection system(s), alarm (campus wide) and sprinkler, and (4) minimum ventilation for health/safety purposes. The fire alarm panel shall be located in the EHPA manager's office. A remote annunciator panel shall be located in or adjacent to the school administrator's office. When generators are installed, the facility housing the generator, permanent or portable, shall be an enclosed area designed to protect the generators from wind and missile impact. Air intakes and exhausts shall be designed and installed to meet the wind load and missile impact criteria. Generators hardened by the manufacturer to withstand the area's design wind and missile impact criteria shall be exempt from the enclosed area criteria requirement.

453.25.5.1 EHPA Lighting

Emergency lighting shall be provided within the EHPA, EHPA manager's office, toilet rooms, main electrical room and generator spaces and shall be at least 10 footcandles (100 lux) of general illumination, which can be reduced to 1/2 footcandle (5 lux) in the sleeping areas during the night.

453.25.5.2 Optional Standby Systems

Additional non-life safety systems, as defined by Chapter 27 and NFPA 70 Article 702 (Optional Standby Systems), may be supplied power, if available, by the standby emergency power system. These systems shall be connected to the standby emergency power system via an electrical subpanel to the standby electrical power system's main electrical panel. This will allow selective or total load shedding of power if required. The fire alarm, emergency lighting and illuminated exit signs throughout the entire campus shall receive first priority to power provided by the standby emergency power system per Chapter 27 and NFPA 70 Article 700. The

systems listed are not all-encompassing but are in order of priority. Local officials may request additional systems they deem necessary for health, welfare and safety of the public during occupancy:

1. Remainder of the school's campus security lighting (building and site).
2. Additional ventilation systems within the EHPA, including heat.
3. Intercom system.
4. Food storage equipment.
5. Additional electric receptacles, other than those required by Section 453.25.5.3.

453.25.5.3 Receptacle Outlets

A minimum of four electrical outlets, served with power from the standby circuits, shall be provided in the EHPA manager's office.

453.25.6 Inspections

EHPAs shall be considered "threshold buildings" in accordance with Section 553.71(12), *Florida Statutes*, and shall comply with Sections 553.79(5), 553.79(7), and 553.79(9), *Florida Statutes*.

453.25.6.1

Construction of EHPAs shall be inspected during the construction process by certified building code inspectors or the design architect/engineer(s) certified pursuant to Part XII Chapter 468, *Florida Statutes* and threshold inspectors for compliance with applicable rules and laws.

453.25.6.2

The emergency electrical systems shall be inspected during the construction process by certified electrical inspector or Florida-registered professional engineers certified pursuant to Part XII Chapter 468, *Florida Statutes*, skilled in electrical design.

453.25.6.3

All shutter systems, roofs, overflow scuppers, and structural systems of EHPAs shall be inspected and maintained annually prior to hurricane season and after a major event. All emergency generators shall be inspected under load conditions including activation of the fire alarms, emergency lights in accordance with applicable equipment codes and NFPA standards, and including mechanical systems and receptacles connected to the emergency power.

453.26

Reserved.

453.27 New Relocatable Buildings

453.27.1 Relocatables

The terms "relocatable" and "portable" are interchangeable and both terms are used to describe buildings which are constructed to the same building codes as permanent public school buildings, except they are designed to be moved. These buildings may be manufactured in a plant, constructed on site, may be made of demountable components, and may be combined. All new relocatable or portable classrooms shall be designed and constructed in compliance with the *Florida Building Code* the *Florida Fire Prevention Code* as adopted by the State Fire Marshal and the Department of Business and Professional Regulation rules for factory-built school buildings (see Section 458). The requirements for new relocatables contained herein are in addition to the minimum requirements of the *Florida Building Code* and the *Florida Fire Prevention Code* as adopted by the State Fire Marshal. New relocatables which do not comply with the building codes, fire codes and these standards shall not be used as classrooms or for any other student occupancy.

453.27.1.1

Factory-built school shelter means any site-assembled or factory-built school building that is designed to be portable, relocatable, demountable or reconstructable and that complies with the provisions for EHPAs, as required by the applicable code (see Section

453.25).

453.27.2 Design, Plan Approval, Construction

Regardless of cost or fund source, whether used for classroom, auxiliary or ancillary space, whether leased, purchased, contracted, or constructed by the school board or Florida college board, plans and documents for relocatables, portables and modular schools shall be prepared by Florida registered design professionals and submitted to the authority having jurisdiction for review and approval for compliance with Florida laws, rules, building and life safety codes. The buildings shall be constructed and inspected by personnel licensed, certified or trained as required by Florida construction industry licensing laws.

453.27.2.1 District-Wide Foundation Plans

District-wide foundation plans for tie down and wind resistance for each type of relocatable and each type of known soil condition in the district, shall be prepared and reviewed at the time of the design and shall be required as a part of the approval of any relocatable. These documents shall be kept on file in the district, with an additional copy in each relocatable filed together with current annual local fire inspection reports, as required by law. The foundation plans shall be reviewed and updated when necessary for compliance with current code for subsequent installations of the relocatable. Relocatables which do not meet the requirements of code for tie down and wind resistance shall not be occupied.

453.27.2.2 DOT Requirements

Relocatable units designed to be moved on state roads shall comply with the maximum unit height, length and width requirements of DOT.

453.27.2.3 Inventory/Construction Date Signage

A FISH inventory room number and the date of construction shall be noted on an inventory sign permanently affixed outside, beside or above the door, on all relocatables owned or leased by a district.

453.27.3 Construction Type

All new relocatables constructed, purchased or otherwise acquired by a board shall be noncombustible Type I, II or IV construction.

453.27.4 Accessibility

All relocatables constructed, purchased or otherwise acquired by a board after the effective date of these standards shall comply with the Americans with Disabilities Act as modified by Chapter 553, *Florida Statutes, Florida Building Code, Accessibility*. Relocatables intended for use at facilities housing up to grades 5 or 6, shall also conform to the federal criteria ADA *Accessibility Guidelines for Building Elements Designed for Children's Use*, which is available from the U.S. Architectural and Transportation Barriers Compliance Board.

453.27.5 Site Standards/Site Plan

Relocatables placed on educational plant sites shall comply with federal and state laws and rules relating to the placement of structures on sites, as well as building code, fire code site requirements.

453.27.5.1 Flood Plain

Compliance with flood plain standards is required for the initial and subsequent installation of public educational relocatable units. The finished floor shall be 12 inches (305 mm) above base flood elevation, the structure shall be designed to meet the *Florida Building Code* and anchored to resist buoyant forces.

453.27.5.2 Covered Walks and Technology

New relocatables and "modular schools" acquired by a board which are intended for long-term use, shall be connected from exit door to the core facilities by accessible covered walkways, and shall contain wiring and computer technologies which connect to the facility's technology, communications and fire alarms infrastructure.

Exceptions:

1. Covered walks and public address systems are not required for Florida college facilities.
2. Temporary relocatables constructed after the date of this standard shall meet all construction requirements of this code, except that covered walks may be installed. The term "temporary relocatable" means relocatables that are used for less than 4 years to provide temporary housing while permanent replacement classrooms and related facilities are under construction, renovation or remodeling. The term "temporary relocatable" does not apply to relocatables that have been

located on a school site for more than 3 years and used for classrooms or for student occupancy, where there is no identifiable permanent facility under construction, being remodeled, or renovated to house the students.

453.27.5.3 Separation of Units

Type I, II or IV, (noncombustible) relocatable units shall be separated as required by the *Florida Building Code* and the school site plan.

453.27.6 Structure

Relocatable structures shall be positively anchored and designed to comply with *Florida Building Code* requirements.

453.27.7 Fire-Retardant-Treated Wood (FRTW)

Only FRTW that does not contain ammonium phosphates, sulfates or halides may be used in the roof structure of Type II construction ancillary facilities, as authorized by other sections of the *Florida Building Code*. FRTW shall comply with the specific requirements found elsewhere in these public educational facilities requirements. Contractors shall provide evidence of compliance to inspectors.

Inspection access panels shall be provided to facilitate initial and annual inspections for general condition assessment of FRTW and connectors.

453.27.8 Doors

Exit doors shall swing in the direction of exit travel.

453.27.8.1 Classroom Locksets

Each door shall be equipped with a lockset, which is readily opened from the side from which egress is to be made at all times, a threshold, heavy duty hinges, and closer to control door closing. Each door shall have a view panel, with minimum dimensions of 8 inches (203 mm) by 42 inches (1067 mm) and a maximum of 1,296 square inches (0.84 m²), of $\frac{1}{4}$ -inch (6 mm) tempered or safety glass installed with the bottom edge of the panel at 30 inches (762 mm) AFF. Each exterior door shall be protected from the elements by a roof overhang.

453.27.8.2 Roofed Platform

All exterior doors shall open onto a minimum 5 foot by 5 foot (1524 mm by 1524 mm) roofed platform with handrails, which is level with the interior floor.

453.27.9 Operable Windows

Classrooms shall have operable windows equal to at least 5 percent of the floor area of the unit where required by Section 1013.44, *Florida Statutes*. Exterior doors may be included in computing the required 5 percent. Awning, casement, or projecting windows shall not be placed in walls with adjacent walks, ramps, steps or platforms.

453.27.9.1 Rescue

Windows for emergency rescue shall comply with NFPA 101, Florida edition as adopted by the *Florida Fire Prevention Code*, shall be operable from the inside by a single operation and shall be labeled "EMERGENCY RESCUE—KEEP AREA CLEAR."

453.27.10 Finishes

Finishes in relocatable units shall comply with the following:

453.27.10.1 Interior Walls and Ceilings

Interior wall and ceiling finishes in classrooms and other student use spaces shall be Class A or B as defined in NFPA 101 as adopted by the *Florida Fire Prevention Code*. Corridor finishes shall be Class A. Formaldehyde levels shall not exceed the minimum HUD standards for manufactured housing.

453.27.10.2 Floors

Floors shall be covered with resilient material, carpet, or other finished product. Carpet in classrooms shall be tested and certified by the manufacturer as passing the Radiant Panel Test Class II. Carpet in corridors shall be tested and certified by the manufacturer as passing the Radiant Panel Test Class I.

453.27.10.3 Toilet Rooms, Showers and Bathing Facilities

Partitions and walls separating group toilet rooms shall be extended to the bottom of the roof deck.

453.27.10.3.1

Toilet room floors and base shall be finished with impervious nonslip materials. Toilet room walls shall be finished with impervious materials which shall be extended to a minimum height of 6 feet (1828 mm).

453.27.10.3.2

Ceilings shall be of solid-type moisture-resistant materials.

453.27.11 Fire Extinguishers

At least one appropriate fire extinguisher shall be provided in each relocatable classroom unit and in each classroom of a multiclassroom building.

453.27.12 Document Storage

Provision shall be made to secure foundation plans and to post the annual fire inspection report within each relocatable unit.

453.27.13

Reserved.

453.27.14 Child Care/Day Care Units

Standard classroom units intended to house birth to age 3 children, including teenage parent programs (TAP), shall meet the additional criteria under the title of *Child Care/Day Care/Prekindergarten Facilities* for permanent buildings contained in these public educational facilities requirements, as well as the following:

453.27.14.1

All TAP spaces where residential kitchens are provided shall have two doors exiting directly to the outside and remotely located from each other. Areas designated for children's sleeping mats, cots or cribs, shall have a clearly marked exit passageway.

453.27.15 Illumination Required

Illumination in classroom units shall be designed to provide an average maintained 50 footcandles (500 lux) at desk top.

453.27.15.1 Emergency Lighting

Each classroom unit shall be equipped with emergency lighting.

453.27.15.2 Exterior Lighting

Exterior lighting shall be provided as required elsewhere in these public educational facilities code requirements.

453.27.15.3 Exit Lighting

Exit lights shall be provided as required by the *Florida Fire Prevention Code* adopted by the State Fire Marshal.

453.27.16 Air Conditioning, Heating and Ventilation

Relocatable facilities shall meet *Florida Building Code* requirements.

453.27.17 Technology

Relocatables shall contain wiring and computer technology appropriate for the programs to be housed.

453.27.18 Fire Safety Requirements

New relocatables shall be provided with fire alarm devices meeting the code requirements for permanent educational facilities and shall be connected to the facility's main fire alarm system as required by code.

453.27.19 Inspection of Units During Construction

Boards shall provide for the inspection of relocatables during construction, as required by the *Florida Building Code* as authorized by statute.

453.27.20 Inspection of Units Prior to Occupancy

Prior to occupancy new relocatables shall be inspected and approved for compliance to the *Florida Building Code*. New units shall have foundation plans provided and secured, in the relocatable along with the local fire inspector report. Certification of such inspection shall remain on file with the district. Inventory/date of construction signage shall be affixed to the relocatable. Where FRTW is used, inspection access panels shall be provided and within easy reach to facilitate inspection for general condition assessment of FRTW and connectors.

Section 454 Swimming Pools and Bathing Places (Public and Private)

454.1 Public Swimming Pools and Bathing Places

Public swimming pools and bathing places shall comply with the design and construction standards of this section.

Exceptions:

1. A portable pool used exclusively for providing swimming lessons or related instruction in support of an established educational program sponsored or provided by a school district may not be regulated as a public pool. Such pool shall be regulated as a private swimming pool under Section 454.2.
2. A temporary pool may not be regulated as a public pool. Such pool shall be regulated as a private swimming pool under Section 454.2.

454.1.1 Flood Hazard Areas

Public swimming pools installed in flood hazard areas established in Section 1612.3 shall comply with Section 1612.

Note: Other administrative and programmatic provisions apply. See Department of Health (DOH) Rule 64E-9, *Florida Administrative Code* and Chapter 514, *Florida Statutes*. The regulation and enforcement of the initial and annual operation permit for public pools are preempted to the DOH. The construction permit holder is responsible for obtaining an operation permit issued by DOH, as a public swimming pool shall not be put into operation without an inspection and operation permit issued from the DOH. DOH may grant variances from the provisions of the *Florida Building Code* specifically pertaining to public swimming pools and bathing places as authorized by Section 514.0115, *Florida Statutes*. Building officials shall recognize and enforce variance orders issued by the Department of Health pursuant to Section 514.0115(5), *Florida Statutes* including any conditions attached to the granting of the variance.

"**Bathing load**" means the maximum number of persons allowed in the pool or bathing place at one time.

"**Collector tank**" means a reservoir, with a minimum of 2.25 square feet (0.2 m^2) water surface area, that is vented by piping and/or open to the atmosphere, from which the recirculation or feature pump takes suction, and which receives the gravity flow from the main drain line and surface overflow system or feature water source line. The vent shall measure a minimum of 12.56 square inches (8103 mm^2) in area. A vent cap assembly shall be installed to minimize rainwater entry into the tank while still allowing for adequate air movement. The vent cap assembly shall be designed to prohibit entry by animals. The vent opening, where connected to the tank, must be set above the static water surface elevation and crown of the overflow piping, if installed. Tanks with vented lids shall not be required to be equipped with a separate vent. Tanks not located in a room or enclosure shall have a lockable lid. Tanks shall be constructed of concrete or other impervious and structurally rigid material, with adequate access for maintenance and cleaning, shall be watertight, shall be free from structural cracks and shall have a nontoxic smooth finish.

"**D.E.**" is the Diatomaceous Earth that is used as a filter aid in D.E.-type filters. For the purpose of this rule, it also includes alternative filter aids that have been approved under NSF/ANSI Standard 50, and accepted by the filter manufacturer.

"**Department**" means the permitting/inspection authority.

"**Effective barrier**" is a barrier which consists of a building, or equivalent structure, plus a 48-inch (1219 mm) minimum height fence on the remaining sides or a continuous 48-inch (1219 mm) minimum height fence. All access through the barrier must have one or more of the following safety features: alarm, key lock or self-locking doors and gates. Safety covers that comply with the American Society for Test Materials standard F1346 may also be considered as an effective barrier.

"**Elevated pool**" means any pool regulated under this section which is installed over a building (as defined in the *Florida Building Code*), including any associated troughs, gutters, or tanks.

"Epsom salt float tanks" are special purpose pools leased by the public for a brief period of time to float quietly immersed in water with dissolved Epsom salt. *Florida Building Code* sections in 454.1 through 454.1.10 apply to these pools, and only the following code sections do not apply to these pools as these code requirements are not necessary for health or safety in these special purpose pools: 454.1.2.1 (a); 454.1.2.2.4, 454.1.3.1.2, 454.1.3.2, 454.1.4.2.2, 454.1.6.1, 454.1.6.5.10.5, 454.1.6.5.11, 454.1.6.5.14, 454.1.6.5.16.6(3), and 454.1.6.5.3.2.5.

"Interactive water features" means a structure designed to allow for recreational activities with recirculated, filtered, and treated water; but having minimal standing water. Water from the interactive fountain type features is collected by gravity below grade in a collector tank or sump. The water is filtered, disinfected and then pumped to the feature spray discharge heads. The collector tank and water filtration features required make this structure a type of public swimming pool.

"Marking" or "Markings" refers to the placement and installation of visual marking cues to help patrons identify step, bench and swimout outlines, slope break location, depth designations and NO ENTRY and NO DIVING warnings. When markings are specified by code to be dark, the term "dark" shall mean a Munsell color value from zero to four.

"Offset" means set back into the deck from the normal pool wall perimeter (three sides must be surrounded by pool deck).

"Perimeter overflow gutter" means a level trough or ledge around the inside perimeter of the pool containing drains to clean the pool water surface.

"Plunge pool" means the receiving body of water located at the terminus of a recreational water slide and is dedicated solely for that purpose. Swimming pools that are not dedicated as plunge pools that include a recreational water slide as part of the design shall meet the requirements of Sections 454.1.1 through 454.1.6.5 and 454.1.9.2 with the exception of Sections 454.1.9.2.1.6.1 and 454.1.9.2.3.

"Pool floor" means the interior pool bottom surface which consists of that area from a horizontal plane up to a maximum of a 45-degree slope.

"Pool wall" means the interior pool side surfaces which consist of that area from a vertical plane to a 45-degree slope.

"Pool turnover" means the circulation of the entire pool volume through the filter system. Pool volume shall be determined from the design water level which is the normal operating water level; for gutter-type pools it is the horizontal plane of the upper lip of the gutter and for skimmer pools it is the centerline of the skimmer opening.

"Portable pool" means a pool or spa, and related equipment systems of any kind, which is designed or intended to be movable from location to location.

"Precoat pot" means a container with a valved connection to the suction side of the recirculation pump of a pressure diatomaceous earth (D.E.) type filter system used for coating the filter with D. E. powder or NSF/ANSI Standard 50-2019 and manufacturer approved substitute filter aid.

A **"public swimming pool"** or **"public pool"** means a single watertight structure of concrete, masonry or other approved materials that is located either indoors or outdoors, used for bathing or swimming by humans, and filled with a filtered and disinfected water supply, together with buildings, appurtenances and equipment used in connection therewith. A public swimming pool or public pool shall mean a conventional pool, spa-type pool, wading pool, special purpose pool, interactive water feature or water recreation attraction, to which admission may be gained with or without payment of a fee and includes, but is not limited to, pools operated by or serving camps, churches, cities, counties, day care centers, group home facilities for eight or more clients, health spas, institutions, parks, state agencies, schools, subdivisions, or the cooperative living-type projects of five or more living units, such as apartments, boardinghouses, hotels, mobile home parks, motels, recreational vehicle parks, and townhouses. The term does not include a swimming pool located on the grounds of a private residence.

"Recirculation system" means the system of piping and mechanics designed to remove the water from the pool then filter, disinfect and return it to the pool.

"Recreational water slide" means a flume that carries riders with more than 30 gallons per minute (113.55 L/m) of flow down the flume.

"Resistance exercise pools" are special purpose pools used by bathers with or without supervision to perform low-impact exercises and physical therapy with circulated water resistance.

"Slip resistant" means having a textured surface which is not conducive to slipping under contact of bare feet unlike glazed tile or masonry terrazzo and nontextured plastic materials. Manufactured surface products shall be designated by the manufacturer as suitable for walking surfaces in wet areas.

"Spa pool" means a pool used in conjunction with high-velocity air or water coming from a nozzle in the back wall of a bench.

"Special purpose pool" means a public pool used exclusively for a specific, supervised purpose, including springboard or platform diving training, SCUBA diving instruction, and aquatic programs for persons with disabilities, preschool or kindergarten children.

"Swimming pool slide" is a slide designed by its manufacturer to discharge over the sidewall of a swimming pool, and which uses not more than 30 gallons per minute (113.55 L/m) of water to carry the riders.

"Swim spa" is a pool used in conjunction with a directional flow of water against which one swims.

"Swim-up bar" means a public swimming pool used for the consumption of food or beverage by people and may include a permanent bar or counter within the pool area from which food and beverage are served to people in the pool.

"Sun shelf" means an area of a pool that adjoins the pool wall with a water depth less than 12 inches (305 mm), and is used for seating and play.

"Temporary pool" means a pool intended to be used in conjunction with a sanctioned national or international swimming or diving competition event that does not exceed 30 consecutive days of use.

"Vanishing edge" means a pool wall structure that is designed in such a way that the top of the pool wall and adjacent deck are not visible from certain vantage points in the pool or from the opposite side of the pool. Water from the pool flows over the edge and is captured and reused through the normal pool circulation system. Includes overflowing edge swimming pools with a lowered deck. Also referred to as an "infinity edge," "negative edge," "overflowing edge," or "zero edge."

"Wading pool" means a shallow pool designed to be used by children.

"Water recreation attraction" means a facility with design and operational features that provide patron recreational activity and purposefully involves immersion of the body partially or totally in the water. Water recreation attractions include water slides, river rides, water course rides, water activity pools, interactive water features, wave pools and any additional pool within the boundaries of the attraction.

"Water activity pool" means a water recreation attraction which has water-related activities such as rope ladders, rope swings, cargo nets and other similar activities.

"Water slides" means a water recreation attraction ride which is characterized by having trough-like or tubular flumes or chutes.

"Water theme park" means a complex with controlled access, a fenced and gated attraction where guests enter through a limited number of entrances upon purchase of a ticket. These facilities are permanent and consist of multiple water recreation attractions. Lifeguards are present during all operating hours.

"Water therapy facilities," as that term is used in Section 514.0115, Item 1, *Florida Statutes*, are pools used exclusively for water therapy to treat a diagnosed injury, illness or medical condition, wherein the therapy is provided under the direct supervision of a Florida licensed physical therapist, occupational therapist or athletic trainer; pursuant to prescription by a physician or a physician's assistant (PA) licensed pursuant to Chapters 458 or 459, *Florida Statutes*, a podiatrist licensed pursuant to Chapter 461, *Florida Statutes*, or an advanced registered nurse practitioner (ARNP) licensed pursuant to Chapter 464, *Florida Statutes*; and the prescribing physician, PA, podiatrist or ARNP authorizes a plan of treatment justifying use of the pool for health care purposes.

"Wave pool" means a water recreation attraction that is characterized by wave action.

"Wet deck area" means the 4-foot-wide (1219 mm) unobstructed pool deck area around the outside of the pool water perimeter, curb, ladders, handrails, diving boards, diving towers, or pool slides, waterfalls, water features, starting blocks, planters or lifeguard chairs.

"Zero depth entry pool" means a pool where the pool floor continues to slope upward to a point where it meets the surface of the water and the pool deck.

454.1.1.1 Sizing

The public pools provided at a transient facility shall have a minimum 6 square feet (0.56 m²) of surface area and a minimum of 1 gallon per minute (0.063 L/s) of recirculation flow per living unit. The public pools provided at nontransient facilities shall have a minimum 4.5 square feet (0.42 m²) of surface area and a minimum of 0.75 gallon per minute (0.047 L/s) of recirculation flow per living unit. Recreational vehicle sites, campsites and boat slips designated for liveabards shall be considered a transient living unit. For properties with multiple pools, this requirement includes the cumulative total surface area and recirculation rate of all swimming pools, spas, wading pools and interactive water features. If the only pools at a facility are spa pools or interactive water features, this

requirement does not apply. The bathing load for conventional swimming pools, wading pools, interactive water features, water activity pools and special purpose pools shall be computed on the basis of one person per 5 gpm (0.32 L/s) of recirculation flow. The bathing load for spa type pools shall be based on one person per each 10 square feet (0.9 m²) of surface area.

454.1.2 Swimming Pool Construction Standards

454.1.2.1 Pool Structure

Pools shall be constructed of concrete or other impervious and structurally rigid material. All pools shall be watertight, shall be free from structural cracks and shall have a nontoxic smooth and slip-resistant finish. All elevated pools constructed of concrete shall have waterproofing integral to the mix, or applied over the surface prior to the final surface application. All materials shall be installed in accordance with manufacturer's specifications unless such specifications violate Chapter 64E-9, *Florida Administrative Code*, rule requirements or the approval criteria of NSF/ANSI Standard 50 or NSF/ANSI Standard 60.

- (a) Tile used in less than 3 feet (914 mm) of water must be slip resistant. A minimum 4-inch (102 mm) tile line, each tile a minimum size of 1 inch (25 mm) on all sides, shall be installed at the water line, but shall not exceed 12 inches (305 mm) in height if a dark color is used. Gutter-type pools may substitute 2-inch (51 mm) tile, each a minimum size of 1 inch (25 mm) on all sides, along the pool wall edge of the gutter lip.
- (b) One-inch (25 mm) square tile may be used if the manufacturer has specified the adhesive for use underwater to adhere the type of tile used [vitreous (glass) or ceramic]. Tiles shall not have sharp edges exposed that could cause bather injury.
- (c) The grout line is allowed to be included when meeting the 1-inch (25 mm) square tile requirements, if the tile is sold and distributed as nominal or trade size tile.

454.1.2.2 Dimensions

Any dimensional requirement given in Section 454.1 as a single dimension, with no range or tolerance specified, may have a final constructed tolerance of up to 3 inches (76 mm), or 5 percent of the specified dimension, whichever is less. All approved designs, plans and drawings must comply with all exact dimensional requirements specified in Section 454.1. This construction tolerance may be positive or negative, except negative construction tolerances shall not be applied to any part of a diving bowl. Construction tolerances shall not be applied to dimensional requirements affecting the accessibility of the swimming pool to disabled bathers.

454.1.2.2.1 Dimensional Standards

Dimensional standards for competition-type pools shall be those published by the National Collegiate Athletic Association, 2019-20 and 2020-21; Federation Internationale de Natation Amateur (FINA), 2021 Handbook; USA Swimming, 2022; and National Federation of State High School Associations, 2021-22, which are incorporated by reference in this code.

454.1.2.2.2 Walls and Corners

All pool walls shall have a clearance of 15 feet (4572 mm) perpendicular to the edge (as measured at design water level from gutter lip to gutter lip, or on skimmer pools, from vertical wall to vertical wall). Offset steps, spa pools and wading pools are exempt from this clearance requirement. Where interior steps or a sun shelf protrude into the pool, the remaining width from the junction of the step or shelf riser and the floor to the opposite wall shall be 10 feet (3048 mm) or more. The upper part of pool walls in areas 5 feet (1524 mm) deep or less shall be within 5 degrees vertical for a minimum depth of 2 $\frac{1}{2}$ feet (762 mm) from which point the wall may join the floor with a maximum radius equal to the difference between the pool depth and 2 $\frac{1}{2}$ feet. The upper part of pool walls in areas over 5 feet (1524 mm) deep shall be within 5 degrees vertical for a minimum depth equal to the pool water depth minus 2 $\frac{1}{2}$ feet (762 mm) from which point the wall may join the floor with a maximum radius of 2 $\frac{1}{2}$ feet (762 mm). Corners shall be a minimum 90-degree angle. The corner intersections of walls which protrude or angle into the pool water area shall be rounded with a minimum radius of 2 inches (51 mm). This radius shall be continued through the top of the gutter edge; chamfering is allowed, and pool coping shall not overhang into the pool more than 1 $\frac{1}{2}$ inches (38 mm).

454.1.2.2.3 Pool Floor Slope and Slope Transition

The radius of curvature between the floor and walls is excluded from these requirements. Multiple floor levels in pools are prohibited, however, an area meeting all of the requirements of a sun shelf shall not be considered a violation of this requirement.

454.1.2.2.3.1 Floor Slope Shall Be Uniform

The floor slope shall be a maximum 1 unit vertical in 10 units horizontal in areas 5 feet (1524 mm) deep or less. The floor slope shall be a maximum 1 unit vertical in 3 units horizontal in areas more than 5 feet (1524 mm) deep.

454.1.2.2.3.2

Any transition in floor slope shall occur at a minimum of 5 feet (1524 mm) of water depth. A slope transition must have a 2 to 6 inch (51 to 152 mm) wide dark contrasting tile marking across the bottom and must extend up both sides of the pool at the transition point. The marking shall be continuous except for recessing grouting. A slope transition must have a safety line mounted by use of recessed cup anchors, 2 feet (610 mm) before the contrasting marking, towards the shallow end. The safety line shall have visible floats at maximum 7-foot (2134 mm) intervals.

454.1.2.2.4 Pool Depths

Reserved.

454.1.2.3 Markings

454.1.2.3.1 Depth and Markings

Depth and markings shall meet the following criteria:

1. The minimum water depth shall be 3 feet (914 mm) except in sun shelves, wading pools, water-activity pools, and zero entry areas.
2. Permanent depth markings followed by the appropriate full or abbreviated words "FEET," "FT," or "INCHES," "IN," shall be installed in minimum 4-inch-high (102 mm) numbers and letters on a contrasting background. Depth markers shall indicate the actual pool depth, within 3 inches (76 mm), at normal operating water level when measured 3 feet (914 mm) from the pool wall.
3. At a minimum, the markings shall be located on both sides of the pool at the shallow end, slope break, deep-end wall and deep point (if located more than 5 feet (1524 mm) from the deep-end wall). Depth markings shall be legible from inside the pool and also from the pool deck. The maximum perimeter distance between depth markings is 25 feet (7620 mm). Pool size and geometry may necessitate additional depth marking placements about all sides of the pool to meet this requirement.
4. When a curb is provided, the depth markings shall be installed on the inside and outside or top of the pool curb. When a pool curb is not provided, the depth markings shall be located on the inside vertical wall at or above the water level and on the edge of the deck within 2 feet (610 mm) of the pool water. When open type gutter designs are utilized, depth markers shall be located on the back of the gutter wall. When a coping stone with curved or angled underside is provided, the depth markings may be installed on the curved or angled coping underside, and outside or top of the pool curb.
5. When deck level perimeter overflow systems are utilized, additional depth marking signs shall be posted nearby or placed on adjacent fencing or walls and the size shall be increased so they are recognizable from inside the swimming pool. Alternatively, tile depth markers may be placed at the top of the pool wall just under the water level. Depth markers placed on the pool deck shall be within 3 feet (914 mm) of the water.
6. Those areas of the pool that are not part of an approved diving bowl shall have dark contrasting tile, 4-inch-high (102 mm) "NO DIVING" markings installed along the perimeter of the pool on the top of the pool curb or deck within 2 feet (610 mm) of the pool water with a maximum perimeter distance of 25 feet (7620 mm) between markings. A 6-inch (152 mm) tile with a 4-inch (102 mm) or larger red, international "NO DIVING" symbol may be substituted for the "NO DIVING" markings. "NO DIVING" markings are not required within the swimming pool.
7. All markings shall be tile, except that pools constructed of fiberglass, thermoplastic or stainless steel may substitute other type markings when it can be shown that said markings are permanent and will not fade over time. This exemption does not extend to concrete pools that are coated with fiberglass. Tile alternative examples include stone or manufactured plaques with engraved or sandblasted numbers and characters with permanent paint. Permanent appliqués may be used for fiberglass, thermoplastics or stainless steel pools. All markings installed on horizontal surfaces shall have a slip-resistant finish. Markings shall be flush with the surrounding area where placed and recessed if necessary to provide a smooth finish.

that will avoid creation of an injury hazard to bathers. Pools that are not conducive to tile can employ other equivalent markings as stated above.

454.1.2.3.2 Designs or Logos

Any design or logo on the pool floor or walls shall be such that it will not hinder the detection of a human in distress, algae, sediment, or other objects in the pool.

454.1.2.3.3 Lane Markings

Pools that are not intended to be utilized for officially sanctioned competition may install lap lane markings provided they meet the following criteria: the markings must be 2 to 6 inches (51 to 152 mm) wide, they must terminate 5 feet (1524 mm) from the end wall in a "T" with the "T" bar at least 18 inches (457.2 mm) long, they must be placed at 7-foot (2134 mm) minimum intervals on center and be no closer than 4 feet (1219 mm) from any side wall, steps or other obstructions. Floating rope lines associated with lap lanes must not obstruct the entrance or exit from the pool and are prohibited when the pool is open for general use.

454.1.2.3.4 Targets

Pools that are not intended for officially sanctioned competition may have 2 to 6 inch (51 to 152 mm) wide 18-inch by 18-inch (457 mm by 457 mm) targets (+) installed on the pool wall.

454.1.2.3.5 Rules and Regulations Signage

Rules and regulations for bathers shall be installed in minimum 1-inch (25.4 mm) letters that must be legible from the pool deck, and shall contain the following:

1. No food or beverages in the pool or on pool wet deck. Commercially bottled water in plastic bottles is allowed on the pool wet deck for pool patron hydration.

Exception: Food and beverages served in accordance with swim-up bar requirements found in Department of Health (DOH) Rule 64E-9.004, *Florida Administrative Code*.

2. No glass or animals in the fenced pool area (or 50 feet (15 240 mm) from unfenced pool).

Exception: Service animals as defined in s. 413.08, *Florida Statutes* All animals are prohibited to enter the pool water or onto the drained area of an interactive water feature.

3. Bathing load: ___ persons.

4. Pool hours: ___ a.m. to ___ p.m.

5. Shower before entering.

6. Pools of 200 square feet (18.58 m²) in area or greater without an approved diving well configuration shall have "NO DIVING", in 4 inch (102 mm) letters included with the above listed pool rules.

7. Do not swallow the pool water. This statement shall be added to signs at pools that conduct alterations as that term is defined.

8. If the pool includes a sun shelf, "WARNING: DROP OFF AT SUN SHELF EDGE IS ___ FEET ___ INCHES DEEP" in 4-inch (102 mm) letters. Not required where sun shelves transition to steps.

9. If the pool includes a sun shelf or a zero depth entry area, "DO NOT PLACE FURNITURE IN POOL." Not required when all movable furniture on the deck or in the pool is entirely made from UV-resistant, inert plastic.

10. By January 1, 2022, all pools shall add: "POOL MAXIMUM DEPTH: ___ FEET ___ INCHES" in 2-inch (51 mm) letters with the previously listed pool rules.

454.1.2.4 Color

Pool floors and walls shall be white or light pastel in color and shall have the characteristic of reflecting rather than absorbing light. Floors and walls in slide landing areas, and in pools with a maximum depth of 24 inches (610 mm) or less, are exempt from this color requirement. The interior finish coating floors and walls shall be comprised of a nonpigmented white cementitious binder component together with a sand/aggregate component. The finish coating shall have a dry lightness level (CIE L value) of 80.0 or greater and a wet luminous reflectance value (CIE Y value) of 50.0 or greater, as determined by test results provided by the manufacturer, utilizing testing methodology from American Standard ASTM D4086, ASTM E1477, ASTM E1347. Pools constructed of fiberglass, thermoplastic, or stainless steel shall be subject to the same interior finish color requirements. A minimum 4-inch (102 mm) tile line, each tile a minimum size of 1 inch (25 mm) on all sides, shall be installed at the water line, but shall not exceed 12 inches (305 mm) in height if a dark color is used. Gutter-type pools may substitute a 2-inch (51 mm) tile line, each tile a minimum size of 1 inch (25 mm) on all sides, along the pool wall edge of the gutter lip.

454.1.2.5 Access

All pools shall have a means of access every 75 feet (22 860 mm) of pool perimeter with a minimum of two, located so as to serve both ends of the pool, except for swimming pools with eight (8) or more lap lanes, which shall have means of access every 90 feet (27 432 mm) of pool perimeter in the lap lane area. In addition, an access point shall be provided at the deep portion, if the deep portion is not at one end of the pool. When the deep portion of the pool is over 30 feet (9144 mm) wide, both sides of this area shall have a means of access. Access shall consist of ladders, stairs, recessed treads, sun shelves or swimouts and may be used in combination. All treads shall have a slip-resistant surface.

454.1.2.5.1 Ladders

Ladders shall be of the crossbraced type and shall be constructed of corrosion-resistant materials and be securely anchored into the pool deck. Clearance between the ladder and pool wall shall be between 3 to 6 inches (76 mm to 152 mm). Ladders shall extend at least 28 inches (711 mm) and no more than 40 inches (1016 mm) above the pool deck. Ladder bottom braces shall have intact end caps or bumpers that rest firmly against the pool wall. The top rung of the ladder shall be at or below the water level on open-gutter pools and not more than 12 inches (305 mm) below the deck or curb top on all other type pools.

454.1.2.5.2 Recessed Treads

Recessed treads shall be installed flush with the wall and shall be a minimum 5 inches (127 mm) wide, 10 inches (254 mm) long, with a maximum vertical distance of 12 inches (305 mm) between treads.

454.1.2.5.3 Stairs

Stairs shall have a minimum tread width of 10 inches (254 mm) and a maximum width of 48 inches (1219 mm) for a minimum tread length of 24 inches (610 mm) and a maximum riser height of 10 inches (254 mm). Treads and risers between the top and bottom treads shall be uniform to within $\frac{1}{2}$ inch (12.7 mm) in width and height. The riser heights shall be measured at the marked step edges and the differences in elevation shall be considered the riser heights. The front $\frac{3}{4}$ to 2 inches (19.1 to 51 mm) of the tread and the top 2 inches (51 mm) of the riser shall be tile, dark in color, contrasting with the interior of the pool. Tile shall be slip resistant. Bullnose tile that is slip resistant may be used when the $\frac{3}{4}$ -inch (19 mm) segment is placed on the tread or horizontal surface and the 2-inch (51 mm) segment is placed on the riser or vertical surface. Where the gutter is used as the top step, the tile on the gutter for the width of the steps shall be slip resistant. Vinyl liner and fiberglass pools may use other material for the step edge marking, provided the material is permanent, permanently secured, dark in color, nonfading and slip resistant.

Exception: Where a gutter is used as a top step, the gutter's 2-inch slope from lip to the drain shall be continuous for the full length of the stairs, and the riser from the gutter to the next tread need not be uniform with the remaining risers and treads.

454.1.2.5.4 Swimouts

Swimouts shall extend 18 (457 mm) to 24 inches (610 mm) back from the pool wall, shall be 4 to 5 feet (1219 mm to 1524 mm) wide, shall be a maximum of 12 inches (305 mm) below the deck, unless stairs are provided in the swimout, and shall be located only in areas of the pool greater than 5 feet (1524 mm) deep. Pools that do not utilize a continuous perimeter overflow system must provide a wall return inlet in the swimout for circulation. A permanent dark contrasting colored band of tile shall be installed at the intersection of the pool wall and the swimout and must extend 2 inches (51 mm) on the horizontal and vertical surfaces. Tile must be slip resistant. Bullnose tile may be substituted and installed in accordance with Section 454.1.2.5.3 above.

454.1.2.5.5 Handrails and Grabrails

Handrails shall be provided for all stairs, shall be anchored in the bottom step and the deck. Where "figure 4" deck-mounted-type handrails are used, they shall be anchored in the deck and extend laterally to any point vertically above the bottom step.

Grabrails must be mounted in the pool deck at each side of recessed steps. Handrails and grabrails shall extend between 28 and 40 inches (711 mm and 1016 mm) above the step edge and deck. Where stairs are used as an access point between a sun shelf and pool area, a handrail shall be provided. The hand rail shall be anchored into the bottom step and the sun shelf floor. Where such stairs are inset into the sun shelf, a handrail shall be placed adjacent to each edge of the sun shelf.

454.1.2.5.6 Disabled Access

Permanent or portable steps, ramps, handrails, lifts or other devices designed to accommodate handicapped individuals in swimming pools may be provided. Excluding all ADA pool access area(s) and their clear deck area(s), the height of the pool wall above wet deck around the remainder of pool perimeter shall comply with Section 454.1.3.1.2 or 454.1.8.5. Lifts mounted into the pool deck shall have a minimum 4-foot-wide (1219 mm) deck behind the lift mount.

454.1.2.6 Obstructions

The pool water area shall be unobstructed by any type structure unless justified by engineering design as a part of the recirculation system. Engineering design and material specifications shall show that such structures will not endanger the pool patron, can be maintained in a sanitary condition and will not create a problem for sanitary maintenance of any part of the pool, pool water, or pool facilities. Structures in accord with the above shall not be located in a diving bowl area or within 15 feet (4572 mm) of any pool wall.

Exceptions:

1. Stairs, ladders and ramps, necessary for entrance/exit from the pool are not considered obstructions.
2. Underwater seat benches may be installed in areas less than 5 feet (1524 mm) deep. Bench seats must be 14 to 18 inches (356 to 457 mm) wide and must have a dark contrasting tile marking on the seat edge extending 2 inches (51 mm) on the horizontal and vertical surface. Tile shall be slip resistant. Bullnose tile may be substituted and installed in accordance with Section 454.1.2.5.3. Vinyl liner, stainless steel and fiberglass pools may use other material for the bench edge marking as detailed in Section 454.1.2.3.1, Item 7, provided the material is permanently secured, dark in color, nonfading and slip resistant. Benches shall not protrude into the 15-foot (4572 mm) clearance requirement of Section 454.1.2.6. The bench shall not protrude into the diving bowl.
3. A sun shelf may be installed in pool areas with no more than 4 feet (1219 mm) of water depth, or less, except where the entire sun shelf transitions to steps, where the depth at the bottom of the steps can exceed 4 feet (1219 mm). A sun shelf shall not protrude into the diving bowl. A sun shelf must additionally comply with Section 454.1.2.8.

454.1.2.7 Diving Areas

Diving facilities shall meet the minimum requirements of the FINA dimensions for diving facilities in accordance with the 2021 FINA Handbook and include the following

1. Diving boards or platforms with heights of less than the established standard shall meet the dimensional requirements of the next greater height.
2. Diving boards, platforms and ladders shall have a nonabsorbent, slip-resistant finish and be of sufficient strength to safely carry the anticipated loads. Diving equipment 1 meter and greater shall have guard rails which extend to the edge of the pool wall. All diving boards over 21 inches (533 mm) from the deck shall be provided with a ladder. Diving boards or platforms shall not be installed on curved walls where the wall enters into the defined rectangular diving area specified in this section. Adjacent platform and diving boards shall be parallel.
3. The location of pool ladders shall be such that the distance from the ladder to any point on a diving board or platform centerline is not less than the plummet to side wall dimension (b) indicated in the FINA standards. Trampoline-type diving facilities are prohibited.

4. Diving targets may be installed in accordance with FINA standards.

454.1.2.8 Sun Shelves

454.1.2.8.1 Sun Shelf Dimensional Requirements

Sun shelf areas must be a minimum of 20 inches (508 mm) wide and provide a minimum of 10 square feet (0.93 m²) of horizontal surface adjoining on the edge of the pool over a distance of not less than 3 feet (914 mm). The sun shelf edge that adjoins the pool edge must be continuous. The sun shelf floor shall be horizontal or sloped at a maximum of 1 unit vertical in 60 units horizontal, or shall have a uniform slope from a zero depth entry, and its maximum depth shall be between 6 inches (152 mm) minimum and 12 inches (254 mm) maximum below the water surface.

454.1.2.8.2 Depth Markers at Sun Shelves

Where a sun shelf is installed, wet deck-located depth and no-diving markers shall be placed every 25 feet (7620 mm) or less, with at least two (2) markers per sunshelf. If the vertical distance between the coping or wet deck and the shelf floor adjacent to the wall is 12 inches (305 mm) or less, these markers shall indicate the water depth of the sun shelf. For open-type gutter pools, the vertical distance shall be measured from the gutter lip to the shelf floor. Where vertical distance between the coping or wet deck and the shelf floor adjacent to the wall is more than 12 inches (305 mm), "No-Entry" markers as described in Section 454.1.9.6.4 shall be provided in the deck. When the sun shelf does not use stairs as a transition, depth markers of the adjacent pool depth at the sun shelf edge and no-dive markers shall be placed on the sun shelf floor, every 10 feet (3048 mm) or less, along a line no more than 1 foot (305 mm) back from the edge of the sun shelf above the deeper pool. All markers shall comply with Items 2, 6 and 7 of Section 454.1.2.3.1, except the distance between them as described in this section shall be followed.

454.1.2.8.3 Access to Sun Shelf

For the purposes of Section 454.1.2.5, a sun shelf area shall be considered an entrance to or exit from the pool. If the vertical distance between the coping and the shelf floor adjacent to the wall is more than 10 inches (254 mm), stairs up to the deck or coping shall be provided which shall comply with Sections 454.1.2.5.3 and 454.1.2.5.5; or a zero-depth entry area complying with Section 454.1.9.6 may be provided instead of stairs. For open gutter pools, where the gutter is used as a step, additional steps shall not be required where the distance from the gutter lip to the shelf floor is 10 inches or less. At least one handrail that is compliant with Section 454.1.2.5.5 must be provided at the sun shelf.

454.1.2.8.4 Sun Shelf Turnover Rate

Additional inlets shall be provided in the sun shelf area. The numbers and location shall be such as to ensure the volume of water in the shelf is filtered and chemically treated once every 60 minutes (1 hour) or less.

454.1.3 Pool Appurtenances

454.1.3.1 Decks and Walkways

454.1.3.1.1

Pool wet decks shall be constructed of concrete or other nonabsorbent material having a smooth slip-resistant finish. Wet deck area finishes shall be designed for such use and shall be installed in accordance with the manufacturer's specifications. Wooden decks and walkways are prohibited.

454.1.3.1.2

Pool wet decks shall be uniformly sloped away from the pool or to deck drains to prevent standing water. The minimum slope for the wet deck is 2 percent, but in the portions of the deck intended to be accessible to disabled persons, it may be 1 percent less than the maximum allowable cross slope given by the *Florida Building Code, Accessibility*. The maximum slope is 4 percent. A minimum of 1 percent deck slope is allowable for paver-type decks. Textured deck finishes that provide pitting and crevices of more than $\frac{3}{16}$ inch (4.8 mm) deep that accumulate soil are prohibited. If settling or weathering occurs that would cause standing water, the original slopes shall be restored or corrective drains installed. When a curb is provided, the deck shall not be more than 10 inches (254 mm) below the top of the curb.

Deck-level perimeter overflow systems may be sloped at a maximum of 4 percent toward trench or slot drains for a maximum distance of 18 inches (457 mm) where deck-level perimeter overflow systems are utilized. These must be slip resistant. This distance is not applicable to zero depth entries in Section 454.1.9.6.2. Wet deck area in accordance with Section 454.1.3.1.3 shall be provided beyond the trench grate or slot drain.

Up to 40 percent or 65 feet (19 812 mm), whichever is less, of the wet deck may be lowered. Lowered portions of wet deck shall be at least 10 inches (254 mm) but not more than 36 inches (914 mm) below the pool water level or curb height. Lowered portions of wet deck shall adjoin the rest of the wet deck via a set of stairs or a ramp at each end. If the lowered deck is adjacent to a transfer wall per Section 1009.4 of the *Florida Building Code, Accessibility*, one end of the lowered deck must be connected to the rest of the wet deck via an accessible route as described in Section 402 of the *Florida Building Code, Accessibility*.

454.1.3.1.3

Pool wet decks shall have a minimum unobstructed width of 4 feet (1219 mm) around the perimeter of the pool, pool curb, ladders, handrails, diving boards, diving towers and slides.

454.1.3.1.4

Traffic barriers shall be provided as needed so that parked vehicles do not extend over the deck area.

454.1.3.1.5

Walkways shall be provided between the pool and the sanitary facilities, and shall be constructed of concrete or other nonabsorbent material having a smooth slip-resistant finish for the first 15 feet (4572 mm) of the walkway measured from the nearest pool water's edge. A hose bibb with a vacuum breaker shall be provided to allow the deck to be washed down with potable water.

454.1.3.1.6

Twenty percent of the deck along the pool perimeter may be obstructed as long as any one obstruction does not exceed 20 feet (6096 mm) in any one area where water depth is 5 feet (1524 mm) or less. No lowered portion of the wet deck may be obstructed. Obstructions shall have a wet deck area behind or through them, with the near edge of the walk within 15 feet (4572 mm) of the water except approved slide obstructions shall have the near edge of the walk within 35 feet (10 668 mm) of the water. These obstructions must be protected by a barrier or must be designed to discourage patron access. Obstructions shall not include pool exit points. When an obstruction exists in multiple areas around the pool, the minimum distance between obstructions shall be 4 feet (1219 mm).

454.1.3.1.7

Food or drink service facilities shall not be located within 12 feet (3658 mm) of the water's edge.

Exception: Food and beverages service facilities complying with Section 454.1.9.9.

454.1.3.1.8

The vertical clearance above the pool deck shall be at least 7 feet (2137 mm).

454.1.3.1.9

All public pools shall be surrounded by a minimum 48 inch (1219 mm) high fence or other approved substantial barrier. The fence shall be continuous around the perimeter of the pool area that is not otherwise blocked or obstructed by adjacent buildings or structures and shall adjoin with itself or abut to the adjacent members. Access through the barrier or fence from dwelling units, such as homes, apartments, motel rooms and hotel rooms, shall be through self-closing, self-latching lockable gates of 48 inch (1219 mm) minimal height from the floor or ground with the latch located a minimum of 54 inches (1372 mm) from the bottom of the gate or at least 3 inches (76 mm) below the top of the gate on the pool side. If the self-closing, self-latching gate is also self-locking and is operated by a key lock, electronic opener or integral combination lock, then the operable parts of such locks or openers shall be 34 inches minimum (864 mm) and 48 inches maximum (1219 mm) above the finished floor or ground. Doored access points from public rooms such as lobbies or club houses need not be through gates if the door(s) meet the same self-closing, self-latching requirements as a gate. Operable parts used for opening doors at these access points shall be 45 inches (1143 mm) minimum to 48 inches (1220 mm) maximum above the finish floor or ground. Gates shall open outward away from the pool area. A latched, lockable gate shall be placed in the fence within 10 feet (3048 mm) of the closest point between the pool and the equipment area for service access.

Instead of a fence, permanent natural or manmade features such as bulkheads, canals, lakes, navigable waterways, etc., adjacent to a pool may be permitted as a barrier when approved. When evaluating such barrier features, the applicable governing body may perform on-site inspections, and review evidence, such as surveys, aerial photographs, water management agency standards and specifications, and any other similar documentation to verify at minimum, the following: the barrier feature is not subject to natural changes, deviations or alterations and is capable of providing an equivalent level of protection as that provided by a structure, and the barrier feature clearly impedes, prohibits or restricts access to the pool.

Screened pool enclosures must be hardened on the bottom 3 feet (914 mm). Fencing consideration shall be given to the U.S. Consumer Product Safety Commission (CPSC) Publication, No. 362, March 2005, guidelines available from CPSC.gov; or Sections 454.2.17.1.1 through 454.2.17.1.8. Safety covers that comply with ASTM F1346-91 (Reapproved 2003), titled *Safety Covers and Labeling Requirements for All Covers for Swimming Pools, Spas and Hot Tubs*, and available from ASTM.org, do not satisfy this requirement.

454.1.3.2 Bridges and Overhead Obstructions or River Rides

Bridges and overhead obstructions over the pool shall be designed so they will not introduce any contamination to the pool water. The minimum height of the bridge or obstruction shall be at least 4 feet (1219 mm) above the surface of the pool in all cases except when the pool is a river ride where it shall be at least 5 feet (1524 mm) above the surface of the pool. Minimum 42-inch-high (1067 mm) handrails shall be provided along each side of the bridge. The walking surfaces shall be constructed of concrete or other nonabsorbent material having a smooth slip-resistant finish. Pool coping shall not overhang into the pool more than 1 $\frac{1}{2}$ inches (38 mm).

454.1.3.3 Safety

454.1.3.3.1

All swimming pools shall be installed with a shepherd's hook securely attached to a one piece pole not less than 16 feet (4880 mm) in length, and at least one 16—24-inch (457—610 mm) diameter lifesaving ring, approved or certified under a nationally recognized water safety device standard, with sufficient rope attached to reach all parts of the pool from the pool deck. Safety equipment shall be mounted in a conspicuous place and be readily available for use. Pools greater than 50 feet (15 250 mm) in length shall have multiple units with at least one shepherd's hook and one lifesaving ring located along each of the longer sides of the pools. Spa pools under 200 square feet (1.86 m²) of surface area, and interactive water features or wading pools with 2 feet (610 mm) or less of water depth are exempt from this requirement.

454.1.3.3.2

All pools with a slope transition shall have safety line anchors as required by Section 454.1.2.2.3.2.

454.1.3.3.3

If a pool cover or solar blanket is installed, it shall be secured around the entire perimeter and designed to support a live load of an adult person; or, the pool area shall be inaccessible to unauthorized individuals during times of cover or blanket use.

454.1.3.3.4

A room or space shall be provided for chemicals to be stored, and the area shall be inaccessible to the public.

454.1.3.3.5

Swimming pool slides shall be installed in accordance with manufacturer's specifications and sound engineering practice, to include water depth, height above water, distance from pool structure, and isolation of landing area from other pool patrons. If an unenclosed ladder is used, it shall have handrails beginning at the bottom step and be no taller than 6 feet (1829 mm). Pools with slides designed for swimming pools are not required to satisfy those of slide plunge pools in Section 454.1.9.2.1.

454.1.3.3.6

Floating and climb-on devices, objects or toys that are not a part of the approved pool design shall not be tethered in the pool or installed without an engineering alterations application.

454.1.3.3.7

To reduce the possibility of injury, removable padding may be installed over the walls and floors of the pool, in areas where impacts are likely, so long as the surface of the padding is impervious, nontoxic, smooth, and slip resistant. Such padding shall be installed and maintained according to the manufacturer's specifications. The surface underneath the padding must be structurally rigid, impervious, nontoxic, smooth, and slip resistant. The padding may be white or a contrasting color.

454.1.4 Electrical Systems

454.1.4.1 Electrical Equipment and Wiring

Electrical equipment wiring and installation, including the bonding and grounding of pool components shall comply with Chapter 27 of the *Florida Building Code, Building*. Outlets supplying pool pump motors connected to single-phase 120-volt through 240-volt branch circuits, whether by receptacle or by direct connection, and outlets supplying other electrical equipment and underwater

luminaires operating at voltages greater than the low voltage contact limit, connected to single-phase, 120 volt through 240 volt branch circuits, rated 15 or 20 amperes, whether by receptacle or by direct connection, shall be provided with ground-fault circuit interrupter protection for personnel.

454.1.4.2 Lighting

Artificial lighting shall be provided at all swimming pools which are to be used at night or which do not have adequate natural lighting so that all portions of the pool, including the bottom, may be readily seen without glare.

454.1.4.2.1 Outdoor Pool Lighting

Lighting shall provide a minimum of 3 footcandles (30 lux) of illumination at the pool water surface and the pool wet deck surface. Underwater lighting shall be a minimum of $\frac{1}{2}$ watt incandescent equivalent, or 10 lumens, per square foot of pool water surface area.

454.1.4.2.2 Indoor Pool Lighting

Lighting shall provide a minimum of 10 footcandles (100 lux) of illumination at the pool water surface and the pool wet deck surface. Underwater lighting shall be a minimum of $\frac{8}{10}$ watt incandescent equivalent, or 15 lumens, per square foot of pool surface area.

454.1.4.2.3 Underwater Lighting

Underwater luminaires shall comply with Chapter 27 of the *Florida Building Code, Building*. The location of the underwater luminaires shall be such that the underwater illumination is as uniform as possible. Underwater lighting requirements can be waived when the overhead lighting provides at least 15 footcandles (150 lux) of illumination at the pool water surface and pool wet deck surface. If signage clearly indicates that night swimming is prohibited, underwater lights supplying less than minimum illumination required for night swimming may be installed for safety and decorative purposes. Nothing in this section exempts swimming pools located in coastal areas, as specified in Section 3109 of this code, from compliance with all applicable local and state wildlife and environmental lighting requirements.

454.1.4.2.4 Overhead Wiring

Overhead service wiring shall not pass within an area extending a distance of 10 feet (3048 mm) horizontally away from the inside edge of the pool walls, diving structures, observation stands, towers or platforms. Allowances for overhead conductor clearances to pools that meet the safety standards in the *National Electrical Code* may be used instead. Electrical equipment wiring and installation including the grounding of pool components shall comply with Chapter 27.

454.1.4.2.5 Voltage Limitation

Underwater lighting, or lighting that may be exposed to nozzle-directed pool water, shall not exceed 30 volts DC or 15 volts AC. Such lights shall be installed in accordance with manufacturer's installation instructions and be listed by a nationally recognized testing laboratory.

454.1.5 Equipment Area or Rooms

454.1.5.1 Equipment

Equipment designated by the manufacturer for outdoor use may be located in an equipment area, all other equipment must be located in an equipment room or enclosure. Plastic pipe subject to a period of prolonged sunlight exposure must be coated to protect it from ultraviolet light degradation. An equipment area shall be surrounded with a fence at least 4 feet (1219 mm) high on all sides not confined by a building or equivalent structure. A self-closing and self-latching gate with a permanent locking device shall be provided if necessary for access. An equipment room shall be protected on at least three sides and overhead. Any fence or gate installed shall use members spacing that shall not allow passage of a 4-inch (102 mm) diameter sphere. The fourth side may be a gate, fence, or open if otherwise protected from unauthorized entrance. An equipment enclosure shall be lockable or otherwise protected from unauthorized access.

454.1.5.2 Indoor Equipment

Equipment not designated by the manufacturer for outdoor use shall be located in an equipment room. An equipment room shall be protected on at least three sides and overhead. The fourth side may be a gate, fence or open if otherwise protected from unauthorized entrance.

454.1.5.3 Materials

The equipment enclosure, area or room floor shall be of concrete or other nonabsorbent material having a smooth slip-resistant finish and shall have positive drainage, including a sump pump if necessary. Ancillary equipment, such as a heater, not contained in an equipment enclosure or room shall necessitate an equipment area as described above.

454.1.5.4 Ventilation

Equipment rooms shall have either forced draft or cross ventilation. All below-grade equipment rooms shall have a stairway access with forced draft ventilation or a fully louvered door and powered intake within 6 inches (152 mm) of the floor. Where stairway access is not necessary to carry heavy items into the below grade room or vault, a "ship's ladder" may be used if specified by the design engineer who must consider anticipated workload including equipment removal; and the ladder slope, tread height and width; and construction material of the ladder.

454.1.5.5 Access

The opening to an equipment room or area shall be a minimum 3 feet by 6 feet (914 mm by 1829 mm) and shall provide easy access to the equipment. Below-grade collector tank(s) must have adequate access for cleaning, maintenance and inspection.

454.1.5.6 Size

The size of the equipment enclosure, room or area shall provide working space to perform routine operations. Clearance shall be provided for all equipment as prescribed by the manufacturer to allow normal maintenance operation and removal without disturbing other piping or equipment. In rooms with fixed ceilings, the minimum height shall be 7 feet (2137 mm).

454.1.5.7 Lighting

Equipment rooms or areas shall be lighted to provide 30 footcandles (300 lux) of illumination at floor level.

454.1.5.8 Storage

Equipment enclosures, rooms or areas shall not be used for storage of chemicals emitting corrosive fumes or for storage of other items to the extent that entrance to the room for inspection or operation of the equipment is impaired.

454.1.5.9 Hose Bibbs

A hose babb with vacuum breaker shall be located in the equipment room or area.

454.1.6 Plumbing Systems

454.1.6.1 Sanitary Facilities

Restrooms shall include a water closet, a diaper change table, a and a lavatory. Diaper changing tables are not required at restrooms where all pools served are restricted to adult use only. The entry doors of all restrooms shall be located within a 200-foot (60 960 mm) walking distance of the nearest water's edge of each pool served by the facilities.

Exception: Where a swimming pool serves only a designated group of residential dwelling units including hotel rooms and not the general public, poolside sanitary facilities are not required if all living units are within a 200-foot (60 960 mm) horizontal radius of the nearest water's edge, are not over three stories in height unless serviced by an elevator, and are each equipped with private sanitary facilities.

TABLE 454.1.6.1

PUBLIC SWIMMING POOL—REQUIRED FIXTURE COUNT PER SQUARE FOOT OF POOL SURFACE

MEN'S RESTROOM		WOMEN'S RESTROOM	
WC	Lavatory	WC	Lavatory
1 per 2,500 for first 10,000, 1 per 5,000 for remainder exceeding 10,000	1 per 5,000 for first 10,000, 1 per 10,000 for remainder exceeding 10,000	1 per 1,250 for first 10,000, 1 per 2,500 for remainder exceeding 10,000	1 per 5,000 for first 10,000, 1 per 10,000 for remainder exceeding 10,000

For SI: 1 square foot = 0.0929 m².

454.1.6.1.1 Required Fixtures

Fixtures shall be provided as indicated on Table 454.1.6.1, rounded up to the next whole number. The fixture count on this chart is deemed to be adequate for the pool and pool deck area that is up to three times the area of the pool surface provided.

454.1.6.1.2 Outside Access

Outside access to facilities shall be provided for bathers at outdoor pools. Where the restrooms are located within an adjacent building and the restroom doors do not open to the outside, the restroom doors shall be within 50 feet (15 240 mm) of the building's exterior door. If the restrooms are not visible from any portion of the pool deck, signs shall be posted showing directions to the facilities. Directions shall be legible from any portion of the pool deck; letters shall be a minimum of 1 inch (25 mm) high.

454.1.6.1.3 Sanitary Facility Floors

Floors of sanitary facilities shall be constructed of concrete or other nonabsorbent materials, shall have a smooth, slip-resistant finish, and shall slope to floor drains, which must be installed within the facility. Carpets, duckboards and footbaths are prohibited. The intersection between the floor and walls shall be coved where either floor or wall is not made of waterproof materials such as tile or vinyl.

454.1.6.1.4 Hose Bibb

A hose bibb with vacuum breaker shall be provided in or within 25 feet (7620 mm) of each restroom to allow for ease of cleaning.

454.1.6.2 Rinse Shower

A minimum of one rinse shower shall be provided on the pool deck of all outdoor pools within the perimeter of the fence.

454.1.6.3 Cross-Connection Prevention

An atmospheric break or approved backflow prevention device shall be provided in each pool water supply line that is connected to a public water supply. Vacuum breakers shall be installed on all hose bibbs.

454.1.6.4 Plastic Pipes

Plastic pipe subject to a period of prolonged sunlight exposure shall be coated to protect it from ultraviolet light degradation.

454.1.6.5 Recirculation and Treatment Systems

454.1.6.5.1 Equipment Testing

Recirculation and treatment equipment such as filters, recessed automatic surface skimmers, ionizers, ozone generators, disinfection feeders and chlorine generators shall be tested and approved using *NSF/ANSI 50—2019, Equipment and Chemicals for Swimming Pools, Spas, Hot Tubs and Other Recreational Water Facilities*, which is incorporated by reference.

454.1.6.5.2 Volume

The recirculation system shall be designed to provide a minimum of four turnovers of the pool volume per day. Pools that are less than 1,000 square feet (93 m^2) at health clubs shall be required to provide a minimum of eight turnovers per day.

454.1.6.5.3 System Design

The design pattern of recirculation flow shall be 100 percent of the minimum turnover rate through the main drain piping and 100 percent of the minimum turnover rate through the perimeter overflow system, or at least 60 percent of the minimum turnover rate through the skimmer system. Except when a bottom drain is used in conjunction with a wall main drain carrying 100 percent of the recirculation flow.

454.1.6.5.3.1 Perimeter Overflow Gutters

The lip of the gutter shall be uniformly level with a maximum tolerance of $\frac{1}{4}$ inch (6 mm) between the high and low areas. The bottom of the gutter shall be level or slope to the drains. The spacing between drains shall not exceed 10 feet (3048 mm) for 2-inch (51 mm) drains or 15 feet (4572 mm) for $2\frac{1}{2}$ -inch (64 mm) drains, unless hydraulically justified by the design engineer. Gutters may be eliminated along pool edges for no more than 15 feet (4572 mm) and this shall not exceed 10 percent of the perimeter (at least 90 percent of the perimeter shall be guttered). In areas where gutters are eliminated, handholds shall be provided within 9 inches (229 mm) of the water surface. Handhold design shall be approved by the jurisdictional building department prior to construction.

454.1.6.5.3.1.1

Either recessed-type or open-type gutters shall be used. Special designs can be approved provided they are within limits of sound engineering practice. Recessed-type gutter open areas shall be at least 4 inches (102 mm) deep and 4 inches (102 mm) wide, with a minimum 4 inches (102 mm) clearance for cleaning. The open area of the recessed gutter, excluding the gutter front dam wall, shall not be visible from a position directly above the gutter sighting vertically down the edge of the deck or curb. Open-type gutters shall be at least 6 inches (150 mm) deep and 12 inches (305 mm) wide. The gutter shall slope 2 inches (51 mm), +/- $\frac{1}{4}$ inch (+/-6 mm), from the lip to the drains. The gutter drains shall be located at the deepest part of the gutter.

454.1.6.5.3.1.2

All gutter systems shall discharge into a collector tank.

454.1.6.5.3.1.3

The gutter lip shall be tiled with a minimum of 2-inch (51 mm) tile on the pool wall, each a minimum size of 1 inch (25 mm) on all sides. The back vertical wall of the gutter shall be tiled with glazed tile. All tile used on the flat, horizontal part, or the leading edge of an open-type gutter, must be slip resistant.

Exception: Stainless steel gutter systems when it can be shown that the surfaces at the waterline and back of the gutter are easily cleanable.

454.1.6.5.3.2 Recessed Automatic Surface Skimmers

Recessed automatic surface skimmers may be utilized when the pool water surface area is 1,000 square feet (93 m^2) or less excluding offset stairs and swimouts and the width of the pool is not over 20 feet (6096 mm).

454.1.6.5.3.2.1 Volume

The recessed automatic surface skimmer piping system shall be designed to carry 60 percent of the pool total design flow rate with each skimmer carrying a minimum 30 gpm (2 L/s). One skimmer for every 400 square feet (37 m^2) or fraction thereof of pool water surface area shall be provided.

454.1.6.5.3.2.2 Location

Prevailing wind direction and the pool outline shall be considered by the designer in the selection of skimmer locations. The location of skimmers shall be such that the interference of adjacent inlets and skimmers is minimized. Recessed automatic surface skimmers shall be installed so that there is no protrusion into the pool water area. The deck or curb shall provide for a handhold around the entire pool perimeter and shall not be located more than 9 inches (229 mm) above the midpoint of the opening of the skimmer.

454.1.6.5.3.2.3 Equalizers

If installed, an equalizer valve shall be a spring-loaded vertical check valve that will not allow direct suction on the equalizer line. Float valves are prohibited. If installed, the equalizer line outlet shall be installed at least 1 foot (305 mm) below the normal pool water level and the equalizer line outlet shall be protected by an ASME/ANSI A112.19.8 compliant cover/grate. Any equalizer line shall be 2 inches (51 mm) or larger.

454.1.6.5.3.2.4 Wall-Inlet Fitting

A wall-inlet fitting shall be provided directly across from each skimmer within a tolerance of 5 feet (304.8 mm) measured along the perimeter in either direction from center, or shall have a directional flow inlet across from the skimmer that directs flow toward the skimmer.

454.1.6.5.3.2.5 Waterline Tile

A minimum 6-inch (152 mm) water line tile shall be provided on all pools with automatic skimmer systems, each a minimum size of 1 inch (25 mm) on all sides. Glazed tile that is smooth and easily cleanable shall be utilized.

454.1.6.5.4 Pumps

If the pump or suction piping is located above the water level of the pool, the pump shall be self-priming. Pumps that take suction prior to filtration shall be equipped with a hair and lint strainer. The recirculation pump shall be selected to provide the required recirculation flow against a minimum total dynamic head of 60 feet (18 288 mm) unless hydraulically justified by the design engineer. Vacuum D.E. filter system pumps shall provide at least 50 feet (15 240 mm) of total dynamic head. Should the total dynamic head required not be appropriate for a given project, the design engineer shall provide an alternative.

454.1.6.5.5 Filters

Filters sized to handle the required recirculation flow shall be provided.

454.1.6.5.5.1 Filter Capacities

The maximum filtration rate in gallons per minute per square foot of filter area shall be: 15 [or 20 if so approved using the procedure stated in Section 454.1.6.5.1] for high rate sand filters, 3 for rapid sand filters, 0.375 for pleated cartridge filters, and 2 [or 3 if so approved using the procedure stated in Section 454.1.6.5.1] for Diatomaceous Earth (D.E.) or regenerative media type filters.

454.1.6.5.5.2 Filter Appurtenances**454.1.6.5.5.2.1 Pressure Filter Systems**

Pressure filter systems shall be equipped with an air relief valve, influent and effluent pressure gauges with minimum face size of 2 inches (51 mm) reading 0—60 psi (0—414 kPa), and a sight glass when a backwash line is required.

454.1.6.5.5.2.2 Vacuum Filter Systems

Vacuum filter systems shall be equipped with a vacuum gauge which has a 2-inch (51 mm) face and reads from 0—30 inches of mercury.

454.1.6.5.5.2.3 D.E. Systems

A precoat pot or collector tank shall be provided for D.E.-type systems.

454.1.6.5.5.3 Filter Tanks and Elements

The filter area shall be determined on the basis of effective filtering surfaces with no allowance given for areas of impaired filtration, such as broad supports, folds, or portions which may bridge. D.E.- type filter elements shall have a minimum 1-inch (25 mm) clear spacing between elements up to a 4 square foot (0.4 m^2) effective area. The spacing between filter elements shall increase $\frac{1}{8}$ inch (3 mm) for each additional square foot of filter area or fraction thereof above an effective filter area of 4 square feet (0.4 m^2). All cartridges used in public pool filters shall be permanently marked with the manufacturer's name, pore size and area in square feet of filter material. All cartridges with end caps shall have the permanent markings on one end cap. Vacuum filter tanks shall have coved intersections between the wall and the floor and the tank floor shall slope to the filter tank drain. The D.E.-type filter tank and elements shall be installed such that the recirculation flow draw down does not expose the elements to the atmosphere whenever only the main drain valve is open or only the surface overflow gutter system valve is open.

454.1.6.5.6 Piping

All plastic pipe used in the recirculation system shall be imprinted with the manufacturer's name and the NSF-pw logo for potable water applications. Size, schedule and type of pipe shall be included on the drawings. Plastic pipe subject to a period of prolonged sunlight exposure shall be coated to protect it from ultraviolet light degradation.

454.1.6.5.7 Valves

Return lines, main drain lines, and surface overflow system lines, shall each have proportioning valves.

454.1.6.5.8 Flow Velocity

Pressure piping shall not exceed 10-feet per second (2038 mm/s), except that precoat lines with higher velocities may be used when necessary for agitation purposes. The flow velocity in suction piping shall not exceed 6-feet per second (1829 mm/s) except that flow velocities up to 10-feet per second (3048 mm/s) in filter assembly headers will be acceptable. Main drain systems and surface overflow systems which discharge to collector tanks shall be sized with a maximum flow velocity of 3-feet per second (914 mm/s). The filter and vacuuming system shall have the necessary valves and piping to allow filtering to pool, vacuuming to waste, vacuuming to filter, complete drainage of the filter tank, backwashing for sand and pressure D.E.- type filters and precoat recirculation for D.E.-type filters.

454.1.6.5.9 Inlets

All inlets shall be adjustable with wall-type inlets being directionally adjustable and floor-type inlets having a means of flow adjustment. Floor inlets shall be designed and installed such that they do not protrude above the pool floor and all inlets shall be designed and installed so as not to constitute sharp edges or protrusions hazardous to pool bathers. Floor inlets for vinyl liner and fiberglass pools, shall be smooth with no sharp edges, and shall not extend more than $\frac{3}{8}$ inch (9.5 mm) above the pool floor.

Wall inlets shall be installed a minimum of 12 inches (305 mm) below the normal operating water level unless precluded by the pool depth or intended for a specific acceptable purpose. The spacing of inlets shall comply with one of the following:

1. The pool is 30 feet (9144 mm) in width or less and has wall inlets such that the inlet spacing does not exceed 20 feet (6096 mm) along the entire pool water perimeter.
2. The pool has floor inlets such that the spacing between adjacent inlets does not exceed 20 feet (6096 mm) and the spacing between inlets and adjacent walls does not exceed 10 feet (3048 mm).
3. The pool has a combination of wall and floor inlets such that the spacing between adjacent inlets of the same type does not exceed 20 feet (6096 mm), the spacing between a floor inlet and an adjacent wall without inlets does not exceed 10 feet (3048 mm), and the spacing between a floor inlet and an adjacent wall with inlets does not exceed 25 feet (7620 mm).

In each case, additional wall or floor inlets may be provided above and beyond these minimum requirements. The flow rate through each inlet shall not exceed 20 gpm (1 L/s) except for inlets designed for higher flows as specified by the manufacturer.

454.1.6.5.10 Main Drain Outlets

All pools shall be provided with an outlet at the deepest point.

454.1.6.5.10.1

If the depth at the outlet deviates more than 3 inches (76 mm) from the side wall, that depth shall be identified on depth markers in addition to the markers normally required for the sidewall depth. Markers for the depth at the drains shall be in accordance with Section 454.1.2.3 with the following words added: "AT CENTER" for circular areas and "AT DEEP POINT" for other pool shapes.

454.1.6.5.10.2

Outlets shall be covered by a secured grating which requires the use of a tool to remove and whose open area is such that the maximum velocity of water passing through the openings does not exceed 1 $\frac{1}{2}$ feet per second (457 mm/s) at 100 percent of the design recirculation flow. Main drain covers/grates shall comply with the requirements of ANSI/APSP 16 and the water velocity of this section.

454.1.6.5.10.3

Multiple outlets, equally spaced from the pool side walls and from each other, shall be installed in pools where the deep portion of the pool is greater than 30 feet (9144 mm) in width.

454.1.6.5.10.4

If the area is subject to high ground water, the pool shall be designed to withstand hydraulic uplift or shall be provided with hydrostatic relief devices.

454.1.6.5.10.5

The main drain outlet shall be connected to a collector tank. The capacity of the collector tank shall be at least 1 minute of the recirculated flow unless justified by the design engineer. Vacuum filter tanks are considered collector tanks.

454.1.6.5.11 Water Makeup Control

An automatic and manual water makeup control shall be provided to maintain the water level at the lip of the overflow gutter or at the mouth of the recessed automatic surface skimmers and shall discharge through an air gap into a fill pipe or collector tank. Over the rim fill spouts are prohibited.

454.1.6.5.12 Cleaning System

A portable, robotic or plumbed-in vacuum cleaning system shall be provided. All vacuum pumps shall be equipped with hair and lint strainers. When the system is plumbed in, the vacuum fittings shall be located to allow cleaning the pool with a 50-foot (15 240 mm) maximum length of hose. Vacuum fittings shall be located remotely in the pool deck. Remote vacuum assemblies shall be installed with an equalizer line when the vacuum piping system is connected directly to pump suction and the suction line shall be protected with a threaded plug when not in use. The equalizer line outlet shall be installed at least 1 foot (305 mm) below the normal pool water level and the equalizer line outlet shall be protected by an ANSI/APSP-16 compliant cover/grate. The

equalizer line shall be sized to handle the expected flow with a 2-inch (51 mm) minimum line size. The provision of a filtered, chemically treated water supply to the equalizer piping shall be provided to assist in preventing algae from forming within the equalizer piping arrangement. Bag-type cleaners, which operate as ejectors on potable water supply pressure, shall be protected by a vacuum breaker. Cleaning devices shall not be used while the pool is open to bathers.

454.1.6.5.13 Rate of Flow Indicators

A rate of flow indicator, reading in gpm, shall be installed on the return line following filtration and prior to chemical injection. The rate of flow indicator shall be properly sized for the design flow rate and shall be capable of measuring from three-quarters to at least one-and-one-quarter times the design flow rate. The flow measuring device shall have an operating range appropriate for the anticipated flow rates and be installed where it is readily accessible to read and for routine maintenance. The clearances upstream and downstream from the rate of flow indicator shall comply with manufacturer's installation specifications.

454.1.6.5.14 Heaters

Pool heaters shall comply with nationally recognized standards acceptable to the jurisdictional building department and to the design engineer. Pools equipped with heaters shall have a fixed thermometer mounted in the pool recirculation line downstream from the heater outlet. Thermometers mounted on heater outlets do not meet this requirement. A sketch of any proposed heater installation including valves, thermometer, pipe sizes, and material specifications shall be included in the application for permit prior to installation. Piping and influent, effluent and bypass valves which allow isolation or removal of the heater from the system shall be provided. Materials used in solar and other heaters shall be nontoxic and acceptable for use with potable water. Heaters shall not prevent the attainment of the required turnover rate.

454.1.6.5.15 Pool Waste Water Disposal

Pool waste water shall be discharged through an air gap; disposal shall be to sanitary sewers, storm sewers, drainfields, or by other means, in accordance with local requirements including obtaining all necessary permits. Disposal of water from pools using D.E. powder shall be accomplished through separation tanks which are equipped with air bleed valves, bottom drain lines, and isolation valves, or through a settling tank with final disposal being acceptable to local authorities. D.E. separator tanks shall have a capacity as rated by the manufacturer, equal to the square footage of the filter system. All lines shall be sized to handle the expected flow. There shall not be a direct physical connection between any drain from a pool or recirculation system and a sewer line.

454.1.6.5.16 Addition of Chemicals

Disinfection and ph adjustment shall be added to the pool recirculation flow using automatic feeders meeting the requirement of ANSI/NSF 50. All chemicals shall be fed into the return line after the pump, heater and filters unless the feeder was designed by the manufacturer and approved by the NSF to feed to the collector tank or to the suction side of the pump.

454.1.6.5.16.1 Gas Chlorination

When gas chlorination is utilized, the chlorinator shall be capable of continuously feeding a chlorine dosage of 6 mg/L to the recirculated flow of the filtration system. The application point for chlorine shall be located in the return line downstream of the filter, recirculation pump, heater, and flow meter, and as far as possible from the pool.

454.1.6.5.16.1.1

Gas chlorinators shall be located in above-grade rooms and in areas which are inaccessible to unauthorized persons.

454.1.6.5.16.1.1.1

Chlorine gas rooms shall have: continuous forced draft ventilation capable of a minimum of one air change per minute with an exhaust at floor level to the outside, a minimum of 30 footcandles (300 lux) of illumination with the switch located outside and the door shall open out and shall not be located adjacent to the filter room entrance or the pool deck. A shatterproof gas-tight inspection window shall be provided.

454.1.6.5.16.1.1.2

Chlorine gas areas shall have a roof and shall be enclosed by a chain-link-type fence at least 6 feet (1829 mm) high to allow ventilation and prevent vandalism.

454.1.6.5.16.1.1.3

After December 31, 2023, new pools may not use chlorine gas.

454.1.6.5.16.1.2

When booster pumps are used with the chlorinator, the pump shall use recirculated pool water supplied via the recirculation filtration system. The booster pump shall be electrically interlocked with the recirculation pump to prevent the feeding of chlorine when the recirculation pump is not operating.

454.1.6.5.16.1.3

A means of weighing chlorine containers shall be provided. When 150-pound (68 kg) cylinders are used, platform-type scales shall be provided and shall be capable of weighing a minimum of two full cylinders at one time. The elevation of the scale platform shall be within 2 inches (51 mm) of the adjacent floor level, and the facilities shall be constructed to allow easy placement of full cylinders on the scales.

454.1.6.5.16.2 Hypohalogenation and Electrolytic Chlorine Generators

The hypohalogenation-type feeder and electrolytic chlorine generators shall be adjustable from 0 to full range. A rate of flow indicator is required on erosion-type feeders. The feeders shall be capable of continuously feeding a dosage of 6 mg/L to the minimum required turnover flow rate of the filtration systems. Solution feeders shall be capable of feeding the above dosage using a 10-percent sodium hypochlorite solution, or 5-percent calcium hypochlorite solution, whichever disinfectant is to be utilized at this facility. To prevent the disinfectant from siphoning or feeding directly into the pool or pool piping under any type failure of the recirculation equipment, an electrical interlock with the recirculation pump shall be incorporated into the system for electrically operated feeders. The minimum size of the solution reservoirs shall be at least 50 percent of the maximum daily capacity of the feeder. The solution reservoirs shall be marked to indicate contents. The solution reservoirs shall be manufactured to accommodate corrosive and oxidizing liquid chemicals.

454.1.6.5.16.3 Feeders for pH Adjustment

Feeders for pH adjustment shall be provided on all pools. pH adjustment feeders shall be positive displacement type, shall be adjustable from 0 to full range, and shall have an electrical interlock with the circulation pump to prevent discharge when the recirculation pump is not operating. When soda ash is used for pH adjustment, the maximum concentration of soda ash solution to be fed shall not exceed 1/2-pound (0.2 kg) soda ash per gallon of water. Feeders for soda ash shall be capable of feeding a minimum of 3 gallons (11 L) of the above soda ash solution per pound of gas chlorination capacity. The minimum size of the solution reservoirs shall not be less than 50 percent of the maximum daily capacity of the feeder. The solution reservoirs shall be marked to indicate the type of contents. The solution reservoirs shall be manufactured to accommodate corrosive and oxidizing liquid chemicals.

454.1.6.5.16.4 Ozone Generating Equipment

Ozone generating equipment may be used for supplemental water treatment on public swimming pools subject to the conditions of this section.

454.1.6.5.16.4.1

Ozone generating equipment electrical components and wiring shall comply with the requirements of Chapter 27 of the *Florida Building Code, Building* and the manufacturer shall provide a certificate of conformance. The process equipment shall be provided with an effective means to alert the user when a component of this equipment is not operating.

454.1.6.5.16.4.2

Ozone generating equipment shall meet the NSF/ANSI Standard 50.

454.1.6.5.16.4.3

The concentration of ozone in the return line to the pool shall not exceed 0.1 mg/L.

454.1.6.5.16.4.4

The injection point for ozone generating equipment shall be located in the pool return line after the filtration and heating equipment, prior to the halogen injection point, and as far as possible from the nearest pool return inlet with a minimum distance of 4 feet (1219 mm). Injection methods shall include a mixer, contact chamber, or other means of efficiently mixing the ozone with the recirculated water. The injection and mixing equipment shall not prevent the attainment of the required turnover rate of the recirculation system. Ozone generating equipment shall be equipped with a check valve between the generator and the injection point. Ozone generating equipment shall be equipped with an air flow meter and a means to control the flow. The generator shall be electrically interlocked with the recirculation pump to prevent the feeding of ozone when the recirculation pump is not operating. A flow sensor controller can also be used to turn off the feeder when flow is sensed.

454.1.6.5.16.4.5 Ventilation Requirements

Ozone generating equipment shall be installed in equipment rooms with either forced draft or cross draft ventilation. Below-grade equipment rooms with ozone generators shall have forced draft ventilation and all equipment rooms with forced draft ventilation shall have the fan control switch located outside the equipment room door. The exhaust fan intake for forced draft ventilation and at least one vent grille for cross draft ventilation shall be located at floor level.

454.1.6.5.16.4.6

A self-contained breathing apparatus designed and rated by its manufacturer for use in ozone contaminated air shall be provided when ozone generator installations are capable of exceeding the maximum pool water ozone contact concentration of 0.1 mg/L. The self-contained breathing apparatus shall be available at all times and shall be used at times when the maintenance or service personnel have determined that the equipment room ozone concentration exceeds 10 mg/L. Ozone generator installations which require the self-contained breathing apparatus shall also be provided with Draeger-type detector tube equipment which is capable of detecting ozone levels of 10 mg/L and greater.

Exception: In lieu of the self-contained breathing apparatus an ozone detector capable of detecting 1 mg/L may be used. Said detector shall be capable of stopping the production of ozone, venting the room and sounding an alarm once ozone is detected.

454.1.6.5.16.5

Ionization units may be used as supplemental water treatment on public pools subject to the condition of this section.

454.1.6.5.16.5.1

Ionization equipment and electrical components and wiring shall comply with the requirements of Chapter 27 of the *Florida Building Code, Building* and the manufacturer shall provide a certification of conformance.

454.1.6.5.16.5.2

Ionization equipment shall meet the NSF/ANSI Standard 50, *Circulation System Components and Related Materials for Swimming Pools, Spas/Hot Tubs*, or equivalent, shall meet UL standards and shall be electrically interlocked with a recirculation pump.

454.1.6.5.16.6

Ultraviolet (UV) light disinfectant equipment may be used subject to the conditions of this paragraph and manufacturer's specifications. UV is encouraged to be used to eliminate or reduce chlorine-resistant pathogens, especially the protozoan cryptosporidium.

1. UV equipment and electrical components and wiring shall comply with the requirements of the *National Electrical Code* and the manufacturer shall provide a certification of conformance to the jurisdictional building department.
2. UV equipment shall meet UL standards and shall be electrically interlocked with recirculation pump(s) on all pools and with feature pump(s) on an IWF such that when the UV equipment fails to produce the required dosage as measured by an automated sensor, the feature pump(s) are disabled so the water features do not operate.
3. UV equipment shall be certified for secondary or supplemental disinfection per NSF 50—2020.
4. UV equipment that is not certified for secondary disinfection per NSF 50—2020 shall be installed and configured to constantly produce a validated dosage of at least 40 mJ/cm² (millijoules per square centimeter) at the end of lamp life, and other third party validation criteria in accordance with the USEPA *Ultraviolet Disinfectant Guidance Manual* dated November 2006, publication number EPA 815-R-06-007, whenever these devices are used in high-risk pools for secondary disinfection.
5. The UV equipment shall not be located in a side stream flow and shall be located to treat all water returning to the pool or water features. Any treatment chemicals shall be injected downstream of the UV equipment.

454.1.6.5.17

Up to 50 percent of the return water that has passed through the filter and received the addition of chemicals may be diverted to water features such as waterfalls or fountains in pools, however, all waters used in the feature shall not be counted toward attaining the minimum turnover rate specified in Section 454.1.1.1 or 454.1.6.5.2, or elsewhere in this code. The return piping system shall be designed and capable of handling the additional feature flow when the feature is turned off, otherwise the pump speed shall be reduced automatically. All water features that utilize water from the pool shall be designed to return the water to the pool. Spray features mounted in the pool deck shall be flush with the pool deck and shall be designed with the safety of the pool patron in mind. Where a pool's feature flow is greater than 20 percent, that pool shall comply with Section 454.1.7.9 for automated controllers, and with Section 454.1.9.2.7 for 12 mg/L disinfectant capacity by the halogen feeder equipment.

454.1.6.5.18 Chemical Quality

Only NSF-60 approved chemicals shall be provided.

454.1.6.5.19

Automated oxidation reduction potential (ORP) and pH controllers with sensing probes shall be provided on all newly built public swimming pools to assist in maintaining proper disinfection and pH levels.

454.1.7 Wading Pools

454.1.7.1 General

Wading pools shall meet the requirements of Sections 454.1.1 through 454.1.6.5, unless otherwise indicated. Wading pools and associated piping shall not be physically connected to any other swimming pools and have no minimum width dimensions requirements.

454.1.7.2 Depths

Wading pools shall have a maximum depth of 2 feet (610 mm). The depth at the perimeter of the pool shall be uniform and shall not exceed 12 inches (305 mm). However, where jurisdictional building department-approved zero depth entry designs are used, this uniform depth requirement must be met only on the remainder of the pool outside the zero depth entry portion. The pool floor shall not be more than 12 inches (305 mm) below the deck unless steps and handrails are provided. Depth and "NO DIVING" markers are not required on wading pools.

454.1.7.3 Recirculation

Wading pools shall have a minimum of one turnover every hour.

454.1.7.3.1

Skimmer equalizer lines, when installed, shall be plumbed into the main drain.

454.1.7.4 Inlets

Wading pools with 20 feet (6096 mm) or less of perimeter shall have a minimum of two equally spaced adjustable inlets.

454.1.7.5 Emergency Drainage

All wading pools shall have drainage to waste without a cross connection through a quick opening valve to facilitate emptying the wading pool should accidental bowel or other discharge occur. This can also be achieved utilizing a pump taking suction from the collector tank drain with immediate discharge to waste. The pump must be capable of draining all water in the pool and tank.

454.1.7.6

Reserved.

454.1.7.7 Wading Pool Decks

When within 50 feet of swimming pools, wading pools shall be separated from the swimming pool by an effective barrier or a fence of a minimum of 48 inches (1219 mm) in height with self-latching and self-closing gates. When adjacent to areas less than 1 foot (305 mm) deep of zero depth entry pools, the fence or effective barrier is required if the water edges are less than 40 feet (12 192 mm) apart. Where the walking distance is at least 50 feet (15 240 mm) between the wading pool and all other pools, fencing requirements should be carefully considered by the applicant to control usage, but are not required by rule. Effective barriers that are designed to define the walking path shall be subject to review and approval by the department. Wading pools shall have a minimum 10-feet (3048 mm) wide deck around at least 50 percent of their perimeter with the remainder of the perimeter deck being at least 4 feet (1219 mm) wide. There shall be at least 10 feet (3048 mm) between adjacent swimming pools and wading pools.

454.1.7.8 Lighting

Wading pools are exempt from underwater lighting requirements but shall have lighting installed for night use of 10 footcandles (100 lux) if indoors or 3 footcandles (30 lux) for outdoor night use. Such illumination shall be provided over the pool water surface and the pool deck surface.

454.1.7.9

Automated oxidation reduction potential (ORP) and pH controllers with sensing probes shall be provided to assist in maintaining proper disinfection and pH levels.

454.1.8 Spa Pools**454.1.8.1 General**

Spa pools shall meet the requirements of Sections 454.1.1 through 454.1.6.5, unless specifically indicated otherwise.

454.1.8.2 Color, Pattern, Finish

The color, pattern or finish of the pool interior shall not obscure the existence or presence of objects or surfaces within the pool.

454.1.8.3 Water Depths

Spa-type pools shall have a minimum water depth of $2\frac{1}{2}$ feet (762 mm) and a maximum water depth of 4 feet (1219 mm), except that swim spa pools may have a maximum water depth of 5 feet (1524 mm). Depth markers and "NO DIVING" markers are not required on spa-type pools with 200 square feet (19 m^2) or less of water surface area.

454.1.8.4 Steps and Handrails

Steps or ladders shall be provided and shall be located to provide adequate entrance to and exit from the pool. The number of sets of steps or ladders required shall be on the basis of one for each 75 feet (22 860 mm), or major fraction thereof, of pool perimeter. Step sets for spa-type pools with more than 200-square-feet (19 m^2) of pool water surface area shall comply with Section 454.1.2.5. Step sets for spa-type pools with 200 square feet (19 m^2) or less of pool water surface area shall comply with the following: Step treads shall have a minimum width of 10 inches (254 mm) for a minimum continuous tread length of 12 inches (305 mm). Step riser heights shall not exceed 12 inches (305 mm). Intermediate treads and risers between the top and bottom treads and risers shall be uniform in width and height, respectively. Contrasting markings on the leading edges of the submerged benches and the intersections of the treads and risers are required to be installed in accordance with Section 454.1.2.5.

454.1.8.5 Decks

Spa pools that are 10 feet (3048 mm) wide or less shall have a minimum 4-foot-wide (1219 mm) unobstructed continuous deck around a minimum of 50 percent of the pool perimeter, with all points on the water surface within 10 feet (3048 mm) horizontally of the deck. Decks shall not be more than 36 inches (914 mm) below the top of the pool. For spa pools greater than 10 feet (3048 mm) in width, deck obstructions shall comply with Section 454.1.3.1.6.

454.1.8.6 Therapy or Jet Systems**454.1.8.6.1**

The return lines of spa-type therapy or jet systems shall be independent of the recirculation-filtration and heating systems.

454.1.8.6.2

Therapy or jet pumps shall take suction from the collector tank. Collector tank sizing shall take this additional gallonage into consideration.

454.1.8.6.3

Heated systems shall incorporate a 15-minute patron-activated timer on the therapy pump circuit.

454.1.8.7 Filtration System Inlets

Spa-type pools shall have a minimum of two equally spaced adjustable inlets.

454.1.8.8 Filtration Recirculation

Spa-type pools shall have a minimum of one turnover every 30 minutes. The piping, fittings, and hydraulic requirements shall be in accordance with Section 454.1.6.5. All recirculation lines to and from the pool shall be individually valved with proportional flow-type

valves in order to control the recirculation flow.

454.1.8.9 Vacuuming

Spa-type pools of over 200 square feet (19 m^2) of pool water surface area shall have provisions for vacuuming.

454.1.8.10 Combination Spas/Pools

When spa pools are part of a conventional swimming pool, the spa pool area shall be the same water depth as the main pool area. The spa pool area shall meet Sections 454.1.8.6 and 454.1.8.7, and the deck area shall be protected by connected 30-inch-high (762 mm) stanchions or other approved obstruction to prevent entry, wherever there is a bench with high velocity nozzles producing air bubbles. The deck perimeter at the offset spa area shall not exceed 20 feet (6096 mm). All benches shall have contrasting markings on the leading edges of the intersection of the bench seats. If tile is used, it shall be slip resistant.

454.1.8.11 Portable and Wooden Spa Pools

Portable and wooden-type spa pools are prohibited.

454.1.8.12 Automated Controllers

Automated oxidation reduction potential (ORP) and pH controllers with sensing probes shall be installed on spa pools to assist in maintaining proper disinfection and pH levels.

454.1.8.13

In addition to the requirements of Section 454.1.2.3.5 spa pool signs installed shall include the following:

1. Maximum water temperature: 104°F (40°C).
2. Children under twelve must have adult supervision.
3. Pregnant women, small children, people with health problems and people using alcohol, narcotics or other drugs that cause drowsiness should not use spa pools without first consulting a doctor.
4. Maximum use: 15 minutes.

454.1.8.14

A clock shall be visible from the spa pool to assist the patron in meeting Item 4 of Section 454.1.8.13.

454.1.8.15

If a spa is equipped with an emergency cutoff or kill switch, it shall include provisions for a minimum 80 decibel audible alarm near the spa to sound continuously until deactivated when such device is triggered. The following additional rule sign shall be installed to be visible by the spa which reads "ALARM INDICATES SPA PUMPS OFF. DO NOT USE SPA WHEN ALARM SOUNDS UNTIL ADVISED OTHERWISE."

454.1.9 Water Recreation Attractions and Specialized Pools

454.1.9.1 General

Water recreation attraction projects shall be designed and constructed within the limits of sound engineering practice. In addition to the requirements of this section, compliance is required with Sections 454.1.1 through 454.1.6.5 of this chapter depending upon the pool design and function. Additionally, all pools listed in this section shall provide a minimum of one turnover every 2 hours unless otherwise noted.

454.1.9.2 Recreational Water Slides

Recreational Water slides shall terminate in either a plunge pool or run out lanes.

454.1.9.2.1 Plunge Pool

Plunge pools shall be constructed of concrete or other structurally rigid impervious materials with a nontoxic, smooth and slip-

resistant finish. The plunge pool design shall meet the criteria of Sections 454.1.9.2.1.1 through 454.1.9.2.1.6.

454.1.9.2.1.1 Adequate Space at Terminus

The slide design engineer must demonstrate to the jurisdictional building department's satisfaction that the water depth, clear area, distance between adjacent slides, floor slope, rope line placement, exit location, and pool floor surface finish are all adequate to prevent injury or harm to riders or other users of the pool, making reference to ASTM F2376, *Standard Practice for Classification, Design, Manufacture, Construction, and Operation of Water Slide Systems*, as appropriate. Only one entry or exit location shall be required, regardless of the plunge pool's perimeter.

454.1.9.2.1.2

Reserved.

454.1.9.2.1.3 Slide Flume Terminus

454.1.9.2.1.3.1

The slide flume terminus shall be designed by the design engineer who can demonstrate to the jurisdictional building department's satisfaction that riders will be adequately slowed prior to discharge so as to prevent injury or harm to the rider upon impact with the plunge pool water. The design engineer must document the designed, safe location of the terminus relative to the plane of the pool wall and to the water level.

454.1.9.2.1.4 Plunge Pool Main Drains

The plunge pool shall have a minimum of one main drain with separate piping and valve to the filtration system collector tank. The velocity through the openings of the main drain grate shall not exceed 1 $\frac{1}{2}$ feet per second (457 mm/s) at the design flow rate of the recirculation pump. The main drain piping shall be sized to handle 100 percent of the design flow rate of the filtration system with a maximum flow velocity of 3 feet (914 mm) per second.

454.1.9.2.1.5 Plunge Pool Floor Slope

The plunge pool floor shall slope to the main drains and the slope shall not exceed 1 in 10.

454.1.9.2.1.6 Plunge Pool Decks

454.1.9.2.1.6.1

Decking shall be provided at the entrance and exit points as necessary to provide safe patron access but shall not be smaller than 10 feet (3048 mm) in width and length.

454.1.9.2.1.6.2 Slopes

All plunge pool decks shall slope to the plunge pool or pump reservoir or to deck drains which discharge to waste, or other acceptable means. All slopes shall be between 2- and 4-percent grade except for paver-type decks where a minimum of 1 percent grade is allowed.

454.1.9.2.1.7 Plunge Pool Volume

The total volume of a plunge pool and its collector tank or tanks shall be equal to or greater than 3 minutes of the combined flow rate in gallons per minute of all filter and slide pumps. The design engineer must account for the water level in the pool both when the slide pumps are on and when they are off. If skimmers are used, skimmers must be placed at both levels if the variance is greater than 3 inches (76 mm). If perimeter overflow is used, half of the gutter outlets must be functional at each water level.

454.1.9.2.2 Run Out Lanes

454.1.9.2.2.1

Run out lanes may be utilized in lieu of or within a plunge pool system, provided they are constructed to the slide manufacturers specifications and are approved by the design engineer of record.

454.1.9.2.2.2

Five-foot-wide (1524 mm) walkways shall be provided adjacent to run out lanes, as either dry deck or as part of a pool with up

to 12 inches (305 mm) of water depth in this area. The 5-foot (1524 mm) walkway need be only on one side of the run out lane.

454.1.9.2.2.3

Minimum water level indicator markings shall be provided on both sides of the run out trough to ensure adequate water for the safe slowing of pool patrons.

454.1.9.2.2.4

Attendants or lifeguards shall be provided at the top of the slides and at the run out in accordance with a safety/lifeguard plan approved by the Department of Health. If night operation is proposed, 3 footcandles (30 lux) of light shall be provided at the top of the slides and at the run outs.

454.1.9.2.3 Pump Reservoirs

Pump reservoirs are only required for slides with run out lanes. Pump reservoirs shall be made of concrete or other impervious material with a smooth finish. Pump reservoirs shall be for the slide pump intakes, but where properly sized may also be used as a collector tank for the filter system. Pump reservoir designs shall meet the criteria of Sections 454.1.9.2.3.1 through 454.1.9.2.3.5.

454.1.9.2.3.1 Pump Reservoir Volume

The minimum reservoir volume shall be equal to 3 minutes of the combined flow rate in gallons per minute of all filter and slide pumps unless justified by the design engineer.

454.1.9.2.3.2 Pump Reservoir Security

Pump reservoirs shall be accessible only to authorized individuals.

454.1.9.2.3.3 Pump Reservoir Maintenance Accessibility

Access decks or walkable grating shall be provided for the reservoir such that all areas are accessible for vacuuming, skimming, and maintenance. The decks shall have a minimum width of 3 feet (914 mm) and shall have a slope of 2—4 percent away from the reservoir. If any part of the pump reservoir has a permanent cover or roof, hatches or other openings for access to and observation of the floor must be provided with one hatch or opening per 150 square feet (13.9 m^2) of tank floor area.

454.1.9.2.3.4 Pump Reservoir Slide Pump Intakes

The slide pump intakes shall be located in the pump reservoir and shall be designed to allow cleaning without danger of operator entrapment.

454.1.9.2.3.5 Pump Reservoir Main Drains

The pump reservoir shall have a minimum of one main drain with separate piping and valve to the filtration system collector tank unless the reservoir is used as the collector tank. Velocity through the openings of the main drain grates shall not exceed $1\frac{1}{2}$ feet per second (457 mm/s) at the design flow rate of the filtration system pump. The main drain piping shall be sized to handle 100 percent of design flow rate of the filtration system pump with a maximum flow velocity of 3 feet per second (914 mm/s).

454.1.9.2.3.6

Reserved.

454.1.9.2.4 Slide Pump Check Valves

Slide pumps shall have check valves on all discharge lines.

454.1.9.2.5 Perimeter Overflow Gutters or Skimmers

Plunge pools shall have perimeter overflow gutter system or skimmer which shall be an integral part of the filtration system.

454.1.9.2.5.1 Perimeter Overflow Gutter Systems

Perimeter overflow gutter systems shall meet the requirements of Section 454.1.6.5.3.1 except that gutters are not required directly under slide flumes or along the weirs which separate plunge pools and pump reservoirs.

454.1.9.2.5.2 Surface Skimmers

Surface skimmers may be used in lieu of perimeter overflow gutters. The provisions of Section 454.1.6.5.3.2 shall apply, except no maximum width or maximum area shall apply to plunge pools.

454.1.9.2.6 Water Slide Recirculation—Filtration Equipment

454.1.9.2.6.1 Recirculation Rate

The recirculation-filtration system of water slide plunge pools shall turn the water over in a period of 2 hours or less. The turnover rate for slides with run out lanes shall be 1 hour or less. For swimming pools that are not dedicated as plunge pools, but include a recreational water slide as part of the design, the total water volume shall include the water in the plunge pool dimensions stipulated by code, plus the slide water.

454.1.9.2.6.2 Filter Performance

A continuous readout/electronic recording in-line turbidity meter shall be installed per manufacturer's specifications and used to determine compliance with Rule 64E-9, *Florida Administrative Code* water quality criteria for clarity. Otherwise if not installed, the recirculation turnover rate of the plunge pool's water volume as defined in Section 454.1.9.2.6.1, must be enhanced to 1 hour or less.

454.1.9.2.7 Disinfection

The disinfection equipment shall be capable of feeding 12 mg/L of halogen to the continuous recirculation flow of the filtration system.

454.1.9.2.8

Slide design and construction is the responsibility of a professional engineer licensed in Florida and the applicant.

454.1.9.2.9

A lockable gate shall be provided at the stair or ladder entrance to the slide.

454.1.9.2.10

Upon construction completion, a professional engineer licensed in Florida shall certify that the slide was constructed in accordance with the manufacturer's specifications and is structurally sound.

454.1.9.3 Water Activity Pools

454.1.9.3.1

Water activity pools shall be designed and constructed within the limits of sound engineering practice.

454.1.9.3.2

Water activity pools shall be constructed of concrete or other structurally rigid impervious materials with a nontoxic, smooth and slip-resistant finish. These pools shall be of such shape and design as to be operated and maintained in a safe and sanitary manner.

454.1.9.3.3

The recirculation-filtration system of water activity pools shall achieve a minimum of one turnover every 2 hours for water activity pools over 2 feet (610 mm) deep, and 1 hour for these pools that are 2 feet (610 mm) deep or less.

454.1.9.3.4

Those portions of the activity pool where the water depth will not allow for the proper installation of underwater lighting shall be provided with 6 footcandles (60 lux) of lighting on the deck and water surface.

454.1.9.3.5

Fence requirements shall be in accordance with Section 454.1.7.7.

454.1.9.3.6

Play features with an overhead clearance of less than 4 feet (1219 mm) shall be blocked or barricaded to preclude children becoming entrapped.

454.1.9.3.7

In addition to the requirements of Section 454.1.2.3.5, all water activity pool signs installed shall have the following added in one inch letters:

"Do not swallow the pool water, it is recirculated."

"Do not use pool if you are ill with diarrhea."

454.1.9.4 Wave Pools**454.1.9.4.1**

Wave pools shall be designed and constructed within the limits of sound engineering practice.

454.1.9.4.2

Wave pools shall be constructed of concrete or other impervious materials with a smooth slip-resistant finish. These pools shall be of such shape and design as to be operated and maintained in a safe and sanitary manner.

454.1.9.4.3

The recirculation-filtration system of wave pools shall be capable of a minimum of one turnover every 3 hours.

454.1.9.4.4

Floors shall be sloped in accordance with the manufacturer's or design engineer's specifications; however, they shall not exceed the slope limits of Section 454.1.2.2.3.

454.1.9.5 River Rides**454.1.9.5.1**

River rides shall be constructed within the limits of sound engineering practice.

454.1.9.5.2

River rides shall be constructed on concrete or other impervious materials with a nontoxic, smooth and slip-resistant finish. These rides shall be of such shape and design as to be operated in a safe and sanitary manner.

454.1.9.5.3

The recirculation-filtration system of the river ride shall be capable of a minimum of one turnover every 3 hours.

454.1.9.5.4

The maximum water depth of the river ride shall not exceed 3 feet (914 mm) unless justified to the jurisdictional building department's satisfaction by the design engineer.

454.1.9.5.5

Decking shall comply with Section 454.1.9.2.1.6.1. Additional decking along the ride course is not required except that decking shall be required at lifeguard locations and emergency exit points.

454.1.9.5.6

Access and exit shall be provided at the start and end of the ride and additional exit locations shall be located along the ride course as necessary to provide for the safety of the patrons.

Propulsion jets shall be installed in the walls of the river ride. In the alternative, propulsion jets may be installed in the floor if they are covered by a grate that will inhibit entrapment or injury of the pool patrons' feet or limbs.

454.1.9.6 Zero Depth Entry Pools**454.1.9.6.1**

Zero depth entry pools shall have a continuous floor slope from the water edge to 3 feet (914 mm) of water depth at which point the slope can transition to another, less steep continuous slope. Floating safety ropes and slope transition markings are not

required at this transition point.

454.1.9.6.2

The deck level perimeter overflow system with grate shall be provided at the water's edge across the entire zero depth portion of the pool. Zero entry grate must be 8 to 12 inches wide, slip resistant, and constructed for intended purpose of submersion in water and exposure to UV sunlight.

454.1.9.6.3

The pool deck may slope toward the pool for no more than 7 feet (2133 mm), as measured from the overflow system grate outward. Beyond this area the deck shall slope away from the pool in accordance with Section 454.1.2.2.3.

454.1.9.6.4

"No Entry" markers shall be provided along the pool wall edge where the water depth is more than 10 inches (254 mm) but less than 3 feet (914 mm), unless stairs and handrails are provided. "No Entry" markers shall be slip-resistant, shall have 2-inch-high (51 mm) letters, shall be located within 2 feet (610 mm) of the pool edge and shall be spaced no more than 8 feet (2438 mm) apart, or 15 feet (4572 mm) apart if 4-inch-high (102 mm) letters are provided. "NO DIVING" markers are not required around the zero entry area.

454.1.9.6.5

Additional inlets shall be provided in areas of less than 18 inches (457 mm) deep. The numbers and location shall be such as to ensure a 1-hour turnover in this area.

454.1.9.6.6

The recirculation-filtration system shall be of a minimum of one turnover every 2 hours in the area of the pool that is 18" (457 mm) to 3 feet (914 mm) deep. In the remainder of the pool where the depth is greater than 3 feet (914 mm), the system shall have a maximum 6-hour turnover rate. The design plans submitted by the applicant shall provide the volume of water in the pool area of 0" to 18" (457 mm) depth, the volume of 18" (457mm) to 3 feet (914 mm) depth, the volume of water in the pool area greater than 3 feet (914 mm) in depth and the total volume in the pool for determination of minimum circulation flow. The volume calculations shall provide verification that the correct volume of water is used to determine the minimum flow at the 1-hour, 2-hour and the 6-hour flow requirements.

454.1.9.6.7

Those portions of the zero depth entry pool, where the water depth will not allow for the proper installation of underwater lighting, shall be provided with 6 footcandles (60 lux) of lighting on the deck and the water.

454.1.9.6.8

Play structures in a zero depth entry area [in depth 0—3 feet (0 to 914 mm)] may be within 15 feet (4572 mm) of the pool walls, but shall comply with sound engineering requirements for the safety of pool patrons.

454.1.9.7 Special Purpose Pools

454.1.9.7.1 General

Special purpose pool projects may deviate from the requirements of other sections of these rules provided the design and construction are within the limits of sound engineering practice. Only those deviations necessary to accommodate the special usage shall be allowed and all other aspects of the pool shall comply with the requirements of this section and with Section 454.1.2.

454.1.9.7.2

A special purpose pool may incorporate ledges which do not overhang into the pool.

454.1.9.7.3

Resistance exercise pools shall comply with the requirements of Sections 454.1 through 454.1.6.5 unless exempted or modified by Section 454.1.9.7.3.

454.1.9.7.3.1

Resistance exercise pools shall be circular or oval in shape with a center island that creates a channel to direct the flow of circulated water. Resistance exercise pools shall have a recirculation rate of 5gpm per bather, shall have a gutter type

recirculation system, and shall have a maximum bathing load of 20 persons.

454.1.9.7.3.2 Resistance Exercise Pool Dimensions and Depth

The distance from the outer vertical pool wall to the inner island vertical wall of a resistance exercise pool shall be a minimum of 8.5 feet (2591 mm) and maximum of 10 feet (3048 mm), measured at the designed water level.

The water depth of resistance exercise pools shall be a minimum of 3 feet (914 mm) and a maximum of 3 feet 5 inches (1041 mm).

454.1.9.7.3.3 Grabrails and Handrails

The inner island of resistance exercise pools shall have grab rails mounted on the entire top circumference of the island for use has handholds by bathers while in the pool.

454.1.9.7.3.4 Non-Applicable Requirements

The following code provisions do not apply to resistance exercise pool: Sections 454.1.1.1, 454.1.2.2.3.1, 454.1.2.6 and 454.1.2.2.4.

454.1.9.7.4

Epsom salt float tanks are special purpose pools leased by the public for a brief period of time to float quietly immersed in water with dissolved Epsom salt. *Florida Building Code* Sections 454.1 through 454.1.10 apply to these pools, and only the following code sections do not apply to these pools, as these code requirements are not necessary for health or safety in these special purpose pools: Sections 454.1.2.1(a), 454.1.2.2.4, 454.1.3.1.2, 454.1.3.2, 454.1.4.2.2, 454.1.6.1, 454.1.6.5.10.5, 454.1.6.5.11, 454.1.6.5.14, 454.1.6.5.16.6(3) and 454.1.6.5.3.2.5.

454.1.9.8 Interactive Water Features (IWFs)

454.1.9.8.1

Waters discharged from all fountain or spray features shall not pond on the feature floor but shall flow by gravity through a main drain fitting to a collection system which discharges to a collector tank. The minimum size of the collector tank shall be equal to the volume of 3 minutes of the combined flow of all feature pumps and the filter pump. Smaller tanks may be utilized if hydraulically justified by the design engineer. Adequate access shall be provided to the sump or collector tank. Stairs or a ladder shall be provided as needed to ensure safe entry into the tank.

454.1.9.8.2

Reserved.

454.1.9.8.3

Chemical feeders shall be in accordance with Section 454.1.6.5; except that the disinfection feeder shall be capable of feeding 12 ppm of free chlorine to the pressure side of the recirculation system or the collector tank (based upon a hypothetical 30-minute turnover of the contained volume within the system). Automated oxidation reduction potential (ORP) and pH controllers with sensing probes shall be installed to assist in maintaining proper disinfection and pH levels.

454.1.9.8.4

If night operation is proposed, 6 footcandles (60 lux) of light shall be provided on the pool deck and the water feature area. For IWFs that are operated with attendants or lifeguards, 3 footcandles (30 lux) of light is acceptable.

454.1.9.8.5

All electrical work shall comply with Chapter 27 of the *Florida Building Code, Building*.

454.1.9.8.6 Hydraulics

454.1.9.8.6.1

All water discharged to the spray features must first be treated with UV disinfection as described in Section 454.1.6.5.16.6, with final treatment provided by disinfectant adjustment chemicals, before any of this treated water is piped to the spray features.

The recirculation system shall be sized to treat the contained volume of water in the tank and piping system based on a 30-minute turnover with chlorine feeder/generators capable of producing a dosage of at least 12ppm.

The UV disinfection equipment shall be electrically interconnected such that whenever it fails to produce the required UV dosage, the water spray features pump(s) will be immediately stopped. All pumps must draw suction from the collector tank.

454.1.9.8.6.2

All IWFs must comply with one of three options for filtration and disinfection systems as follows:

Option 1: A single pump may be used for water treatment and to supply the water features. Flow must be filtered, treated by a UV unit certified for supplemental disinfection per NSF Standard 50, then treated with disinfectant adjustment chemicals prior to discharge to the spray features. Excess flow not required by the features must be directed back to the collector tank following UV treatment and must be treated with disinfectant and pH adjustment chemicals prior to discharge to the tank.

Option 2: Separate filter and feature pumps may be utilized. The filter flow must be filtered and treated with disinfectant and pH adjustment chemicals prior to discharge to the tank. All feature flow must be filtered, treated by a unit certified for supplemental disinfection per NSF Standard 50, then treated with disinfectant adjustment chemicals prior to discharge to the spray features. UV flow capacity must meet the feature pump(s) flow capacity, and a rate of flow indicator complying with Section 454.1.6.5.13 shall be provided for each UV system.

Option 3: Separate filter and feature pumps may be utilized. The filter flow must be filtered and treated with disinfectant and pH adjustment chemicals prior to discharge to the tank. All feature flow must be treated by a UV disinfection certified for secondary disinfection per NSF Standard 50, then treated with disinfectant adjustment chemicals prior to discharge to the water features. UV flow capacity must meet the feature pump(s) flow capacity, and a rate of flow indicator complying with Section 454.1.6.5.13 shall be provided for each UV system.

454.1.9.8.6.3

Reserved.

454.1.9.8.6.4

The flow rate through the feature nozzles of the water features shall be such as not to harm the patrons and shall not exceed 20 feet per second (6096 mm/s) unless justified by the design engineer and by the fountain system manufacturer.

454.1.9.8.6.5

An automatic water level controller shall be provided.

454.1.9.8.6.6

An overfill waste line with air gap shall be provided.

454.1.9.8.6.7

A means of vacuuming and completely draining the tank(s) shall be provided.

454.1.9.8.6.8

Reserved.

454.1.9.8.6.9

IWFs shall be fenced in the same fashion as wading pools as noted in Section 454.1.7.7. Where the walking distance is at least 50 feet (15 240 mm) between the IWF and all other pools and the IWF is not designed to have any standing water, fencing requirements should be carefully considered by the applicant to control usage, but are not required by rule. Effective barriers that are designed to define the walking path shall be subject to review and approval by the department.

454.1.9.8.6.10

A minimum 4-foot-wide (1219 mm) wet deck area shall be provided around all IWFs. The wet deck shall meet the requirements of Section 454.1.2.2.3; however, up to 50 percent of the perimeter may be obstructed.

454.1.9.8.6.11

IWFs shall be constructed of concrete or other impervious and structurally rigid material.

454.1.9.8.6.12

Floor slopes of an IWF shall be a maximum 1 foot (305 mm) vertical in 10 feet (3048 mm) horizontal and a minimum of 1 foot (305 mm) vertical in 60 feet (18 288 mm) horizontal.

454.1.9.8.6.13

In addition to the requirements of Section 454.1.2.3.5, all IWF pool rule signs installed shall have the following added in one inch letters:

"Do not swallow the fountain water, it is recirculated."

"Do not use fountain if you are ill with diarrhea."

454.1.9.8.7

Water theme parks shall meet all other aspects of these rules for the features provided.

454.1.9.8.7.1

Rules and regulations for water theme parks shall be posted in minimum 1-inch (305 mm) letters at each entrance to the park and shall contain the following:

1. No food, drink, glass or animals in pool or on the pool decks.
2. Park operating hours __A.M. to __P.M.
3. Shower before entering.
4. Do not swallow the pool water.

454.1.9.8.7.2

Showers shall be provided at or near the entrance (queue line) to a water recreation attraction.

454.1.9.8.7.3

Water theme parks are exempt from the fencing requirements of Section 454.1.3.1.9, except that pools designed for small children shall be fenced when located within 50 feet (15 240 mm) walking distance of a pool with water depths of 3 feet (914 mm) or more. Where the walking distance is at least 50 feet (15 240 mm) between a pool designed for small children and all other pools, fencing requirements should be carefully considered by the applicant to control usage, but are not required by rule. Barriers that are designed to define the walking path shall be subject to review and approval by the department.

454.1.9.8.7.4

Sanitary facilities within a water theme park shall be as near to the water recreation attractions as prudent to ensure patron use, but not over 200 feet (60 960 mm) walking distance from any exit of a water attraction.

454.1.9.9 Swim-Up Bars

Swim-up bars shall comply with the requirements of Sections 454.1.9.9.1 through 454.1.9.9.9.

454.1.9.9.1

Swim-up bars are only permitted at transient public lodging establishments licensed under s. 509.013(4)(a)1, *Florida Statutes*, or at a theme park or entertainment complex as defined in s. 509.013(9), F.S.

454.1.9.9.2

A swim-up bar shall be constructed in accordance with the applicable provisions of this code and within the limits of sound engineering practice. The maximum pool depth shall not exceed 54 inches (1372 mm). The disinfection equipment shall be

capable of feeding 12 mg/L of halogen to the continuous recirculation flow of the filtration system. Attendants or lifeguards shall be provided in accordance with a safety/lifeguard plan approved by the Department of Health.

454.1.9.9.3

A swim-up bar shall be equipped with a recirculation system which provides for a maximum time of 2 hours for turnover of the entire pool water volume. Swim-up bar water quality shall be continuously sustained in accordance with Department of Health (DOH) Rule 64E-9.004, *Florida Administrative Code*, by the installation and use of an automated controller with chemical sensing probes for disinfection and pH control.

454.1.9.9.4

Signage complying with Section 454.1.2.3.5 must be posted to inform patrons that the public swimming pool has a swim-up bar that provides food and beverages, that spillages should be reported to staff for rapid cleanup, and that consumption of alcoholic beverages may cause drowsiness.

454.1.9.9.5

If the bar or counter is built into the edge of the pool, pool access complying with Section 454.1.2.5 shall be provided at both ends of the bar. A deck complying with Section 454.1.3.1 shall be provided, except, up to 50 percent of the pool perimeter may be obstructed by the bar. Gutter or skimmers are not required at or under the bar counter, however, they are required at the rest of the pool. An automatic water level controller shall be provided, and an overfill waste line with air gap shall be provided.

454.1.9.9.6

A smooth, easily cleanable poolside surface must be provided for patrons to place their food and beverage containers upon.

454.1.9.9.7

A swim-up bar may be physically combined or connected with other pool types, however, food and drink must be permitted over the entire body of water and the requirements of Section 454.1.9.9 shall apply to the entire water volume. A swim-up bar's water must not mix with any body of water that is not a swim-up bar and does not allow the consumption of food and beverages.

454.1.9.9.8

A swim-up bar may include obstructions intended for seating. Any structure intended for seating in the pool shall have a minimum of 2 inch (51 mm) horizontal and 2 inch (51 mm) vertical markings in contrasting color on every edge, and be structurally rigid, impervious, non-toxic, smooth, and slip resistant. The corner intersections which protude or angle into the pool water shall be rounded with a minimum of 2 inch (51 mm) radius. Edges of such obstructions shall not overhang into the water.

454.1.9.10 Vanishing Edge Pools

454.1.9.10.1

Vanishing edge pools shall be designed and constructed within the limits of sound engineering practice and shall meet the requirements of Sections 454.1.1 through 454.1.6.5, unless specifically indicated otherwise.

454.1.9.10.2

Vanishing edges and associated discharge troughs or catch basins shall be constructed of concrete or other structurally rigid impervious materials with a nontoxic, smooth and slip-resistant finish.

454.1.9.10.3

The vanishing edge shall discharge into a trough or basin. The trough or basin must be covered with a lid or secure grating that has the capacity to support a responder attending to a bather in distress on the opposite side of the vanishing edge. The trough or basin must be designed to deter access. The maximum height of the trough or basin wall above surrounding grade shall be 10 inches (254 mm). A lowered wet deck in accordance with Section 454.1.3.1 must be provided around the trough or basin and immediately adjacent to it.

454.1.9.10.4

The vanishing edge length shall not exceed 65 feet (19 812 mm) or 40 percent of the pool perimeter, whichever is less. The maximum vertical distance from the top of the vanishing edge wall to the trough or catch basin cover or adjacent grade shall be 36 inches (914 mm). The maximum water depth in the pool at the vanishing edge wall shall be 4 feet (1219 mm). The vanishing

edge wall shall not be considered as a perimeter deck obstruction. Water line tile at the top of the edge wall as required by Section 454.1.2.1(a) is not required to be non-skid.

454.1.9.10.5

Depth markings for vanishing edges shall be in accordance with Section 454.1.2.3.1(5).

454.1.9.10.6

The remainder of the pool perimeter must have perimeter overflow gutters per Section 454.1.6.5.3.1 or recessed automatic surface skimmers in accordance with Section 454.1.6.5.3.2. Alternatively, a combination of recessed automatic surface skimmers and perimeter overflow gutters may be used along the remainder of the perimeter, such that parts of the perimeter without perimeter overflow gutters or vanishing edges shall have skimmers spaced every 20 feet (6096 mm) or less, regardless of the width or area of the pool.

454.1.10 Resurfacing

454.1.10.1 Repairs or Alterations of Pool Structure and Equipment

Replacement of the pool or spa shell is considered to be construction of a new facility and shall be processed as such. Resurfacing the pool interior to original nontoxic, slip-resistant and smooth specifications is considered a repair or alteration. Equivalent replacement of equipment is not considered a repair or alteration. The following items shall be addressed during resurfacing projects:

454.1.10.1.1

The lip of the gutter must be leveled to within $\frac{1}{4}$ inch (6.4 mm) between the highest and lowest point and the downward slope from the lip to the drain must be maintained as originally designed or increased, but shall not exceed new construction standards. The gutter surfaces shall be made to comply with Section 454.1.6.5.3.1.3.

454.1.10.1.2

Tile step markings must be installed meeting the requirements of Section 454.1.2.5.3.

454.1.10.1.3

Where applicable, the slope break marking must be installed meeting the requirements of Section 454.1.2.2.3.2 and safety line must be installed 2 feet (610 mm) before the marking.

454.1.10.1.4

Depth markers and NO DIVING markers must be installed in accordance with Section 454.1.2.3.

454.1.10.1.5

The pool ladder must have a 3 to 6 inch (76 to 152 mm) clearance from the pool wall. New cross-braced ladder(s) shall be installed in place of noncross-braced ladder(s) in conformance with Section 454.1.2.5.1 during a pool resurfacing.

454.1.10.1.6

Should resurfacing works affect the step riser heights, no riser shall exceed 12 inches (305 mm) for pools and 12 inches (305 mm) for spas, and the intermediate risers shall be made uniform.

454.1.10.1.7

Step treads that protrude from the pool wall shall be removed and replaced with a crossbraced ladder or reconstructed to meet the requirements of Section 454.1.2.5.1 or 454.1.2.5.2.

454.1.10.1.8

Handrails and grabrails that do not meet the requirements of Section 454.1.2.5.5 shall be brought into compliance with Section 454.1.2.5.5 or removed if not needed for compliance with Section 454.1.2.5.

454.1.10.1.9

If gutter grates are replaced, the new gutter grates shall have a total open surface area to meet or exceed the designed flow rate of the pool.

454.1.10.1.10

All elevated above-grade concrete pool walls and floors shall have waterproofing/dampproofing installed prior to the final surface application.

454.1.10.2

The painting of pools shall not be considered a *repair or alteration* provided the following conditions are met:

1. Only paints designated by the manufacturer as pool paints are used.
2. All step stripes, slope break markers and safety line, and depth and NO DIVING markings shall be provided to comply with the applicable provision(s) this section.

454.1.10.3

The installation of copper or copper/silver ionization units and ozone generators capable of producing less than a pool water ozone contact concentration of 0.1 milligrams per liter (mg/L) shall not be considered a pool repair or alteration provided compliance when the following is met:

1. The ionization or ozone generator unit complies with paragraph 64E-9.008(10)(e), *Florida Administrative Code*.
2. The manufacturer provides one set of signed and sealed engineering drawings indicating the following:
 - a. The unit does not interfere with the design flow rate.
 - b. The unit and the typical installation meet the requirements of the *National Electrical Code*.
 - c. A copper test kit and information regarding the maximum allowed copper and silver level and the minimum required chlorine level shall be available to the pool owner.
 - d. The unit shall meet the requirements of NSF/ANSI Standard 50.
3. At least 7 days before the time of installation, the installer will provide a photocopy of the above drawings and a letter of intent identifying the pool on which the unit is to be installed.
4. Upon completion of the installation, a professional engineer or electrician licensed in the state of Florida shall provide a letter to the county health department, indicating the unit was properly installed in accordance with the typical drawings, the *National Electrical Code* and local codes.

454.1.10.4 Electrical**454.1.10.4.1 Ground-Fault Circuit Interrupter Protection for Personnel**

Outlets supplying repaired, replaced, altered, or relocated pool pump motors connected to single-phase, 120-volt through 240-volt branch circuits, whether by receptacle or by direct connection, and outlets supplying all other repaired, replaced, altered, or relocated electrical equipment and underwater luminaires operating at voltages greater than the low voltage contact limit, connected to single-phase, 120-volt through 240-volt branch circuits, rated 15- and 20-amperes, whether by receptacle or by direct connection, shall be provided with ground-fault circuit interrupter protection for personnel.

454.1.10.4.2 Equipoential Bonding

Any of the parts specified in Sections 680.26(B)(1) through (B)(7) of the NFPA 70, *National Electrical Code* that are repaired, replaced, altered, or installed new at an existing swimming pool shall be connected to the existing bonding system using solid

copper conductors, insulated, covered, or bare, not smaller than 8 AWG or with rigid metal conduit of brass or other identified corrosion-resistant metal. Connections to bonded parts shall be made in accordance with Section 250.8 of NFPA 70, *National Electrical Code*. An 8 AWG or larger solid copper bonding conductor provided to reduce voltage gradients in the pool area shall not be required to be extended or attached to remote panelboards, service equipment, or electrodes. All metallic float-in light rings shall be connected to the equipotential bonding grid. Float-in light rings with no provision for bonding, and other devices which do not provide an electrical connection between a metallic underwater luminaire and the forming shell of a wet niche fixture, including screws or bolts not supplied by the luminaire's manufacturer and listed for use with the specific luminaire, shall not be allowed for use with any underwater luminaire that is required to be grounded. Where none of the bonded parts is in direct connection with the pool water, the pool water shall be in direct contact with an approved corrosion-resistant conductive surface that exposes not less than 9 square inches (5800 mm^2) of surface area to the pool water at all times. The conductive surface shall be located where it is not exposed to physical damage or dislodgement during usual pool activities, and it shall be bonded in accordance with Section 680.26(B) of the NFPA 70, *National Electrical Code*. A bonded concrete pool shell shall be considered to be a conductive surface. The interior metallic surface or surfaces of any forming shell (wet niche) shall not be covered with any material, including plaster, except potting compound covering internal bonding connections in conformance with 680.23(B)(2)(b) of NFPA 70, *National Electrical Code*, shall be allowed.

454.1.11 Public Bathing Places—Artificial Lagoons

454.1.11.1 General

An artificial lagoon is a type of water impoundment used as a public bathing place as defined in Section 514.011, *Florida Statutes*, that is man-made and has either: a total water surface area of at least one-half acre (2023.4 m^2) in size, with an impervious containment system such as an artificial liner, and incorporates a method of disinfection that results in a disinfectant residual in the swimming zone(s) that is protective of the public health; or has no impervious containment system or disinfectant system, and the water surface area of the artificial lagoon shall be at least 2 acres (8093.9 m^2) in size. Such artificial lagoons shall be designed and constructed within the limits of sound engineering practice and the provisions of Section 454.1.11.

454.1.11.2 Sizing and Sanitary Facilities for Artificial Lagoons

The maximum bathing load for an artificial lagoon with a disinfection system approved by the local authority shall be limited by total square footage of the entire lagoon area that allows for swimming or bathing with 25 square feet (2.32 m^2) assigned per bather in water 4 feet (1.219 m) deep or less, and 75 square feet (6.96 m^2) in water more than 4 feet deep. The maximum bathing load for all other artificial lagoons shall be limited by total square footage of the entire lagoon area that allows for swimming or bathing with 50 square feet (4.65 m^2) assigned per bather in water 4 feet deep or less, and 75 square feet in water more than 4 feet deep. Sanitary facilities serving patrons of an artificial lagoon shall meet the *Florida Building Code, Plumbing* criteria and are exempt from the fixture count requirements in Section 454.1.6.1.1. All sanitary facilities shall be located as near to the designated swimming area(s) as prudent to ensure patron use, but not more than 200 feet (61 m) walking distance from the designated swimming area(s).

454.1.11.3 Construction Standards for Artificial Lagoons

If an artificial liner is utilized as a containment system, the artificial liner used to contain the water shall consist of a material certified under NSF/ANSI Standard 61—2019, *Drinking Water System Components—Health Effects*, hereby incorporated by reference, which has been deemed copyright protected, and is available for review at the Department of State, R.A. Gray Building, 500 South Bronough Street, Tallahassee, FL 32399-0250. The liner or artificial bottom, the floor, and the walls, if any, shall be white or light pastel in color and shall have the characteristic of reflecting rather than absorbing light. The liner material color shall have a dry lightness level (CIE L value) of 80.0 or greater and a wet luminous reflectance value (CIE Y value) of 50.0 or greater, as determined by test results provided by the manufacturer, utilizing testing methodology from ASTM D4086, ASTM E1477 or ASTM E1347. The design of such liner system is the responsibility of a professional engineer licensed in Florida. If any designated swimming area, or portion thereof, is designed with swimming pool features, including concrete vertical walls and floors, such areas of the artificial lagoon shall be designed in compliance with Sections 454.1.2.2.2, 454.1.2.2.3 and 454.1.2.2.4. Additionally, debris skimmers shall be provided in such areas at least every 40 linear feet (12.19 m). Zero depth entry areas of artificial lagoons shall be designed in compliance with Sections 454.1.11.5 and 454.1.11.6.

454.1.11.4 Access to Artificial Lagoons

Points of access shall be provided as needed to provide adequate entrance to and exit from the artificial lagoon. Means of access may consist of ladders, stairs, recessed treads, and swimouts, designed in compliance with Section 454.1.2.5, zero depth entry areas, and docks, in any number and combination that is appropriate for the intended use(s) of the artificial lagoon. Permanent or portable steps, ramps, handrails, lifts or other devices designed to accommodate handicapped individuals may be provided. Lifts mounted into the wet deck shall have a minimum 4-foot-wide (1219 mm) deck behind the lift mount.

454.1.11.5 Decks and Walkways for Artificial Lagoons

Decks and walkways, if utilized to access a designated swimming area, shall be designed in compliance with Sections 454.1.3.1.1 and 454.1.3.1.2. Zero depth entry areas may slope toward the water for no more than 7 feet (2133 mm), as measured from the water's edge outward. Beyond this area, the deck or other surface shall slope away from the lagoon at a minimum of 2 percent to a maximum of 4 percent. Docks for aquatic activities such as sailing or kayaking, located outside of designated swimming areas, are exempt from this section.

454.1.11.6 Safety for Artificial Lagoons

The portion(s) of artificial lagoons designated for swimming shall meet the safety requirements in Section 454.1.3.3. Such designated swimming area(s) shall be visually separated from the rest of the artificial lagoon using a buoyed safety line(s) or similar device(s) approved by the local authority. Additionally, the floor slope at any designated swimming area(s) shall be continuous from the water's edge to the deepest point and not exceed 1-unit vertical in 10-units horizontal. The depth at the deepest point in any designated swimming area shall be indicated, along with the other rules and regulations signage required in Section 454.1.2.3.5. Where access to a portion of the artificial lagoon with a vertical wall is not blocked or obstructed by an approved substantial barrier, NO DIVING markers and depth markers shall be installed in accordance with Section 454.1.2.3.1, except that markers are not required on inside vertical walls of an artificial lagoon. Signage may be substituted for markers if approved by the local authority, and such markers or signs are required only along the accessible perimeter of the lagoon. Markings shall be of such materials that will not fade over time. Artificial lagoons are exempt from the fencing requirements of Section 454.1.3.1.9, except that separate swimming pools designed for small children shall be fenced when located within 50 feet (15 240 mm) of an artificial lagoon. If installed, underwater seat bench construction shall be in compliance with Section 454.1.2.6, Exception 2. If installed, sun shelf construction shall be in compliance with Section 454.1.2.6, Exception 3 and the applicable provisions of Section 454.1.2.8. Where water slides or climbable water activity features are used in or adjacent to the artificial lagoon, a lifeguard safety plan shall be submitted to the health department for approval and implemented by the owner/operator. Slides and water activity features shall be reviewed and approved by the local authority to conform with the same criteria for public swimming pools. If boating is allowed in the lagoon, provisions for bather safety and injury prevention must be specified and provided to the health department.

454.1.11.7 Electrical Systems for Artificial Lagoons

Electrical equipment wiring and installation, including the bonding and grounding of components, shall comply with Chapter 27 of the *Florida Building Code, Building*. Outlets supplying pump motors connected to single-phase 120-volt through 240-volt branch circuits, whether by receptacle or by direct connection, and outlets supplying other electrical equipment and underwater luminaires operating at voltages greater than the low voltage contact limit, connected to single-phase, 120 volt through 240 volt branch circuits, rated 15 or 20 amperes, whether by receptacle or by direct connection, shall be provided with ground-fault circuit interrupter protection for personnel. Any portions of the artificial lagoon designated for swimming at night shall comply with the lighting requirements in Sections 454.1.4.2.1 and 454.1.4.2.3.

454.1.11.8 Equipment Rooms

Equipment rooms for artificial lagoons shall comply with Section 454.1.5.

454.1.11.9 Treatment Systems for Artificial Lagoons

If continuous or intermittent chemical disinfection and/or non-chemical disinfection is provided to the artificial lagoon water, the equipment that feeds or generates the chemical shall be NSF/ANSI Standard 50 certified and subject to review and approval by the local authority. The disinfectant chemical shall be applied in accordance with the manufacturer's instructions, and must be an NSF/ANSI Standard 60 certified chemical, or a US EPA registered microbial biocide. Any other chemical applied to the water for water quality treatment must be applied in accordance with the manufacturer's instructions and must be an NSF/ANSI Standard 60 or Standard 50 certified chemical. If remote chemical monitoring sensors are used, one (1) chemical sensor shall be installed in or directly adjacent to each designated swimming area. Vacuum systems shall not be used in designated swimming area(s) while such area(s) is (are) open for swimming, and all suction outlets shall comply with the requirements of Section 514.0315, *Florida Statutes*.

454.1.12 Surf Pools

454.1.12.1 General

A surf pool is a type of water impoundment used as a public bathing place as defined in Section 514.011, *Florida Statutes*, that is man-made and has either: a total water surface area of at least one-quarter acre (1012 m^2) in size, with an impervious containment system such as an artificial liner, and incorporates a method of disinfection that results in a disinfectant residual in the swimming zone(s) that is protective of the public health. Such surf pools shall be designed and constructed within the limits of sound engineering practice and the provisions of Section 454.1.12.

454.1.12.2 Sizing and Sanitary Facilities

The maximum bathing load for a surf pool with a disinfection system approved by the local authority shall be limited by total square footage of the entire area that allows for surfing with 100 square feet (9.29 m^2) per bather in water more than 4 feet (1219 mm) deep. Sanitary facilities serving patrons of an artificial lagoon shall meet the *Florida Building Code, Plumbing* criteria and are exempt from the fixture count requirements in Section 454.1.6.1.1. All sanitary facilities shall be located as near to the designated surfing area(s) as prudent to ensure patron use, but not more than 200 feet (60 960 mm) walking distance from the designated surfing area(s).

454.1.12.3 Construction Standards

If an artificial liner is utilized as a containment system, the artificial liner used to contain the water shall consist of a material certified under NSF/ANSI Standard 61-2021, *Drinking Water System Components—Health Effects*, dated April 14, 2021, hereby incorporated by reference, which has been deemed copyright protected, and is available for review at the Department of State, R.A. Gray Building, 500 South Bronough Street, Tallahassee, FL 32399-0250. The liner or artificial bottom, the floor, and the walls, if any, shall be white or light pastel in color and shall have the characteristic of reflecting rather than absorbing light. The liner material color shall have a wet luminous reflectance value (CIE Y value) of 50.0 or greater, as determined by test results provided by the manufacturer, utilizing testing methodology from ASTM D4086, ASTM E1477 or ASTM E1347. The design of such liner system is the responsibility of a professional engineer licensed in Florida. If any designated surfing area, or portion thereof, is designed with swimming pool features, including concrete vertical walls and floors, such areas of the pool shall be designed in compliance with Sections 454.1.2.2.2, 454.1.2.2.3 and 454.1.2.2.4.

454.1.12.4 Access

Points of access shall be provided as needed to provide adequate entrance to and exit from the surf pool. Means of access may consist of ladders, stairs, recessed treads, and swimouts designed in compliance with Section 454.1.2.5, zero depth entry areas, and docks, in any number and combination that is appropriate for the intended use(s) of the surf pool. Permanent or portable steps, ramps, handrails, lifts or other devices designed to accommodate handicapped individuals may be provided. Lifts mounted into the wet deck shall have a minimum 4-foot-wide (1219 mm) deck behind the lift mount.

454.1.12.5 Decks and Walkways

Decks and walkways, if utilized to access a designated surfing area, shall be designed in compliance with Sections 454.1.3.1.1 and 451.1.3.1.2. Zero depth entry areas may slope toward the water for no more than 15 feet (4572 mm), as measured from the water's edge outward. Beyond this area, the deck or other surface shall slope away from the surf pool at a minimum of 2 percent to a maximum of 4 percent, and shall be ADA compliant.

454.1.12.6 Safety

The portion(s) designated for surfing shall meet the safety requirements in Section 454.1.3.3. The depth at the deepest point in any designated swimming/surfing area shall be indicated, along with the other rules and regulations signage required in Section 454.1.2.3.5. Where access to a portion with a vertical wall is not blocked or obstructed by an approved substantial barrier, NO DIVING markers and depth markers shall be installed in accordance with Section 454.1.2.3.1, except that markers are not required on inside vertical walls. Signage may be substituted for markers if approved by the local authority, and such markers or signs are required only along the accessible perimeter. Markings shall be of such materials that will not fade over time. A lifeguard safety plan shall be submitted to the health department for prior approval and implemented by the owner/operator.

454.1.12.7 Electrical Systems for Artificial Lagoons

Electrical equipment wiring and installation, including the bonding and grounding of components, shall comply with Chapter 27 of the *Florida Building Code, Building*. Outlets supplying pump motors connected to single-phase 120-volt through 240-volt branch circuits, whether by receptacle or by direct connection, and outlets supplying other electrical equipment and underwater luminaires operating at voltages greater than the low voltage contact limit, connected to single-phase, 120- volt through 240-volt branch circuits, rated 15 or 20 amperes, whether by receptacle or by direct connection, shall be provided with ground-fault circuit interrupter protection for personnel. Any portions of the artificial lagoon designated for swimming at night shall comply with the lighting requirements in Sections 454.1.4.2.1 and 454.1.4.2.3.

454.1.12.8 Equipment Rooms

Equipment rooms shall comply with Section 454.1.5.

454.1.12.9 Treatment Systems

The design of the treatment system is the responsibility of a professional engineer licensed in Florida. Chemical disinfection of recirculated water immediately following the filtration process shall achieve a measurable residual in the surf pool water that is continuously protective of public health and shall be in compliance with Section 454.1.6.5.16. The equipment that feeds or generates the chemical shall be NSF/ANSI Standard 50 certified and subject to review and approval by the local authority. The disinfectant

chemical shall be applied in accordance with the manufacturer's instructions, and must be an NSF/ANSI Standard 60-certified chemical, or a US EPA-registered microbial biocide. Any other chemical applied to the water for water quality treatment must be applied in accordance with the manufacturer's instructions and must be an NSF/ANSI Standard 60- or Standard 50-certified chemical. If remote chemical monitoring sensors are used, one (1) chemical sensor shall be installed in or directly adjacent to each designated surf area. Vacuum systems shall not be used in designated swimming area(s) while such area(s) is (are) open for swimming, and all suction outlets shall comply with the requirements of Section 514.0315, *Florida Statutes*.

454.2 Private Swimming Pools

454.2.1 Definitions—General

454.2.1.1 Tense, Gender and Number

For the purpose of this code, certain abbreviations, terms, phrases, words, and their derivatives shall be construed as set forth in this section. Words used in the present tense include the future. Words in the masculine gender include the feminine and neuter. Words in the feminine and neuter gender include the masculine. The singular number includes the plural and the plural number includes the singular.

454.2.1.2 Words Not Defined

Words not defined herein shall have the meanings stated in the *Florida Building Code, Building; Florida Building Code, Mechanical; Florida Building Code, Plumbing; Florida Building Code, Fuel Gas; or Florida Fire Prevention Code*. Words not defined in the *Florida Building Code* shall have the meanings stated in the Webster's Ninth New Collegiate Dictionary, as revised.

454.2.2 Definitions

ABOVE-GROUND/ON-GROUND POOL. See "Swimming pool."

ADMINISTRATIVE AUTHORITY. The individual official, board, department or agency established and authorized by a state, county, city or other political subdivision created by law to administer and enforce the provisions of the swimming pool code as adopted or amended.

APPROVED. Accepted or acceptable under an applicable specification stated or cited in this code, or accepted as suitable for the proposed use under procedures and power of the administrative authority.

APPROVED SAFETY COVER. A manually or power-applied safety pool cover that meets all of the performance standards of ASTM International in compliance with ASTM F1346.

APPROVED TESTING AGENCY. An organization primarily established for the purpose of testing to approved standards and approved by the administrative authority.

BACKWASH PIPING. See "Filter waste discharge piping."

BARRIER. A fence, dwelling wall or nondwelling wall or any combination thereof which completely surrounds the swimming pool and obstructs access to the swimming pool, especially access from the residence or from the yard outside the barrier.

BODY FEED. Filter aid fed into a diatomite-type filter throughout the filtering cycle.

CARTRIDGE FILTER. A filter using cartridge-type filter elements.

CHEMICAL PIPING. Piping which conveys concentrated chemical solutions from a feeding apparatus to the circulation piping.

CIRCULATION PIPING SYSTEM. Piping between the pool structure and the mechanical equipment. Usually includes suction piping, face piping and return piping.

COMBINATION VALVE. A multipart valve intended to perform more than one function.

DESIGN HEAD. Total head requirement of the circulation system at the design rate of flow.

DIATOMITE (DIATOMACEOUS EARTH). A type of filter aid.

DIATOMITE-TYPE FILTER. A filter designed to be used with filter aid.

DIRECT ACCESS FROM THE HOME. Any opening which discharges into the "perimeter" of the pool or any opening in an exterior dwelling wall, or interior wall (for indoor pools) which faces the pool.

EXIT ALARM. A device that makes audible, continuous alarm sounds when any door or window which permits access from the residence to any pool that is without an intervening enclosure is opened or left ajar.

FACE PIPING. Piping, with all valves and fittings, which is used to connect the filter system together as a unit.

FILTER. Any apparatus by which water is clarified.

FILTER AID. A nonpermanent type of filter medium or aid such as diatomite, alum, etc.

FILTER CARTRIDGE. A disposable or renewable filter element which generally employs no filter aid.

FILTER ELEMENT. That part of a filter which retains the filter medium.

FILTER MEDIUM. Fine material which entraps the suspended particles and removes them from the water.

FILTER RATE. Average rate of flow per square foot of filter area.

FILTER ROCK. Specially graded rock and gravel used to support filter sand.

FILTER SAND. A specially graded type of permanent filter medium.

FILTER SEPTUM. That part of the filter element in a diatomite-type filter upon which a cake of diatomite or other nonpermanent filter aid may be deposited.

FILTER WASTE DISCHARGE PIPING. Piping that conducts waste water from a filter to a drainage system. Connection to drainage system is made through an air gap or other approved methods.

FRESH WATER. Those waters having a specific conductivity less than a solution containing 6,000 ppm of sodium chloride.

HIGH RATE SAND FILTER. A sand filter designed for flows in excess of 5 gpm (0.3 L/s) per square foot.

HOT TUB. See "Swimming pool."

INGROUND POOL. See "Swimming pool."

INLET FITTING. Fitting or fixture through which circulated water enters the pool.

MAIN SUCTION OUTLET. Outlet at the deep portion of the pool through which the main flow of water leaves the pool when being drained or circulated.

MEDICALLY FRAIL ELDERLY PERSON. Any person who is at least 65 years of age and has a medical problem that affects balance, vision, or judgment, including but not limited to a heart condition, diabetes, or Alzheimer's disease or any related disorder.

MESH SAFETY BARRIER. A combination of materials, including fabric, posts, and other hardware to form a barrier around a swimming pool.

POOL. See "Swimming pool."

POOL DEPTHS. The distance between the floor of pool and the maximum operating water level.

POOL PERIMETER. A pool perimeter is defined by the limits of the pool deck, its surrounding area including yard area on same property, and any dwelling or nondwelling wall or any combination thereof which completely surrounds the pool.

POOL PLUMBING. All chemical, circulation, filter waste discharge piping, deck drainage and water filling systems.

PORTABLE POOL. A prefabricated pool which may be erected at the point of intended use and which may be subsequently disassembled and reerected at a new location. Generally installed on the surface of the ground and without excavation.

PRECOAT. In a diatomite-type filter, the initial coating or filter aid placed on the filter septum at the start of the filter cycle.

RAPID SAND FILTER. A filter designed to be used with sand as the filter medium and for flows not to exceed 5 gpm (0.3 L/s) per square foot.

RECEPTOR. An approved plumbing fixture or device of such material, shape and capacity as to adequately receive the discharge from indirect waste piping, so constructed and located as to be readily cleaned.

RESIDENTIAL. Situated on the premises of a detached one- or two-family dwelling or a one-family townhouse not more than three stories high.

RETURN PIPING. That portion of the circulation piping which extends from the outlet side of the filters to the pool.

SALINE WATER. Those waters having a specific conductivity in excess of a solution containing 6,000 ppm of sodium chloride.

SEPARATION TANK. A device used to clarify filter rinse or waste water; sometimes called a "reclamation tank."

SKIM FILTER. A surface skimmer combined with a vacuum diatomite filter.

SPA, NONPORTABLE. See "Swimming pool."

SPA, PORTABLE. Nonpermanent structure intended for recreational bathing, in which all controls and water heating and water circulating equipment are an integral part of the product and which is cord-connected and not permanently electrically wired.

SUCTION PIPING. That portion of the circulation piping located between the pool structure and the inlet side of the pump and usually includes main outlet piping, skimmer piping, vacuum piping and surge tank piping.

SURFACE SKIMMER. A device generally located in the pool wall which skims the pool surface by drawing pool water over a self-adjusting weir.

SWIMMING POOL, INDOOR. A swimming pool which is totally contained within a structure and surrounded on all four sides by walls of said structure.

SWIMMING POOL, OUTDOOR. Any swimming pool which is not an indoor pool.

SWIMMING POOL, PRIVATE. Any structure, located in a residential area, that is intended for swimming or recreational bathing and contains water over 24 inches (610 mm) deep including but not limited to inground, above-ground, and on-ground swimming pools, hot tubs, and nonportable spas.

SWIMMING POOL, PUBLIC. A watertight structure of concrete, masonry, fiberglass, stainless steel or plastic which is located either indoors or outdoors, used for bathing or swimming by humans, and filled with a filtered and disinfected water supply, together with buildings, appurtenances and equipment used in connection therewith. A public swimming pool or public pool shall mean a conventional pool, spa-type pool, wading pool, special purpose pool or water recreation attraction, to which admission may be gained with or without payment of a fee and includes, pools operated by or serving camps, churches, cities, counties, day care centers, group home facilities for eight or more clients, health spas, institutions, parks, state agencies, schools, subdivisions; or the cooperative living-type projects of five or more living units, such as apartments, boarding houses, hotels, mobile home parks, motels, recreational vehicle parks and townhouses.

SWIMMING POOL, RESIDENTIAL. See "Swimming pool, private."

TURNOVER TIME. The time in hours required for the circulation system to filter and recirculate a volume of water equal to the pool volume.

VACUUM FITTING. A fitting in the pool which is used as a convenient outlet for connecting the underwater suction cleaning equipment.

VACUUM PIPING. The piping from the suction side of a pump connected to a vacuum fitting located at the pool and below the water level.

WASTE PIPING. See "Filter waste discharge piping."

WIDTH AND/OR LENGTH. Actual water dimension taken from wall to wall at the maximum operating water level.

YOUNG CHILD. Any person under the age of 6 years.

454.2.3 Mechanical Requirements

Unless otherwise specified in this code, all piping, equipment and materials used in the process piping system of swimming pools that are built in place shall conform to the *Florida Building Code, Plumbing*.

454.2.4 Approvals

454.2.4.1 Compliance

All materials, piping, valves, equipment or appliances entering into the construction of swimming pools or portions thereof shall be of a type complying with this code or of a type recommended and approved by a nationally recognized testing agency or conforming to other recognized standards acceptable to the administrative authority.

454.2.4.2 Items Not Covered

For any items not specifically covered in these requirements, the administrative authority is hereby authorized to require that all equipment, materials, methods of construction and design features shall be proven to function adequately, effectively and without excessive maintenance and operational difficulties.

454.2.4.2.1 Flood Hazard Areas

Private swimming pools installed in flood hazard areas established in Section 1612.3 shall comply with Section 1612.

454.2.4.3 Applicant Responsibility

It shall be the responsibility of the applicant to provide such data, tests or other adequate proof that the device, material or product will satisfactorily perform the function for which it is intended, before such item shall be approved or accepted for tests.

454.2.5 Alternate Materials and Methods of Construction**454.2.5.1 Approval and Authorization**

The provisions of this code are not intended to prevent the use of any alternate material, method of construction, appliance or equipment, provided any such alternate has been first approved and its use authorized by the administrative authority.

454.2.5.2 Required Tests

When there is insufficient evidence to substantiate claims for alternates, the administrative authority may require tests, as proof of compliance, to be made by an approved agency at the expense of the applicant.

454.2.6 Private Swimming Pools**454.2.6.1 Conformance Standard**

Design, construction and workmanship shall be in conformity with the requirements of ANSI/APSP/ICC 3, ANSI/APSP/ICC 4, ANSI/APSP/ICC 5, ANSI/APSP/ICC 6, and ANSI/PHTA/ICC 7.

454.2.6.2 Required Equipment

Every swimming pool shall be equipped complete with approved mechanical equipment consisting of filter, pump, piping valves and component parts.

Exception: Pools with a supply of fresh water equivalent to the volume of the pool in the specified turnover time will be allowed.

454.2.6.3 Water Velocity

Pool piping shall be designed so the water velocity will not exceed 10 feet per second (mm/s) for pressure piping and 8 feet per second (mm/s) for suction piping, except that the water velocity shall not exceed 8 feet per second (3048 mm/s) in copper tubing. Main suction outlet velocity must comply with ANSI/PHTA/ICC 7.

Exception: Jet inlet fittings shall not be deemed subject to this requirement.

454.2.6.4 Piping to Heater

Water flow through the heater, any bypass plumbing installed, any back-siphoning protection, and the use of heat sinks shall be done in accordance with the manufacturer's recommendations.

454.2.6.5 Piping Installation

All piping materials shall be installed in strict accordance with the manufacturer's installation standards.

Exception: Primer and glue on exposed aboveground piping not required to be colored.

454.2.6.6

Entrapment protection for suction outlets shall be installed in accordance with requirements of ANSI/PHTA/ICC 7.

454.2.7 Pumps

454.2.7.1 Strainer

Pool circulating pumps shall be equipped on the inlet side with an approved-type hair and lint strainer when used with a pressure filter.

454.2.7.2 Installation

Pumps shall be installed in accordance with manufacturer recommendations.

454.2.7.3 Capacity

Pumps shall have design capacity at the following heads.

1. Pressure diatomaceous earth—At least 60 feet (18 288 mm).
2. Vacuum D.E.—20-inch (508 mm) vacuum on the suction side and 40 feet (1219 mm) total head.
3. Rapid sand—At least 45 feet (13 716 mm).
4. High rate sand—At least 60 feet (18 288 mm).

454.2.7.4 Materials

Pump impellers, shafts, wear rings and other working parts shall be of corrosion-resistant materials.

454.2.8 Valves

454.2.8.1 General

Valves shall be made of materials that are approved in the *Florida Building Code, Plumbing*. Valves located under concrete slabs shall be set in a pit having a least dimension of five pipe diameters with a minimum of at least 10 inches (254 mm) and fitted with a suitable cover. All valves shall be located where they will be readily accessible for maintenance and removal.

454.2.8.2 Full-Way (Gate) Valves

Full-way valves shall be installed to insure proper functioning of the filtration and piping system. When the pump is located below the overflow rim of the pool, a valve shall be installed on the discharge outlet and the suction line.

454.2.8.3 Check Valves

Where check valves are installed they shall be of the swing, spring or vertical check patterns.

454.2.8.4 Combination Valves

Combination valves shall be installed per the manufacturer's installation instructions.

454.2.9 Water Supply

Unless an approved type of filling system is installed, any water supply which in the judgment of the administrative authority may be used to fill the pool, shall be equipped with backflow protection. No over the rim fill spout shall be accepted unless located under a diving board, or properly guarded.

454.2.10 Waste Water Disposal

454.2.10.1 Connection Limitations

Direct or indirect connections shall not be made between any storm drain, sewer, drainage system, seepage pit underground leaching pit, or subsoil drainage line, and any line connected to a swimming pool unless approved by the administrative authority.

454.2.10.2 Disposal Through Public Sewer

When the waste water from a swimming pool is to be disposed of through a public sewer, a 3-inch (76 mm) P-trap shall be installed on the lower terminus of the building drain and the tail piece from the trap shall extend a minimum of 3 inches (76 mm) above finished grade and below finished floor grade. This trap need not be vented. The connection between the filter waste discharge piping and the P-trap shall be made by means of an indirect connection.

454.2.10.3 Deviations

Plans and specifications for any deviation from the above manner of installation shall first be approved by the administrative authority before any portion of any such system is installed. When waste water disposal is to seepage pit installation, it shall be installed in accordance with the approval granted by the administrative authority.

454.2.11 Separation Tank

A separation tank of an approved type may be used in lieu of the aforementioned means of waste water disposal when connected as a reclamation system.

454.2.12 Tests**454.2.12.1 Pressure Test**

All pool piping shall be tested and proved tight to the satisfaction of the administrative authority, under a static water or air pressure test of not less than 35 psi (241 kPa) for 15 minutes.

Exception: Circulating pumps need not be tested as required in this section.

454.2.12.2 Drain and Waste Piping

All drain and waste piping shall be tested by filling with water to the point of overflow and all joints shall be tight.

454.2.13 Drain Piping**454.2.13.1 Slope to Discharge**

Drain piping serving gravity overflow gutter drains and deck drains shall be installed to provide continuous grade to point of discharge.

454.2.13.2 Joints and Connections

Joints and connections shall be made as required by the *Florida Building Code, Plumbing*.

454.2.14 Water Heating Equipment**454.2.14.1 Labels**

Swimming pool water heating equipment shall conform to the design, construction and installation requirements in accordance with accepted engineering practices and shall bear the label of a recognized testing agency, and shall include a consideration of combustion air, venting and gas supply requirements for water heaters.

454.2.14.2 Water Retention

If a heater is not equipped or designed for an approved permanent bypass or antisiphon device, an approved permanent bypass or antisiphon device shall be installed to provide a positive means of retaining water in the heater when the pump is not in operation.

454.2.14.3 Pit Drainage

When the heater is installed in a pit, the pit shall be provided with approved drainage facilities.

454.2.14.4 Connections

All water heating equipment shall be installed with flanges or union connection adjacent to the heater.

454.2.14.5 Relief Valve

When water heating equipment which is installed in a closed system has a valve between the appliance and the pool, a pressure relief valve shall be installed on the discharge side of the water heating equipment. For units up to and including 200,000 Btu/hour

input, the relief valve shall be rated by the American Gas Association.

454.2.15 Gas Piping

Gas piping shall comply with the *Florida Building Code, Fuel Gas*.

454.2.16 Electrical

Electrical equipment wiring and installation, including the bonding and grounding of pool components, shall comply with Chapter 27 of the *Florida Building Code, Building*. Outlets supplying pool pump motors connected to single-phase 120-volt through 240-volt branch circuits, whether by receptacle or by direct connection, and outlets supplying other electrical equipment and underwater luminaires operating at voltages greater than the low voltage contact limit, connected to single-phase, 120 volt through 240 volt branch circuits, rated 15 or 20 amperes, whether by receptacle or by direct connection, shall be provided with ground-fault circuit interrupter protection for personnel.

454.2.17 Residential Swimming Barrier Requirement

Residential swimming pools shall comply with Sections 454.2.17.1 through 454.2.17.3.

Exception: A swimming pool with an approved safety pool cover complying with ASTM F1346.

454.2.17.1 Outdoor Swimming Pools

Outdoor swimming pools shall be provided with a barrier complying with Sections 454.2.17.1.1 through 454.2.17.1.14.

454.2.17.1.1

The top of the barrier shall be at least 48 inches (1219 mm) above grade measured on the side of the barrier which faces away from the swimming pool. The maximum vertical clearance between grade and the bottom of the barrier shall be 2 inches (51 mm) measured on the side of the barrier which faces away from the swimming pool. Where the top of the pool structure is above grade the barrier may be at ground level or mounted on top of the pool structure. Where the barrier is mounted on top of the pool structure, the maximum vertical clearance between the top of the pool structure and the bottom of the barrier shall be 4 inches (102 mm).

454.2.17.1.2

The barrier may not have any gaps, openings, indentations, protrusions, or structural components that could allow a young child to crawl under, squeeze through, or climb over the barrier as herein described below. One end of a removable child barrier shall not be removable without the aid of tools. Openings in any barrier shall not allow passage of a 4-inch diameter (102 mm) sphere.

454.2.17.1.3

Solid barriers which do not have openings shall not contain indentations or protrusions except for normal construction tolerances and tooled masonry joints.

454.2.17.1.4

Where the barrier is composed of horizontal and vertical members and the distance between the tops of the horizontal members is less than 45 inches (1143 mm), the horizontal members shall be located on the swimming pool side of the fence. Spacing between vertical members shall not exceed $1\frac{3}{4}$ inches (44 mm) in width. Where there are decorative cutouts within vertical members, spacing within the cutouts shall not exceed $1\frac{3}{4}$ inches (44 mm) in width.

454.2.17.1.5

Where the barrier is composed of horizontal and vertical members and the distance between the tops of the horizontal members is 45 inches (1143 mm) or more, spacing between vertical members shall not exceed 4 inches (102 mm). Where there are decorative cutouts within vertical members, spacing within the cutouts shall not exceed $1\frac{3}{4}$ inches (44 mm) in width.

454.2.17.1.6

Maximum mesh size for chain link fences shall be a $2\frac{1}{4}$ inch (57 mm) square unless the fence is provided with slats fastened at the top or bottom which reduce the openings to no more than $1\frac{3}{4}$ inches (44 mm).

454.2.17.1.7

Where the barrier is composed of diagonal members, the maximum opening formed by the diagonal members shall be no more than $1\frac{3}{4}$ inches (44 mm).

454.2.17.1.8

Access gates, when provided, shall be self-closing and shall comply with the requirements of Sections 454.2.17.1.1 through 454.2.17.1.7 and shall be equipped with a self-latching locking device located on the pool side of the gate. Where the device release is located no less than 54 inches (1372 mm) from the bottom of the gate, the device release mechanism may be located on either side of the gate and so placed that it cannot be reached by a young child over the top or through any opening or gap from the outside. Gates that provide access to the swimming pool must open outward away from the pool. The gates and barrier shall have no opening greater than $\frac{1}{2}$ inch (12.7 mm) within 18 inches (457 mm) of the release mechanism.

454.2.17.1.9

Where a wall of a dwelling serves as part of the barrier, one of the following shall apply:

1. All doors and windows providing direct access from the home to the pool shall be equipped with an exit alarm complying with UL 2017 that has a minimum sound pressure rating of 85 dBA at 10 feet (3048 mm). Any deactivation switch shall be located at least 54 inches (1372 mm) above the threshold of the access. Separate alarms are not required for each door or window if sensors wired to a central alarm sound when contact is broken at any opening.

Exceptions:

1. Screened or protected windows having a bottom sill height of 48 inches (1219 mm) or more measured from the interior finished floor at the pool access level.
2. Windows facing the pool on the floor above the first story.
3. Screened or protected pass-through kitchen windows 42 inches (1067 mm) or higher with a counter beneath.

2. All doors providing direct access from the home to the pool must be equipped with a selfclosing, self-latching device with positive mechanical latching/locking installed a minimum of 54 inches (1372 mm) above the threshold, which is approved by the authority having jurisdiction.

3. A swimming pool alarm that, when placed in a pool, sounds an alarm upon detection of an accidental or unauthorized entrance into the water. Such pool alarm must meet and be independently certified to ASTM F2208, titled "Standard Safety Specification for Residential Pool Alarms," which includes surface motion, pressure, sonar, laser, and infrared alarms. For purposes of this paragraph, the term "swimming pool alarm" does not include any swimming protection alarm device designed for individual use, such as an alarm attached to a child that sounds when the child exceeds a certain distance or becomes submerged in water.

454.2.17.1.10

Where an above-ground pool structure is used as a barrier or where the barrier is mounted on top of the pool structure, and the means of access is a ladder or steps, the ladder or steps either shall be capable of being secured, locked or removed to prevent access, or the ladder or steps shall be surrounded by a barrier which meets the requirements of Sections 454.2.17.1.1 through 454.2.17.1.9 and Sections 454.2.17.1.12 through 454.2.17.1.14. When the ladder or steps are secured, locked or removed, any opening created shall not allow the passage of a 4-inch-diameter (102 mm) sphere.

454.2.17.1.11

Standard screen enclosures which meet the requirements of Section 454.2.17 may be utilized as part of or all of the "barrier" and shall be considered a "nondwelling" wall. Removable child barriers shall have one end of the barrier nonremovable without the aid of tools.

454.2.17.1.12

The barrier must be placed around the perimeter of the pool and must be separate from any fence, wall, or other enclosure surrounding the yard unless the fence, wall, or other enclosure or portion thereof is situated on the perimeter of the pool, is

being used as part of the barrier, and meets the barrier requirements of this section.

454.2.17.1.13

Removable child barriers must be placed sufficiently away from the water's edge to prevent a young child or medically frail elderly person who may manage to penetrate the barrier from immediately falling into the water. Sufficiently away from the water's edge shall mean no less than 20 inches (508 mm) from the barrier to the water's edge. Dwelling or nondwelling walls including screen enclosures, when used as part or all of the barrier and meeting the other barrier requirements, may be as close to the water's edge as permitted by this code.

454.2.17.1.14

A wall of a dwelling may serve as part of the barrier if it does not contain any door or window that opens to provide direct access from the home to the swimming pool.

454.2.17.1.15

A mesh safety barrier meeting the requirements of Section 454.2.17, installed in accordance with the manufacturer's instructions and complying with ASTM F2286, shall be considered a barrier as defined in this section. Where a hinged gate is used with a mesh fence, the gate shall comply with Section 454.2.17.1.8. Mesh fences shall not be installed on top of above-ground/on-ground private swimming pools.

454.2.17.1.16 Adjacent Waterways

Permanent natural or permanent man-made features such as bulkheads, canals, lakes, navigable waterways, etc., adjacent to a public or private swimming pool or spa may be permitted as a barrier when approved by the authority having jurisdiction. When evaluating such barrier features, the authority may perform on-site inspections and review evidence such as surveys, aerial photographs, water management agency standards and specifications, and any other similar documentation to verify, at a minimum, the following:

1. The barrier feature is not subject to natural changes, deviations, or alterations and is capable of providing an equivalent level of protection as that provided by the code.
2. The barrier feature clearly impedes, prohibits or restricts access to the swimming pool or spa.

454.2.17.2 Indoor Swimming Pools

All walls surrounding indoor swimming pools shall comply with Section 454.2.17.1.9.

454.2.17.3 Prohibited Locations

A barrier may not be located in a way that allows any permanent structure, equipment, or window that opens to provide access from the home to the swimming pool.

454.2.18 Ladders and Steps

All pools whether public or private shall be provided with a ladder or steps in the shallow end where water depth exceeds 24 inches (610 mm). In private pools where water depth exceeds 5 feet (1524 mm) there shall be ladders, stairs or underwater benches/swim-outs in the deep end. Where manufactured diving equipment is to be used, benches or swim-outs shall be recessed or located in a corner.

Exception: In private pools having more than one shallow end, only one set of steps are required. A bench, swimout or ladder may be used at all additional shallow ends in lieu of an additional set of steps.

454.2.19 Final Inspection

Final electrical, and barrier code, inspection shall be completed prior to filling the pool with water.

Exception: Vinyl liner and fiberglass pools are required to be filled with water upon installation.

454.2.20 Filters

Components shall have sufficient capacity to provide a complete turnover of pool water in 12 hours or less.

454.2.20.1 Sand Filters

454.2.20.1.1 Approved Types

Rapid sand filters [flow up to 5 gpm per square foot (0.3L/s)] shall be constructed in accordance with approved standards. Where high rate sand filters [flow in excess of 5 gpm per square foot (0.3 L/s)] are used, they shall be of an approved type. The circulation system and backwash piping shall be adequate for proper backwashing of said filter and shall provide backwash flow rates of at least 12 gpm per square foot (0.8 L/s) for rapid sand filters or 15 gpm per square foot (0.9 L/s) for high rate sand filters.

454.2.20.1.2 Instructions

Every filter system shall be provided with written operating instructions.

454.2.20.1.3 Filter System Equipment

On pressure-type filters, a means shall be provided to permit the release of internal pressure. A filter incorporating an automatic internal air release as its principal means of air release shall have lids which provide a slow and safe release of pressure as part of its design. A separation tank used in conjunction with a filter tank shall have as part of its design a manual means of air release or a lid which provides a slow and safe release of pressure as it is opened.

454.2.20.2 Diatomite-Type Filters**454.2.20.2.1 Design**

Diatomite-type filters shall be designed for operation under either pressure or vacuum. The design capacity for both pressure and vacuum filters shall not exceed 2 gpm per square foot (0.13 L/s) of effective filter area.

454.2.20.2.2 Filter Aid

Provision shall be made to introduce filter aid into the filter in such a way as to evenly precoat the filter septum.

454.2.21 Pool Fittings**454.2.21.1 Approved Type**

Pool fittings shall be of an approved type and design as to be appropriate for the specific application.

454.2.21.2 Skimmers

Approved surface skimmers are required and shall be installed in strict accordance with the manufacturer's installation instructions. Skimmers shall be installed on the basis of one per 800 square feet (74 m^2) of surface area or fraction thereof, and shall be designed for a flow rate of at least 25 gpm (94 L/m) per skimmer.

454.2.21.3 Main Outlet

An approved main outlet, when provided, shall be located on a wall or floor at or near the deepest point in the pool for emptying or circulation, or both, of the water in the pool.

454.2.21.4 Hydrostatic Relief Device

In areas of anticipated water table an approved hydrostatic relief device shall be installed.

Exception: Plastic liner pools (where there is no structural bottom to the pool).

454.2.21.5 Inlet Fittings

Approved manufactured inlet fittings for the return of recirculated pool water shall be provided on the basis of at least one per 300 square feet (28 m^2) of surface area. Such inlet fittings shall be designed and constructed to insure an adequate seal to the pool structure and shall incorporate a convenient means of sealing for pressure testing of the pool circulation piping. Where more than one inlet is required, the shortest distance between any two required inlets shall be at least 10 feet (3048 mm).

454.2.22 Equipment Foundations and Enclosures

All pool motors and equipment shall be installed in compliance with the manufacturer's recommendations. All heating and electrical equipment, unless approved for outdoor installation, shall be adequately protected against the weather or installed within a building.

454.2.23 Accessibility and Clearances

Equipment shall be so installed as to provide ready accessibility for cleaning, operating, maintenance and servicing.

Section 455 Public Lodging Establishments

455.1 Scope

Public lodging establishments shall comply with the following design and construction standards.

Note: Other administrative and programmatic provisions may apply. See Department of Business and Professional Regulations (DBPR) Rules 61C-1 and 61C-3, *Florida Administrative Code* and Chapter 509, *Florida Statutes*.

455.2 Definitions

PUBLIC LODGING ESTABLISHMENT. See Section 509.013, *Florida Statutes*.

455.3 General Sanitation and Safety Requirements

The following general requirements and standards shall be met by all public lodging establishments:

455.3.1 Water, Plumbing and Waste

Except as specifically provided in this code, standards for water, plumbing and waste shall be governed by Chapter 5 of 1999 Food Code and Chapter 509 Part I, *Florida Statutes*. For the purposes of this section, the term "food establishment" as referenced in the Food Code shall apply to all public lodging establishments as defined in Chapter 509, *Florida Statutes*.

455.3.2 Public Bathrooms

455.3.2.1

Each public lodging establishment shall be provided with adequate and conveniently located bathroom facilities for its employees and guests in accordance with provisions of this section and the *Florida Building Code, Plumbing*. Public access to toilet facilities shall not be permitted through food preparation, storage, or ware washing areas. Bathroom fixtures shall be of readily cleanable sanitary design.

455.3.2.2

Public bathrooms shall be completely enclosed and shall have tight-fitting, self-closing doors or have entrances and exits constructed in such a manner as to ensure privacy of occupants. Such doors shall not be left open except during cleaning or maintenance.

455.3.2.3

Resort condominiums, nontransient establishments and resort dwellings are exempt from the provisions of this section.

455.3.3 Vermin Control

Effective control measures shall be taken to protect against the entrance into the establishment, and the breeding or presence on the premises of rodents, flies, roaches and other vermin. All buildings shall be effectively rodent-proofed. All windows used for ventilation must be screened, except when effective means of vermin control are used. Screening material shall not be less than 16 mesh to the inch or equivalent, tightfitting and free of breaks.

455.3.4 Fire Safety

All fire safety, protection and prevention equipment must be installed, approved, maintained and used in accordance with Chapter 509, *Florida Statutes*, Chapter 69A-3 Fire Prevention—General Prevention Code, *Florida Administrative Codes*.

455.3.4.1 Specialized Smoke Detectors

Specialized smoke detectors for the deaf and hearing-impaired shall be made available upon request by guests in transient public lodging establishments without charge. Failure of the operator to inform any employee charged with registering guests of the location of such detector constitutes failure to make such detectors available.

455.3.5 Electrical Wiring

To prevent fire or injury, defective electrical wiring shall be replaced and wiring shall be kept in good repair. Only a wall switch or approved pull cord shall be permitted in bathrooms. Electrical wiring shall be in accordance with the provisions of Chapter 27 of the

Florida Building Code, Building.

455.3.6 Heating and Ventilation

The heating and ventilation system shall be kept in good repair or be installed to maintain a minimum of 68°F (20°C) throughout the building.

455.3.7 Gas Appliances

All appliances, including water heaters using gas, shall be properly vented as required by the *Florida Building Code, Fuel Gas*.

455.4 Sanitation and Safety Requirements

455.4.1 Guest Bathrooms

455.4.1.1

Connecting bathrooms shall provide toilets with open-front seats. Guest and private bathrooms shall provide toilets. Guest, private, and connecting bathrooms shall provide lavatories and shower enclosures with hot and cold running water under pressure.

455.4.1.2

Each transient public lodging establishment shall maintain one public bathroom with a minimum of a toilet, lavatory, and shower enclosure for each sex on every floor for every 15 guests rooming on that floor not having access to private or connecting bathrooms.

455.4.2 Ice Storage Bins

Ice storage bins shall be drained through an air gap in accordance with the provisions of the *Florida Building Code, Plumbing*.

455.4.3 Locks

A locking device shall be provided in accordance with the *Florida Fire Prevention Code*. Public lodging establishments as defined in Rule 61C-1.002(4)(a), *Florida Statutes*, shall have at least one approved locking device which does not include a sliding chain or hook-and-eye type device, on all outside and connecting doors which cannot be opened by a nonmaster guest room key.

Section 456 Public Food Service Establishments

456.1 Scope

Public food service establishments or food establishments shall comply with design and construction standards as described in the Food Code, Chapter 509 Part I or Chapter 500, *Florida Statutes*, as applicable.

Note: Other administrative and programmatic provisions may apply. See Department of Business and Professional Regulation (DBPR) Rule 61C-4, *Florida Administrative Code*, Chapter 500 and Chapter 509, *Florida Statutes*.

456.2 Definitions

FOOD ESTABLISHMENTS. See Section 500.03, *Florida Statutes*.

PUBLIC FOOD SERVICE ESTABLISHMENTS. See Section 509.013, *Florida Statutes*.

456.3 General Sanitation and Safety Requirements

The following general requirements and standards shall be met by all food service establishments:

456.3.1 Water, Plumbing, and Waste

Except as specifically provided in this section, standards for water, plumbing and waste shall be governed by Chapter 5, Food Code, herein adopted by reference.

456.3.1.1

Grease interceptors shall be designed and installed in accordance with the *Florida Building Code, Plumbing*.

456.3.2 Public Bathrooms

456.3.2.1

Food service establishment shall be provided with adequate and conveniently located bathroom facilities for its employees and guests in accordance with provisions of the *Florida Building Code, Plumbing*. Public access to toilet facilities shall not be permitted through food preparation, storage, or ware washing areas. Bathroom fixtures shall be of readily cleanable sanitary design.

456.3.2.2

Public bathrooms shall be completely enclosed and shall have tight-fitting, self-closing doors or, in public lodging establishments or bathrooms located outside a public food service, have entrances and exits constructed in such a manner as to ensure privacy of occupants.

456.3.3 Vermin Control

Effective control measures shall be taken to protect against the entrance into the establishment, and the breeding or presence on the premises of rodents, flies, roaches and other vermin. All buildings shall be effectively rodent-proofed. All windows used for ventilation must be screened, except when effective means of vermin control are used. Screening material shall not be less than 16 mesh to the inch or equivalent, tightfitting and free of breaks.

456.3.4 Fire Safety

All fire safety, protection and prevention equipment must be installed, approved, maintained and used in accordance with Chapter 509, *Florida Statutes*, Chapter 69A-55, Uniform Fire Safety Standards for Public Food Service Establishments, *Florida Administrative Codes* and the *Florida Fire Prevention Code* as adopted by the State Fire Marshal.

456.3.5 Electrical Wiring

To prevent fire or injury, defective electrical wiring shall be replaced and wiring shall be kept in good repair. Only a wall switch or approved pull cord shall be permitted in bathrooms. Electrical wiring shall be in accordance with the provisions of *Florida Building Code, Building*, Chapter 27.

456.3.6 Gas Appliances**456.3.6.1**

All appliances, including water heaters using gas, shall be properly vented in accordance with the *Florida Building Code, Fuel Gas*. All appliances shall have a nationally recognized testing laboratory seal such as AGA or UL seal.

456.3.6.2

Heating appliances shall be properly sized in Btu input for room air space. Proper sizing of heating appliances shall be determined in accordance with the provisions of the *Florida Building Code, Fuel Gas*.

456.4 Sanitation and Safety Requirements**456.4.1 Bathroom Facilities**

All bathrooms shall be of easy and convenient access to both patrons and employees and shall be located on the same floor of the premises served. For the purpose of this section, the same floor includes any intermediate levels between the floor and ceiling of any room or space not to exceed a vertical height of 8 feet (2438 mm). Public food service establishments whose occupancy is incidental to another occupancy may utilize public restrooms provided on the same floor. The travel distance may vary where adequate directional signs are provided and the number of fixtures is deemed satisfactory by the applicable plumbing authority. Each public food service establishment shall maintain a minimum of one public bathroom for each sex, properly designated, except as provided herein:

456.4.1.1

Places serving food or drink on a take-out, carry-out or delivery basis only which provide no seating shall be required to provide a minimum of one bathroom accessible to the public.

456.4.1.2

Arcades, malls, or flea markets containing public food service establishments which offer no seating within the public food service establishment may have centrally located bathroom facilities accessible to patrons of the establishments in the arcade, mall, or flea market provided such bathroom facilities are within 300 feet (91 440 mm) of each establishment.

456.4.1.3

Public food service establishments located within theme parks and entertainment complexes may utilize centrally located bathroom facilities accessible to patrons of the establishments in the theme park or entertainment complex provided such bathroom facilities are reasonably accessible. For purposes of this section, reasonably accessible means within 300 feet (91 440 mm) of each establishment.

456.4.1.4

Public food service establishments which seat 10 persons or less shall be required to provide a minimum of one bathroom accessible to the public.

456.4.1.5

Public food service establishments located within a public lodging establishment shall be permitted to utilize public bathrooms located within the public lodging establishment, provided such bathrooms are available for use by the patrons of the public food service establishment during all hours of operation, are within 300 feet (91 440 mm) of the public food service establishment, and are located on the same floor as the public food service establishment. For purposes of this section, the same floor includes any intermediate levels between the floor and ceiling of any room or space without restriction as to vertical height.

Section 457 Mental Health Programs

457.1 Public Mental Health Crisis Stabilization Units and Short-Term Residential Treatment Programs

457.1.1 Scope

Crisis stabilization units and short-term residential treatment units shall comply with the design and construction standards in this section.

Note: Other administrative and programmatic provisions may apply. See Department of Children and Family Services (DCFS) Rule 65E-12, *Florida Administrative Code*, and Chapter 394, *Florida Statutes*.

457.1.2 Definitions

CRISIS STABILIZATION UNIT (CSU). A state-supported mental health service or program and is a short-term alternative to inpatient psychiatric hospitalization and an integrated part of a designated public receiving facility under the authority of Chapter 394, *Florida Statutes*. A CSU provides brief intensive services for individuals who are presented as acutely mentally ill on a 24-hour-a-day, seven-day-a-week basis, under the licensing authority of the department of Children and Families and the Agency for Health Care Administration. The purpose of a CSU is emergency psychiatric reception, psychiatric examination, to stabilize and redirect people to the most appropriate and least restrictive treatment settings consistent with their needs.

SHORT-TERM RESIDENTIAL TREATMENT PROGRAM (SRT). A state-supported acute care 24-hour-a-day, seven-day-a-week residential alternative service, generally of 90 days or less, and which is an integrated part of a designated public receiving facility and receives state mental health funds under the authority of Chapter 394, *Florida Statutes*. The purpose of an SRT is to provide less acute intensive short-term treatment to individuals who have previously been admitted to either a hospital or CSU and have been transferred to the SRT as being temporarily in need of a 24-hour-a-day structured therapeutic setting in a less restrictive, but longer-stay alternative to hospitalization.

457.1.3

Facility standards for facilities licensed prior to or on July 14, 1993.

457.1.3.1 Building Construction Requirements

457.1.3.1.1

Construction, additions, refurbishing, renovations, and alterations to existing facilities shall comply with the following codes and standards:

1. The building codes described in the *Florida Building Code*;

2. The fire codes contained in Chapter 69A-44, "Minimum Fire Safety Standards for Residential Alcohol and Drug Abuse Treatment and Prevention Programs, Mental Health Residential Treatment Facilities and Crisis Stabilization Units," *Florida Administrative Code*, as described in NFPA 101, Chapters 18 and 19, Special Definitions, as adopted by the *Florida Fire Prevention Code*, as applicable to limited health care facilities, which is included by reference in Chapter 59A-3, *Florida Administrative Code*.

457.1.3.2 Minimum Physical Plant Requirements

Each CSU and SRT shall conform to the requirements of Sections 457.1.3.2.1 through 457.1.3.2.12.

457.1.3.2.1

In multiple occupancy bedrooms or sleeping areas there shall be a minimum of 60 square feet (6 m^2) per bed and no less than a 30-inch (762 mm) separation between beds. Bedrooms shall be limited to a maximum of four occupants.

457.1.3.2.2

The minimum size of a single occupant bedroom shall be 55 square feet (5 m^2).

457.1.3.2.3

Each CSU shall have at least one seclusion room and another room which may be used as a seclusion room. Each SRT shall have a seclusion room. Seclusion rooms shall be a minimum of 55 square feet (5 m^2). If a restraint bed is utilized it shall have access around it and be bolted to the floor. Seclusion rooms shall minimally include a mattress. Ceilings shall be solid, and all lighting fixtures shall be tamperproof, and power receptacles are not permitted in the room.

457.1.3.2.4

The facility shall have at least one water fountain readily accessible for the use of persons receiving services.

457.1.3.2.5

The facility shall have a minimum ratio of one shower for each eight individuals and one toilet and lavatory for each six individuals. Individual shower stalls and dressing areas shall be provided. The use of gang showers is prohibited. Access to a bathroom shall not be through another person's room.

457.1.3.2.6

The facility shall have a locked area for personal possessions being held for safekeeping. Individual shelves or other similar dividers shall be provided in the locked area for the storage of personal possessions. The facility shall have written policies and procedures to ensure reasonable access to personal possessions.

457.1.3.2.7

Each facility shall have a fenced outside recreation area with a minimum fence height of no less than 6 feet (1829 mm) suitable for impeding elopements.

457.1.3.2.8

External windows shall have security screens or equivalent protection.

457.1.3.2.9

The facility shall provide an appropriate separate nontreatment area to serve as a general reception area with accommodations for such activities as receiving visitors. This reception area shall be separated from the treatment area by a locked doorway.

457.1.3.2.10

When a CSU is collocated with another program, as provided for in Section 65E-12.106(23), *Florida Administrative Code*, the following minimum facility requirements shall be met.

Collocation means the operation of CSU and SRT, or CSU and substance abuse detoxification services from a common nurses' station without treatment system integration. It may result in the administration of those services by the same organization and the sharing of common services, such as housekeeping, maintenance and professional services.

1. A CSU shall be separated and secured by locked doors, used by persons receiving services, from the SRT and detoxification units.
2. Whenever a CSU is collocated with an SRT or substance abuse detoxification unit there shall be no compromise in CSU standards. In all instances, whenever there is a conflict between CSU rules and SRT, alcohol or drug abuse rules, the more restrictive rules shall apply.

457.1.3.2.11

All CSUs shall be locked facilities and, to the maximum extent practical, provide a locked perimeter around a living unit and fenced exercise area within which individuals can reside 24 hours-a-day in an environment designed to minimize potential for injury. Where this is not possible, operational compensation shall be made as follows:

1. Each person receiving services shall be provided a minimum of 175 square feet (16 m^2) of usable client space within the CSU. Useable client space is the sum, in gross square feet, of all rooms, interior wall to interior wall, that are part of a CSU and SRT facility. Mechanical and electrical rooms, administrative and staff offices, screening areas, nurses' stations, visitor and reception areas, crawl space and attic space are excluded. Bedrooms shall be spacious and attractive, and activity rooms or space shall be provided.
2. CSU facilities shall be locked to provide reasonable control over access to and egress from the unit, recreational area, and emergency reception areas. When individuals are moved to other areas, the pathways shall also be locked or have adequate control provisions to prevent elopement. Such controlled passageways shall include access to the emergency reception area, unit proper, off unit doorways, and recreational areas.
3. All unit door locks shall employ a common key for rapid access in emergency situations with quick releasing or single-turn mechanisms.

457.1.3.2.12

Food preparation areas for 13 or more persons shall comply with the provisions of Chapter 64E-11, *Florida Administrative Code*, "Food Hygiene."

457.1.3.3 Health and Sanitation

457.1.3.3.1

Appropriate health and sanitation inspections shall be obtained before occupying any new physical facility or addition. A report of the most recent inspections must be on file and accessible to authorized individuals.

457.1.3.3.2

Hot and cold running water under pressure shall be readily available in all washing, bathing and food preparation areas. Hot water in areas used by persons being served shall be at least 100°F (38°C) but not exceed 120°F (49°C).

457.1.3.4 Seclusion Room

Each CSU shall have at least one seclusion room located in the CSU facility. Additional space shall be available that can be used either as a seclusion room or bedroom, as need dictates. Policies and procedures shall be developed on handling emergency situations that require seclusion. Each SRT shall have a seclusion room.

457.1.4 Minimum Construction Standards for CSU and SRT Facilities Initially Licensed After July 14, 1993

457.1.4.1 Construction Requirements

457.1.4.1.1 New Facility Construction

New facility construction and additions, refurbishing, renovations and alterations to existing facilities shall comply with the following codes and standards:

1. The building codes described in the *Florida Building Code*.
2. The fire codes contained in Chapter 69A-44, "Minimum Fire Safety Standards for Residential Alcohol and Drug Abuse Treatment and Prevention Programs, Mental Health Residential Treatment Facilities and Crisis Stabilization Units," *Florida Administrative Code*, as described in NFPA 101, Chapters 12 and 13, "Special Definitions," as adopted by the *Florida Fire Prevention Code*, as applicable to limited health care facilities, which is included by reference in Chapter 59A-3, *Florida Administrative Code*.
3. The accessibility requirements of the *Florida Building Code, Accessibility*.

457.1.4.1.2 Plumbing

All plumbing shall comply with the requirements of the *Florida Building Code, Plumbing*.

457.1.4.1.3 Inspections and Certificate of Occupancy

Appropriate health and sanitation inspections and a certificate of occupancy shall be obtained before occupying any new facility or addition. A report of the most recent inspections must be on file and accessible to authorized individuals.

457.1.4.1.4 Sprinklers

No unsprinklered building classification as defined in the *Florida Building Code, Building*, is allowed. All facilities shall be protected throughout by an approved automatic sprinkler and smoke detection system to include a smoke detector in every bedroom. Provision shall be made for automatic emergency forces notification.

457.1.4.1.5 Surge Protection

Surge protection in compliance with NFPA 70, *National Electric Code*, shall be installed to protect the service equipment and have integral visual indication of surge protector failure. Additional surge protection shall be provided for all low-voltage and power connections to all electronic equipment and conductors entering or exiting the building and other life safety systems equipment such as fire alarm, telephone and nurse call. Protection shall be in accordance with appropriate IEEE standards for the type of equipment being protected.

457.1.4.2 Overall Functional Design

457.1.4.2.1

The CSU or SRT shall be designed to provide a locked perimeter around a living unit and fenced exercise area within which individuals can reside 24 hours a day in an environment designed to minimize potential for injury. The CSU or SRT structure shall be a single-story ground level facility. These facilities shall have separate off-unit reception and administration areas which may also be locked. Service corridors and pathways to other nonunit activities shall not be through the locked CSU or SRT unit.

457.1.4.2.2

The walls throughout all client areas of the CSU or SRT shall either be concrete block or a double layer of gypsum wallboard or $\frac{3}{4}$ -inch (19 mm) thick plaster on metal lath to minimize maintenance of the facility. The general architecture of the unit shall provide for optimal line-of-sight observation from the nurses' station throughout the unit, minimizing hidden spots and blind corners.

457.1.4.2.3

The CSU or SRT shall be designed to create a pleasant functional therapeutic environment throughout, by the use of sunlight, colors, designs, textures, and furnishings. The design shall achieve a secure unit which looks more residential than institutional in its construction and furnishings, while incorporating substantial safety considerations throughout.

457.1.4.2.4

The CSU or SRT shall be designed in order that the general unit be divided into a close observation area and a general observation area based upon the need for frequent physical proximity, singular observation of individuals, and lowered stimulation levels. These areas do not need physical separation; for example, they may be the left and right sides of the unit.

457.1.4.2.4.1 Close Observation Area

This area shall include persons brought onto the CSU or SRT needing initial observation or restraints, individualized observation, and lowered stimulation levels, all of which require the frequent physical proximity of nurses. This area shall be directly adjacent to the primary unit doorway and nurses' station. The immediately adjacent rooms shall be used for single occupancy and restraint or seclusion. These rooms shall be remote from routine high activity areas and corridors.

457.1.4.2.4.2 General Observation Area

This shall include areas where persons routinely congregate or walk through such as multioccupant bedrooms, activity rooms, smoking areas, dining room and routine traffic corridors, or pathways. The dining and activity areas shall be directly observable, or under constant staff supervision, but may be a greater distance from the nurses' station.

457.1.4.2.5

All areas of CSUs and SRTs shall be ventilated by central, ducted supply and return forced air systems. Toilets, bathrooms and soiled function rooms shall be mechanically exhausted to the outside. Ventilation units shall distribute tempered heated or cooled air to all spaces and shall supply outside air in the quantity of either the sum of all exhausts or 20 cfm (0.009 m³/s) per person whichever is greater. The quality of all exhausts must match the intake volume of all outside air. Supply, exhaust, and return fans shall run continuously while the building is occupied. Areas in which smoking is permitted shall be well vented by at least 35 cfm (0.02 m³/s) per person to the outside in order to minimize smoke diffusion throughout the unit.

457.1.4.2.6

All doors opening directly onto the unit from nonclient rooms or office areas shall be equipped with locksets which are key released to leave the client area and permit unobstructed return to the client area. Door closures are required to deny persons receiving services accidental unsupervised access to the contents of staff offices, janitorial closets, and mechanical areas.

457.1.4.2.7

Corridors shall ensure maximum clear distances by recessing water fountains and fire extinguishers, or placing them in alcoves. Corridors in client areas must be at least a 6 foot (1829 mm) clear width; nonclient areas must be at least 44 inches (1118 mm) minimum clear width. Corridor ceilings shall be a minimum height of 7 feet 6 inches (2284 mm).

457.1.4.2.8

Hot and cold running water under pressure shall be readily available in all washing, bathing, food preparation, and food handling areas. Hot water in client areas shall be at least 100°F (38°C), but not exceed 120°F (49°C).

457.1.4.2.9

The minimum size for doors shall be no less than 3 feet (914 mm) wide and 6 feet 8 inches high (2032 mm). Areas accessible to persons with physical disabilities shall comply with applicable codes and standards.

457.1.4.2.10

Since glass fragments are a safety hazard throughout the unit, the use of glass shall be minimal.

457.1.4.2.11

All television sets must be securely fastened.

457.1.4.2.12

Door closures shall not be utilized in unobserved client areas.

457.1.4.2.13

All CSUs and SRTs equipped with electronic locks on internal doors or egress doors shall ensure that such locks have manual common key mechanical override that will operate in the event of a power failure or fire. Egress pathways and doors shall be locked as provided for in the *Life Safety Code*, NFPA 101, Chapter 12, as incorporated by reference in Chapter 59A-3, *Florida Administrative Code* as adopted by the *Florida Fire Prevention Code*.

457.1.4.2.14

CSUs and SRTs with electronic or magnetic door locks or other fundamental operational components which are electric shall have either: a battery back-up system rated for facility emergency power draw and capable of sustaining door locks and emergency operations for a minimum period of 6 hours; or an emergency generator with transfer switch with a battery pack back-up system capable of operating for 2 hours at facility emergency power draw level.

457.1.4.2.15

The use of door vision panels and windows shall minimize the opportunity for isolation of staff or persons served in unobserved areas. This does not include privacy provisions such as bathrooms and bedrooms.

457.1.4.3 Uniform Specifications**457.1.4.3.1**

The design shall ensure that each person receiving services in a CSU or SRT is provided a minimum of 175 square feet (16 m^2) of usable client space.

457.1.4.3.2

Tamper-resistant screws shall be used to protect electrical switches and outlets throughout the facility in all areas accessible to persons receiving services. Lighting fixtures shall be tamperproof type throughout the facility in all areas accessible to persons receiving services.

457.1.4.3.3

All electrical switches and outlets in wet areas shall be ground-fault protected with a remote breaker switch. Tamperproof, safety-type duplex outlets shall be used in all areas accessible to persons receiving services.

457.1.4.3.4

Air ducts shall be covered with a perforated-type metal grille not residential louvered grilles, throughout the unit in all areas accessible to persons receiving services.

457.1.4.3.5

All hose bibbs shall be equipped with a vacuum breaker device.

457.1.4.3.6

The unit shall have a minimum of one drinking fountain.

457.1.4.3.7

Ceiling height in bedrooms, activity areas, and bathrooms shall be at least 9 feet (2743 mm).

457.1.4.3.8

The operation of all perimeter locks shall ensure reasonable control over both access and egress.

457.1.4.4 Administration and Public Areas**457.1.4.4.1**

Waiting rooms shall have an adjacent rest room which is designed to accommodate persons with physical disabilities in accordance with the *Florida Building Code, Accessibility*.

457.1.4.4.2

The entrance shall be grade level, sheltered from inclement weather and accessible to persons with physical disabilities in accordance with the *Florida Building Code, Accessibility*.

457.1.4.4.3

The lobby shall include a drinking fountain and space for clerical personnel. Private interview space for emergency screening of voluntary persons shall be adjacent to the lobby.

457.1.4.5 Emergency Screening Area for CSUs**457.1.4.5.1**

This shall be a locked area in which law enforcement admissions may be received. This area shall not be wholly isolated visually from the CSU to provide safety for emergency screening personnel who may become isolated in this area. This area shall provide for medical clearance, emergency screening, bathroom facilities, and other activities which may be necessary.

457.1.4.5.2

A separate entrance shall be provided directly to emergency screening areas and examination rooms for law enforcement personnel. It shall have a driveway where a law enforcement vehicle can pull immediately adjacent to the building before transferring a person through the separate entrance to the emergency screening area. The law enforcement entrance shall also have a lock box where the law enforcement officer can lock his weapons during such time as he or she is in the facility.

457.1.4.5.3

A separate bathroom with supervised shower area shall be located so that all persons being admitted may be showered before being admitted to the residential section of the unit.

457.1.4.6 Seclusion Rooms**457.1.4.6.1**

Each CSU shall have a minimum of two seclusion rooms that shall share a common vestibule with a bathroom off the vestibule area. Each SRT shall have at least one seclusion room. Seclusion rooms shall be free of sharp edges or corners and be strongly constructed to withstand repeated physical assaults. Walls shall be either concrete block or double layered to provide resistance and be smooth. The ceilings shall be 9 feet (2743 mm) in clear height, hard-coated, and lighting fixtures recessed and tamperproof. Lighting fixtures shall be nonbreakable, preferably Lexan, and shall be installed with tamperproof screws, as shall any other items in the seclusion rooms. The seclusion room door shall be heavy wood or metal at least 36 inches (914 mm) in width and shall open outward. The door frame shall be heavy steel and shall be thoroughly bolted into the wall and cemented in.

457.1.4.6.2

At least one seclusion room in the CSU shall have a sturdily constructed bed, without sharp edges and bolted to the floor. A bed in the SRT seclusion room is optional; however, if present, the bed shall meet the same requirements as specified for the CSU. Its placement in the room shall provide adequate space for staff to apply restraints and not assist individuals in tampering with the lights, smoke detectors, cameras, or other items that may be in the ceiling of the room. There shall be a rheostat control mechanism outside the room to adjust the illumination of the light in the seclusion room.

457.1.4.6.3

The floor and walls, up to a height of 3 feet (914 mm), shall be coated with an impermeable finish to resist penetration of body fluids. One seclusion room shall have a floor drain. A hose bibb shall be in a readily adjacent area such as a bathroom.

457.1.4.6.4

There shall be a vision panel in the door of the seclusion room, no larger than 8 inches by 8 inches (203 mm by 203 mm), which provides a view of the entire room. This vision panel shall be Lexan or other suitably strong material and it shall be securely mounted in the door. Provisions shall be made to ensure privacy from the public and other persons receiving services while providing easy access for staff observation.

457.1.4.6.5

Seclusion rooms shall be a minimum of 70 square feet (7 m^2) and a minimum room dimension of 9 feet (2743 mm).

457.1.4.6.6

Fire sprinkler heads shall be ceiling mounted and either recessed or flush-mounted type without a looped spray dispersal head.

457.1.4.6.7

A voice-activated and switchable emergency calling system for monitoring persons receiving services shall be provided in each seclusion room.

457.1.4.6.8

Each seclusion room shall have an electronic visual monitoring system capable of viewing the entire room and be monitored from the nurses' station.

457.1.4.7 Janitor's Closet**457.1.4.7.1**

A janitor's closet shall be on the unit. It shall contain a floor receptor for mop water and provide space for mop bucket, brooms,

457.1.4.7.2

This closet shall have an automatic door closer and have automatic-relocking type lock.

457.1.4.8 Bathrooms

457.1.4.8.1

Access to a bathroom shall not be through another person's bedroom. Bathrooms shall provide space, in addition to bathing, for dry clothes and changing of clothes and for observation staff. The shower head shall be recessed or have a smooth curve from which items cannot be hung. There shall be no overhead rod, privacy stall supports, protrusions, or fixtures capable of carrying more than 40 pounds (18 kg) of weight. The ceiling shall be hard coated. Sprinkler heads shall be either recessed or a flush-mounted type dispersal head. The toilet shall be a flushometer-type, not residential with water tank and cover. Toilets shall be of heavy duty construction securely fastened to the floor and have seats with locking nuts. Secure cleanout access shall be provided for the toilet to clean out plugs and pipes. Floor drains in bathroom areas shall be of sufficient size that they cannot be plugged by standing on them.

457.1.4.8.2

Mirrors shall not be common glass. A polycarbonate mirror, fully secured, and flat-mounted to the wall is required. Polished metal mirrors shall not be permitted.

457.1.4.8.3

Lighting fixtures shall be recessed and tamperproof with Lexan or other strong translucent material.

457.1.4.8.4

Bathroom fixtures, shower, lavatory, and toilet shall be readily accessible from a common area. If not accessible from a common area, they will be deemed to be available only to the occupants of directly adjoining bedroom or bedrooms.

457.1.4.8.5

Each CSU and SRT shall have a bathroom of sufficient size for use by persons with physical disabilities. It shall include toilet, lavatory, shower, and safety grab bars for shower and toilet.

457.1.4.8.6

The facility shall have a minimum ratio of one shower for each eight persons receiving services and one toilet and lavatory for each six persons receiving services. Individual shower stalls and dressing areas shall be provided. The use of gang showers is prohibited.

457.1.4.9 Nurses' Station

457.1.4.9.1

The nurses' station shall be positioned so that the unit may be under constant direct visual surveillance. Charting and records areas shall be located in the rear of the nurses' station, and not in a separate area, so that staff on duty can readily observe the client areas. A bathroom shall be nearby for staff use. The nurses' station, if separated from client areas, shall utilize either Lexan or safety wire glass for enclosure to above counter top level. If not enclosed the counter top shall be at least 18 inches (457 mm) in width.

457.1.4.9.2

Thirty is the maximum number of beds which may be served by a common nurses' station in colocated units, as described in Section 65E-12.106(23), *Florida Administrative Code*.

457.1.4.9.3

The nurses' station, which functions as the primary control center, shall have necessary electronic assistance such as camera monitors and intercoms in more remote areas where persons may become isolated. Areas warranting visual and auditory monitoring include remote entrance or egress doors, isolated hallways, after hours law enforcement entrance, emergency screening area, and fenced recreational yard.

457.1.4.10 Medication Room

The medication room shall be located near the nurses' station. The medication room shall have a sink, refrigerator, locked storage, and facilities for dispensing medication. Security against unauthorized access shall be assured. The refrigerator shall store medications and clean materials only.

457.1.4.11 Examination Room

A suitable examination room shall be provided for physical examinations, nursing assessments, and other related medical activities. It shall include a sink for hand washing.

457.1.4.12 Bedrooms**457.1.4.12.1**

Ceilings shall be nonaccessible to prohibit persons receiving services from entering attic spaces or having access to overhead pipes and beams. Light switches and electrical outlets shall be secured with nontamper-type screws. When feasible each bedroom shall have a window, operable by staff, with an exterior view. Window sills shall not exceed a height of 36 inches (914 mm) above floor level and should incorporate protective screens or Lexan-type material to prevent direct access to glass surfaces. There should be no overhead protrusions available for hanging in excess of 40 pounds (18 kg) weight.

457.1.4.12.2

Beds and other heavy furniture suitable for barricading the door shall be secured to the floor or walls.

457.1.4.12.3

Multiple occupant bedrooms shall be limited to a maximum of four occupants and shall be a minimum size of 60 square feet (6 m^2) per bed with no less than a 30-inch (762 mm) separation between beds. Single occupant bedrooms shall be a minimum of 80 square feet (7 m^2).

457.1.4.12.4

Bedroom doors shall be a minimum of 36 inches (914 mm) wide.

457.1.4.13 Kitchen and Nourishment Preparation Area**457.1.4.13.1**

Preparation or food handling areas shall have water and plumbing fixtures suitable for cleaning dining utensils. The requirements for nourishment preparation areas are less than that of kitchens due to the minimal scale of operations for these areas. If these areas are accessible to persons receiving services, they should include appropriate safety considerations for sharp and other dangerous instruments and the elimination of hot surfaces. Space shall be provided for disposal of wet garbage. Refrigeration and freezer space shall be provided in these areas for the carryover of a minimum amount of perishable food.

457.1.4.13.2

Kitchens shall comply with Chapter 64E-11, *Florida Administrative Code*, Food Preparation and Sanitation Requirements, as well as the 1985 NFPA 101, Chapters 12 and 13, Fire Safety Requirements as incorporated by reference in Chapter 59A3, *Florida Administrative Code* as adopted by the *Florida Fire Prevention Code*. Kitchens shall be designed with flow-through type operation where food arriving is immediately placed into dry storage or freezer units without walking through food preparation areas. The flow-through type system would provide for the preparation of food, serving and dishes returned with garbage and waste going out to an adjacent dumpster and can wash with water collection curbing and drain. A concrete pad shall be provided for the trash dumpster and garbage truck entrance.

457.1.4.13.3

Kitchens shall be equipped with fire suppression hoods and through-wall grease laden air evacuation and ventilation systems. All electrical outlets shall be ground-fault circuit interrupter protected. If meals are to be served via an open area, directly from the kitchen, this area shall have a firerated steel retractable overhead-door type mechanism to continue the fire wall protection around the kitchen area. Kitchens shall have heat detectors rather than smoke sensors.

457.1.4.13.4

External to the kitchen, and outside the waste exit door, there shall be a curbed slop sink for mops and dirty kitchen water with an immediately accessible hose bibb and drain. This area shall be external to the kitchen area, but immediately adjacent to it, to

provide ready disposal of waste water as well as for the removal of cleaning items from the kitchen when they are not in use.

457.1.4.13.5

There shall be a large food storage pantry in or adjacent to the kitchen.

457.1.4.13.6

Facilities using off-site kitchens for food preparation shall have an on-site food reception, warming, and holding area of sufficient size and with sufficient equipment to warm and hold food for each meal served. Required space shall include provision for proper disposal or holding of used implements and disposal of wet garbage in accordance with Chapter 64E-11, *Florida Administrative Code*.

457.1.4.14 Dining Area

Each CSU or SRT shall have an attractive dining area on the unit. Seating capacity shall reflect the licensed capacity of the entire CSU or SRT, although residents may eat or be served in shifts during daily operations. Individual, rather than bench seating, shall be used for easy floor cleaning.

457.1.4.15 Unit Laundry Facilities**457.1.4.15.1**

Provision shall be made for the storage of soiled laundry in an adjacent, isolated, fire-resistant area.

457.1.4.15.2

Each CSU or SRT shall have a personal laundry room which shall incorporate a flow-through design in which dirty laundry enters, is sorted, placed in the washer, dried, folded, and moved out without crossing clean laundry with dirty laundry. CSUs and SRTs shall have a small washer and dryer for immediate unit needs and to wash clothes. These washing and drying units shall be equipped to sanitize clothes as a preventive measure of infection control.

457.1.4.15.3

The soiled laundry room shall have a locked door equipped with automatic door closer to restrict access to cleaning chemicals. The soiled laundry room air shall be exhausted outside the facility.

457.1.4.16 Clean Laundry Room**457.1.4.16.1**

A separate space shall be provided for clean laundry capable of storing an adequate supply of laundry for the size of the CSU or SRT. The laundry closet shall have a locked door to prevent access to these items by persons receiving services.

457.1.4.16.2

Items stored on the top shelf shall provide an 18 inch (457 mm) clear space from sprinkler heads so as to not block dispersal of water.

457.1.4.17 Fenced Recreational Area**457.1.4.17.1**

CSUs and SRTs shall have a no less than 6-foot-high (1829 mm) fenced, out-of-doors area where persons receiving services may have access to fresh air and exercise. It must provide privacy for persons receiving services otherwise exposed to public view. This area shall be constructed to retain persons inside the area and minimize elopements from the area, although it is not a secure area.

457.1.4.17.2

The fenced area shall provide some shaded area where persons receiving services may be out of doors without being in direct sunlight or may receive sunlight as they desire. The enclosing fences shall have an exit gate which is located away from the building as a secondary egress from the fenced area, for use in fire situations, or access by lawn maintenance equipment. The gate shall be provided with a lock which is readily accessible from both sides. The area of this fenced enclosure shall be at least

1,100 square feet (102 m^2) including an activity area having dimensions of not less than 20 feet by 40 feet (6096 mm by 1219 mm).

457.1.4.17.3

Objects shall not be placed near the fence to provide a ready step ladder over the fence and, if fabric fencing is used, the horizontal bracing used for corners shall be outside the fabric to preclude its use as an escape ladder step. The fenced area shall be designed, without blind corners, to be readily visible by one staff member standing in a central location. If desired, the fence may be topped with a 45-degree inward slanting restraining-type wire. The use of barbed wire and other sharp injurious materials, however, is prohibited.

457.1.4.17.4

This area, as all other primary fire exit routes, shall have egress lighting which is connected to the power side of the facility electrical panel so that in the event of a fire and electrical panel disconnect, the exit and congregation areas would still have lighting.

457.1.4.18 Multipurpose Room

In addition to open, on unit floor space, each CSU and SRT shall have an accessible multipurpose room for group activities of at least 180 square feet (7 m^2). This area may be the dining area.

457.1.4.19 Off Unit Storage Areas

457.1.4.19.1

Each CSU and SRT shall have appropriate storage, in nonclient areas, for operating supplies and materials.

457.1.4.19.2

Adjacent nonclient area storage for personal belongings shall be a minimum of 8 cubic feet (0.23 m^3) for each person receiving services.

457.2 Community Mental Health Regulation

Adult residential treatment facilities (RTFs) shall be limited to adults and comply with the regulations in Sections 457.2.1 through 457.2.4.

Note: Other administrative and programmatic provisions may apply. See Department of Children and Family Services (DCFS) Rule 65E-4.016, *Florida Administrative Code*, and Chapter 394, *Florida Statutes*.

457.2.1 Facility Standards

457.2.1.1 Building Construction Requirements

The construction and renovation of a facility shall comply with the provisions of the *Florida Building Code*.

457.2.2 Health and Safety

Facilities and additions shall be constructed to allow full compliance with the provisions of this section.

457.2.2.1 Fire Safety

457.2.2.1.1

Residential treatment facilities shall comply with all applicable federal, state and local fire safety standards as follows:

1. Level IA licensed facilities shall comply with the fire codes contained in Chapter 69A-3, Fire Prevention—General Provisions, *Florida Administrative Code*, as described in NFPA 101, Chapters 18 and 19, Special Definitions as adopted by the *Florida Fire Prevention Code*, as applicable to limited health care facilities.
2. For facility Level IB, which may have no more than three residents incapable of self-preservation, and for facility Levels II, III, IV and V, which may have no residents incapable of self-preservation, each resident record shall have a signed statement by a physician or licensed psychologist regarding the resident's capability of self-preservation.

3. Facility Levels IB, II, III, IV and V shall have a prompt evacuation capability.

457.2.2.1.2

Level IV and V facilities shall have a written policy on the safe use of extension cords and adapters. The use of extension cords and adaptors is prohibited in Level I, II and III facilities.

457.2.2.1.3

Electrical cords and appliances shall be maintained in a safe condition.

457.2.2.1.4

Portable heating devices shall be used only in emergency situations as defined in agency procedures approved by the governing board.

457.2.2.1.5

Flammable liquids or gas cylinders shall not be positioned near flame or heat sources, nor stored with combustible materials.

457.2.2.1.6 Emergency Power

The facility shall provide egress lighting that will operate in the event of a power failure.

457.2.2.1.7 Smoking

The program shall have a written policy governing smoking in the facilities. Smoking shall be prohibited in any area of the facility where combustible supplies, materials, liquids or gases will be used or stored.

457.2.2.1.8 Fire Safety Inspections

A fire safety inspection shall be obtained before occupying any new physical facility or addition.

457.2.2.2 Personal Safety**457.2.2.2.1**

The building shall be free of hazards such as cracks in the floors, walls or ceiling; warped or loose boards, tile, linoleum, handrails or railings; and broken window panes or missing window screens.

457.2.2.2.2

Protection shall be provided from sharp or jagged projections, "invisible" glass, moving parts, heated surfaces, heavy objects that could fall, or any other potentially hazardous condition.

457.2.2.2.3

Grab bars shall be nonremovable.

457.2.2.2.4

The temperature of the hot water supply shall be regulated and shall be between 105°F (41°C) and 115°F (46°C) at the outlet.

457.2.2.2.5

Any electrical fans, except ceiling paddle fans, shall be screened. All electrical fans, including paddle fans, shall be placed in a safe location.

457.2.2.2.6

Indoor and outdoor recreational areas shall be provided with safeguards designed for the needs of the residents.

457.2.2.2.7

Outdoor recreational areas shall be well drained.

457.2.2.3 Health and Sanitation

457.2.2.3.1

Appropriate health and sanitation inspection certificates shall be obtained before occupying any new physical facility or addition, and at least yearly or as required by statute, thereafter. A report of the most recent inspection must be on file and accessible to authorized individuals.

457.2.2.3.2

Hot and cold running water under pressure shall be readily available in all washing, bathing and food preparation areas.

457.2.2.3.3

The kitchen and food preparation area shall be well-lighted, ventilated and located apart from areas which could cause food contamination. All doors and windows in the kitchen and food preparation areas that open to the outside shall be screened.

457.2.3 Food Service**457.2.3.1**

For food service areas with a capacity of 13 or more residents, all matters pertaining to food service shall comply with the provisions of Chapter 64E-11, *Florida Administrative Code*.

457.2.3.2 Food Preparation, Sanitation and Storage**457.2.3.2.1**

Each refrigerator or freezer used for storage of perishable foods shall be provided with an accurate indicating thermometer located in the warmest part toward the front side of the refrigerator or freezer so that the temperature can be easily and readily observed.

457.2.3.2.2

Freezers should be kept at or below 0°F (-18°C).

457.2.3.3 Dining**457.2.3.3.1**

Dining tables shall seat small groups of residents unless other arrangements are justified on the basis of resident needs.

457.2.3.3.2

The dining area shall be suitably lighted, ventilated and furnished.

457.2.4 Environment**457.2.4.1**

Residential facilities shall not be identified by an exterior sign or vehicle sign that labels the residents or special functions of the facility. Vehicle traffic and parking relating to the facility shall be similar to that of surrounding structures or residences.

457.2.4.2

The grounds of the facility shall have adequate space for resident activities.

457.2.4.3

The facility shall be accessible to persons with disabilities or the facility shall have written policies and procedures that describe how disabled individuals can gain access to the facility for necessary services.

457.2.4.4

Areas that accommodate the following shall be available:

1. A full range of social activities;

2. Private conversations;

3. Group activities; and
4. Resident privacy, when appropriate.

457.2.4.5

All areas of the facility occupied by residents shall be climatically controlled in a manner conducive to the comfort and privacy of the residents and shall include the following:

457.2.4.5.1

A design temperature of at least 72°F (22°C) and not to exceed 85°F (29°C) shall be used for waking hours in all areas used by residents. During sleeping hours, a temperature of at least 68°F (20°C) shall be used. These temperature requirements apply unless otherwise mandated by federal or state authorities.

457.2.4.5.2

When cooling devices are used, they shall be placed or adjusted in a manner which minimizes drafts.

457.2.4.6

Drinking water shall be readily available and easily accessible to residents.

457.2.4.7

Mirrors reasonably free of distortion shall be placed in appropriate places to aid in grooming and to enhance self-awareness.

457.2.4.8

Clocks shall be provided to promote awareness of time and day.

457.2.4.9

The use of door locks or closed sections of the building shall comply with all applicable safety standards.

457.2.4.10

Clean, well-lighted and ventilated laundering facilities for resident use shall be available on the premises or in the immediate neighborhood.

457.2.4.11

A telephone which allows private conversations shall be available and easily accessible within the facility.

457.2.4.12

Facility lighting shall promote clear perceptions of people and functions. When and where appropriate, lighting shall be controlled by residents.

457.2.4.13

Whenever feasible, the environment shall provide views of the outdoors.

457.2.4.14 Bedrooms

Bedrooms shall be designed to meet the following criteria:

457.2.4.14.1

All resident bedrooms shall be ventilated, well-lighted and located convenient to a bathroom.

457.2.4.14.2

Resident bedrooms designated for single occupancy shall provide a minimum inside measurement of 80 square feet (7 m^2) of usable floor space.

457.2.4.14.3

Resident bedrooms designated for multiple occupancy shall provide a minimum inside measurement of 60 square feet (6 m^2) of usable floor space per bed and be limited to four occupants.

457.2.4.14.4

All resident bedrooms shall open directly into a corridor, a common use area or the outside, except in those facilities comprised of apartments.

457.2.4.14.5

Each resident bedroom where furnishings are supplied by the facility shall be furnished with personal storage space and adequate space for hanging clothes.

457.2.4.14.6

Bedroom doors shall not have vision panels.

457.2.4.15 Bathrooms

Bathrooms shall be designed to meet the following criteria:

457.2.4.15.1

A toilet and lavatory facility shall be provided for every six residents, and toilets shall be equipped with seats.

457.2.4.15.2

A minimum of one tub or shower facility, equipped with nonslip devices, shall be provided for every eight residents.

457.2.4.15.3

Bathrooms shall be ventilated, adequately lighted and have clearly labeled hot and cold running water.

457.2.4.15.4

Each bathroom shall have a door in working order to assure privacy.

457.2.4.15.5

When there is more than one toilet or bathing facility in a bathroom, provisions are required for privacy.

457.2.4.15.6

Bathrooms used by residents with disabilities shall be equipped to ensure safety and independent mobility.

457.2.4.15.7

Sole access to toilet or bathing facilities shall not be through another resident's sleeping room, except in facilities comprised of apartments.

457.2.4.16 Common Living Areas

Common living areas shall be designed to meet the following criteria:

457.2.4.16.1

A room, separate from sleeping areas, shall be provided where residents may read or engage in socialization or other leisure time activities.

457.2.4.16.2

A minimum of 35 square feet (3 m^2) of living and dining space per resident shall be provided by all facilities except those comprised of apartments. This space shall include living, recreational and other space designated accessible to residents, but shall not include bathrooms, corridors, storage space, or screened porches which cannot be adapted for year round use. Facilities with bedrooms which include living space may count the square footage that is in excess of the bedroom square footage requirements as part of the 35 square footage (3 m^2) living and dining space requirements.

Section 458 Manufactured Buildings**458.1 General**

The following administrative requirements for inspection and plan review apply to manufactured buildings including factory-built schools. Additional technical requirements for factory-built schools can be found in Section 453.

Note: See Department of Business and Professional Regulation Rule 61-41, *Florida Administrative Code* and Chapter 553, *Florida Statutes*.

458.2 Definitions

458.2.1 "Agency"

means an individual or entity authorized to perform inspections of or review plans for manufactured buildings as provided by Rule 61-41, *Florida Administrative Code*.

458.2.2 "Factory-Built School"

means any building designed or intended for use as a school building which is manufactured in whole or in part at an off-site facility, including prefabricated educational facilities, factory-built educational facilities and modular built educational facilities that are designed to be portable, relocatable, demountable or reconstructible, are used primarily as classrooms or the components of an entire school and do not fall under the provisions of Sections 320.822 through 320.862, *Florida Statutes*.

458.2.3 Department

Refers to Department of Business and Professional Regulation.

458.3 Inspections

Inspection of installation of manufactured buildings and construction activities conducted at the site of the installation shall be conducted pursuant to Chapter 1 hereof. Inspections during the manufacturing process shall be conducted by those agencies as follows:

458.3.1

Inspections shall be conducted by an appropriately licensed representative of an agency selected by the manufacturer. The inspections shall ensure that the buildings are being manufactured in compliance with the applicable codes and the approved plans. Once an agency has inspected a manufactured building, the manufacturer shall not seek to have the building inspected by another agency, nor shall any agency inspect a building that has already been inspected by another agency unless the subsequent inspection is at the direction of the department or unless the building or modification thereto is being inspected for recertification by the department.

458.3.2

At a minimum, a certified agency shall meet the criteria in Sections 458.3.2.1 through 458.3.2.4.

458.3.2.1

With regard to manufactured buildings, observe the first building built, or with regard to components, observe the first unit assembled, after certification of the manufacturer, from start to finish, inspecting all subsystems: electrical, plumbing, structural, mechanical, or thermal. Continue observation of the manufacturing process until the approved inspection agency determines that the manufacturer's quality control program, in conjunction with the application of the plans approved by the approved inspection agency, will result in a building and components that meet or exceed the applicable *Florida Building Code* requirements. Thereafter, inspect each module produced during at least one point of the manufacturing process and inspect at least 75 percent of the subsystems of each module: electrical, plumbing, structural, mechanical, or thermal.

458.3.2.2

With respect to components, inspect at least 75 percent of the manufactured building components and at least 20 percent of the storage sheds that are not designed for human habitation and that have a floor area of 720 square feet or less.

458.3.2.3

During each inspection, the agency shall verify the manufacturer's in-plant quality control program is working as set forth in the approved quality control manual.

458.3.2.4

Should work stop on a particular module or component for a period of two months, reinspection shall be required.

458.3.3

When an agency discovers a deviation from the code or the approved plans which creates or threatens to create an imminent life safety hazard, all buildings or components which have progressed through that stage of production since the agency's previous inspection shall be inspected to ensure the absence of that deviation, and the agency shall immediately notify the manufacturer and the department in writing. Any building or component exhibiting the deviation shall be brought into conformance with the applicable code and the approved plans by the manufacturer within thirty days of notification of the deviation by the agency. The corrective action must be left available for reinspection by the agency.

458.3.4

The agency shall note all inspections, deviations and corrective actions in a written inspection report and shall complete the inspection report portion of the building code information system available via the Internet.

458.3.5

The agency shall give a copy of the inspection report(s) to the manufacturer for record and shall retain another copy. The agency or the manufacturer shall provide a copy of an inspection report to the department when requested.

458.4 Design Plan and Systems Approval

Plan review pertaining to installation of manufactured buildings and construction activities conducted at the site of the installation shall be conducted pursuant to Chapter 1 hereof. Plan review pertaining to construction activities occurring within the manufacturing process shall be conducted by Department approved agencies. If the residential manufactured building is transportable in one or more sections and is 8 body feet (24 584 mm) or more in width or 40 body feet (12 192 mm) or more in length, or, when erected on site, is 320 square feet (29 m²) or more, and which is built on a permanent chassis, the manufacturer shall certify the manufactured building has been excluded from regulation by the United States Department of Housing and Urban Development.

458.4.1 Plan Approval Expiration

Plan approvals for manufactured buildings shall expire upon the effective date of the new code. Upon revision of the *Florida Building Code*, plan approvals shall expire upon the effective date of that revision unless the manufacturer files, with the department, a sworn statement by an agency the plans have been reviewed and are in compliance with the revisions to the *Florida Building Code*. The agency shall transmit plans electronically through the building code information system to the Department.

Exception: In accordance with Section 105.3.7, manufacturers should be permitted to complete all buildings designed and approved prior to the effective date of a new code edition, provided a clear signed contract is in place. The contract shall provide specific data mirroring that required by an application for permit, specifically, without limitation, date of execution, building owner or dealer, and anticipated date of completion. However, the construction activity must commence within 6 months of the contract's execution. The contract is subject to verification by the Department of Business and Professional Regulation.

458.4.2 Evidence of Agency Approval

Approved plans and specifications shall be evidenced by a letter of certification from the agency. No manufacturing activity shall commence until plan approval has been obtained from the agency.

Approved copies of the design plans and specifications shall be returned to the manufacturer with an agency approval letter indicating the limitations, if any, of such approval. An approved copy of the plans shall be available at each place of manufacture, which shall be made available for inspection and monitoring. Upon approval of the plans, the agency shall electronically submit the plans bearing the approval stamp, with a list of any limitations of that plan approval, to the department via the building code information system at www.floridabuilding.org.

458.5 Factory-Built Schools, Plan Review (Also See Section 453, State Requirements for Education Facilities)

Plan review of plans for constructed factory-built schools shall be performed by the agency selected by the department. An applicant for plan approval shall submit complete plans to the agency in the manner and format agreed to by the agency and the applicant. Upon determination by the agency that the submitted plans comply with all applicable standards, the agency shall certify such determination by affixing an approval stamp on each page of the plans, and shall return one copy to the applicant, maintain an original set, and submit one copy electronically to the department. The agency shall be compensated for the actual cost of the plan review by the applicant. No manufacturing activity shall commence until plan approval has been obtained from the agency. Plan review at a minimum shall include those items identified in Chapter 1 hereof.

458.6 Factory-Built Schools, Plan Review, Inspections and Work Progress Reports (Also See Section 453, State Requirements for Education Facilities)

458.6.1 Inspectors

The school board or Florida college (educational entity) which is to utilize the factory-built school shall be responsible for compliance with inspection requirements. Inspections may be performed by an agency.

458.6.2 New Construction

All buildings shall be subject to inspection during the manufacturing process. The educational entity shall ensure that factory inspections are performed periodically and are sufficient to ensure the building and its systems comply with the applicable standards. Inspections may be performed by an agency. The inspector shall require the correction of all deficiencies found during the manufacturing process. Upon an inspector's determination that the building complies with the applicable standards, the inspector shall provide the department the information as required on the data plate for the building and identify the building as satisfactory for use as an educational facility on the building code information system.

Section 459 Boot Camps for Children

459.1

Boot camps for children shall comply with the design and construction standards as described herein. Enforcement and interpretation of these provisions shall be by the entities authorized by Chapter 553.80, *Florida Statutes*.

Note: Other administrative and programmatic provisions may apply. See Department of Juvenile Justice Rule 63-E 2, *Florida Administrative Code*, and Chapter 39, *Florida Statutes*.

459.2 Facility Structural and Operational Standards

459.2.1

The facility shall conform to the *Florida Fire Prevention Code*. All new construction and building renovations shall comply with the *Florida Building Code*.

459.2.2

All juvenile justice residential treatment program facilities shall conform to the *Florida Building Code*.

459.2.3

All juvenile justice residential treatment program facilities shall comply with the sanitation, health and fire codes set forth in the *Florida Building Code* and in the *Florida Fire Prevention Code*.

Section 460 Mausoleums and Columbariums

460.1 General

The provisions of Section 460 shall apply to buildings or structures as defined in Section 202 as chapel mausoleums, garden mausoleums, nonvisitation crypt mausoleums, and columbariums. All crypts and niches built after this code becomes effective shall conform to this code.

460.2 Occupancy Classification

Mausoleums and columbariums shall be classified as a Group S2 low hazard storage occupancy.

460.3 Construction Type

Mausoleums, columbariums and accessory occupancies shall be of Type I unsprinklered, Type II unsprinklered, or Type IIB unsprinklered construction.

460.4 Accessory Occupancies

Accessory occupancies shall comply with Section 508.2.

460.5 Structural Loads

Mausoleums and columbariums shall be designed to comply with the structural design requirements of Chapter 16. Crypts shall be designed for a minimum total live load of 35 psf (2 kN/m²).

460.6 Mausoleum and Columbarium Construction

The design and construction of mausoleums and columbariums shall comply with the *Florida Building Code, Building* and Section 460.6.

460.6.1 Plumbing Systems

Mausoleums and columbariums shall not be required to comply with the *Florida Building Code, Plumbing*.

Exception: Accessory areas and an occupancy in a mixed occupancy building shall comply with *Florida Building Code, Plumbing*. The number and location of plumbing facilities shall be based on the accessory areas and the mixed occupancy areas.

460.6.2 Mechanical Systems

Mausoleums and columbariums shall not be required to comply with the *Florida Building Code, Mechanical*.

Exceptions:

1. Accessory areas and an occupancy in a mixed occupancy building shall comply with *Florida Building Code, Mechanical*. Mechanical systems shall be based on the accessory areas and the mixed occupancy areas.
2. Crypt pressure relief systems shall comply with Section 460.7.2 except that for family mausoleum units where all crypts are bordering an exterior wall, pressure relief ventilation shall be provided from the crypt to the outside of the mausoleum through the exterior wall or roof.
3. Niches shall not require pressure relief systems.

460.6.3 Fire Protection Systems

Mausoleums and columbariums shall not be required to comply with Chapter 9, Fire Protection Systems.

Exception: Accessory areas and an occupancy in a mixed occupancy building shall comply with Chapter 9. The fire protection systems shall be based on the accessory areas and the mixed occupancy areas.

460.6.4 Interior Finish

The interior finish for mausoleums and columbariums shall be Class A for exits and exit access and Class B for other spaces. The floor tile, marble, and granite used in a chapel mausoleum shall comply with the Marble Institute of America (1998).

460.6.5 Exterior Finish

The exterior finish for mausoleums and columbariums shall be one or more of the following finishes:

Granite

Marble

Rubbed concrete

Painted concrete

Stucco

Synthetic stucco

Waterproofing products

Tile

460.7 Crypts

460.7.1 Crypts Construction

Crypts and companion crypts shall be constructed of reinforced concrete complying with Chapter 19 and Section 460.7.1.

460.7.1.1 Cast in Place Crypt

Cast in place crypts shall have a minimum thickness of 3 inches (76 mm) for floor slabs, walls, and other structural framework.

460.7.1.2 Precast Crypt

Concrete shall have a minimum specified compressive strength f_c' of 5,000 psi (34.5 mPa). Crypt floor slabs and roof slabs shall have a minimum thickness of $2\frac{1}{2}$ inches (63.5 mm) Crypt walls shall be a minimum thickness of $3\frac{1}{2}$ inches (88.9 mm) at the top of the wall to a minimum of 2 inches (50.8 mm) at the bottom of the wall.

460.7.1.3 Crypt Front

Crypt fronts are to be independent of the crypt panel. The front shall be Grade A exterior-type granite or marble according to the Marble Institute of America (1998), or travertine, or bronze, or tile mosaic. The front shall be installed with a hanger system. The hangers, clips, and other exterior or interior fastenings shall be of copper-based alloy, copper, or stainless steel designed for strength and durability. Aluminum fastenings may be used if they will not react with any material or metal that they may come in contact with and when not embedded in concrete. The front, trim, and wall stone shall be a minimum $\frac{3}{4}$ inch (19.1 mm) thick, other materials used for crypt fronts shall be the thickness as dictated at the time by modern mausoleum construction.

460.7.2 Crypt Relief Vent

For family mausoleum units where all crypts are bordering an exterior wall, pressure relief ventilation shall be provided from the crypt to the outside of the mausoleum through the exterior wall or roof. For all other mausoleum units, each crypt shall have a pressure relief vent from the crypt to the roof of the mausoleum complying with Section M515, Mausoleum relief system, of the *Florida Building Code, Mechanical*. Niches shall not require pressure relief systems.

460.8 Casket Placement

Casket placement shall have minimum interior dimensions of 2 feet 6 inches (762 mm) wide mm) by 2 feet 1 inch (635 mm) high by 7 feet $3\frac{1}{2}$ inches (2223 mm) deep.

460.9 Niches

Niches shall be designed and constructed in accordance with Section 460.9.

460.9.1 Minimum Size

Niches shall have a minimum volume of 200 cubic inches (7 m^3) with a minimum width of $4\frac{1}{2}$ inches (114.3 mm), a minimum height of 9 inches (228.6 mm), and a minimum depth of 5 inches (127 mm).

460.9.2 Niche Front

The niche front shall be Grade A exterior-type granite or marble according to the Marble Institute of America (1998), or travertine, bronze, tile mosaic, glass, lexan, or plexiglass.

460.9.3 Pressure Relief Systems

Niches shall not require pressure relief systems.

460.9.4 Wall Thickness

Niche wall thickness shall be the thickness as dictated at the time of construction by modern mausoleum and columbarium construction.

460.10 Family Mausoleum

Family mausoleums consisting of six or fewer casket placements shall comply with either Section 460.1 or 460.10.

460.10.1 Materials

Family mausoleums shall be constructed of the materials in Sections 460.10.1.1 through 460.10.1.6.

460.10.1.1 Reinforced Concrete Floor

Reinforced concrete floor shall have a minimum specified compressive strength f_c of 5,000 psi (34.5 MPa).

460.10.1.2 Hardware

Hardware and fasteners shall be of stainless steel or bronze.

460.10.1.3 Doors

When installed, doors and door hardware shall be bronze.

460.10.1.4 Crypt Front

Crypt fronts shall be granite or marble.

460.10.1.5 Walls and Roof

Walls and roof shall be of granite, marble or reinforced concrete.

460.10.1.6 Floor

The floor shall be granite, marble, or reinforced concrete.

460.10.2 Crypt Relief Vent

For family mausoleum units where all crypts are bordering an exterior wall, pressure relief ventilation shall be provided from the crypt to the outside of the mausoleum through the exterior wall or roof.

For family mausoleum units where all crypts are not bordering an exterior wall, each crypt shall have a pressure relief vent from the crypt to the roof of the mausoleum complying with Section M515, Mausoleum relief system, of the *Florida Building Code, Mechanical*.

460.10.3 Minimum Thickness

The minimum thickness for the components of a family mausoleum shall comply with Section 460.10.3.

460.10.3.1 Family Mausoleum

Exterior walls shall be a minimum of 4 inches (101.6 mm). The roof shall be minimum of 6 inches (152 mm). The floor shall be a minimum of 6 inches (152 mm) granite, marble, or reinforced concrete. Shelves shall be a minimum of 2 inches (51 mm). Crypt fronts shall be a minimum of $\frac{3}{4}$ inch (19.1 mm).

460.10.3.2 Burial Chamber Mausoleum

Exterior walls shall be a minimum of 6 inches (152 mm). The roof shall be a minimum of 6 inches (152 mm). The floor shall be a minimum of 8 inches (203 mm) granite. Shelves shall be a minimum of 2 inches (51 mm). Crypt fronts shall be a minimum of $\frac{3}{4}$ inch (19.1 mm).

Section 461 Transient Public Lodging Establishments

461.1

Any transient public lodging establishment, as defined in Chapter 509, *Florida Statutes*, and used primarily for transient occupancy as defined in Section 83.43(10), *Florida Statutes*, or any timeshare unit of a timeshare plan as defined in Chapters 718 and 721, *Florida Statutes*, which is of three stories or more and for which the construction contract has been let after the effective date of this code, with interior corridors which do not have direct access from the guest area to exterior means of egress and on buildings over 75 feet (22 860 mm) in height that have direct access from the guest area to exterior means of egress and for which the construction contract has been let after the effective date of this code, shall be equipped with an automatic sprinkler system installed in compliance with the provisions prescribed in the NFPA 13, Standards for the Installation of Sprinkler Systems. Each guestroom and each timeshare unit shall be equipped with an approved listed single-station smoke detector meeting the minimum requirements of NFPA 74, Standards for the Installation, Maintenance and Use of Household Fire Warning Equipment, powered from the building electrical service, notwithstanding the number of stories in the structure, if the contract for construction is let after the effective date of this code. Single-station smoke detectors shall not be required when guest-rooms or timeshare units contain smoke detectors connected to a central alarm system which also alarms locally.

Section 462 Use of Asbestos in New Public Buildings or Buildings Newly Constructed for Lease to Government Entities—Prohibition

462.1

The use of asbestos or asbestos-based fiber materials is prohibited in any building, construction of which is commenced after September

30, 1983, which is financed with public funds or is constructed for the express purpose of being leased to any governmental entity.

Section 463 Adult Day Care

463.1 General

Adult day care facilities shall comply with the following design and construction standards.

Note: See Agency for Health Care Administration (AHCA) Rule 58A-6, *Florida Administrative Code*, and Chapter 400, Part V, *Florida Statutes*.

463.2 Definitions

"Adult day care center" or "center" means any building, buildings, or part of a building, whether operated for profit or not, in which is provided through its ownership or management, for a part of a day, basic services to three or more persons who are 18 years of age or older, who are not related to the owner or operator by blood or marriage, and who require such services. The following are exempt from this part:

1. Any facility, institution, or other place that is operated by the federal government or any agency thereof.
2. Any freestanding inpatient hospice facility that is licensed by the state and which provides day care services to hospice patients only.
3. A licensed assisted living facility, a licensed hospital, or a licensed nursing home facility that provides services during the day which include, but are not limited to, social, health, therapeutic, recreational, nutritional and respite services, to adults who are not residents, so long as the facility does not hold itself out as an adult day care center.

"Capacity" shall mean the number of participants for which a center has been licensed to provide care at any given time and shall be based upon required net floor space.

"Net floor space" shall mean the actual climatically controlled occupied area, not including accessory unoccupied areas such as hallways, stairs, closets, storage areas, bathrooms, kitchen or thickness of walls, set aside for the use of the day care center participants.

"Participant space" shall mean the required net floor space per participant. Maximum participant capacity shall refer to the licensed capacity.

463.3

The following minimum conditions shall be met:

463.3.1

The floor surface in kitchens, all rooms and areas in which food is stored or prepared and in which utensils are washed or stored shall be of smooth nonabsorbent material and constructed so it can be easily cleaned and shall be washable up to the highest level reached by splash or spray.

463.3.2

The walls and ceilings of all food preparation, utensil washing and hand washing rooms or areas shall have smooth, easily cleanable surfaces. Walls shall be washable up to the highest level reached by splash or spray.

463.3.3

Hot and cold running water under pressure shall be easily accessible to all rooms where food is prepared or utensils are washed.

463.3.4

Hand-washing facilities, provided with hot and cold running water, shall be located within the food preparation area in new adult day care facilities and adult day care facilities which are extensively altered.

463.3.5

Multiuse equipment and utensils shall be constructed and repaired with materials that are nontoxic, corrosion resistant and nonabsorbent; and shall be smooth, easily cleanable and durable under conditions of normal use; and shall not impart odors, color or taste nor contribute to the contamination of food.

463.3.6

A three-compartment sink or a two-compartment sink and a dishwater with an effective, automatic sanitizing cycle, shall be provided.

463.3.7

Refrigeration units and hot food storage units used for the storage of potentially hazardous foods shall be provided with a numerically scaled indicating thermometer accurate to $\pm 3^{\circ}\text{F}$ (-16°C). The thermometer shall be located in the warmest or coldest part of the units and of such type and so situated that the temperature can be easily and readily observed.

463.4 Participant and Program Data, Emergency Procedures

Fire safety protection shall be governed in accordance with the *Florida Fire Prevention Code*.

463.5 Physical Plant, Sanitary Conditions, Housekeeping Standards and Maintenance**463.5.1**

The participant capacity shall be determined by the total amount of net floor space available for all of the participants. Centers shall provide not less than 45 square feet (4 m^2) of net floor area per participant. Centers shall be required to provide additional floor space for special target populations to accommodate activities required by participant care plans.

463.5.2

Facilities exempt pursuant to Section 400.553, *Florida Statutes*, shall utilize separate space over and above the minimum requirement needed to meet their own licensure certification approval requirements. Only congregate space shall be included in determining minimum space. For purposes of this section, congregate space shall mean climatically controlled living room, dining room, specialized activity rooms, or other rooms to be commonly used by all participants.

463.5.3

Center facilities shall consist of, but not be limited to, the following:

1. Bathrooms.
2. Dining areas.
3. Kitchen areas.
4. Rest areas.
5. Recreation and leisure time areas.

463.5.4

A private area shall be available for the provision of first aid, special care and counseling services when provided, or as necessary for other services required by participants. This area shall be appropriately furnished and equipped.

463.5.5

Bathrooms shall be ventilated and have hot and cold running water, supplying hot water at a minimum of 105°F (41°C) and a maximum of 115°F (46°C).

463.5.6

Recreation and leisure time areas shall be provided where a participant may read, engage in socialization or other leisure time activities. The recreation areas also may be utilized for dining areas.

463.5.7

All areas used by participants shall be suitably lighted and ventilated and maintained at a minimal inside temperature of 72°F (22°C) when outside temperatures are 65°F (18°C) or below, and all areas used by participants must not exceed 90°F (32°C). Mechanical cooling devices must be provided when indoor temperatures exceed 84°F (29°C). The facility shall have a thermometer which accurately identifies the temperature.

Section 464 Assisted Living Facilities

464.1 Scope

Assisted living facilities shall comply with the following design and construction standards as described herein.

Note: Other administrative and programmatic provisions may apply. See Agency of Health Care Administration (AHCA) Rule 58A-5, *Florida Administrative Code* and Chapter 400 Part III, *Florida Statutes*.

464.2 Definitions

AGENCY. The Agency for Health Care Administration.

AHCA CENTRAL OFFICE. The Assisted Living Unit, Agency for Health Care Administration.

ASSISTED LIVING FACILITY. Any building or buildings, section or distinct part of a building, private home, boarding home, home for the aged or other residential facility, whether operated for profit or not, which undertakes through its ownership or management to provide housing, meals and one or more personal services for a period exceeding 24 hours to one or more adults who are not relatives of the owner or administrator. The following are exempted from this definition:

1. Any facility, institution, or other place operated by the federal government or any agency of the federal government.
2. Any facility or part of a facility licensed under Chapter 393, *Florida Statutes*, or Chapter 394, *Florida Statutes*.
3. Any facility licensed as an adult family care home under Part VII Chapter 400, *Florida Statutes*.
4. Any person who provides housing, meals and one or more personal services on a 24-hour basis in the person's own home to not more than two adults who do not receive optional state supplementation. The person who provides the housing, meals, and personal services must own or rent the home and reside therein.
5. Any home or facility approved by the United States Department of Veterans Affairs as a residential care home wherein care is provided exclusively to three or fewer veterans.
6. Any facility that has been incorporated in this state for 50 years or more on or before July 1, 1983, and the board of directors of which is nominated or elected by the residents, until the facility is sold or its ownership is transferred; or any facility, with improvements or additions thereto, which has existed and operated continuously in this state for 60 years or more on or before July 1, 1989, is directly or indirectly owned and operated by a nationally recognized fraternal organization, is not open to the public, and accepts only its own members and their spouses as residents.
7. Any facility certified under Chapter 651, *Florida Statutes*, or a retirement community, may provide services authorized under this section or Part IV of Chapter 400, *Florida Statutes* to its residents who live in single-family homes, duplexes, quadruplexes, or apartments located on the campus without obtaining a license to operate an assisted living facility if residential units within such buildings are used by residents who do not require staff supervision for that portion of the day when personal services are not being delivered and the owner obtains a home health license to provide such services. However, any building or distinct part of a building on the campus that is designated for persons who receive personal services and require supervision beyond that which is available while such services are being rendered must be licensed in accordance with this section. If a facility provides personal services to residents who do not otherwise require supervision and the owner is not licensed as a home health agency, the buildings or distinct parts of buildings where such services are rendered must be licensed under this section. A resident of a facility that obtains a home health license may contract with a home health agency of his or her choice, provided that the home health agency provides liability insurance and workers' compensation coverage for its employees. Facilities covered by this exemption may establish policies that give residents the option of contracting for services and care beyond that which is provided by the facility to enable them to age in place. For purposes of this section, a retirement community consists of a facility licensed under this section or under Part II of Chapter 400, *Florida Statutes*, and apartments designed for independent living located on the same campus.

8. Any residential unit for independent living which is located within a facility certified under Chapter 651 *Florida Statutes*, or any residential unit which is colocated with a nursing home licensed under Part II of Chapter 400 *Florida Statutes*, or colocated with a facility licensed under this section in which services are provided through an outpatient clinic or a nursing home on an outpatient basis.

CAPACITY. The number of residents for which a facility has been licensed to provide residential care.

DEPARTMENT. The Department of Elderly Affairs.

DISTINCT PART. Designated bedrooms or apartments, bathrooms and a living area; or a separately identified wing, floor or building which includes bedrooms or apartments, bathrooms and a living area. The distinct part may include a separate dining area, or meals may be served in another part of the facility.

DOEA ASSISTED LIVING PROGRAM. The Assisted Living Program, Department of Elder Affairs.

EXTENDED CONGREGATE CARE. Acts beyond those authorized in subsection (5) that may be performed pursuant to Part I of Chapter 464, *Florida Statutes*, by persons licensed thereunder while carrying out their professional duties. The purpose of such services is to enable residents to age in place in a residential environment despite mental or physical limitations that might otherwise disqualify them from residency in a facility licensed under this part.

FOOD SERVICE. The storage, preparation, serving and cleaning up of food intended for consumption in a facility or a formal agreement that meals will be regularly catered by a third party.

PERSONAL SERVICES. Direct physical assistance with or supervision of the activities of daily living and the self-administration of medication and other similar services which the department may define by rule. Personal services shall not be construed to mean the provision of medical, nursing, dental or mental health services.

RELATIVE. An individual who is the father, mother, stepfather, stepmother, son, daughter, brother, sister, grandmother, grandfather, great-grandmother, greatgrandfather, grandson, granddaughter, uncle, aunt, first cousin, nephew, niece, husband, wife, father-in-law, mother-in-law, son-in-law, daughter-in-law, brother-in-law, sister-in-law, stepson, stepdaughter, stepbrother, stepsister, half brother or half sister of an owner or administrator.

RENOVATION. Additions, repairs, restorations or other improvements to the physical plant of the facility within a five-year period that costs in excess of 50 percent of the value of the building as reported on the tax rolls, excluding land, before the renovation.

RESIDENT. A person 18 years of age or older, residing in and receiving care from a facility.

RESIDENT'S REPRESENTATIVE OR DESIGNEE. A person other than the owner, or an agent or employee of the facility, designated in writing by the resident, if legally competent, to receive notice of changes in the contract executed pursuant to Section 400.424, *Florida Statutes*; to receive notice of and to participate in meetings between the resident and the facility owner, administrator or staff concerning the rights of the resident; to assist the resident in contacting the ombudsman council if the resident has a complaint against the facility; or to bring legal action on behalf of the resident pursuant to Section 400.429, *Florida Statutes*.

464.3 Codes and Standards for the Design and Construction of Assisted Living Facilities

464.3.1

Except as modified and required by this section of the code, Chapter 59A-36, *Florida Administrative Code* or Chapter 429 Part I, *Florida Statutes*, all new assisted living facilities and all additions, alterations, or renovations to existing assisted living facilities with more than 16 licensed beds shall also be in compliance with *The Guidelines for the Design and Construction of Residential Health, Care, and Support Facilities (The Guidelines)* Part 1 General, and Chapter 4.1 Special Requirements for Assisted Living Facilities as referenced in Chapter 35 of this code.

464.4 Additional Physical Plant Requirements for Assisted Living Facilities

In addition to the codes and standards referenced in Section 464.3 of the code, the following minimum essential facilities shall apply to all new assisted living facilities.

464.4.1

Indoor radon testing as mandated by Section 404.056(5), *Florida Statutes*, shall be completed by all facilities.

464.4.2 Heating and Cooling

464.4.2.1

Mechanical systems shall be designed to maintain dry-bulb temperatures between 70°F (18°C) and 81°F (27°C) in resident-occupied areas and in areas intended for resident occupancy. Residents who have individually controlled thermostats in their bedrooms or apartments shall be permitted to control temperatures in those areas, including maintaining temperatures outside the range stated previously.

464.4.2.2

A new facility shall be equipped with either a permanent on-site alternate power source to operate at least the equipment necessary to maintain safe indoor air temperatures, life safety systems and equipment for resident care needs, or there shall be a permanently installed predesigned electrical service entry for the electrical system that will allow a quick connection to a temporary alternate power source to operate at least the equipment necessary to maintain safe indoor air temperatures, life safety systems and equipment for resident care needs. This quick connection shall be installed inside of a permanent metal enclosure rated for this purpose and may be located on the exterior of the building. See Chapter 59A-36.025, *Florida Administrative Code*, "Emergency Environmental Control for Assisted Living Facilities" for additional requirements.

464.4.2.2.1

If the alternate power source is a generator, it shall comply with the requirements of NFPA 70 for either an optional standby system or a legally required system.

464.4.2.2.2

If the alternate power source is a generator, gasoline shall not be permitted as a fuel source.

464.4.3 Common Areas

464.4.3.1

A minimum of 35 square feet (3 m^2) of living and dining space per resident, live-in staff and live-in family member shall be provided except in facilities comprised of apartments. This space shall include living, dining, recreational or other space designated accessible to all residents, and shall not include bathrooms, corridors, storage space or screened porches which cannot be adapted for year round use. Facilities with apartments may count the apartment's living space square footage as part of the 35 square footage (3 m^2) living and dining space requirement.

Those facilities also serving as adult day care centers must provide an additional 35 square feet (3 m^2) of living and dining space per adult day care client. Excess floor space in residents' bedrooms or apartments cannot be counted toward meeting the requirement of 35 square feet (3 m^2) of living and dining space requirements for adult day care participants. Day care participants may not use residents' bedrooms for resting unless the room is currently vacant.

464.4.3.2

A room, separate from resident bedrooms, shall be provided where residents may read, engage in socialization or other leisure time activities. Comfortable chairs or sofas shall be provided in this communal area.

464.4.3.3

The dining area shall be furnished to accommodate communal dining.

464.4.4 Bedrooms

464.4.4.1

Resident sleeping rooms designated for single occupancy shall provide a minimum inside measurement of 80 square feet (7 m^2) of usable floor space. Usable floor space does not include closet space or bathrooms.

464.4.4.2

Resident bedrooms designated for multiple occupancy shall provide a minimum inside measurement of 60 square feet (6 m^2) of usable floor space per room occupant.

464.4.4.3

Resident bedrooms designated for multiple occupancy in facilities newly licensed or renovated 6 months after October 17, 1999, shall have a maximum occupancy of two persons.

464.4.4.4

All resident bedrooms shall open directly into a corridor, common use area or to the outside. A resident must be able to exit his bedroom without having to pass through another bedroom unless the two rooms have been licensed as one bedroom.

464.4.4.5

All resident bedrooms shall be for the exclusive use of residents. Live-in staff and their family members shall be provided with sleeping space separate from the sleeping and congregate space required for residents.

464.4.5 Bathrooms

464.4.5.1

There shall be at least one bathroom with one toilet and sink per six persons, and one bathtub or shower per eight persons. All residents, all live-in staff and family members, and respite care participants must be included when calculating the required number of toilets, sinks, bathtubs and showers. All adult day care participants shall be included when calculating the required number of toilets and sinks.

464.4.5.2

Each bathroom shall have a door in working order to assure privacy. The entry door to bathrooms with a single toilet shall have a lock which is operable from the inside by the resident with no key needed. A nonlocking door shall be permitted if the resident's safety would otherwise be jeopardized.

464.4.5.3

There shall be nonslip safety devices such as bath mats or peel off stickers in the showers and bathtubs of all facilities. Showers and bathtubs with a nonskid surface require a separate nonskid device only if the surface is worn. Grab bars shall be required in showers and bathtubs. Grab bars, whether portable or permanent, must be securely affixed to the floor or adjoining walls. Facilities newly licensed or renovated six months after October 17, 1999 must have grab bars next to the commode.

464.4.5.4

Sole access to a toilet or bathtub or shower shall not be through another resident's bedroom, except in apartments within a facility.

464.4.6 Security

External boundaries of a facility or a distinct part of a facility, including outside areas, may be secured using egress control or perimeter control devices if the following conditions are met.

464.4.6.1

The use of the device complies with all life safety requirements.

464.4.6.2

Residents residing within a secured area are able to move freely throughout the area, including the resident's bedroom or apartment, bathrooms and all common areas, and have access to outdoor areas on a regular basis and as requested by each resident.

464.4.6.3

Residents capable of entering and exiting without supervision have keys, codes or other mechanisms to exit the secured area without requiring staff assistance.

464.4.6.4

Staff who provide direct care or who have regular contact with residents residing in secured areas complete Level 1 Alzheimer's training as described in Rule 58A-5.0191.

464.4.6.5

Pursuant to Section 400.441, *Florida Statutes*, facilities with 16 or fewer residents shall not be required to maintain an accessible telephone in each building where residents reside, maintain written staff job descriptions, have awake night staff or maintain

464.5 Extended Congregate Care

464.5.1 Physical Site Requirements

Each extended congregate care facility shall provide a homelike physical environment which promotes resident privacy and independence including:

464.5.1.1

A private room or apartment, or a semiprivate room or apartment shared with a roommate of the resident's choice. The entry door to the room or apartment shall have a lock which is operable from the inside by the resident with no key needed. The resident shall be provided with a key to the entry door on request. The resident's service plan may allow for a nonlocking entry door if the resident's safety would otherwise be jeopardized.

464.5.1.2

A bathroom, with a toilet, sink and bathtub or shower, which is shared by a maximum of four residents. A centrally located hydromassage bathtub may substitute for the bathtub or shower in two of the bath rooms. The entry door to the bathroom shall have a lock which is operable from the inside by the resident with no key needed. The resident's service plan may allow for a nonlocking bathroom door if the resident's safety would otherwise be jeopardized.

Section 465 Control of Radiation Hazards

465.1 Scope

Control of radiation hazards shall comply with the following design and construction standards as described herein.

Note: Other administrative and programmatic provisions may apply. See Department of Health (DOH) Rule 64E-5, *Florida Administrative Code*, and Chapter 404, *Florida Statutes*.

465.2 Control of Access to High Radiation Areas

465.2.1 Definitions

HIGH RADIATION AREA. An area, accessible to individuals, in which radiation levels from radiation sources external to the body could result in an individual receiving a dose equivalent in excess of 1 mSv (0.1 rem) in 1 hour at 30 cm from any source of radiation or from any surface that the radiation penetrates. For purposes of this section, rooms or areas in which diagnostic X-ray systems are used for healing arts purposes are not considered high radiation areas.

VERY HIGH RADIATION AREA. An area, accessible to individuals, in which radiation levels from radiation sources external to the body could result in an individual receiving an absorbed dose in excess to 500 rad (5 gray) in 1 hour at 1 m from a source of radiation or from any surface that the radiation penetrates. At very high doses received at high dose rates, units of absorbed dose, gray and rad, are appropriate, rather than units of dose equivalent, sievert and rem.

465.2.2

The licensee or registrant shall ensure that each entrance or access point to a high radiation area has one or more of the following features:

465.2.2.1

A control device that upon entry into the area causes the level of radiation to be reduced below that level at which an individual might receive a deep dose equivalent of 0.1 rem (1 millisievert) in 1 hour at 30 cm from the source of radiation from any surface that the radiation penetrates;

465.2.2.2

A control device that energizes a conspicuous visible or audible signal so that the individual entering the high radiation area and the supervisor of the activity are made aware of the entry; or

465.2.2.3

Entryways that are locked except during periods when access to the areas is required with positive control over each individual entry.

465.3 Caution Signs

465.3.1 Standard Radiation Symbol

Unless otherwise authorized by the department, the symbol prescribed in this section shall use the colors magenta or purple or black on yellow background. The symbol prescribed is the three-bladed design as follows:

465.3.1.1 Radiation Symbol

465.3.1.1.1

Cross-hatched area is to be magenta or purple or black.

465.3.1.1.2

The background is to be yellow.

465.3.2 Exception to Color Requirements for Standard Radiation Symbol

In spite of the requirements of Section 465.3.1, licensees or registrants are authorized to label sources, source holders or device components containing sources of radiation that are subjected to high temperatures, with conspicuously etched or stamped radiation caution symbols and without a color requirement.

465.3.3 Additional Information on Signs and Labels

In addition to contents of signs and labels prescribed in this part, the licensee or registrant shall provide on or near the required signs and labels additional information to make individuals aware of potential radiation exposures and to minimize the exposures.

465.4 Posting Requirements

465.4.1 Posting of Radiation Areas

The licensee or registrant shall post each radiation area with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, RADIATION AREA."

465.4.2 Posting of High Radiation Areas

The licensee or registrant shall post each high radiation area with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, HIGH RADIATION AREA" or "DANGER, HIGH RADIATION AREA."

465.4.3 Posting of Very High Radiation Areas

The licensee or registrant shall post each very high radiation area with a conspicuous sign or signs bearing the radiation symbol and words "GRAVE DANGER, VERY HIGH RADIATION AREA."

465.4.4 Posting of Airborne Radioactivity Areas

The licensee shall post each airborne radioactivity area with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, AIRBORNE RADIOACTIVITY AREA" or "DANGER, AIRBORNE RADIOACTIVITY AREA."

465.4.5 Posting of Areas or Rooms in Which Licensed Material Is Used or Stored

The licensee shall post each area or room in which there is used or stored an amount of licensed material exceeding 10 times the quantity of such material specified in State of Florida Office of Radiation Control Radioactive Material Requiring Labeling, May 2000, which is herein incorporated by reference and which is available from the department, with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, RADIOACTIVE MATERIAL(S)" or "DANGER, RADIOACTIVE MATERIAL(S)."

465.4.6

A licensee or registrant is not required to post caution signs in areas or rooms containing sources of radiation for periods of less than 8 hours if each of the following conditions is met.

465.4.6.1

The sources of radiation are constantly attended during these periods by an individual who takes the precautions necessary to prevent the exposure of individuals to sources of radiation in excess of the limits established in this section, and

465.4.6.2

The area or room is subject to the licensee's or registrant's control.

465.4.7

Rooms or other areas in hospitals that are occupied by patients are not required to be posted with caution signs as specified in Rule 64E-5.323 if the patient could be released from confinement as specified in Rule 64E-5.622.

465.4.8

A room or area is not required to be posted with a caution sign because of the presence of a sealed source provided the radiation level at 30 cm from the surface of the sealed source container or housing does not exceed 0.005 rem (0.05 millisievert) per hour.

465.4.9

A room or area is not required to be posted with a caution sign because of the presence of radiation machines used solely for diagnosis in the healing arts.

465.5 General Requirements**465.5.1 Shielding**

Each x-ray facility shall have primary and secondary protective barriers as needed to assure that an individual will not receive a radiation dose in excess of the limits specified in Part III of Chapter 64E-5, *Florida Administrative Code*.

465.5.1.1

Structural shielding in walls and other vertical barriers required for personnel protection shall extend without breach from the floor to a height of at least 7 feet (2.1 m).

465.5.1.2

Doors, door frames, windows and window frames shall have the same lead equivalent shielding as that required in the wall or other barrier in which they are installed.

465.5.1.3

Prior to construction, the floor plans and equipment arrangement of all new installations, or modifications of existing installations, utilizing x-ray energies of 200 keV and above for diagnostic or therapeutic purposes shall be submitted to the Department of Health for review and approval. In computation of protective barrier requirements, the maximum anticipated workload, use factors, occupancy factors and the potential for radiation exposure from other sources shall be taken into consideration.

465.5.1.3.1

The plans shall show, as a minimum, the following:

465.5.1.3.1.1

The normal location of the x-ray system's radiation port; the port's travel and traverse limits; general direction of the useful beam; locations of any windows and doors; the location of the operator's booth; and the location of the xray control panel.

465.5.1.3.1.2

The structural composition and thickness or lead equivalent of all walls, doors, partitions, floor and ceiling of the room concerned.

465.5.1.3.1.3

The dimensions of the room concerned.

465.5.1.3.1.4

The type of occupancy of all adjacent areas inclusive of space above and below the room concerned. If there is an exterior wall, the distance to the closest area where it is likely that individuals may be present.

465.5.1.3.1.5

The make and model of the x-ray equipment and the maximum technique factors.

465.5.1.3.1.6

The type of examinations or treatments which will be performed with the equipment.

465.5.1.3.2

Information shall be submitted on the anticipated maximum workload of the x-ray system.

465.5.1.3.3

If the services of a qualified person have been utilized to determine the shielding requirements, a copy of the report, including all basic assumptions used, shall be submitted with the plans.

465.5.2 X-Ray Film Processing Facilities**465.5.2.1 Processing Facilities**

Each installation using a radiographic x-ray system shall provide suitable equipment for handling and processing radiographic film in accordance with the following provisions:

465.5.2.1.1

The area in which undeveloped films are handled for processing shall be devoid of light with the exception of light in the wave lengths having no significant effect on the radiographic film.

465.5.2.1.2

Film pass boxes, if provided, shall be so constructed as to exclude light when film is placed in or removed from the boxes, and shall incorporate adequate shielding to prevent exposure of undeveloped film to stray radiation.

465.5.2.1.3

Darkrooms used by more than one individual shall be provided a positive method to prevent accidental entry while undeveloped films are being handled or processed.

465.5.2.1.4

Where film is developed manually, the following conditions shall be met:

465.5.2.1.4.1

At least one trisectional tank made of mechanically rigid, corrosion-resistant material shall be utilized; and

465.5.2.1.4.2

The temperature of each solution shall be maintained within the range of 600°F to 800°F (160°C to 270°C). Film shall be developed in accordance with the time-temperature relationships specified by the film manufacturer, or, in the absence of such recommendations by the film manufacturer, with the following time-temperature chart:

TIME-TEMPERATURE CHART

Thermom Reading (Degrees)		Minimum Developing Time (minutes)
C	F	
26.7	80	2
26.1	79	2
25.6	78	2 ¹ / ₂
25.0	77	2 ¹ / ₂
24.4	76	3
23.9	75	3

23.3	74	3 ¹ / ₂
22.8	73	3 ¹ / ₂
22.2	72	4
21.7	71	4
21.1	70	4 ¹ / ₂
20.6	69	4 ¹ / ₂
20.0	68	5
19.4	67	5 ¹ / ₂
18.9	66	5 ¹ / ₂
18.3	65	6
17.8	64	6 ¹ / ₂
17.2	63	7
16.7	62	8
16.1	61	8 ¹ / ₂
15.6	60	9 ¹ / ₂

465.5.2.1.4.3

Devices shall be utilized which will:

1. Indicate the actual temperature of the developer; and
2. Signal the passage of a preset time as short as 2 minutes.

465.6 Doors, Interlocks, and Warning Systems**465.6.1**

A licensee shall control access to the teletherapy room by a door at each entrance.

465.6.2

A licensee shall equip each entrance to the teletherapy room with an electrical interlock system that shall:

1. Prevent the operator from turning on the primary beam of radiation unless each treatment room entrance door is closed;
2. Turn off the beam of radiation immediately when an entrance door is opened; and
3. Prevent the primary beam of radiation from being turned on following an interlock interruption until all treatment room entrance doors are closed and the beam on-off control is reset at the console.

465.6.3

A licensee shall equip each entrance to the teletherapy room with a conspicuously visible beam condition indicator light.

465.7 Radiation Monitoring Devices

465.7.1

A licensee shall have a permanent radiation monitor in each teletherapy room capable of continuously monitoring beam status.

465.7.2

Each radiation monitor shall be capable of providing visible notice of a teletherapy unit malfunction that results in an exposed or partially exposed source. The visible indicator of high radiation levels shall be observable by an individual entering the teletherapy room.

465.7.3

Each radiation monitor shall be equipped with a backup power supply separate from the power supply to the teletherapy unit. This backup power supply may be a battery system.

465.8 Viewing Systems

A licensee shall construct or equip each teletherapy room to permit continuous observation of the patient from the teletherapy unit console during irradiation.

465.9 Warning Devices

465.9.1

All locations designated as high radiation areas, and all entrances to such locations shall be equipped with easily observable warning lights that operate when and only when radiation is being produced.

465.9.2

Except in facilities designed for human exposure, each high radiation area shall have an audible warning device which shall be activated for 15 seconds prior to the possible creation of such high radiation area. Such warning device shall be clearly discernible in all high radiation areas and in any adjacent radiation areas.

465.9.3

Barriers, temporary or otherwise, and pathways leading to high radiation areas shall be identified in accordance with the Department of Health.

465.10 Design Requirements for Radiation Rooms

Panoramic irradiators shall not be operated unless the following are met:

465.10.1

Each entrance to a radiation room must have a door or other physical barrier to prevent inadvertent entry of personnel while the sources are exposed. Product conveyor systems can serve as barriers as long as they reliably and consistently function as a barrier. It must not be possible to move the sources out of their shielded position if any door or barrier to the radiation room is open. Opening the door or barrier while the sources are exposed must cause the sources to return promptly to their shielded position. The primary entry door must have a lock which is operated by the same key used to control source movement. The doors and barriers must not prevent any individual in the radiation room from leaving.

465.10.2

Each entrance to a radiation room must have an independent backup access control to detect personnel entry while the sources are exposed if the primary access control fails. Entry while the sources are exposed must cause the sources to return to their fully shielded position and also must activate a visible and audible alarm to make the individual entering the room aware of the hazard. The alarm also must alert at least one other individual of the entry who is on site and who is trained to render or summon assistance promptly.

465.10.3

A radiation monitor must be provided to detect the presence of high radiation levels in the radiation room before personnel entry. The monitor must be integrated with personnel access door locks to prevent room access when the monitor detects high radiation levels. The monitor must generate audible and visible alarms if high radiation levels are detected when personnel entry is attempted. The monitor can be located in the entrance or maze but not in the direct radiation beam.

465.10.4

Before sources move from their shielded position, the source control automatically must activate conspicuous visible and audible alarms to alert people in the radiation room that the sources will be moved from their shielded position. The alarms must give individuals enough time to leave the room before the sources leave the shielded position.

465.10.5

Each radiation room must have a clearly visible and readily accessible control which will allow an individual in the room to return the sources to their fully shielded position.

465.10.6

Each radiation room must contain a control which allows the sources to move from the shielded position only if the control has been activated and the door or barrier to the radiation room subsequently has been closed within a preset time.

465.10.7

Each entrance to the radiation room and each entrance to the area within the personnel access barrier of an underwater irradiator must be posted as required by this section. Panoramic irradiators also must be posted as required by this section. The sign can be removed, covered or otherwise made inoperative when the sources are shielded fully.

465.10.8

If the radiation room has roof plugs or other movable shielding, it must not be possible to operate the irradiator unless the shielding is in its proper location. This requirement can be met by interlocks which prevent operation if shielding is not placed properly or by an operating procedure requiring inspection of shielding before operating.

465.10.9

Underwater irradiators must have a personnel access barrier around the pool which must be locked to prevent access when the irradiator is not attended. Only operators and facility management shall have access to keys to the personnel access barrier. There must be an intrusion alarm to detect unauthorized entry when the personnel access barrier is locked. Activation of the intrusion alarm must alert an individual, not necessarily on site, who is prepared to respond or summon assistance.

465.11 Fire Protection**465.11.1**

The radiation room at a panoramic irradiator must have heat and smoke detectors. The detectors must activate an audible alarm. The alarm must be capable of alerting a person who is prepared to summon assistance promptly. The sources must become fully shielded automatically and the air handling systems within the radiation room must be disabled automatically if a fire is detected.

465.11.2

The radiation room at a panoramic irradiator must be equipped with a fire suppression or extinguishing system capable of extinguishing a fire without the entry of personnel into the room. The system for the radiation room must have a shutoff valve to control flooding into unrestricted areas.

465.12 Irradiator Pools**465.12.1**

Irradiator pools must possess a watertight stainless steel liner or a liner metallurgically compatible with other components in the pool or be constructed so that there is a low likelihood of substantial leakage and have a surface designed to facilitate decontamination and must include a means of safely storing sources during repairs of the pool.

465.12.2

Irradiator pools must have no penetration more than 0.5 m below the normal low water level which could allow water to drain out of the pool. Pipes which have intakes more than 0.5 m below the normal low water level must have siphon breakers to prevent the siphoning of the pool.

465.12.3

A means must be provided to replenish water losses from the pool.

465.12.4

An audible and visible indicator must be provided to indicate if the pool water level is below the normal low water level or above the normal high water level.

465.12.5

Irradiator pools must be equipped with a purification system designed to maintain the water during normal operation at a level of conductance not exceeding 20 microsiemens per centimeter and with a clarity so the sources can be seen clearly.

465.12.6

A physical barrier such as a railing or cover must be used around irrigator pools during normal operation to prevent personnel from accidentally falling into the pool. The barrier can be removed during maintenance, inspection, and service operations.

465.12.7

If long-handled tools or poles are used in irrigator pools, the radiation dose rate on the handling areas of the tools must not exceed 2 millirem (0.02 millisievert) per hour.

465.13 Design Requirements**465.13.1**

Panoramic irradiators shall meet the following design requirements:

465.13.1.1 Shielding

The shielding walls shall be designed to meet generally accepted building code requirements for reinforced concrete and shall design the walls, wall penetrations, and entrance ways to meet the radiation shielding requirements of Rule 64E-5.1407. If the irrigator will use more than 2×10^{17} becquerels (5 million curies) of activity, the licensee shall evaluate the effects of heating of the shielding walls by the irrigator sources.

465.13.1.2 Foundations

The foundation shall be designed with consideration given to soil characteristics to ensure it is adequate to support the weight of the facility.

465.13.1.3 Fire Protection

The number, design, locations and spacing of the smoke and heat detectors and extinguishing system shall be appropriate to detect fires and that the detectors are protected from mechanical and radiation damage. The fire extinguishing system shall be designed to provide the necessary discharge patterns, densities, and flow characteristics for complete coverage of the radiation room and that the system is protected from mechanical and radiation damage.

465.13.1.4 Wiring

The electrical wiring and electrical equipment in the radiation room shall be selected to minimize failures due to prolonged exposure to radiation.

465.13.2 Pool Irradiators Shall Meet the Following Design Requirements**465.13.2.1 Pool Integrity**

The pool shall be designed to assure that it is leak resistant, that it is strong enough to bear the weight of the pool water and shipping casks, that a dropped cask would not fall on sealed sources, that all penetrations meet the requirements of Section 465.12.2, and that metal components are metallurgically compatible with other components in the pool.

465.13.2.2 Water-Handling System

The water purification system shall be designed to meet the requirements of Section 465.12.5. The system must be designed so that water leaking from the system does not drain to unrestricted areas without being monitored. The licensee shall design the water chiller system so that it shall compensate adequately for the amount of heat generated by the sealed sources. The water-handling system must have remote controls capable of safely operating a contaminated system.

465.13.3 Floor Penetrations

No floor penetrations, including expansion joints, floor joints and drains, shall allow the uncontrolled release of water from the radiation room that has not been analyzed for its radioactive content.

465.14 Construction Control

The requirements of this section must be met before loading sources. Panoramic irradiators shall meet the following construction requirements:

465.14.1 Shielding

The construction of the shielding shall be monitored to verify that it meets design specifications and generally accepted building code requirements for reinforced concrete.

465.14.2 Foundations

The construction of the foundations shall be monitored to verify that they meet design specifications.

465.14.3 Fire Protection

The ability of the heat and smoke detectors shall be verified to detect a fire, to activate alarms and to cause the source rack to become fully shielded automatically. The operability of the fire suppression or extinguishing system shall also be verified.

465.14.4 Wiring

The electrical wiring and electrical equipment that were installed shall be verified to meet the design specifications.

465.15 Pool Irradiators Shall Meet the Following Construction Requirements

465.15.1 Pool Integrity

The integrity of the pool shall be tested to verify that the pool meets the design specifications. The penetrations and water intakes shall be verified to meet the requirements of Section 465.12.2.

Section 466 Day Care Occupancies

466.1 General

466.1.1

Places of religious worship shall not be required to meet the provisions of this section in order to operate a nursery while services are being held in the building.

466.1.2

Where day care occupancies with clients 24 months or less in age or incapable of self-preservation are located one or more stories above the level of exit discharge or where day care occupancies are located two or more stories above the level of exit discharge, smoke barriers shall be provided to divide such stories into a minimum of two smoke compartments. The smoke barriers shall be constructed in accordance with Section 709 but shall not be required to have a fire-resistance rating.

466.2 Closet Doors

Every closet door latch shall be such that clients can open the door from inside the closet.

466.3 Bathroom Doors

Every bathroom door lock shall be designed to permit opening of the locked door from the outside in an emergency. The opening device shall be readily accessible to the staff.

466.4 Door Closure

Any exit door designed to be normally closed shall be kept closed and shall comply with Section 716.5.

466.5 Location and Construction Types

Day care occupancies shall be limited to the locations and construction types specified in Table 466.5. Day care homes and adult day care shall be permitted to be of any type construction permitted by this code.

TABLE 466.5

DAY CARE LOCATION AND TYPE OF CONSTRUCTION

LOCATION OF DAY CARE	TYPE OF CONSTRUCTION	
	Sprinklered Building	Construction Type
1 story below LED ¹	Yes	I, II, IIIA, IV, V-A
Level of Exit Discharge	No	Any type permitted by this code
1 story above LED ¹	Yes No	Any type
2 or 3 stories above LED ¹	Yes	I, II, III-A, V-A
> 3 stories above LED ¹ but not high rise	Yes	I
High rise	Yes	I

Notes:

¹ LED means Level of Exit Discharge.

466.6 Protection From Hazards

Rooms or spaces for the storage, processing or use of materials specified below shall be protected in accordance with the following:

466.6.1

The following rooms or spaces shall be separated from the remainder of the building by fire barriers having a fire-resistance rating of not less than 1 hour or shall be protected by an approved automatic extinguishing system.

1. Boiler and furnace rooms.

Exception: Rooms enclosing only air-handling equipment.

2. Rooms or spaces used for the storage of combustible supplies in quantities deemed hazardous by the building official.

3. Rooms or spaces used for the storage of hazardous materials or flammable or combustible liquids in quantities deemed hazardous by recognized standards.

4. Janitor closets.

Exception: Doors to janitor closets shall be permitted to have ventilating louvers where the space is protected by automatic sprinklers.

466.6.2

The following rooms or spaces shall be separated from the remainder of the building by fire barriers having a fire-resistance rating of not less than 1 hour and shall be protected by an approved automatic fire-extinguishing system.

1. Laundries.

2. Maintenance shops, including woodworking and painting areas.

3. Rooms or spaces used for processing or use of combustible supplies deemed hazardous by the building official.

4. Rooms or spaces used for processing or use of hazardous materials or flammable or combustible liquids in quantities deemed hazardous by recognized standards.

Exception: Food preparation facilities protected in accordance with NFPA 96 shall not be required to have openings protected between food preparation areas and dining areas. Where domestic cooking equipment is used for food warming or limited cooking, protection or segregation of food preparation facilities shall not be required if approved by the building official.

466.6.3

Where automatic extinguishing is used to meet the requirements of this section, sprinkler piping serving not more than six sprinklers for any isolated hazardous area shall be permitted to be connected directly to a domestic water supply system having a capacity sufficient to provide 0.15 gpm/per square foot (6.1 L/min/m²) of floor area throughout the entire enclosed area. An indicating shutoff valve shall be installed in an accessible location between the sprinklers and the connection to the domestic water supply.

466.7 Detection and Alarm Systems

Day care occupancies shall be provided with a fire alarm system in accordance with Section 907 and this section.

Exception: Day care occupancies housed in one room.

466.7.1

Initiation of the required fire alarm system shall be by manual means and by operation of any required smoke detectors and required sprinkler systems.

466.7.1.1

Occupant notification signals shall be audible and visual signals in accordance with NFPA 72 and *Florida Building Code, Accessibility*. The general evacuation alarm signal shall operate throughout the entire building.

Exceptions:

1. Where total evacuation of occupants is impractical because of building configuration, only the occupants in the affected zones shall be initially notified. Provisions shall be made to selectively notify occupants in other zones to afford orderly evacuation of the entire building.
2. Where occupants are incapable of evacuating themselves because of age, physical or mental disability or physical restraint, the private operating mode as described in NFPA 72 shall be permitted to be used. Only the attendants and other personnel required to evacuate occupants from a zone, area, floor, or building shall be required to be notified. This notification shall include means to readily identify the zone, area, floor or building in need of evacuation.

466.7.1.2 Fire Department Notification

The fire alarm system shall be arranged to transmit the alarm automatically to the fire department in accordance with NFPA 72 by means of one of the following methods as approved by the building official:

1. An auxiliary alarm system, or
2. A central station connection, or
3. A proprietary system, or
4. A remote station connection.

Exception: Where none of the above means of notification is available, a plan for notification of the fire department, acceptable to the building official, shall be provided.

466.7.2 Detection

A smoke detection system shall be installed in accordance with NFPA 72, with placement of detectors in each story in front of doors to the stairways and in the corridors of all floors occupied by the day care occupancy. Detectors also shall be installed in lounges, recreation areas and sleeping rooms in the day care occupancy.

Exception: Day care occupancies housed in one room.

466.8 Corridors

Every interior corridor shall be constructed of walls having not less than a 1-hour fire-resistance rating.

Exceptions:

1. In buildings protected throughout by an approved, supervised automatic sprinkler system in accordance with Sections 901.6 and 903.3.1.1 corridor walls shall not be required to be rated, provided that such walls form smoke partitions in accordance with Section 710.
2. Where the corridor ceiling is an assembly having a 1-hour fire-resistance rating where tested as a wall, the corridor walls shall be permitted to terminate at the corridor ceiling.
3. Lavatories in unsprinklered buildings shall not be required to be separated from corridors, provided that they are separated from all other spaces by walls having not less than a 1-hour fire-resistance rating in accordance with Section 709.
4. Lavatories shall not be required to be separated from corridors, provided the building is protected throughout by an approved, supervised automatic sprinkler system in accordance with Sections 901.6 and 903.3.1.1.

466.9 Flexible Plan and Open Plan Buildings

Flexible plan and open plan buildings shall comply with the requirements of this chapter as modified as follows:

466.9.1

Each room occupied by more than 300 persons shall have two or more means of egress entering into separate atmospheres. Where three or more means of egress are required, not more than two of them shall enter into a common atmosphere.

466.9.2

Flexible plan buildings shall be evaluated while all folding walls are extended and in use as well as when they are in the retracted position.

466.10 Day Care Homes

466.10.1

This section establishes life safety requirements for day care homes in which more than three but not more than 12 clients receive care, maintenance and supervision by other than their relative(s) or legal guardian(s) for less than 24 hours per day.

Exception: Facilities that supervise clients on a temporary basis with a parent or guardian in close proximity.

466.10.2 Definitions

For definitions, see Chapter 2.

466.10.3

Places of religious worship shall not be required to meet the provisions of this section in order to operate a nursery while services are

being held in the building.

466.10.4

Occupancies that include part-day preschools, kindergartens and other schools whose purpose is primarily educational even though the children are of preschool age shall comply with the provisions for Group E occupancy.

466.10.5 Smoke Detection Systems

466.10.5.1

Single-station smoke alarms installed in accordance with the household fire warning equipment requirements of Chapter 2 of NFPA 72 shall be installed within day care homes.

Exception: System smoke detectors installed in accordance with NFPA 72 and arranged to function in the same manner shall be permitted.

466.10.5.2

Where the day care home is located within a building of another occupancy, any corridors serving the day care home shall be provided with a complete smoke detection system installed in accordance with NFPA 72.

466.10.5.3

Single-station smoke alarms shall be powered by the building electrical system.

466.10.5.4

Single-station smoke alarms shall be provided in all rooms used for sleeping.

466.10.5.5

Where two or more smoke alarms are required within a living unit, suite of rooms, or similar area, they shall be arranged so that operation of any smoke alarm shall cause all smoke alarms within the living unit, suite of rooms or similar area to sound.

466.10.5.5.1

The alarms shall sound only within an individual living unit, suite of rooms or similar area and shall not actuate the building fire alarm system. Remote annunciation shall be permitted.

Section 467 Hospice Inpatient Facilities and Units and Hospice Residential Facilities

467.1 Scope

All hospice inpatient facilities and units and residential facilities shall comply with the following design and construction standards. Enforcement and interpretation of these provisions shall be by the state agency authorized by Section 553.73, *Florida Statutes*.

Note: Other administrative and programmatic provisions may apply. See Department of Elder Affairs (DOEA) Rule 58A-2, *Florida Administrative Code*, Agency for Health Care Administration (AHCA) Rule 59C-1, *Florida Administrative Code*, and Chapter 400 Part VI, *Florida Statutes*.

467.1.2

The following are exempt from review under this section:

467.1.2.1

Change of ownership of an existing licensed hospice facility or unit.

467.1.2.2

Change of the functional use of a space, room or area when no physical plant revisions are made or are required to be made by this code.

467.1.3

The *Florida Building Code, Existing Building*, Section 101.2, Scope exempts state licensed facilities such as hospices from compliance with that code. Any repair, alteration, change of occupancy, addition or relocation of an existing state licensed inpatient hospice facility shall

467.2 Physical Plant Definitions

467.2.1

As used in this section, "inpatient facility and unit" means the location where inpatient services are provided to hospice patients that are in need of hospice inpatient care.

467.2.2

As used in this section, the term "inpatient facility" means a freestanding building or structure that houses inpatient beds licensed exclusively to the hospice program but does not house any inpatient beds licensed to a hospital or nursing home.

467.2.3

As used in this section, the term "unit" means a distinct part, section, wing or unit within a hospital or nursing home that houses beds licensed to the hospital or nursing home but which is leased by a hospice for the provision of hospice inpatient care to its patients.

467.2.4

As used in this section, the term "existing" means an inpatient hospice facility, unit or hospice residential facility constructed and approved under a previous edition of the *Florida Building Code, Building*.

467.3 Codes and Standards

467.3.1

All new inpatient facilities and units, and additions or renovations to existing facilities and units, shall be in compliance with the requirements for:

467.3.1.1

Institutional Occupancy - Group I-2, Condition 1, as described in Section 308.3 of this code.

467.3.1.2

The *National Fire Protection Association Life Safety Code 101*, Chapter 18, New Health Care Occupancy as applicable to nursing homes, as described in Rule 69A-3.012, *Florida Administrative Code*, Standards of the National Fire Protection Association and incorporated by reference in Rule 69A-3.012, *Florida Administrative Code*.

467.3.1.3

Part 1 of the *Guidelines for the Design and Construction of Residential Health, Care, and Support Facilities* as referenced in Chapter 35 of this code.

467.3.1.4

Inpatient sleeping rooms shall be made accessible in accordance with the requirements for medical care facilities of the *Florida Building Code, Accessibility*.

467.3.1.5

In renovations and additions to existing facilities, only that portion of the total facility affected by the project must comply with applicable sections of the codes for new facilities and units.

467.3.1.6

Existing portions of the facility that are not included in the renovation or addition but are essential to the functioning of the complete facility, as well as existing areas that receive less than substantial amounts of new work, shall comply with the applicable sections of the codes for existing inpatient facilities and units.

467.3.1.7

All existing inpatient facilities and units licensed by the Agency for Health Care Administration shall be in compliance with *National Fire Protection Association Life Safety Code 101*, Chapter 19, Existing Health Care Occupancy, as applicable to nursing homes and incorporated by reference in Rule 69A-3.012, *Florida Administrative Code*.

467.4 Design Requirements for Inpatient Facilities and Units

The following shall be provided in each inpatient facility or unit:

467.4.1

Each new patient sleeping room shall have a minimum room area exclusive of toilet room, or permanently attached or built-in closets, lockers or wardrobes, of 120 square feet (11.15 m^2) per bed for private rooms and 100 square feet (9.29 m^2) per bed for double occupancy rooms.

467.4.1.1

In new construction and additions, the maximum room capacity of each patient room shall be two persons. In double occupancy patient rooms, sleeping areas shall be separated from each other by a wall or partition to increase acoustic and visual privacy. Each person lying in bed shall have direct visual access to an exterior window at all times. For visual privacy, either doors or cubicle curtains to these individual patient sleeping areas shall be provided.

467.4.1.2

The design for privacy shall not restrict a patient's access at any time to the room entrance, resident armchair, toilet or bathroom, wardrobe, exterior window or closet.

467.4.2

Each patient sleeping room shall have a window(s), with a maximum sill height of 36 inches (0.914 m) for any building constructed after July 5, 2016, or door with a clear glass light in compliance with Section 1205.2 of this code. The window or door shall open directly to an atrium or to the outside of the building with a minimum of 20 feet (6.10 m) in clear and unobstructed vista measured perpendicularly from the window or door.

467.4.3

Each patient sleeping room shall have a wardrobe, locker or closet suitable for hanging clothing of the patient.

467.4.4

Each patient sleeping room shall have access to a toilet room without having to enter the general corridor area. One toilet room shall serve no more than two beds and no more than one resident room unless the hospice unit is located inside of an existing hospital or nursing home.

467.4.4.1

The door shall be side hinged and swing out from the toilet room, or shall be a sliding barn-type door without a bottom track and have at least 32 inches (813 mm) wide clear opening.

467.4.4.2

The toilet room shall contain a water closet with grab bars on both sides.

467.4.4.3

The water closet shall be equipped with a bedpan-rinsing device unless the Functional Program as described in Part 1 of the *Guidelines for the Design and Construction of Residential Health, Care, and Support Facilities* as referenced in Chapter 35 provides for disposable bedpans after every use.

467.4.4.4

There shall be an emergency nurse call station inside of each toilet room.

467.4.5

A hand washing facility shall be provided within each patient toilet room or, if the hospice unit is located inside of an existing hospital or nursing home, within each patient bedroom.

467.4.6

A nurses' station, clean workroom and soiled workroom shall be provided. Access to these rooms shall be from a corridor or ante room.

467.4.7

A charting space for clinical staff shall be provided at each nurses' station.

467.4.8

A hand washing facility shall be located in or near each nurses' station.

467.4.9

The clean workroom shall be provided with a work counter, hand wash facility, storage facilities and covered waste receptacle.

467.4.10

The soiled workroom shall be provided with a service sink equipped with rinsing device, work counter, a hand-washing facility, storage facilities, covered waste receptacle and covered linen receptacle.

467.4.11

A drug distribution system shall be provided with provisions for the locked storage of medications. The use of the clean workroom for drug distribution shall be permitted.

467.4.12

A clean linen storage room or closet shall be provided.

467.4.13

A nourishment station with equipment for preparing or serving nourishments between scheduled meals shall be provided and shall be available for patient, family, volunteers, guests and staff use. Provisions shall be made for the use and storage of small appliances such as coffee makers or toasters. A minimum of two duplex receptacles connected to a small appliance circuit shall be provided.

467.4.14

Storage for administrative supplies shall be provided.

467.4.15

Parking for stretchers and wheelchairs in an area out of the path of normal traffic and of adequate size for the unit shall be provided.

467.4.16

A janitor's closet with a floor drain and storage space for housekeeping equipment and supplies shall be provided.

467.4.17

A multipurpose lounge suitable and furnished for reception, recreation, dining, visitation, group social activities and worship shall be provided.

467.4.18

A conference or consultation room for patient and family use shall be provided for every hospice facility or unit.

467.4.19

A washer and dryer for patients' personal use shall be provided.

467.4.20 Bathing Facilities**467.4.20.1**

A centralized resident bathing room(s) shall be provided with a minimum of one bathtub, hydro tub or shower for every 20 hospice inpatients or fraction thereof not otherwise served by shower facilities designed to accommodate a shower chair, connected directly to the resident rooms.

467.4.20.2

A separate private toilet room shall be provided that is directly accessible to each central bathing area with multiple bathing fixtures without requiring entry into the general corridor.

467.4.20.3

All showers located in bathing rooms connected directly to the resident rooms shall be designed so that a shower chair can be easily rolled in and out of the shower area.

467.5 Details for Inpatient Facilities and Units

467.5.1

Fixtures, such as drinking fountains, public telephone, vending machines and portable equipment, shall not be located or stored so as to restrict corridor traffic or reduce the minimum required corridor width.

467.5.2

Doors to patient tub rooms, showers and water closets that swing into the room shall be equipped with reversible hardware that will allow the door to swing out in an emergency.

467.5.3

Doors, except those to closets or spaces not subject to occupancy, shall not swing into the exit access corridors.

467.5.4

Windows and outer doors, if operable, shall be equipped with insect screens.

467.5.5

Interior thresholds and expansion joint covers shall be made flush with the floor surface.

467.5.6

Grab bars shall be provided at all patient toilets, showers and tubs. The bars shall have a clearance of 1 $\frac{1}{2}$ inches (38 mm) to the walls and shall be sufficiently anchored to sustain a concentrated applied load of not less than 250 pounds (113 kg).

467.5.7

Single paper towel dispensers, soap dispensers and covered waste receptacles shall be provided at all hand washing facilities.

467.5.8

Staff hand washing facilities shall be fitted with wrist blades and a gooseneck-type spout.

467.5.9

All hand washing facilities shall be securely anchored to withstand an applied vertical load of not less than 250 pounds (113 kg) on the front of the fixture.

467.6 Elevators

467.6.1 Elevators

In new multistory units and facilities an elevator shall be provided in compliance with the requirements of Chapter 30 of the *Florida Building Code, Building*. In addition, a hospital-type elevator large enough to accommodate a bed and attending staff shall service all patient sleeping rooms and patient treatment areas located above the ground floor. The car shall be at least 5 feet 8 inches (1.73 m) wide by 9 feet (2.74 m) deep and the car doors shall have a clear opening of not less than 4 feet (1.22 m) wide and 7 feet (2.13 m) high.

467.7 Mechanical System Requirements for Inpatient Facilities and Units

467.7.1 Air Conditioning, Heating and Ventilating Systems

467.7.1.1

All patient-occupied areas shall be heated or cooled by individual or central units. Heating units shall be designed to provide a minimum of 72°F (22.22°C) ambient indoor temperature and air conditioning units shall be designed to provide a minimum of 78°F (25.55°C) ambient indoor temperature.

467.7.1.2

All air-supply and air-exhaust systems shall be mechanically operated. Fans serving exhaust systems shall be located at the

467.7.2 Carbon Monoxide Detector

See Section 915.

467.7.3 Plumbing and Other Piping Systems

Water distribution systems shall be arranged to provide hot water at each hot water outlet at all times. Hot water at shower, bathing, and hand washing facilities for patients' personal use shall not exceed 110°F (43.3°C).

467.8 Electrical Systems for Inpatient Facilities and Units

467.8.1 Lighting

467.8.1.1

All spaces occupied by people, machinery and equipment within the building, approaches to the building and parking areas shall have electric lighting.

467.8.1.2

All patients' rooms shall have general lighting and night lighting. General room luminaires shall be switched at the entrance to the patient room.

467.8.2 Receptacles

All patient rooms shall have hospital grade duplex grounding-type receptacles.

467.8.3 Emergency Electrical System

467.8.3.1

A Type III essential electrical system shall be provided in all hospice facilities as described in *National Fire Protection Association Life Safety Code* 99, "Health Care Facilities", and incorporated by reference in Rule 69A-3.012, *Florida Administrative Code*. The emergency power for this system shall meet the requirements of a Level II, type 10, Class 48 generator as described in *National Fire Protection Association Life Safety Code* 110, "Emergency Standby Power Systems", and incorporated by reference in Rule 69A-3.012, *Florida Administrative Code*.

467.8.3.2

The essential electrical system shall have at a minimum one transfer switch. Separate electrical branches are not required.

467.8.3.3

There shall be selected life safety lighting provided at a minimum of 1 footcandle (10 lux) and designed for automatic dusk-to-dawn operation along the travel paths from the exits to the public way or to safe areas located a minimum of 30 feet (9.14 m) from the building.

467.8.3.4

A minimum of one elevator per bank serving any patient use floor shall be connected to the essential electric system and arranged for automatic operation during loss of normal power. Elevator cab lighting, controls, and communication and signal systems shall be connected to the essential electrical system.

467.8.3.5

If required by the facility's emergency food plan, there shall be power connected to the essential electrical system for kitchen refrigerators, freezers and range hood exhaust fans. Selected lighting within the kitchen and dry storage areas shall be connected to the essential electrical system.

467.8.3.6 Nurse Call Systems

467.8.3.6.1

Wired- or wireless-type nurse call systems shall be permitted if they have been tested and approved by a nationally recognized testing laboratory (NRTL) to meet the requirements of UL 1069, 7th edition, published October 12, 2007, as referenced in Chapter

35 of this code. All wireless systems shall have been tested and approved by an NRTL to meet the requirements of Section 49, Wireless Systems of UL 1069, 7th edition as referenced in Chapter 35 of this code. All nurse call systems, whether wired or wireless, shall have electronically supervised visual and audible annunciation in accordance with the supervision criteria of UL 1069, 7th edition for nurse call systems and be tested and approved by an NRTL to meet those requirements.

467.8.3.6.2

A nurse call system accessible by the patient shall be provided in each patient sleeping room. A nurse call master panel shall be provided at the nurses' station. Nurse call duty stations shall be provided in each clean workroom, soiled workroom, medicine preparation room and nourishment room.

467.9 Residential Facilities

467.9.1

Residential facilities shall comply with the *Florida Building Code* and the *National Fire Protection Association Life Safety Code* 101 as adopted by the *Florida Fire Prevention Code*.

467.9.2

Residential facilities shall comply with the following codes and standards:

467.9.2.1

All new facilities and additions and renovations to existing facilities shall be in compliance with:

467.9.2.1.1

Section 310.6 of this code for Group R-4 occupancy;

467.9.2.1.2

The *National Fire Protection Association Life Safety Code* 101, Chapter 32, Residential Board and Care Occupancy and incorporated by reference in Rule 69A-3.012, *Florida Administrative Code*; and

467.9.2.1.3

The *Florida Building Code, Accessibility* for residential facilities.

467.9.2.2

All existing facilities shall comply with *National Fire Protection Association Life Safety Code* 101, Chapter 33, Existing Residential Board and Care Occupancy and incorporated by reference in Rule 69A-3.012, *Florida Administrative Code*.

Section 468 Schools, Colleges and Universities

468.1 Scope:

Florida's public and private schools, colleges, and universities shall comply with all applicable requirements of the code and the following standards. These are minimum standards; boards or owners may impose more restrictive requirements. Additional requirements for public educational facilities in Florida, including public schools and Florida's colleges, are found in Section 453, State Requirements for Educational Facilities.

468.2 Sites

468.2.1 Drainage

Soil, grass, and planting beds shall provide positive drainage away from sidewalks, but shall not fall away at more than a 3-percent gradient slope for a minimum distance of 5 feet (1524 mm) from the edge. Gutters or other water funneling devices shall prevent storm water from pouring onto or draining across walks. The location of all drains, grates, drop inlets, catch basins, other drainage elements and curb cuts shall be out of the main flow of pedestrian traffic.

468.2.2 Playgrounds and Equipment

Playgrounds shall be evenly graded and sloped to provide positive surface drainage. Playground equipment shall be safe, structurally sound, verminproof, and shall not have jagged or sharp projections. Playground equipment shall be anchored to suitable foundations

to prevent toppling or dislodgement. Cushioning materials such as mats, wood chips, or sand shall be used under climbing equipment, slides, and swings as required by the *Public Playground Safety Handbook*.

468.2.3 Outdoor Waste Containers

A smooth nonabsorbent surface shall be provided for outdoor waste containers.

468.2.4 Transmission Line Right-of-Way

Buildings, play areas and common use areas shall not be located within a high-voltage power transmission line right-of-way.

468.3 Building Construction

468.3.1 Rodent Proofing

Buildings for Group E occupancies shall be rodent proofed per Appendix F, Rodent proofing.

468.3.2 Glare From Natural Light

Sources of natural light in instructional spaces shall be glazed with glare reducing materials or shall be shielded to prevent glare that can interfere with seeing tasks within the instructional space.

468.3.3 Automated External Defibrillator

Automated external defibrillators shall be provided in public educational facilities that are a member of the Florida High School Athletic Association.

468.3.4 Changing Facilities

468.3.4.1 Diaper Changing Stations

A diaper changing station shall be located in or adjacent to any classroom where children wearing diapers are in attendance. A hand washing lavatory shall be provided within the changing station area. Access shall be provided to the lavatory without opening doors or touching a handle.

468.3.4.2 Unisex Changing Facilities

Accessible single-user unisex dressing rooms, as described in section 803, FBC, Accessibility, and Section 553.865, Florida Statutes may be utilized in place of accessible male and accessible female dressing rooms.

468.3.5 Plumbing

468.3.5.1 Standards

Educational and ancillary facilities shall be provided with toilets, hand washing facilities, and drinking fountains for all occupants, in ratios and accessible as required by the *Florida Building Code*, Florida law, and federal requirements.

Exceptions:

A single unisex toilet room is allowed where provided in child care, pre-kindergarten through grade 3 and ESE classrooms.

Accessible single-user unisex toilet rooms may be utilized in place of male and female toilet rooms for students or staff.

468.3.5.2 Teacher Toilets

Faculty and staff toilets shall be separate from student toilets.

Exception: Separation of faculty/staff and student toilet facilities is not required for colleges and universities.

468.3.5.3 Toilet Room Access

468.3.5.3.1

Toilet facilities for pre-k through grade 12 shall be accessible under continuous roof cover from all student occupied spaces.

Exception: Relocatable classrooms installed for temporary use.

468.3.5.3.2 Access to Group Toilet Rooms

Access to student group toilet rooms shall not be through an occupied space, storage space, or equipment space.

468.3.5.3.3

Toilet rooms adjacent to food preparation or dining areas shall be completely enclosed, have self-closing doors, and shall open into vestibules with self-closing doors. Toilet rooms shall not open directly into food preparation areas, serving areas, or dining areas.

468.3.5.4 Shielding Device

The entry to each group toilet room shall be provided with a door, partition, or other shielding device to block from view the occupants in the toilet room. If a door is provided, it shall have a closer and shall swing out in the direction of egress.

468.3.5.5 Walls

Walls in toilet rooms shall be impervious to a height of at least 4 feet (1219 mm) above the floor. Walls in kitchens, sculleries, can wash areas, and shower rooms shall be impervious to a height of at least 6 feet (1829 mm) above the floor. Toilet and shower partitions shall be impervious.

468.3.5.6 Floor Drains and Hose Bibbs

All group toilet rooms shall be provided with at least one floor drain and one easily accessible hose bibb or wall hydrant. The floor shall be sloped down to the drain.

468.3.5.6.1 Stall Urinals

Stall urinals shall not serve as the required floor drains.

468.3.5.6.2 Location

Floor drains shall be provided in the food serving area, kitchen area, scullery, garbage and rubbish rooms, and can wash area.

468.3.5.7 Handwashing Facilities

468.3.5.7.1

Handwashing facilities shall be located within or adjoining each toilet room.

468.3.5.7.2

Soap dispensers for liquid, foam, or powdered soap shall be provided at all handwashing basins.

468.3.5.7.3

Individual towel dispensers or hot-air hand drying devices shall be provided near handwashing basins.

468.3.5.8 Showers

468.3.5.8.1

Shower heads shall be based on the peak load to be accommodated at one time and provided at the ratio of one shower head for each five students, located a minimum of 30 inches (762 mm) apart.

468.3.5.8.2

Floors shall be drained in such a manner that waste water from any shower head will not pass over areas occupied by other bathers.

468.3.5.8.3

Water shall be heated and the temperature at the shower head shall not exceed 110°F (43°C) nor be less than 95°F (35°C).

468.3.5.9 Floors

Floors in gymnasium locker rooms, showers, drying areas, toilet rooms, kitchens, sculleries, food storage areas and can wash areas

468.3.5.10 Ceilings

Ceilings in group toilet rooms, kitchens, sculleries, can wash areas, showers and locker rooms shall be impervious.

468.3.5.11 Urinals

Trough urinals shall not be installed in any location.

468.3.5.12 Hot Water

When hot water is supplied to handwash sinks or lavatories in toilet rooms, a mixing valve shall be installed to control the temperature, at the fixture, which shall not exceed 110°F (43°C) nor be less than 95°F (35°C).

468.3.6 Mechanical

468.3.6.1 Natural Ventilation

Natural ventilation shall not be provided in toilet rooms, shower rooms, lockers rooms, and storage rooms for athletic equipment or soiled clothes.

468.3.6.2 Fans and Blowers

Fans and blowers shall be sized and designed to provide the required air movement without excessive or disturbing noise that would interfere with the educational program provided in the space being ventilated.

468.3.6.3 Kilns

Kiln rooms and areas shall be provided with adequate exhaust to dispel emitted heat to the exterior, and they shall not be connected to any other exhaust system.

468.3.6.4 Chemistry Laboratories and Science Classrooms

HVAC systems in chemistry labs and science classrooms shall be designed and installed to ensure that chemicals originating from the space are not recirculated.

Exception: A high capacity emergency exhaust system providing 20 air changes per hour may be used in chemistry laboratories and science classrooms with fume hoods. Positive ventilation may be provided via doors or windows opening to the exterior.

Signs providing operational instructions shall be permanently installed at the emergency exhaust system fan switch and adjacent to the door(s) or window(s) to be opened.

468.3.6.5 Chemical Storage

Rooms used for the storage, handling, and disposal of chemicals used in school, college, and university laboratories shall be vented to the exterior. The ventilation system shall not be connected to the air-conditioning return air system, and the rooms shall be kept at moderate temperatures. Chemical storage cabinets, when vented to the exterior, shall be mechanically vented in accordance with NFPA 30 and NFPA 91.

468.3.6.6 Floor Drains and Plumbing Fixtures in Equipment Rooms

No floor drain or other plumbing fixture shall be installed in a room containing air handling machinery when such room is used as a plenum. When rooms are used as a plenum, equipment drains shall be conveyed through an indirect waste receptor located outside such rooms or other approved point of disposal.

468.3.6.7 Toilet Room Ventilation

Toilet rooms shall be continuously ventilated during building occupancy.

Exception: Individual toilet rooms shall be ventilated continuously during building occupancy or ventilation shall turn on with the light switch and run for at least 10 minutes after the light has been turned off.

468.3.7 Lighting

468.3.7.1 Illumination Level in Classrooms/Instructional Spaces

Illumination at the normal task level for the type of classroom/instruction space shall be designed to provide and maintain an

average of 40 footcandles (400 lux).

468.3.7.2 Illumination Uniformity in Classrooms/Instruction Spaces

Luminaires shall have a ceiling arrangement or be positioned around the walls such that a uniformed illumination level, within 10 footcandles (100 Lux), is maintained at the students required normal task level for the type of classroom/instruction space.

468.3.7.3 Brightness Ratio in Classrooms/Instructional Spaces

The brightness ratio between the student task level and the instruction area or areas or visual display location shall be one to five or less.

468.3.7.4 Illumination Failure of General and Means of Egress Luminaires

Illumination systems shall be designed and maintained so that the failure of any single lighting unit, such as an electric luminaire, does not leave any occupied space or means of egress in the dark (see Section 1008 for additional means of egress requirements).

468.3.7.5 Glare Elimination

Illumination of permanently installed markerboards, chalkboards, and other instruction aids shall be designed to eliminate glare and shadows.

Section 469 Office Surgery Suite

469.1 Scope

An office surgery suite is that portion of a physician's office where surgery is performed according to Rule 64B-8-9009 Standard of Care for Office Surgery, *Florida Administrative Code*. These minimum standards of design and construction apply to a physician's office required to register under Rule 64B8-9009.(1)(a), *Florida Administrative Code*.

469.1.1

The minimum standards of design, construction and specified minimum essential utilities and facilities of this section shall be applicable to all office surgery suites that are required to be registered but have not yet been registered with the Florida Department of Health in accordance with Rule 64B8-9.0091 Requirement for Physician Office Registration; Inspection or Accreditation, *Florida Administrative Code*, and to all newly constructed office surgery suites, and all additions, alterations or renovations to all existing office surgery suites on the effective date of this code.

469.2 Codes and Standards

469.2.1

In addition to the minimum requirements of this section, an office surgery suite shall also be in compliance with the following:

469.2.1.1

The fire codes as described in Chapter 69A-3.012, "Standards of the National Fire Protection Association Adopted," *Florida Administrative Code*.

469.2.1.2

Part 1 and Part 2: Outpatient Facility Types, Chapter 2.1, Common Elements for Outpatient Facilities of *The Guidelines for Design and Construction of Outpatient Facilities (The Guidelines)*, as referenced in Chapter 35 of this code.

469.2.1.3

The architectural, mechanical and electrical design criteria and processes as specified in the physical plant standards in this section shall take precedence over those in *The Guidelines* with no additional requirements.

469.3 Office Surgery Suite Occupancy Classification

469.3.1

Office surgery suites that provide services or treatment on an outpatient basis to four or more patients at the same time that either renders the patients incapable of taking action for self-preservation under emergency conditions without the assistance from others or

that provide surgical treatment requiring general anesthesia to four or more patients at the same time, shall meet the requirements of Ambulatory Health Care Occupancies as described in NFPA 101, *Life Safety Code* and this code.

469.3.2

All other office surgery suites shall comply with the requirements of Business occupancy as described in NFPA 101, *Life Safety Code*, and this code.

469.4 Physical Plant Standards

469.4.1 Administration and Public Areas

There shall be a waiting room or lobby area of sufficient size to accommodate patients and visitors.

469.4.1.1

There shall be a public toilet(s) with handwashing station(s), public access to a telephone for local calls, and an electric water fountain or a water and cup-dispensing unit. When the office surgery suite is located within an office building, these functions may be provided as part of the office building's public areas.

469.4.1.2

As determined by the functional program of the office surgery suite, there shall be an admitting office, secure medical record storage, director of nursing office, in-service training or conference area.

469.4.1.3

There shall be a toilet room(s) with handwashing station located within the office surgery suite for patients.

469.4.2 Pre-Operative Area(s)

469.4.2.1

As determined by the functional program of the office surgery suite the following elements shall be provided for clinical services:

469.4.2.2 Patient Change Areas

An area(s) shall be provided for patients to change from street clothing into surgical gowns and to prepare for surgery. Provisions shall be made for patient privacy and for securing patients' personal effects.

469.4.2.3

A separate and distinct primary recovery area(s) shall be provided that is located adjacent to the operating room(s). It shall contain a minimum of one pre-operative station per each operating room and shall not be part of the restricted area of the office surgery suite. There shall be 3 feet (0.9 m) of clear floor area around three sides of each recovery station for work and circulation.

469.4.2.4

The pre-operative area(s) shall be located in direct view of a nurse station.

469.4.2.5

Cubicle curtains or other provisions for privacy during pre-operative care shall be provided.

469.4.2.6

There shall be a dedicated hand-washing station located in or immediately adjacent to the pre-operative area(s).

469.4.2.7

If determined by the functional program taking into consideration the types of surgery and procedures performed, the types of anesthesia used, average recovery periods, and staffing levels, this area may be shared with the post-operative area.

469.4.3 Operating Room(s)

469.4.3.1

There shall be at a minimum one operating room in each office surgery suite. The size and location of the operating room(s) shall be

469.4.3.2

The size of the operating room(s) shall be as follows:

469.4.3.2.1

An operating room shall have a minimum clear floor area of 255 square feet (23.69 m^2).

469.4.3.2.2

An operating room where anesthetics will be administered using an anesthesia machine and supply cart shall have a minimum clear floor area of 270 square feet (25.08 m^2).

469.4.3.2.3

An operating room where surgery that may require additional staff and equipment will be performed shall have a minimum clear floor area of 400 square feet (37.16 m^2).

469.4.3.3

See *The Guidelines*, Chapter 2.1, Common Elements of Outpatient Facilities, for design details regarding clearances and space requirements for operating rooms.

469.4.3.4

The operating room(s) shall be equipped with an emergency communication system connected to at least one continuously occupied location within the office surgery suite such as a control or nurse station.

469.4.4 Post-Operative Area(s)

469.4.4.1

Area(s) for recovery in office surgery suites shall be provided in accordance with the functional program with the following minimum requirements:

469.4.4.2

A separate and distinct primary recovery area(s) shall be provided that is located within or adjacent to the operating room(s). It shall contain a minimum of one recovery station per each operating room and shall not be part of the restricted area of the office surgery suite. There shall be 3 feet (0.9 m) of clear floor area around three sides of each recovery station for work and circulation.

469.4.4.3

The recovery area shall be located in direct view of the nurse station.

469.4.4.4

Cubicle curtains or other provisions for privacy during post-operative care shall be provided.

469.4.4.5

There shall be a dedicated handwashing station located in or immediately adjacent to the recovery area(s).

469.4.5 Step-Down Recovery Area(s)

469.4.5.1

As required by the functional program, a designated supervised step-down recovery area may be provided for patients who do not require post-anesthesia recovery but need additional time for their vital signs to stabilize before safely leaving the office surgery suite. This area shall contain a clinical workspace, space for family members, and provisions for privacy. It shall have convenient patient access to toilets large enough to accommodate a patient and an assistant. Handwashing stations and nourishment facilities shall be included within or immediately adjacent to this area(s).

469.4.6 Surgical Service Areas

The following areas and spaces shall be provided.

469.4.6.1 Control Station

As determined by the office surgery suite, a control station located to permit visual surveillance of all traffic entering the restricted corridor (access to operating rooms and other ancillary clean/sterile areas) shall be provided.

469.4.6.2 Drug Distribution Station

Provisions shall be made for storage and preparation of medications administered to patients. A refrigerator for pharmaceuticals and a double-locked storage for controlled substances shall be provided.

469.4.6.3 Scrub Station(s)

Scrub station(s) shall be provided outside of and near the entrance to each operating room and may service two operating rooms if needed. Scrub station(s) shall be arranged to minimize incidental splatter on nearby personnel or supply carts. The scrub stations shall be trimmed with foot, knee, or ultrasonic controls (no single lever wrist blades).

469.4.6.4 Soiled Workroom

The soiled workroom shall contain a handwashing station, a sink large enough to accommodate the cleaning of the largest piece of surgical instrument utilized in the operating room, a work counter, and waste receptacle(s). This may be the same workroom as described in Section 469.4.7, "Sterilizing facilities."

469.4.6.5 Fluid Waste Disposal Station(s)

This station(s) shall be convenient to the general operating room(s) and post-anesthesia recovery area(s). A clinical sink or toilet equipped with a rinsing device may meet this requirement.

469.4.6.6 Anesthesia Equipment and Supplies

As required by the functional program, provisions shall be made for cleaning, testing, and storing anesthesia equipment and supplies.

469.4.6.7 Medical Gas Storage

Medical gas storage with space for reserve nitrous oxide and oxygen cylinders, if such gas is used in the office surgery suite, shall be provided and located outside of the restricted surgical area(s). Service and delivery access shall be possible without entering the restricted surgical area(s). All cylinders shall be securely chained or fastened to prevent accidental damage.

469.4.6.8 General Storage Room(s)

General, surgical and equipment storage room(s) or closet enclosures shall be provided for equipment and supplies used or required in the surgical suite.

469.4.6.9 Staff Clothing Change Area(s)

A minimum of one change area shall be provided for staff working within the office surgery suite. This area(s) shall contain locker(s), toilet(s), handwashing station(s), and space for donning scrub attire.

469.4.6.10 Patient Change Areas

An area shall be provided for patients to change from street clothing into surgical gowns and to prepare for surgery. Provisions shall be made for patient privacy and for securing patients' personal effects.

469.4.6.11 Stretcher/Wheelchair Storage Area

This area shall be convenient for use and out of the required exit access.

469.4.6.12 Lounge and Toilet Facilities

Lounge and toilet facilities with a handwashing station for staff shall be provided as required by the functional program.

469.4.6.13 Nourishment Room or Area

For office surgery suites that provide accommodations for overnight stays, a nourishment room or area shall be provided. It shall contain a refrigerator, double compartment sink, counter, and storage for food items and utensils.

469.4.6.14 Housekeeping Room

A room containing a floor receptor or service sink shall be provided exclusively for the office surgery suite. Storage space for housekeeping supplies and equipment shall be provided in this room or in the general storage room(s). Hazardous supplies such as

cleaning chemicals shall be protected in accordance with the requirements of the referenced fire safety codes.

469.4.6.15 Crash/Anesthesia Cart(s)

Space shall be provided for emergency resuscitation equipment and supplies such as crash/anesthesia cart(s) with convenient access to and use from both the surgery and recovery areas.

469.4.7 Sterilizing Facilities

469.4.7.1

A system for providing sterilized equipment and supplies shall be provided. When sterilization is provided off-site, adequate handling (receiving and distribution) and on-site storage of sterile supplies shall be accommodated, and shall meet the minimum requirements for sterilization performed on-site.

469.4.7.2

Adequate space shall be available for the cleaning and sanitizing of clean and soiled carts and vehicles transporting supplies.

469.4.7.3

If on-site processing facilities are provided they shall include the following:

469.4.7.3.1 Soiled Workroom

This room shall be physically separated from all other areas of the office surgery suite. Workspace shall be provided to handle the cleaning and the gross cleaning, debridement, and disinfections of all medical/surgical instruments and equipment. The soiled workroom shall contain work surfaces(s), sink(s), flush-type devices(s), and washer/sterilizer decontaminators or other decontamination equipment as appropriate to the functional program.

469.4.7.3.2 Clean/Assembly Workroom

This workroom shall have access to an immediately adjacent handwashing station and shall contain appropriate and sufficient workspace and equipment for terminal sterilizing of medical and surgical equipment and supplies. Clean and soiled work areas shall be physically separated. Access to sterilization room shall be restricted. The clean assembly room shall have adequate space for the designated number of work areas as defined in the functional program as well as space for storage of clean supplies, sterilizer carriages, and instrumentation.

469.4.7.3.3 Clean/Sterile Supplies

Storage for packs, etc., shall include provisions for ventilation, humidity, and temperature control.

469.4.8 Details and Finishes

469.4.8.1

The minimum nominal door width for patient use shall be 3 feet (0.9 m) except doors requiring gurney/stretcher access, shall have a nominal width of 3 feet, 8 inches (1.11 m).

469.4.8.2

Toilet room doors for patient use shall open outward or be equipped with hardware that permits access from the outside in emergencies.

469.4.8.3

Handwashing stations shall be located and arranged to permit proper use and operation. Each handwashing station shall be equipped with single service paper towel dispensers and a soap dispenser.

469.4.8.4

Provisions for hand drying shall be included at all handwashing stations except scrub stations. Hand drying shall be accomplished by single towel dispensers or electrical hand driers.

469.4.8.5

Wall bases in operating rooms and areas that are frequently subject to wet cleaning shall be monolithic and coved directly up from the floor, tightly sealed to the wall, and constructed without voids. Seam welds in sheet flooring shall utilize manufacturer's weld

469.4.8.6

Heavy ceiling mounted equipment such as operating room lights, tracks or other equipment shall have suspension systems specially designed for that application.

469.4.8.7

Cubicle curtains and draperies designed for appropriate patient privacy shall be noncombustible or flame retardant.

469.4.8.8

Floors subject to continuous use while wet, such as showers areas, shall have a nonslip surface.

469.4.8.9

Floor finishes in areas such as surgical suite, central sterile supply spaces, radiographic rooms, and minor surgical procedure rooms shall be washable, smooth, and capable of withstanding chemical cleaning.

469.4.8.10

Wall finishes shall be washable and, in the proximity of plumbing fixtures, shall be smooth and moisture resistant.

469.4.8.11

Wall finishes in areas such as operating suite, central sterile supply spaces, radiographic rooms, and minor surgical procedure rooms shall be washable, smooth, and capable of withstanding chemical cleaning.

469.4.8.12

Wall finishes in operating room(s) shall be scrubbable, capable of withstanding harsh chemical cleaning, and monolithic.

469.4.8.13

Ceiling finishes in semirestricted areas such as clean corridors, central sterile supply spaces, radiographic rooms, minor surgical procedure rooms and existing operating rooms shall be smooth, scrubbable, nonabsorptive, nonperforated, capable of withstanding cleaning with chemicals, and without crevices that can harbor mold and bacteria growth.

469.4.8.14

Ceilings finishes in operating rooms shall be monolithic, scrubbable, and capable of withstanding chemicals. Ceiling access panels shall be provided as required.

469.4.9 Elevators

469.4.9.1

Installation and testing of elevators shall comply with ANSI/ASME A17.1 for new construction and ANSI/ASME A17.3 for existing facilities.

469.4.9.2

At least one elevator car shall have a minimum inside car platform of 51 inches by 80 inches (1295 m by 2032 m) with a minimum clear opening width of 42 inches (1067 mm) unless otherwise designed to provide equivalent space to allow the entrance and exit of an ambulance stretcher in the horizontal position. The elevator entrance may be of the side opening entrance type in order to accommodate a stretcher in its horizontal position. If more than one elevator is present, this elevator shall be identified.

469.4.9.3

The elevator car to be used for emergency evacuation of patients shall derive its power from an emergency electrical system.

469.4.9.4

Elevator call buttons and controls shall not be activated by heat or smoke. Light beams, if used for operating door reopening devices without touch, shall be used in combination with door-edge safety devices and shall be interconnected with a system of smoke detectors so that the light control feature will be overridden or disengaged should it encounter smoke at any landing.

469.4.10 Waste Processing Services

469.4.10.1 Storage and Disposal

Facilities shall provide for sanitary storage and treatment or disposal of waste using techniques acceptable to the appropriate health and environmental authorities. The functional program shall stipulate the categories and volumes of waste for disposal and shall stipulate the methods of disposal for each.

469.4.10.2 Medical Waste

Medical waste shall be disposed of either by incineration or other approved technologies.

469.4.11 Mechanical System Standards

469.4.11.1 Medical Gas and Vacuum Standards

469.4.11.1.1

If the functional program of the office surgery suite requires a medical gas system, it shall be a minimum a Level III piped medical gas system in accordance with NFPA 99. In lieu of a Level III piped oxygen system, anesthetizing equipment with a double yoke oxygen system is acceptable. If an anesthesia ventilator is planned to be used during the surgical procedure, then a Level III piped gas system shall be required.

469.4.11.1.2

As required by the functional program of the office surgery suite, either a piped clinical vacuum system in accordance with NFPA 99 or portable electrical vacuum equipment shall be provided. In either case, there shall be a redundant vacuum system or equipment exclusively dedicated to the anesthetizing equipment.

469.4.11.1.3

For piped systems, the number of station outlets shall meet the needs of the functional program. However, the minimum number of station outlets shall be as described in Table 469.4.11.1.3.

TABLE 469.4.11.1.3

MINIMUM STATION OUTLETS FOR PIPED GAS SYSTEMS IN OFFICE SURGERY SUITES

LOCATION	OXYGEN	VACUUM
Class A	NA	NA
Class B and C	2	2*
Post Operative Recovery	1	1

* An additional outlet shall be provided for anesthesia evacuation if necessary.

469.4.11.1.4

All piping, except control-line tubing, shall be identified. All valves shall be tagged, and a valve schedule shall be provided to the office surgery suite owner for permanent record and reference.

469.4.11.1.5

All gas cylinders in service and in storage shall be individually secured and located to prevent falling or being knocked over.

469.4.12 Heating, Ventilation, and Air Conditioning (HVAC)

469.4.12.1

All rooms and areas in the office surgery suite used for patient care shall be required to have HVAC systems as described in this section and as described for similar rooms and areas in the 2010 edition of *The Guidelines for the Design and Construction of Health Care Facilities*, Part 6, ANSI/ASHRAE/ASHE Standard 170, Ventilation of Health Care Facilities.

469.4.12.2

Fans serving exhaust systems shall be located at the discharge end and shall be readily serviceable. Air supply and exhaust in rooms for which no minimum total air change rate is noted may vary down to zero in response to room load.

469.4.12.3

The outdoor air introduced through the VAV air handling unit(s) shall remain constant throughout the range of operation.

469.4.12.4

Exhaust outlets, piping and ductwork shall be permanently and clearly identified.

469.4.13 Plumbing Systems**469.4.13.1**

The material used for plumbing fixtures shall be nonabsorptive and acid resistant.

469.4.13.2

Water spouts for staff use in lavatories and sinks shall have the discharge point a minimum of 5 inches (127 m) above the rim of the fixture.

469.4.13.3

General handwashing stations used by staff shall be trimmed with valves that can be operated without hands. (Single lever or wrist blade devices may be used.) Blade handles used for this purpose shall be not less than 3 $\frac{1}{2}$ inches (88.9 mm) nor exceed 4 $\frac{1}{2}$ inches (114.3 mm) in length. If clinical sinks are utilized, handles on clinical sinks shall be at least 6 inches (152.4 mm) long.

469.4.13.4

The water-heating system shall have sufficient supply capacity to deliver at the temperatures of between 105° F to 120°F (41°C to 49°C). Water temperature is measured at the point of use or inlet to the equipment. Water shall be permitted to be stored at higher temperatures.

469.4.13.5

Drain lines from sinks used for acid waste disposal shall be made of acid-resistant material.

469.4.13.6

Drainage piping shall not be installed within the ceiling or exposed in operating rooms or other sensitive areas. If there is existing drainage piping from a floor directly above, special precautions such as safety drain pans shall be provided.

469.4.13.7

Floor drains or sinks shall not be permitted in operating rooms.

469.4.13.8

If a floor drain is installed in a cystoscopy room, it shall contain a nonsplash, horizontal-flow flushing bowl beneath the drain plate.

469.4.13.9

Where plaster traps are used, provisions shall be made for appropriate access and cleaning.

469.4.13.10

All piping, except control-line tubing, shall be identified. All valves shall be tagged, and a valve schedule shall be provided to the office surgery suite owner for permanent record and reference.

469.4.14 Electrical Standards**469.4.14.1**

All electrical material and equipment, including conductors, controls, and signaling devices, shall be installed in compliance with applicable sections of NFPA 70 and NFPA 99 and shall be listed as complying with available standards of listing agencies, or other similar established standards where such standards are required.

469.4.14.2

The electrical installations, including alarm and communication systems, shall be tested to demonstrate that equipment installation and operation is appropriate and functional.

469.4.14.3 Services and Switchboards

469.4.14.3.1

Main switchboards shall be located in an area separate from plumbing and mechanical equipment and shall be accessible to authorized persons only.

469.4.14.3.2

Switchboards shall be convenient for use, readily accessible for maintenance, away from traffic lanes, and located in dry, ventilated spaces free of corrosive or explosive fumes, gases, or any flammable material. Overload protective devices shall operate properly in ambient room temperatures.

469.4.14.4 Panelboards

469.4.14.4.1

Panelboards serving normal lighting, appliance circuits and critical branch emergency circuits shall be located on the same floor as the circuits they serve. Panelboards serving life safety emergency circuits may be located on another floor and serve floors above and/or below.

469.4.14.5 Lighting

469.4.14.5.1

All occupied spaces shall have fixtures for lighting that can be illuminated as necessary.

469.4.14.5.2

Each operating room shall have general lighting for the room in addition to local lighting provided by special lighting unit(s) at the surgical table.

469.4.14.6 Receptacles (Convenience Outlets)

469.4.14.6.1

Duplex grounded-type receptacles shall be installed in all areas in sufficient quantities for tasks to be performed as needed.

469.4.14.6.2

Each operating room, primary recover station shall have a minimum of three hospital grade duplex receptacles that shall be sufficient to connect all equipment and devices and that shall include one spare duplex receptacle.

469.4.14.6.3

At least one of these receptacles shall be connected to the emergency system and one connected to the normal system. The emergency system receptacles shall be distinctively marked so as to be readily identified.

469.4.14.6.4

There shall be no more than two duplex receptacles per circuit in these areas.

469.4.14.6.5

Multiple outlet extenders shall not be permitted except electrical strips with full surge protectors may be utilized.

469.4.14.7 Equipment

469.4.14.7.1

At inhalation anesthetizing locations, all electrical equipment and devices, receptacles, and wiring shall comply with applicable sections of NFPA 99 and NFPA 70.

469.4.14.8 Nurse Call System

469.4.14.8.1

In facilities that contain more than one operating room and where recovery beds are not in direct view from the nurses' station, the following nurses' calling system shall be provided.

469.4.14.8.2

Each recovery bed shall be provided with a call button. Two call buttons serving adjacent beds may be served by one calling station.

469.4.14.8.3

Calls shall activate a visual and audible signal at the nurses' or control station and in the clean workroom and soiled workroom. If voice circuits are provided, indicating lights shall be used and shall remain lighted as long as the voice circuit is operating.

469.4.14.8.4

A nurses' call emergency system shall be provided at each patient toilet and dressing room. Activation shall be by a pull cord that extends to near the floor. This system will activate audiovisual signals in the recovery room nurses' station and in the surgical suite nurses' station. The emergency call system shall be designed so that signal light activation will remain lighted until turned off at the patient's calling station.

469.4.14.9 Emergency Electrical Service**469.4.14.9.1**

There shall be an emergency electrical service to provide power and light to the office surgery suite for a minimum period of 2 hours as prescribed in Rule 64B8-9.009, *Florida Administrative Code*. The system shall operate emergency exit lighting, fire alarm systems, nurses' calling systems, surgical room lighting, recovery room lighting and shall power monitoring equipment, selected receptacles in the operating and recovery areas and medical refrigerator if provided.

469.4.14.9.2

Power may be supplied by batteries or an emergency generator in accordance with NFPA 111 and NFPA 110 respectively.

469.4.14.9.3

All office surgery suites shall at a minimum be equipped with a Type III nonportable, permanently installed emergency electrical system designed and installed in accordance with NFPA 99. New office surgery suites providing Level III surgical procedures as defined by the Board of Medicine should provide a Type I emergency electrical system in accordance with the requirements of NFPA 99.

469.4.14.10 Fire Alarm System**469.4.14.10.1**

The fire alarm system shall be as required by NFPA 101, *Life Safety Code*, and installed in accordance with NFPA 72.

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Chapter 5 General Building Heights and Areas

Section 501 General

501.1 Scope

The provisions of this chapter control the height and area of structures hereafter erected and *additions* to existing structures.

[F] 501.2 Address Identification

New and existing buildings shall be provided with *approved* address identification. The address identification shall be legible and placed in a position that is visible from the street or road fronting the property. Address identification characters shall contrast with their background. Address numbers shall be Arabic numbers or alphabetical letters. Numbers shall not be spelled out. Each character shall be a minimum of 4 inches (102 mm) high with a minimum stroke width of $\frac{1}{2}$ inch (12.7 mm). Where required by the fire *code official*, address identification shall be provided in additional approved locations to facilitate emergency response. Where access is by means of a private road and the building address cannot be viewed from the public way, a monument, pole or other approved sign or means shall be used to identify the structure. Address identification shall be maintained.

Section 502 Definitions

502.1 Definitions

The following terms are defined in Chapter 2:

AREA, BUILDING.

BASEMENT.

EQUIPMENT PLATFORM.

GRADE PLANE.

HEIGHT, BUILDING.

MEZZANINE.

Section 503 General Building Height and Area Limitations

503.1 General

Unless otherwise specifically modified in Chapter 4 and this chapter, *building height*, number of stories and *building area* shall not exceed the limits specified in Sections 504 and 506 based on the type of construction as determined by Section 602 and the occupancies as determined by Section 302 except as modified hereafter. *Building height*, number of stories and *building area* provisions shall be applied independently. Each portion of a building separated by one or more *fire walls* complying with Section 706 shall be considered to be a separate building.

503.1.1 Special Industrial Occupancies

Buildings and structures designed to house special industrial processes that require large areas and unusual *building heights* to accommodate craneways or special machinery and equipment, including, among others, rolling mills; structural metal fabrication shops and foundries; or the production and distribution of electric, gas or steam power, shall be exempt from the *building height*, number of stories and *building area* limitations specified in Sections 504 and 506.

503.1.2 Buildings on Same Lot

Two or more buildings on the same lot shall be regulated as separate buildings or shall be considered as portions of one building where the *building height*, number of stories of each building and the aggregate *building area* of the buildings are within the limitations specified in Sections 504 and 506. The provisions of this code applicable to the aggregate building shall be applicable to each building.

503.1.3 Type I Construction

Buildings of Type I construction permitted to be of unlimited tabular *building heights and areas* are not subject to the special requirements that allow unlimited area buildings in Section 507 or unlimited *building height* in Sections 503.1.1 and 504.3 or increased

building heights and areas for other types of construction.

503.1.4 Occupied Roofs

A roof level or portion thereof shall be permitted to be used as an occupied roof provided the occupancy of the roof is an occupancy that is permitted by Table 504.4 for the story immediately below the roof. The area of the occupied roofs shall not be included in the building area as regulated by Section 506.

Exceptions:

1. The occupancy located on an occupied roof shall not be limited to the occupancies allowed on the story immediately below the roof where the building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2 and occupant notification in accordance with Sections 907.5.2.1 and 907.5.2.3 is provided in the area of the occupied roof. Emergency voice/alarm communication system notification per Section 907.5.2.2 shall also be provided in the area of the occupied roof where such system is required elsewhere in the building.
2. Assembly occupancies shall be permitted on roofs of open parking garages of Type I or Type II construction, in accordance with the exception to Section 903.2.1.6.

Elements or structures enclosing the occupied roof areas shall not extend more than 48 inches (1220 mm) above the surface of the occupied roof.

Exception: Penthouses constructed in accordance with Section 1510.2 and towers, domes, spires and cupolas constructed in accordance with Section 1510.5.

Section 504 Building Height and Number of Stories

504.1 General

The height, in feet, and the number of stories of a building shall be determined based on the type of construction, occupancy classification and whether there is an *automatic sprinkler system* installed throughout the building.

Exception: The *building height* of one-story aircraft hangars, aircraft paint hangars and buildings used for the manufacturing of aircraft shall not be limited where the building is provided with an *automatic sprinkler system* or *automatic fire-extinguishing system* in accordance with Chapter 9 and is entirely surrounded by *public ways* or *yards* not less in width than one and one-half times the *building height*.

504.1.1 Unlimited Area Buildings

The height of unlimited area buildings shall be designed in accordance with Section 507.

504.1.2 Special Provisions

The special provisions of Section 510 permit the use of special conditions that are exempt from, or modify, the specific requirements of this chapter regarding the allowable heights of buildings based on the occupancy classification and type of construction, provided the special condition complies with the provisions specified in Section 510.

504.2 Mixed Occupancy

In a building containing mixed occupancies in accordance with Section 508, no individual occupancy shall exceed the height and number of story limits specified in this section for the applicable occupancies.

504.3 Height in Feet

The maximum height, in feet, of a building shall not exceed the limits specified in Table 504.3.

Exception: Towers, spires, steeples and other roof structures shall be constructed of materials consistent with the required type of construction of the building except where other construction is permitted by Section 1510.2.5. Such structures shall not be used for habitation or storage. The structures shall be unlimited in height where of noncombustible materials and shall not extend more than 20 feet (6096 mm) above the allowable building height where of combustible materials (see Chapter 15 for additional requirements).

TABLE 504.3^a

ALLOWABLE BUILDING HEIGHT IN FEET ABOVE GRADE PLANE

OCCUPANCY CLASSIFICATION	SEE FOOTNOTES	TYPE OF CONSTRUCTION									
		TYPE I		TYPE II		TYPE III		TYPE IV		TYPE V	
		A	B	A	B	A	B	HT	A	B	
A, B, E, F, M, S, U	NS ^b	UL	160	65	55	65	55	65	50	40	
	S	UL	180	85	75	85	75	85	70	60	
H-1, H-2, H-3, H-5	NS ^{c, d}	UL	160	65	55	65	55	65	50	40	
	S										
H-4	NS ^{c, d}	UL	160	65	55	65	55	65	50	40	
	S	UL	180	85	75	85	75	85	70	60	
I-1 Condition 1, I-3	NS ^{d, e}	UL	160	65	55	65	55	65	50	40	
	S	UL	180	85	75	85	75	85	70	60	
I-1 Condition 2, I-2	NS ^{d, e, f}	UL	160	65	55	65	55	65	50	40	
	S	UL	180	85							
I-4	NS ^{d, g}	UL	160	65	55	65	55	65	50	40	
	S	UL	180	85	75	85	75	85	70	60	
R	NS ^{d, h}	UL	160	65	55	65	55	65	50	40	
	S13R	60	60	60	60	60	60	60	60	60	
	S	UL	180	85	75	85	75	85	70	60	

For SI: 1 foot = 304.8 mm.

Note: UL = Unlimited; NS = Buildings not equipped throughout with an automatic sprinkler system; S = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1; S13R = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.2.

- a. See Chapters 4 and 5 for specific exceptions to the allowable height in this chapter.
- b. See Section 903.2 for the minimum thresholds for protection by an automatic sprinkler system for specific occupancies.
- c. New Group H occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.5.
- d. The NS value is only for use in evaluation of existing building height in accordance with the *Florida Building Code, Existing Building*.
- e. New Group I-1 and I-3 occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.6. For new Group I-1 occupancies Condition 1, see Exception 1 of Section 903.2.6.
- f. New and existing Group I-2 occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.6 and the *Florida Fire Prevention Code*.
- g. For new Group I-4 occupancies, see Exceptions 2 and 3 of Section 903.2.6.

h. New Group R occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.8.

504.4 Number of Stories

The maximum number of stories above grade plane of a building shall not exceed the limits specified in Table 504.4.

TABLE 504.4^{a, b}

ALLOWABLE NUMBER OF STORIES ABOVE GRADE PLANE

OCCUPANCY CLASSIFICATION	SEE FOOTNOTES	TYPE OF CONSTRUCTION									
		TYPE I		TYPE II		TYPE III		TYPE IV		TYPE V	
		A	B	A	B	A	B	HT	A	B	
A-1	NS	UL	5	3	2	3	2	3	2	1	
	S	UL	6	4	3	4	3	4	3	2	
A-2	NS	UL	11	3	2	3	2	3	2	1	
	S	UL	12	4	3	4	3	4	3	2	
A-3	NS	UL	11	3	2	3	2	3	2	1	
	S	UL	12	4	3	4	3	4	3	2	
A-4	NS	UL	11	3	2	3	2	3	2	1	
	S	UL	12	4	3	4	3	4	3	2	
A-5	NS	UL	UL	UL	UL	UL	UL	UL	UL	UL	
	S	UL	UL	UL	UL	UL	UL	UL	UL	UL	
B	NS	UL	11	5	3	5	3	5	3	2	
	S	UL	12	6	4	6	4	6	4	3	
E	NS	UL	5	3	2	3	2	3	1	1	
	S	UL	6	4	3	4	3	4	2	2	
F-1	NS	UL	11	4	2	3	2	4	2	1	
	S	UL	12	5	3	4	3	5	3	2	
F-2	NS	UL	11	5	3	4	3	5	3	2	
	S	UL	12	6	4	5	4	6	4	3	
H-1	NS ^{c, d}	1	1	1	1	1	1	1	1	NP	
	S										
H-2	NS ^{c, d}	UL	3	2	1	2	1	2	1	1	
	S										
H-3	NS ^{c, d}	UL	6	4	2	4	2	4	2	1	

	S									
H-4	NS ^{c, d}	UL	7	5	3	5	3	5	3	2
	S	UL	8	6	4	6	4	6	4	3
H-5	NS ^{c, d}	4	4	3	3	3	3	3	3	2
	S									
I-1 Condition 1	NS ^{d, e}	UL	9	4	3	4	3	4	3	2
	S	UL	10	5	4	5	4	5	4	3
I-1 Condition 2	NS ^{d, e}	UL	9	4	3	4	3	4	3	2
	S	UL	10	5						
I-2	NS ^{d, f}	UL	4	2	1	1	NP	1	1	NP
	S	UL	5	3						
I-3	NS ^{d, e}	UL	4	2	1	2	1	2	2	1
	S	UL	5	3	2	3	2	3	3	2
I-4	NS ^{d, g}	UL	5	3	2	3	2	3	1	1
	S	UL	6	4	3	4	3	4	2	2
M	NS	UL	11	4	2	4	2	4	3	1
	S	UL	12	5	3	5	3	5	4	2
R-1	NS ^{d, h}	UL	11	4	4	4	4	4	3	2
	S13R	4	4						4	3
	S	UL	12						4	3
R-2	NS ^{d, h}	UL	11	4	4	4	4	4	3	2
	S13R	4	4	4					4	3
	S	UL	12	5					4	3
R-3	NS ^{d, h}	UL	11	4	4	4	4	4	3	3
	S13R	4	4						4	4
	S	UL	12	5	5	5	5	5	4	4
R-4	NS ^{d, h}	UL	11	4	4	4	4	4	3	2
	S13R	4	4						4	3
	S	UL	12	5	5	5	5	5	4	3
S-1	NS	UL	11	4	2	3	2	5	3	1
	S	UL	12	5	3	4	3	6	4	2
S-2	NS	UL	11	5	3	4	3	5	4	2
	S	UL	12	6	4	5	4	6	5	3

U	NS	UL	5	4	2	3	2	4	2	1
	S	UL	6	5	3	4	3	5	3	2

Note: UL = Unlimited; NP = Not Permitted; NS = Buildings not equipped throughout with an automatic sprinkler system; S = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1; S13R = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.2.

- a. See Chapters 4 and 5 for specific exceptions to the allowable height in this chapter.
- b. See Section 903.2 for the minimum thresholds for protection by an automatic sprinkler system for specific occupancies.
- c. New Group H occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.5.
- d. The NS value is only for use in evaluation of existing building height in accordance with the *Florida Building Code, Existing Building*.
- e. New Group I-1 and I-3 occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.6. For new Group I-1 occupancies, Condition 1, see Exception 1 of Section 903.2.6.
- f. New and existing Group I-2 occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.6 and the *Florida Fire Prevention Code*.
- g. For new Group I-4 occupancies, see Exceptions 2 and 3 of Section 903.2.6.
- h. New Group R occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.8.

Section 505 Mezzanines and Equipment Platforms

505.1 General

Mezzanines shall comply with Section 505.2. Equipment platforms shall comply with Section 505.3.

505.2 Mezzanines

A mezzanine or mezzanines in compliance with Section 505.2 shall be considered a portion of the *story* below. Such *mezzanines* shall not contribute to either the *building area* or number of *stories* as regulated by Section 503.1. The area of the *mezzanine* shall be included in determining the *fire area*. The clear height above and below the *mezzanine* floor construction shall be not less than 7 feet (2134 mm).

505.2.1 Area Limitation

The aggregate area of a *mezzanine* or *mezzanines* within a room shall be not greater than one-third of the floor area of that room or space in which they are located. The enclosed portion of a room shall not be included in a determination of the floor area of the room in which the *mezzanine* is located. In determining the allowable *mezzanine* area, the area of the *mezzanine* shall not be included in the floor area of the room.

Where a room contains both a *mezzanine* and an *equipment platform*, the aggregate area of the two raised floor levels shall be not greater than two-thirds of the floor area of that room or space in which they are located.

Exceptions:

1. The aggregate area of *mezzanines* in buildings and structures of Type I or II construction for special industrial occupancies in accordance with Section 503.1.1 shall be not greater than two-thirds of the floor area of the room.

2. The aggregate area of *mezzanines* in buildings and structures of Type I or II construction shall be not greater than one-half of the floor area of the room in buildings and structures equipped throughout with an *approved automatic sprinkler system* in accordance with Section 903.3.1.1 and an *approved emergency voice/alarm communication system* in accordance with Section 907.5.2.2.

3. In sprinklered Group S2 occupancies of Type III construction, the enclosed and unenclosed areas under mezzanines shall be allowed to be included when calculating the permissible size of mezzanines.

505.2.2 Means of Egress

The *means of egress* for *mezzanines* shall comply with the applicable provisions of Chapter 10.

505.2.3 Openness

A *mezzanine* shall be open and unobstructed to the room in which such *mezzanine* is located except for walls not more than 42 inches (1067 mm) in height, columns and posts.

Exceptions:

1. *Mezzanines* or portions thereof are not required to be open to the room in which the *mezzanines* are located, provided that the *occupant load* of the aggregate area of the enclosed space is not greater than 10.

2. A *mezzanine* having two or more exits or access to exits is not required to be open to the room in which the *mezzanine* is located.

3. *Mezzanines* or portions thereof are not required to be open to the room in which the *mezzanines* are located, provided that the aggregate floor area of the enclosed space is not greater than 10 percent of the *mezzanine* area.

4. In industrial facilities, *mezzanines* used for control equipment are permitted to be glazed on all sides.

5. In occupancies other than Groups H and I, that are no more than two *stories* above *grade plane* and equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, a *mezzanine* having two or more *means of egress* shall not be required to be open to the room in which the *mezzanine* is located.

505.3 Equipment Platforms

Equipment platforms in buildings shall not be considered as a portion of the floor below. Such *equipment platforms* shall not contribute to either the *building area* or the number of *stories* as regulated by Section 503.1. The area of the *equipment platform* shall not be included in determining the *fire area* in accordance with Section 903. *Equipment platforms* shall not be a part of any *mezzanine* and such platforms and the walkways, stairways, alternating tread devices and ladders providing access to an *equipment platform* shall not serve as a part of the *means of egress* from the building.

505.3.1 Area Limitation

The aggregate area of all *equipment platforms* within a room shall be not greater than two-thirds of the area of the room in which they are located. Where an *equipment platform* is located in the same room as a *mezzanine*, the area of the *mezzanine* shall be determined by Section 505.2.1 and the combined aggregate area of the *equipment platforms* and *mezzanines* shall be not greater than two-thirds of the room in which they are located.

505.3.2 Automatic Sprinkler System

Where located in a building that is required to be protected by an *automatic sprinkler system*, *equipment platforms* shall be fully protected by sprinklers above and below the platform, where required by the standards referenced in Section 903.3.

505.3.3 Guards

Equipment platforms shall have *guards* where required by Section 1015.2.

Section 506 Building Area

506.1 General

The floor area of a building shall be determined based on the type of construction, occupancy classification, whether there is an automatic sprinkler system installed throughout the building and the amount of building frontage on public way or open space.

506.1.1 Unlimited Area Buildings

Unlimited area buildings shall be designed in accordance with Section 507.

506.1.2 Special Provisions

The special provisions of Section 510 permit the use of special conditions that are exempt from, or modify, the specific requirements of this chapter regarding the allowable areas of buildings based on the occupancy classification and type of construction, provided the special condition complies with the provisions specified in Section 510.

506.1.3 Basements

Basements need not be included in the total allowable floor area of a building provided the total area of such basements does not exceed the area permitted for a one-story above grade plane building.

506.2 Allowable Area Determination

The allowable area of a building shall be determined in accordance with the applicable provisions of Sections 506.2.1 through 506.2.4 and Section 506.3.

TABLE 506.2^{a, b}

ALLOWABLE AREA FACTOR (A_t = NS, S1, S13R, or SM, as applicable) IN SQUARE FEET

OCCUPANCY CLASSIFICATION	SEE FOOTNOTES	TYPE OF CONSTRUCTION								
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		A	B	A	B	A	B	HT	A	B
A-1	NS	UL	UL	15,500	8,500	14,000	8,500	15,000	11,500	5,500
	S1	UL	UL	62,000	34,000	56,000	34,000	60,000	46,000	22,000
	SM	UL	UL	46,500	25,500	42,000	25,500	45,000	34,500	16,500
A-2	NS	UL	UL	15,500	9,500	14,000	9,500	15,000	11,500	6,000
	S1	UL	UL	62,000	38,000	56,000	38,000	60,000	46,000	24,000
	SM	UL	UL	46,500	28,500	42,000	28,500	45,000	34,500	18,000
A-3	NS	UL	UL	15,500	9,500	14,000	9,500	15,000	11,500	6,000
	S1	UL	UL	62,000	38,000	56,000	38,000	60,000	46,000	24,000
	SM	UL	UL	46,500	28,500	42,000	28,500	45,000	34,500	18,000
A-4	NS	UL	UL	15,500	9,500	14,000	9,500	15,000	11,500	6,000
	S1	UL	UL	62,000	38,000	56,000	38,000	60,000	46,000	24,000
	SM	UL	UL	46,500	28,500	42,000	28,500	45,000	34,500	18,000
A-5	NS	UL	UL	UL	UL	UL	UL	UL	UL	UL
	S1									
	SM									
B	NS	UL	UL	37,500	23,000	28,500	19,000	36,000	18,000	9,000

	S1	UL	UL	150,000	92,000	114,000	76,000	144,000	72,000	36,000
	SM	UL	UL	112,500	69,000	85,500	57,000	108,000	54,000	27,000
E	NS	UL	UL	26,500	14,500	23,500	14,500	25,500	18,500	9,500
	S1	UL	UL	106,000	58,000	94,000	58,000	102,000	74,000	38,000
	SM	UL	UL	79,500	43,500	70,500	43,500	76,500	55,500	28,500
F-1	NS	UL	UL	25,000	15,500	19,000	12,000	33,500	14,000	8,500
	S1	UL	UL	100,000	62,000	76,000	48,000	134,000	56,000	34,000
	SM	UL	UL	75,000	46,500	57,000	36,000	100,500	42,000	25,500
F-2	NS	UL	UL	37,500	23,000	28,500	18,000	50,500	21,000	13,000
	S1	UL	UL	150,000	92,000	114,000	72,000	202,000	84,000	52,000
	SM	UL	UL	112,500	69,000	85,500	54,000	151,500	63,000	39,000
H-1	NS ^c	21,000	16,500	11,000	7,000	9.500	7,000	10,500	7,500	NP
	S1									
H-2	NS ^c	21,000	16,500	11,000	7,000	9.500	7,000	10,500	7,500	3,000
	S1									
	SM									
H-3	NS ^c	UL	60,000	26,500	14,000	17,500	13,000	25,500	10,000	5,000
	S1									
	SM									
H-4	NS ^{c, d}	UL	UL	37,500	17,500	28,500	17,500	36,000	18,000	6,500
	S1	UL	UL	150,000	70,000	114,000	70,000	144,000	72,000	26,000
	SM	UL	UL	112,500	52,500	85,500	52,500	108,000	54,000	19,500
H-5	NS ^{c, d}	UL	UL	37,500	23,000	28,500	19,000	36,000	18,000	9,000
	S1	UL	UL	150,000	92,000	114,000	76,000	144,000	72,000	36,000
	SM	UL	UL	112,500	69,000	85,500	57,000	108,000	54,000	27,000
I-1	NS ^{d, e}	UL	55,000	19,000	10,000	16,500	10,000	18,000	10,500	4,500
	S1	UL	220,000	76,000	40,000	66,000	40,000	72,000	42,000	18,000
	SM	UL	165,000	57,000	30,000	49,500	30,000	54,000	31,500	13,500
I-2	NS ^{d, f}	UL	UL	15,000	11,000	12,000	NP	12,000	9,500	NP
	S1	UL	UL	60,000	44,000	48,000	NP	48,000	38,000	NP
	SM	UL	UL	45,000	33,000	36,000	NP	36,000	28,500	NP
I-3	NS ^{d, e}	UL	UL	15,000	10,000	10,500	7,500	12,000	7,500	5,000
	S1	UL	UL	60,000	40,000	42,000	30,000	48,000	30,000	20,000

		SM	UL	UL	45,000	30,000	31,500	22,500	36,000	22,500	15,000
I-4		NS ^{d, g}	UL	60,500	26,500	13,000	23,500	13,000	25,500	18,500	9,000
		S1	UL	121,000	106,000	52,000	94,000	52,000	102,000	74,000	36,000
		SM	UL	181,500	79,500	39,000	70,500	39,000	76,500	55,500	27,000
M		NS	UL	UL	21,500	12,500	18,500	12,500	20,500	14,000	9,000
		S1	UL	UL	86,000	50,000	74,000	50,000	82,000	56,000	36,000
		SM	UL	UL	64,500	37,500	55,500	37,500	61,500	42,000	27,000
R-1		NS ^{d, h}	UL	UL	24,000	16,000	24,000	16,000	20,500	12,000	7,000
		S13R									
		S1	UL	UL	96,000	64,000	96,000	64,000	82,000	48,000	28,000
		SM	UL	UL	72,000	48,000	72,000	48,000	61,500	36,000	21,000
R-2		NS ^{d, h}	UL	UL	24,000	16,000	24,000	16,000	20,500	12,000	7,000
		S13R									
		S1	UL	UL	96,000	64,000	96,000	64,000	82,000	48,000	28,000
		SM	UL	UL	72,000	48,000	72,000	48,000	61,500	36,000	21,000
R-3		NS ^{d, h}	UL	UL	UL	UL	UL	UL	UL	UL	UL
		S13R									
		S1									
		SM									
R-4		NS ^{d, h}	UL	UL	24,000	16,000	24,000	16,000	20,500	12,000	7,000
		S13R									
		S1	UL	UL	96,000	64,000	96,000	64,000	82,000	48,000	28,000
		SM	UL	UL	72,000	48,000	72,000	48,000	61,500	36,000	21,000
S-1		NS	UL	48,000	26,000	17,500	26,000	17,500	25,500	14,000	9,000
		S1	UL	192,000	104,000	70,000	104,000	70,000	102,000	56,000	36,000
		SM	UL	144,000	78,000	52,500	78,000	52,500	76,500	42,000	27,000
S-2		NS	UL	79,000	39,000	26,000	39,000	26,000	38,500	21,000	13,500
		S1	UL	316,000	156,000	104,000	156,000	104,000	154,000	84,000	54,000
		SM	UL	237,000	117,000	78,000	117,000	78,000	115,500	63,000	40,500
U		NS	UL	35,500	19,000	8,500	14,000	8,500	18,000	9,000	5,500
		S1	UL	142,000	76,000	34,000	56,000	34,000	72,000	36,000	22,000
		SM	UL	106,500	57,000	25,500	42,000	25,500	54,000	27,000	16,500

Note: UL = Unlimited; NP = Not permitted;

For SI: 1 square foot = 0.0929 m².

NS = Buildings not equipped throughout with an automatic sprinkler system; S1 = Buildings a maximum of one story above grade plane equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1; SM = Buildings two or more stories above grade plane equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1; S13R = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.2.

- a. See Chapters 4 and 5 for specific exceptions to the allowable height in this chapter.
- b. See Section 903.2 for the minimum thresholds for protection by an automatic sprinkler system for specific occupancies.
- c. New Group H occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.5.
- d. The NS value is only for use in evaluation of existing building area in accordance with the *Florida Building Code, Existing Building*.
- e. New Group I-1 and I-3 occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.6. For new Group I-1 occupancies, Condition 1, see Exception 1 of Section 903.2.6.
- f. New and existing Group I-2 occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.6 and the *Florida Fire Prevention Code*.
- g. New Group I-4 occupancies see Exceptions 2 and 3 of Section 903.2.6.
- h. New Group R occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.8.

506.2.1 Single-Occupancy, One-Story Buildings

The allowable area of a single-occupancy building with no more than one story above grade plane shall be determined in accordance with Equation 5-1:

$$A_a = A_t + (NS \times I_f) \quad (\text{Equation 5-1})$$

where:

A_a = Allowable area (square feet).

A_t = Tabular allowable area factor (NS, S1, or S13R value, as applicable) in accordance with Table 506.2.

NS = Tabular allowable area factor in accordance with Table 506.2 for nonsprinklered building (regardless of whether the building is sprinklered).

I_f = Area factor increase due to frontage (percent) as calculated in accordance with Section 506.3.

506.2.2 Mixed-Occupancy, One-Story Buildings

The allowable area of a mixed-occupancy building with no more than one story above grade plane shall be determined in accordance with the applicable provisions of Section 508.1 based on Equation 5-1 for each applicable occupancy.

506.2.2.1 Group H-2 or H-3 Mixed Occupancies

For a building containing Group H-2 or H-3 occupancies, the allowable area shall be determined in accordance with Section 508.4.2,

with the automatic sprinkler system increase applicable only to the portions of the building not classified as Group H-2 or H-3.

506.2.3 Single-Occupancy, Multistory Buildings

The allowable area of a single-occupancy building with more than one story above grade plane shall be determined in accordance with Equation 5-2:

$$A_a = [A_t + (NS \times I_f)] \times S_a \quad (\text{Equation 5-2})$$

where:

A_a = Allowable area (square feet).

A_t = Tabular allowable area factor (NS, S13R or SM value, as applicable) in accordance with Table 506.2.

NS = Tabular allowable area factor in accordance with Table 506.2 for a nonsprinklered building (regardless of whether the building is sprinklered).

I_f = Area factor increase due to frontage (percent) as calculated in accordance with Section 506.3.

S_a = Actual number of building stories above grade plane, not to exceed three. For buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.2, use the actual number of building stories above grade plane, not to exceed four.

No individual story shall exceed the allowable area (A_a) as determined by Equation 5-2 using the value of $S_a = 1$.

506.2.4 Mixed-Occupancy, Multistory Buildings

Each story of a mixed-occupancy building with more than one story above grade plane shall individually comply with the applicable requirements of Section 508.1. For buildings with more than three stories above grade plane, the total building area shall be such that the aggregate sum of the ratios of the actual area of each story divided by the allowable area of such stories, determined in accordance with Equation 5-3 based on the applicable provisions of Section 508.1, shall not exceed three.

$$A_a = [A_t + (NS \times I_f)] \quad (\text{Equation 5-3})$$

where:

A_a = Allowable area (square feet).

A_t = Tabular allowable area factor (NS, S13R or SM value, as applicable) in accordance with Table 506.2.

NS = Tabular allowable area factor in accordance with Table 506.2 for a nonsprinklered building (regardless of whether the building is sprinklered).

I_f = Area factor increase due to frontage (percent) as calculated in accordance with Section 506.3.

Exception: For buildings designed as separated occupancies under Section 508.4 and equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.2, the total building area shall be such that the aggregate sum of the ratios of the actual area of each story divided by the allowable area of such stories determined in accordance with Equation 5-3 based on the applicable provisions of Section 508.1, shall not exceed four.

506.2.4.1 Group H-2 or H-3 Mixed Occupancies

For a building containing Group H-2 or H-3 occupancies, the allowable area shall be determined in accordance with Section 508.4.2, with the sprinkler system increase applicable only to the portions of the building not classified as Group H-2 or H-3.

506.3 Frontage Increase

Every building shall adjoin or have access to a public way to receive an area factor increase based on frontage. Area factor increase shall be determined in accordance with Sections 506.3.1 through 506.3.3.

506.3.1 Minimum Percentage of Perimeter

To qualify for an area factor increase based on frontage, a building shall have not less than 25 percent of its perimeter on a public way or open space. Such open space shall be either on the same lot or dedicated for public use and shall be accessed from a street or

approved fire lane.

506.3.2 Minimum Frontage Distance

To qualify for an area factor increase based on frontage, the public way or open space adjacent to the building perimeter shall have a minimum distance of 20 feet (6096 mm) measured at right angles from the building face to any of the following:

1. The closest interior lot line.
2. The entire width of a street, alley or public way.
3. The exterior face of an adjacent building on the same property.

The frontage increase shall be based on the smallest public way or open space that is 20 feet (6096 mm) or greater, and the percentage of building perimeter having a minimum 20 feet (6096 mm) public way or open space.

506.3.3 Amount of Increase

The area factor increase based on frontage shall be determined in accordance with Table 506.3.3.

TABLE 506.3.3
FRONTAGE INCREASE FACTOR^a

Percentage (%) of Perimeter	OPEN SPACE			
	0 to less than 20 feet	20 to less than 25 feet	25 to less than 30 feet	30 feet or greater
0 to less than 25	0	0	0	0
25 to less than 50	0	0.17	0.21	0.25
50 to less than 75	0	0.33	0.42	0.50
75 to 100	0	0.5	0.63	0.75

For SI: 1 foot = 304.8 mm.

- a. Interpolation is permitted.

506.3.3.1 Section 507 Buildings

Where a building meets the requirements of Section 507, as applicable, except for compliance with the minimum 60-foot (18 288 mm) public way or yard requirement, the area factor increase based on frontage shall be determined in accordance with Table 506.3.3.1.

TABLE 506.3.3.1
SECTION 507 BUILDINGS^a

Percentage (%) of Perimeter	OPEN SPACE					
	30 to less than 35 feet	35 to less than 40 feet	40 feet to less than 45 feet	45 feet to less than 50 feet	50 feet to less than 55 feet	55 feet to less than 60 feet
0 to less than 25	0	0	0	0	0	0

25 to less than 50	0.29	0.33	0.38	0.42	0.46	0.5
50 to less than 75	0.58	0.67	0.75	0.83	0.92	1.00
75 to 100	0.88	1.00	1.13	1.25	1.38	1.5

For SI: 1 foot = 304.8 mm.

- a. Interpolation is permitted.

Section 507 Unlimited Area Buildings

507.1 General

The area of buildings of the occupancies and configurations specified in Sections 507.1 through 507.12 shall not be limited. Basements not more than one story below grade plane shall be permitted.

507.1.1 Accessory Occupancies

Accessory occupancies shall be permitted in unlimited area buildings in accordance with the provisions of Section 508.2, otherwise the requirements of Sections 507.3 through 507.13 shall be applied, where applicable.

507.2 Measurement of Open Spaces

Where Sections 507.3 through 507.13 require buildings to be surrounded and adjoined by *public ways* and *yards*, those open spaces shall be determined as follows:

1. Yards shall be measured from the building perimeter in all directions to the closest interior *lot lines* or to the exterior face of an opposing building located on the same *lot*, as applicable.
2. Where the building fronts on a *public way*, the entire width of the *public way* shall be used.

507.2.1 Reduced Open Space

The *public ways* or *yards* of 60 feet (18 288 mm) in width required in Sections 507.3, 507.4, 507.5, 507.6 and 507.12 shall be permitted to be reduced to not less than 40 feet (12 192 mm) in width provided all of the following requirements are met:

1. The reduced width shall not be allowed for more than 75 percent of the perimeter of the building.
2. The *exterior walls* facing the reduced width shall have a *fire-resistance rating* of not less than 3 hours.
3. Openings in the *exterior walls* facing the reduced width shall have opening protectives with a *fire protection rating* of not less than 3 hours.

507.3 Nonsprinklered, One-Story Buildings

The area of a Group F-2 or S-2 building no more than one story in height shall not be limited where the building is surrounded and adjoined by *public ways* or *yards* not less than 60 feet (18 288 mm) in width.

507.4 Sprinklered, One-Story Buildings

The area of a Group A-4 building no more than one story *above grade plane* of other than Type V construction, or the area of a Group B, F, M or S building no more than one story above grade plane of any construction type, shall not be limited where the building is provided

with an *automatic sprinkler system* throughout in accordance with Section 903.3.1.1 and is surrounded and adjoined by *public ways or yards* not less than 60 feet (18 288 mm) in width.

Exceptions:

1. Buildings and structures of Type I or II construction for rack storage facilities that do not have access by the public shall not be limited in height, provided that such buildings conform to the requirements of Sections 507.4 and 903.3.1.1 and the *Florida Fire Prevention Code*.
2. The *automatic sprinkler system* shall not be required in areas occupied for indoor participant sports, such as tennis, skating, swimming and equestrian activities in occupancies in Group A-4, provided that both of the following criteria are met:
 - 2.1. *Exit doors directly to the outside* are provided for occupants of the participant sports areas.
 - 2.2. The building is equipped with a *fire alarm system* with *manual fire alarm boxes* installed in accordance with Section 907.

507.4.1 Mixed Occupancy Buildings With Groups A-1 and A-2

Group A-1 and A-2 occupancies of other than Type V construction shall be permitted within mixed occupancy buildings of unlimited area complying with Section 507.4, provided all of the following criteria are met:

1. Group A-1 and A-2 occupancies are separated from other occupancies as required for separated occupancies in Section 508.4.4 with no reduction allowed in the *fire-resistance rating* of the separation based upon the installation of an *automatic sprinkler system*.
2. Each area of the portions of the building used for Group A-1 or A-2 occupancies shall not exceed the maximum allowable area permitted for such occupancies in Section 503.1.
3. *Exit doors from Group A-1 and A-2 occupancies* shall discharge directly to the exterior of the building.

507.5 Two-Story Buildings

The area of a Group B, F, M or S building no more than two *stories above grade plane* shall not be limited where the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 and is surrounded and adjoined by *public ways or yards* not less than 60 feet (18 288 mm) in width.

507.6 Group A-3 Buildings of Type II Construction

The area of a Group A-3 building no more than one *story above grade plane*, used as a *place of religious worship*, community hall, dance hall, exhibition hall, gymnasium, lecture hall, indoor *swimming pool* or tennis court of Type II construction, shall not be limited provided all of the following criteria are met:

1. The building shall not have a *stage* other than a *platform*.
2. The building shall be equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.
3. The building shall be surrounded and adjoined by *public ways or yards* not less than 60 feet (18 288 mm) in width.

507.7 Group A-3 Buildings of Type III and IV Construction

The area of a Group A-3 building of Type III or IV construction, with no more than one *story above grade plane* and used as a *place of religious worship*, community hall, dance hall, exhibition hall, gymnasium, lecture hall, indoor *swimming pool* or tennis court, shall not be limited provided all of the following criteria are met:

1. The building shall not have a *stage* other than a *platform*.
2. The building shall be equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.
3. The assembly floor shall be located at or within 21 inches (533 mm) of street or grade level and all *exits* are provided with ramps complying with Section 1012 to the street or grade level.
4. The building shall be surrounded and adjoined by *public ways* or *yards* not less than 60 feet (18 288 mm) in width.

507.8 Group H-2, H-3 and H-4 Occupancies

Group H-2, H-3 and H-4 occupancies shall be permitted in unlimited area buildings containing Group F or S occupancies in accordance with Sections 507.4 and 507.5 and the provisions of Sections 507.8.1 through 507.8.4.

507.8.1 Allowable Area

The aggregate floor area of Group H occupancies located in an unlimited area building shall not exceed 10 percent of the area of the building or the area limitations for the Group H occupancies as specified in Section 506 based on the perimeter of each Group H floor area that fronts on a *public way* or open space.

507.8.1.1 Located Within the Building

The aggregate floor area of Group H occupancies not located at the perimeter of the building shall not exceed 25 percent of the area limitations for the Group H occupancies as specified in Section 506.

507.8.1.1.1 Rooms for Flammable or Combustible Liquid Use, Dispensing or Mixing in Open Systems

Rooms for flammable or combustible liquid use, dispensing or mixing in open systems having a floor area of not more than 500 square feet (46.5 m^2) need not be located on the outer perimeter of the building where they are in accordance with the *Florida Fire Prevention Code* and NFPA 30.

507.8.1.1.2 Liquid Storage Rooms and Rooms for Flammable or Combustible Liquid Use in Closed Systems

Liquid storage rooms and rooms for flammable or combustible liquid use in closed systems having a floor area of not more than 1,000 square feet (93 m^2) need not be located on the outer perimeter where they are in accordance with the *Florida Fire Prevention Code* and NFPA 30.

507.8.1.1.3 Spray Paint Booths

Spray paint booths that comply with the *Florida Fire Prevention Code* need not be located on the outer perimeter.

507.8.2 Located on Building Perimeter

Except as provided for in Section 507.8.1.1, Group H occupancies shall be located on the perimeter of the building. In Group H-2 and H-3 occupancies, not less than 25 percent of the perimeter of such occupancies shall be an *exterior wall*.

507.8.3 Occupancy Separations

Group H occupancies shall be separated from the remainder of the unlimited area building and from each other in accordance with Table 508.4.

507.8.4 Height Limitations

For two-story, unlimited area buildings, Group H occupancies shall not be located more than one *story above grade plane* unless permitted based on the allowable height and number of *stories* and feet as specified in Section 504 based on the type of construction of the unlimited area building.

507.9 Unlimited Mixed Occupancy Buildings With Group H-5

The area of a Group B, F, H-5, M or S building no more than two *stories above grade plane* shall not be limited where the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, and is surrounded and adjoined by *public ways* or *yards* not less than 60 feet (18 288 mm) in width, provided all of the following criteria are met:

1. Buildings containing Group H-5 occupancy shall be of Type I or II construction.
2. Each area used for Group H-5 occupancy shall be separated from other occupancies as required in Sections 415.11 and 508.4.
3. Each area used for Group H-5 occupancy shall not exceed the maximum allowable area permitted for such occupancies in Section 503.1 including modifications of Section 506.

Exception: Where the Group H-5 occupancy exceeds the maximum allowable area, the Group H-5 shall be subdivided into areas that are separated by 2-hour fire barriers.

507.10 Aircraft Paint Hangar

The area of a Group H-2 aircraft paint hangar no more than one *story above grade plane* shall not be limited where such aircraft paint hangar complies with the provisions of Section 412.6 and is surrounded and adjoined by *public ways or yards* not less in width than one and one-half times the *building height*.

507.11 Group E Buildings

The area of a Group E building no more than one *story above grade plane*, of Type II, IIIA or IV construction, shall not be limited provided all of the following criteria are met:

1. Each classroom shall have not less than two *means of egress*, with one of the *means of egress* being a direct *exit* to the outside of the building complying with Section 1022 or the building is provided with smoke barriers having a minimum 1-hour fire-resistance rating dividing the building into areas not to exceed 30,000 square feet (2787 m^2) in floor area.
2. The building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.
3. The building is surrounded and adjoined by *public ways or yards* not less than 60 feet (18 288 mm) in width.

507.12 Motion Picture Theaters

In buildings of Type II construction, the area of a motion picture theater located on the first *story above grade plane* shall not be limited where the building is provided with an *automatic sprinkler system* throughout in accordance with Section 903.3.1.1 and is surrounded and adjoined by *public ways or yards* not less than 60 feet (18 288 mm) in width.

507.13 Covered and Open Mall Buildings and Anchor Buildings

The area of *covered and open mall buildings* and *anchor buildings* not exceeding three *stories* in height that comply with Section 402 shall not be limited.

Section 508 Mixed Use and Occupancy

508.1 General

Each portion of a building shall be individually classified in accordance with Section 302.1. Where a building contains more than one occupancy group, the building or portion thereof shall comply with the applicable provisions of Section 508.2, 508.3, 508.4, or 508.5 or a combination of these sections.

Exceptions:

1. Occupancies separated in accordance with Section 510.
2. Where required by Table 415.6.5, areas of Group H-1, H-2 and H-3 occupancies shall be located in a *detached building* or structure.

508.2 Accessory Occupancies

Accessory occupancies are those occupancies that are ancillary to the main occupancy of the building or portion thereof. Accessory occupancies shall comply with the provisions of Sections 508.2.1 through 508.2.4.

508.2.1 Occupancy Classification

Accessory occupancies shall be individually classified in accordance with Section 302.1. The requirements of this code shall apply to each portion of the building based on the occupancy classification of that space.

508.2.2 Allowable Building Height

The allowable height and number of stories of the building containing accessory occupancies shall be in accordance with Section 504 for the main occupancy of the building.

508.2.3 Allowable Building Area

The allowable area of the building shall be based on the applicable provisions of Section 506 for the main occupancy of the building. Aggregate accessory occupancies shall not occupy more than 10 percent of the floor area of the story in which they are located and shall not exceed the tabular values for nonsprinklered buildings in Table 506.2 for each such accessory occupancy.

508.2.4 Separation of Occupancies

No separation is required between accessory occupancies and the main occupancy.

Exceptions:

1. Group H-2, H-3, H-4 and H-5 occupancies shall be separated from all other occupancies in accordance with Section 508.4.
2. Group I-1, R-1, R-2 and R-3 *dwelling units* and *sleeping units* shall be separated from other *dwelling* or *sleeping units* and from accessory occupancies contiguous to them in accordance with the requirements of Section 420.

508.3 Nonseparated Occupancies

Buildings or portions of buildings that comply with the provisions of this section shall be considered as nonseparated occupancies.

508.3.1 Occupancy Classification

Nonseparated occupancies shall be individually classified in accordance with Section 302.1. The requirements of this code shall apply to each portion of the building based on the occupancy classification of that space. In addition, the most restrictive provisions of Chapter 9 that apply to the nonseparated occupancies shall apply to the total nonseparated occupancy area. Where nonseparated occupancies occur in a *high-rise building*, the most restrictive requirements of Section 403 that apply to the nonseparated occupancies shall apply throughout the *high-rise building*.

508.3.2 Allowable Building Area and Height

The allowable *building area and height* of the building or portion thereof shall be based on the most restrictive allowances for the occupancy groups under consideration for the type of construction of the building in accordance with Section 503.1.

508.3.3 Separation

No separation is required between nonseparated occupancies.

Exceptions:

1. Group H-2, H-3, H-4 and H-5 occupancies shall be separated from all other occupancies in accordance with Section 508.4.
2. Group I-1, R-1, R-2 and R-3 *dwelling units* and *sleeping units* shall be separated from other *dwelling* or *sleeping units* and from other occupancies contiguous to them in accordance with the requirements of Section 420.

508.4 Separated Occupancies

Buildings or portions of buildings that comply with the provisions of this section shall be considered as separated occupancies.

TABLE 508.4**REQUIRED SEPARATION OF OCCUPANCIES (HOURS)**

OCCUPANCY	A, E		I-1 ^a , I-3, I-4		I-2		R ^a		F-2, S- 2 ^b , U		B ^e , F-1, M, S-1		H-1		H-2		H-3, H-4		H-5		
	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	
A, E	N	N	1	2	2	NP	1	2	N	1	1	2	NP	NP	3	4	2	3	2	NP	
I-1 ^a , I-3, I-4	—	—	N	N	2	NP	1	NP	1	2	1	2	NP	NP	3	NP	2	NP	2	NP	
I-2	—	—	—	—	N	N	2	NP	2	NP	2	NP	NP	NP	3	NP	2	NP	2	NP	
R ^a	—	—	—	—	—	—	N	N	1 ^c	2 ^c	1	2	NP	NP	3	NP	2	NP	2	NP	
F-2, S-2 ^b , U	—	—	—	—	—	—	—	—	N	N	1	2	NP	NP	3	4	2	3	2	NP	
B ^e , F-1, M, S- 1	—	—	—	—	—	—	—	—	—	—	N	N	NP	NP	2	3	1	2	1	NP	
H-1	—	—	—	—	—	—	—	—	—	—	—	—	N	NP	NP	NP	NP	NP	NP	NP	
H-2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	N	NP	1	NP	1	NP	
H-3, H-4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1 ^d	NP	1	NP
H-5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	N	NP

S = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1.

NS = Buildings not equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1.

N = No separation requirement.

NP = Not permitted.

a. See Section 420.

b. The required separation from areas used only for private or pleasure vehicles shall be reduced by 1 hour but not to less than 1 hour.

c. See Sections 406.3.2 and 406.6.4.

d. Separation is not required between occupancies of the same classification.

e. See Section 422.2 for ambulatory care facilities.

508.4.1 Occupancy Classification

Separated occupancies shall be individually classified in accordance with Section 302.1. Each separated space shall comply with this code based on the occupancy classification of that portion of the building.

508.4.2 Allowable Building Area

In each story, the *building area* shall be such that the sum of the ratios of the actual *building area* of each separated occupancy divided

by the allowable *building area* of each separated occupancy shall not exceed 1.

508.4.3 Allowable Height

Each separated occupancy shall comply with the *building height* limitations based on the type of construction of the building in accordance with Section 503.1.

Exception: Special provisions of Section 510 shall permit occupancies at *building heights* other than provided in Section 503.1.

508.4.4 Separation

Individual occupancies shall be separated from adjacent occupancies in accordance with Table 508.4.

508.4.4.1 Construction

Required separations shall be *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both, so as to completely separate adjacent occupancies.

508.5 Live/Work Units

A *live/work unit* shall comply with Sections 508.5 through 508.5.11.

Exception: Dwelling or sleeping units that include an office that is less than 10 percent of the area of the *dwelling unit* are permitted to be classified as *dwelling units* with accessory occupancies in accordance with Section 508.2.

508.5.1 Limitations

The following shall apply to all live/work areas:

1. The *live/work unit* is permitted to be not greater than 3,000 square feet (279 m^2) in area.
2. The nonresidential area is permitted to be not more than 50 percent of the area of each *live/work unit*.
3. The nonresidential area function shall be limited to the first or main floor only of the *live/work unit*.
4. Not more than five nonresidential workers or employees are allowed to occupy the nonresidential area at any one time.

508.5.2 Occupancies

Live/work units shall be classified as a Group R-2 occupancy. Separation requirements found in Sections 420 and 508 shall not apply within the *live/work unit* where the *live/work unit* is in compliance with Section 508.5. Nonresidential uses that would otherwise be classified as either a Group H or S occupancy shall not be permitted in a *live/work unit*.

Exception: Storage shall be permitted in the *live/work unit* provided that the aggregate area of storage in the nonresidential portion of the *live/work unit* shall be limited to 10 percent of the space dedicated to nonresidential activities.

508.5.3 Means of Egress

Except as modified by this section, the *means of egress* components for a *live/work unit* shall be designed in accordance with Chapter 10 for the function served.

508.5.4 Egress Capacity

The egress capacity for each element of the *live/work unit* shall be based on the occupant load for the function served in accordance with Table 1004.5.

508.5.5 Spiral Stairways

Spiral stairways that conform to the requirements of Section 1011.10 shall be permitted.

508.5.6 Vertical Openings

Floor openings between floor levels of a *live/work unit* are permitted without enclosure.

508.5.7 Fire Protection

The *live/work unit* shall be provided with a monitored *fire alarm* system where required by Section 907.2.9 and an *automatic sprinkler system* in accordance with Section 903.2.8.

508.5.8 Structural

Floors within a *live/work unit* shall be designed for the live loads in Table 1607.1, based on the function within the space.

508.5.9 Accessibility

Accessibility shall be designed in accordance with Chapter 11 for the function served.

508.5.10 Ventilation

The applicable *ventilation* requirements of the *Florida Building Code, Mechanical* shall apply to each area within the *live/work unit* for the function within that space.

508.5.11 Plumbing Facilities

The nonresidential area of the *live/work unit* shall be provided with minimum plumbing facilities as specified by Chapter 29, based on the function of the nonresidential area. Where the nonresidential area of the *live/work unit* is required to be *accessible* by the *Florida Building Code, Accessibility*, the plumbing fixtures specified by Chapter 29 shall be *accessible*.

Section 509 Incidental Uses

TABLE 509.1

INCIDENTAL USES

ROOM OR AREA	SEPARATION AND/OR PROTECTION
Furnace room where any piece of equipment is over 400,000 Btu per hour input	1 hour or provide automatic sprinkler system
Rooms with boilers where the largest piece of equipment is over 15 psi and 10 horsepower	1 hour or provide automatic sprinkler system
Refrigerant machinery room	1 hour or provide automatic sprinkler system
Hydrogen fuel gas rooms, not classified as Group H	1 hour in Group B, F, M, S and U occupancies; 2 hours in Group A, E, I and R occupancies.
Incinerator rooms	2 hours and provide automatic sprinkler system
Paint shops, not classified as Group H, located in occupancies other than Group F	2 hours; or 1 hour and provide automatic sprinkler system
In Group E occupancies, laboratories and vocational shops not classified as Group H	1 hour or provide automatic sprinkler system
In Group I-2 occupancies, laboratories not classified as Group H	1 hour and provide automatic sprinkler system
In ambulatory care facilities, laboratories not classified as Group H	1 hour or provide automatic sprinkler system
Laundry rooms over 100 square feet	1 hour or provide automatic sprinkler system
In Group I-2, laundry rooms over 100 square feet	1 hour
Group I-3 cells and Group I-2 patient rooms equipped with padded surfaces	1 hour
In Group I-2, physical plant maintenance shops	1 hour
In ambulatory care facilities or Group I-2 occupancies, waste and linen collection	1 hour

rooms with containers that have an aggregate volume of 10 cubic feet or greater	
In other than ambulatory care facilities and Group I-2 occupancies, waste and linen collection rooms over 100 square feet	1 hour or provide automatic sprinkler system
In ambulatory care facilities or Group I-2 occupancies, storage rooms greater than 100 square feet	1 hour
Stationary storage battery systems having an energy capacity greater than the threshold quantity specified in the <i>Florida Fire Prevention Code</i>	1 hour in Group B, F, M, S and U occupancies; 2 hours in Group A, E, I and R occupancies.
Electrical installations and transformers	See Sections 110.26 through 110.34 and Sections 450.8 through 450.48 of NFPA 70 for protection and separation requirements.

For SI: 1 square foot = 0.0929 m², 1 pound per square inch (psi) = 6.9 kPa, 1 British thermal unit (Btu) per hour = 0.293 watts, 1 horsepower = 746 watts, 1 gallon = 3.785 L, 1 cubic foot = 0.0283 m³.

509.1 General

Incidental uses located within single occupancy or mixed occupancy buildings shall comply with the provisions of this section. Incidental uses are ancillary functions associated with a given occupancy that generally pose a greater level of risk to that occupancy and are limited to those uses listed in Table 509.1.

Exception: Incidental uses within and serving a *dwelling unit* are not required to comply with this section.

509.2 Occupancy Classification

Incidental uses shall not be individually classified in accordance with Section 302.1. Incidental uses shall be included in the building occupancies within which they are located.

509.3 Area Limitations

Incidental uses shall not occupy more than 10 percent of the *building area* of the *story* in which they are located.

509.4 Separation and Protection

The incidental uses listed in Table 509.1 shall be separated from the remainder of the building or equipped with an *automatic sprinkler system*, or both, in accordance with the provisions of that table.

509.4.1 Separation

Where Table 509.1 specifies a fire-resistance-rated separation, the incidental uses shall be separated from the remainder of the *building* by a *fire barrier* constructed in accordance with Section 707 or a *horizontal assembly* constructed in accordance with Section 711, or both. Construction supporting 1-hour *fire barriers* or *horizontal assemblies* used for incidental use separations in buildings of Type IIB, IIIB and VB construction is not required to be fire-resistance rated unless required by other sections of this code.

509.4.2 Protection

Where Table 509.1 permits an *automatic sprinkler system* without a *fire barrier*, the incidental uses shall be separated from the remainder of the building by construction capable of resisting the passage of smoke. The walls shall extend from the top of the foundation or floor assembly below to the underside of the ceiling that is a component of a fire-resistance-rated floor assembly or roof assembly above or to the underside of the floor or roof sheathing, deck or slab above. Doors shall be self- or automatic-closing upon detection of smoke in accordance with Section 716.5.9.4. Doors shall not have air transfer openings and shall not be undercut in excess of the clearance permitted in accordance with NFPA 80. Walls surrounding the incidental use shall not have air transfer openings unless provided with smoke dampers in accordance with Section 710.8.

509.4.2.1 Protection Limitation

Where an *automatic sprinkler system* is provided in accordance with Table 509.1, only the space occupied by the incidental use need be equipped with such a system.

Section 510 Special Provisions

510.1 General

The provisions in Sections 510.2 through 510.9 shall permit the use of special conditions that are exempt from, or modify, the specific requirements of this chapter regarding the allowable *building heights and areas* of buildings based on the occupancy classification and type of construction, provided the special condition complies with the provisions specified in this section for such condition and other applicable requirements of this code. The provisions of Sections 510.2 through 510.8 are to be considered independent and separate from each other.

510.2 Horizontal Building Separation Allowance

A building shall be considered as separate and distinct buildings for the purpose of determining area limitations, continuity of *fire walls*, limitation of number of *stories* and type of construction where all of the following conditions are met:

1. The buildings are separated with a *horizontal assembly* having a *fire-resistance rating* of not less than 3 hours.
2. The building below the *horizontal assembly* is of Type IA construction.
3. *Shaft, stairway, ramp* and escalator enclosures through the *horizontal assembly* shall have not less than a 2-hour *fire-resistance rating* with opening protectives in accordance with Section 716.

Exception: Where the enclosure walls below the *horizontal assembly* have not less than a 3-hour *fire-resistance rating* with opening protectives in accordance with Section 716, the enclosure walls extending above the *horizontal assembly* shall be permitted to have a 1-hour *fire-resistance rating*, provided:

1. The building above the *horizontal assembly* is not required to be of Type I construction;
2. The enclosure connects fewer than four *stories*; and
3. The enclosure opening protectives above the *horizontal assembly* have a *fire protection rating* of not less than 1 hour.
4. The building or buildings above the *horizontal assembly* shall be permitted to have multiple Group A occupancy uses, each with an *occupant load* of less than 300, or Group B, M, R or S occupancies.
5. The building below the *horizontal assembly* shall be protected throughout by an *approved automatic sprinkler system* in accordance with Section 903.3.1.1, and shall be permitted to be any occupancy allowed by this code except Group H.
6. The maximum *building height* in feet (mm) shall not exceed the limits set forth in Section 504.3 for the building having the smaller allowable height as measured from the *grade plane*.

510.3 Group S-2 Enclosed Parking Garage With Group S-2 Open Parking Garage Above

A Group S-2 enclosed parking garage with not more than one *story* above *grade plane* and located below a Group S-2 *open parking garage* shall be classified as a separate and distinct building for the purpose of determining the type of construction where all of the following conditions are met:

1. The allowable area of the building shall be such that the sum of the ratios of the actual area divided by the allowable area for each separate occupancy shall not exceed 1.
2. The Group S-2 enclosed parking garage is of Type I or II construction and is at least equal to the *fire-resistance* requirements of the Group S-2 *open parking garage*.
3. The height and the number of tiers of the Group S-2 *open parking garage* shall be limited as specified in Table 406.5.4.

4. The floor assembly separating the Group S-2 enclosed parking garage and Group S-2 *open parking garage* shall be protected as required for the floor assembly of the Group S-2 enclosed parking garage. Openings between the Group S-2 enclosed parking garage and Group S-2 *open parking garage*, except *exit* openings, shall not be required to be protected.
5. The Group S-2 enclosed parking garage is used exclusively for the parking or storage of private motor vehicles, but shall be permitted to contain an office, waiting room and toilet room having a total area of not more than 1,000 square feet (93 m^2) and mechanical equipment rooms associated with the operation of the building.

510.4 Parking Beneath Group R

Where a maximum one-story *above grade plane* Group S-2 parking garage, enclosed or open, or combination thereof, of Type I construction or open of Type IV construction, with grade entrance, is provided under a building of Group R, the number of *stories* to be used in determining the minimum type of construction shall be measured from the floor above such a parking area. The number of stories to be used in determining the height in stories in accordance with Section 903.2.11.3 shall include the parking garage as a story. The floor assembly between the parking garage and the Group R above shall comply with the type of construction required for the parking garage and shall also provide a *fire-resistance rating* not less than the mixed occupancy separation required in Section 508.4.

510.5 Group R-1 and R-2 Buildings of Type IIIA Construction

For buildings of Type IIIA construction in Groups R-1 and R-2, the maximum allowable height in Table 504.3 shall be increased by 10 feet and the maximum allowable number of stories in Table 504.4 shall be increased by one where the first floor assembly above the *basement* has a *fire-resistance rating* of not less than 3 hours and the floor area is subdivided by 2-hour fire-resistance-rated *fire walls* into areas of not more than 3,000 square feet (279 m^2).

510.6 Group R-1 and R-2 Buildings of Type IIA Construction

The height limitation for buildings of Type IIA construction in Groups R-1 and R-2 shall be increased to nine *stories* and 100 feet (30 480 mm) where the building is separated by not less than 50 feet (15 240 mm) from any other building on the *lot* and from *lot lines*, the *exits* are segregated in an area enclosed by a 2-hour fire-resistance-rated *fire wall* and the first floor assembly has a *fire-resistance rating* of not less than $1\frac{1}{2}$ hours.

510.7 Open Parking Garage Beneath Groups A, I, B, M and R

Open parking garages constructed under Groups A, I, B, M and R shall not exceed the height and area limitations permitted under Section 406.5. The height and area of the portion of the building above the *open parking garage* shall not exceed the limitations in Section 503 for the upper occupancy. The height, in both feet and *stories*, of the portion of the building above the *open parking garage* shall be measured from *grade plane* and shall include both the *open parking garage* and the portion of the building above the parking garage.

510.7.1 Fire Separation

Fire barriers constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711 between the parking occupancy and the upper occupancy shall correspond to the required *fire-resistance rating* prescribed in Table 508.4 for the uses involved. The type of construction shall apply to each occupancy individually, except that structural members, including main bracing within the open parking structure, which is necessary to support the upper occupancy, shall be protected with the more restrictive fire-resistance-rated assemblies of the groups involved as shown in Table 601. *Means of egress* for the upper occupancy shall conform to Chapter 10 and shall be separated from the parking occupancy by *fire barriers* having not less than a 2-hour *fire-resistance rating* as required by Section 707 with *self-closing doors* complying with Section 716 or *horizontal assemblies* having not less than a 2-hour *fire-resistance rating* as required by Section 711, with *self-closing doors* complying with Section 716. *Means of egress* from the *open parking garage* shall comply with Section 406.5.

510.8 Group B or M Buildings With Group S-2 Open Parking Garage Above

Group B or M occupancies located below a Group S-2 open parking garage of a lesser type of construction shall be considered as a separate and distinct building from the Group S-2 open parking garage for the purpose of determining the type of construction where all of the following conditions are met:

1. The buildings are separated with a *horizontal assembly* having a *fire-resistance rating* of not less than 2 hours.
2. The occupancies in the building below the *horizontal assembly* are limited to Groups B and M.

3. The occupancy above the *horizontal assembly* is limited to a Group S-2 *open parking garage*.

4. The building below the horizontal assembly is of Type IA construction.

Exception: The building below the *horizontal assembly* shall be permitted to be of Type IB or II construction, but not less than the type of construction required for the Group S-2 *open parking garage* above, where the building below is not greater than one story in height above grade plane.

5. The height and area of the building below the *horizontal assembly* does not exceed the limits set forth in Section 503.

6. The height and area of the Group S-2 *open parking garage* does not exceed the limits set forth in Section 406.5. The height, in both feet and stories, of the Group S-2 *open parking garage* shall be measured from *grade plane* and shall include the building below the *horizontal assembly*.

7. Exits serving the Group S-2 *open parking garage* shall discharge at grade with direct and unobstructed access to a street or *public way* and are separated from the building below the *horizontal assembly* by 2-hour *fire barriers* constructed in accordance with Section 707 or 2-hour *horizontal assemblies* constructed in accordance with Section 711, or both.

510.9 Multiple Buildings Above a Horizontal Assembly

Where two or more buildings are provided above the *horizontal assembly* separating a Group S-2 parking garage or building below from the buildings above in accordance with the special provisions in Section 510.2, 510.3 or 510.8, the buildings above the *horizontal assembly* shall be regarded as separate and distinct buildings from each other and shall comply with all other provisions of this code as applicable to each separate and distinct building.

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Chapter 6 Types of Construction

Section 601 General

TABLE 601

FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (HOURS)

BUILDING ELEMENT	TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
	A	B	A	B	A	B	HT	A	B
Primary structural frame ^f (see Section 202)	3 ^{a, b}	2 ^{a, b, c}	1 ^{b, c}	0 ^c	1 ^{b, c}	0	HT	1	0
Bearing walls									
Exterior ^{e, f}	3	2	1	0	2	2	2	1	0
Interior	3 ^a	2 ^a	1	0	1	0	1/HT	1	0
Nonbearing walls and partitions Exterior	See Table 705.5								
Nonbearing walls and partitions Interior ^d	0	0	0	0	0	0	See Section 2304.11.2	0	0
Floor construction and associated secondary members (see Section 202)	2	2	1	0	1	0	HT	1	0
Roof construction and associated secondary members (see Section 202)	1 ^{1/2} ^b	1 ^{b,c}	1 ^{b,c}	0 ^c	1 ^{b,c}	0	HT	1 ^{b,c}	0

For SI: 1 foot = 304.8 mm.

- a. Roof supports: Fire-resistance ratings of primary structural frame and bearing walls are permitted to be reduced by 1 hour where supporting a roof only.
- b. Where every part of the roof construction is 20 feet or more above the floor or mezzanine immediately below, fire protection of structural members in roof construction shall not be required, including protection of primary structural frame members, roof framing and decking, except where any of the following conditions apply.
 - 1. In Group F-1, H, M and S-1 occupancies.
 - 2. Where the roof is an occupiable space.

Fire-retardant-treated wood members shall be allowed to be used for such unprotected members.
- c. In all occupancies, heavy timber complying with Section 2304.11 shall be allowed for roof construction, including primary structural frame members, where a 1-hour or less fire-resistance rating is required.
- d. Not less than the fire-resistance rating required by other sections of this code.
- e. Not less than the fire-resistance rating based on fire separation distance (see Table 705.5).

f. Not less than the fire-resistance rating as referenced in Section 704.10.

601.1 Scope

The provisions of this chapter shall control the classification of buildings as to type of construction.

Section 602 Construction Classification

602.1 General

Buildings and structures erected or to be erected, altered or extended in height or area shall be classified in one of the five construction types defined in Sections 602.2 through 602.5. The building elements shall have a *fire-resistance rating* not less than that specified in Table 601 and exterior walls shall have a *fire-resistance rating* not less than that specified in Table 705.5. Where required to have a *fire-resistance rating* by Table 601, building elements shall comply with the applicable provisions of Section 703.2. The protection of openings, ducts and air transfer openings in building elements shall not be required unless required by other provisions of this code.

602.1.1 Minimum Requirements

A building or portion thereof shall not be required to conform to the details of a type of construction higher than that type which meets the minimum requirements based on occupancy even though certain features of such a building actually conform to a higher type of construction.

602.2 Types I and II

Types I and II construction are those types of construction in which the building elements listed in Table 601 are of noncombustible materials, except as permitted in Section 603 and elsewhere in this code.

602.3 Type III

Type III construction is that type of construction in which the exterior walls are of noncombustible materials and the interior building elements are of any material permitted by this code. *Fire-retardant-treated wood* framing complying with Section 2303.2 shall be permitted within *exterior wall* assemblies of a 2-hour rating or less.

602.4 Type IV

Type IV construction is that type of construction in which the exterior walls are of noncombustible materials and the interior building elements are of solid wood, laminated wood, heavy timber (HT) or structural composite lumber (SCL) without concealed spaces. The minimum dimensions for permitted materials including solid timber, glued-laminated timber, structural composite lumber (SCL) and cross-laminated timber and details of Type IV construction shall comply with the provisions of this section and Section 2304.11. Exterior walls complying with Section 602.4.1 or 602.4.2 shall be permitted. Interior walls and partitions not less than 1-hour fire-resistance rating or heavy timber complying with Section 2304.11.2.2 shall be permitted.

602.4.1 Fire-Retardant-Treated Wood in Exterior Walls

Fire-retardant-treated wood framing and sheathing complying with Section 2303.2 shall be permitted within exterior wall assemblies with a 2-hour rating or less.

602.4.2 Cross-Laminated Timber in Exterior Walls

Cross-laminated timber not less than 4 inches (102 mm) in thickness complying with Section 2303.1.4 shall be permitted within exterior wall assemblies with a 2-hour rating or less. Heavy timber structural members appurtenant to the CLT exterior wall shall meet the requirements of Table 2304.11 and be fire-resistance rated as required for the exterior wall. The exterior surface of the cross-laminated timber and heavy timber elements shall be protected by one of the following:

1. *Fire-retardant-treated wood* sheathing complying with Section 2303.2 and not less than $\frac{15}{32}$ inch (12 mm) thick;
2. *Gypsum board* not less than $\frac{1}{2}$ inch (12.7 mm) thick; or
3. A noncombustible material.

602.4.3 Exterior Structural Members

Where a horizontal separation of 20 feet (6096 mm) or more is provided, wood columns and arches conforming to heavy timber sizes complying with Section 2304.11 shall be permitted to be used externally.

602.5 Type V

Type V construction is that type of construction in which the structural elements, *exterior walls* and interior walls are of any materials permitted by this code.

Section 603 Combustible Material in Types I and II Construction**603.1 Allowable Materials**

Combustible materials shall be permitted in buildings of Type I or II construction in the following applications and in accordance with Sections 603.1.1 through 603.1.3:

1. *Fire-retardant-treated wood* shall be permitted in:
 - 1.1. Nonbearing partitions where the required *fire-resistance rating* is 2 hours or less.
 - 1.2. Nonbearing *exterior walls* where fire-resistance-rated construction is not required.
 - 1.3. Roof construction, including girders, trusses, framing and decking.

Exception: In buildings of Type IA construction exceeding two stories *above grade plane*, *fire-retardant-treated wood* is not permitted in roof construction where the vertical distance from the upper floor to the roof is less than 20 feet (6096 mm).

2. Thermal and acoustical insulation, other than foam plastics, having a *flame spread index* of not more than 25.

Exceptions:

1. Insulation placed between two layers of noncombustible materials without an intervening airspace shall be allowed to have a *flame spread index* of not more than 100.
2. Insulation installed between a finished floor and solid decking without intervening airspace shall be allowed to have a *flame spread index* of not more than 200.
3. Foam plastics in accordance with Chapter 26.
4. Roof coverings that have an A, B or C classification.
5. *Interior floor finish* and floor covering materials installed in accordance with Section 804.
6. Millwork such as doors, door frames, window sashes and frames.
7. *Interior wall and ceiling finishes* installed in accordance with Sections 801 and 803.
8. *Trim* installed in accordance with Section 806.
9. Where not installed greater than 15 feet (4572 mm) above grade, show windows, nailing or furring strips and wooden bulkheads below show windows, including their frames, aprons and show cases.
10. Finish flooring installed in accordance with Section 805.

11. Partitions dividing portions of stores, offices or similar places occupied by one tenant only and that do not establish a *corridor* serving an *occupant load* of 30 or more shall be permitted to be constructed of *fire-retardant-treated wood*, 1-hour fire-resistance-rated construction or of wood panels or similar light construction up to 6 feet (1829 mm) in height.
12. Stages and platforms constructed in accordance with Sections 410.3 and 410.4, respectively.
13. Combustible *exterior wall coverings*, balconies and similar projections and bay or oriel windows in accordance with Chapter 14.
14. Blocking such as for handrails, millwork, cabinets and window and door frames.
15. Light-transmitting plastics as permitted by Chapter 26.
16. Mastics and caulking materials applied to provide flexible seals between components of *exterior wall* construction.
17. Exterior plastic veneer installed in accordance with Section 2605.2.
18. Nailing or furring strips as permitted by Section 803.13.
19. Heavy timber as permitted by Note c to Table 601 and Sections 602.4.3 and 1406.3.
20. Aggregates, component materials and admixtures as permitted by Section 703.2.1.2.
21. Sprayed fire-resistive materials *intumescent fire-resistive materials*, determined on the basis of *fire resistance* tests in accordance with Section 703.2.
22. Materials used to protect penetrations in fire-resistance-rated assemblies in accordance with Section 714.
23. Materials used to protect joints in fire-resistance-rated assemblies in accordance with Section 715.
24. Materials allowed in the concealed spaces of buildings of Types I and II construction in accordance with Section 718.5.
25. Materials exposed within plenums complying with Section 602 of the *Florida Building Code, Mechanical*.
26. Wall construction of freezers and coolers of less than 1,000 square feet (92.9 m²), in size, lined on both sides with noncombustible materials and the building is protected throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

603.1.1 Ducts

The use of nonmetallic ducts shall be permitted where installed in accordance with the limitations of the *Florida Building Code, Mechanical*.

603.1.2 Piping

The use of combustible piping materials shall be permitted where installed in accordance with the limitations of the *Florida Building Code, Mechanical* and the *Florida Building Code, Plumbing*.

603.1.3 Electrical

The use of electrical wiring methods with combustible insulation, tubing, raceways and related components shall be permitted where installed in accordance with the limitations of this code.

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Chapter 7 Fire and Smoke Protection Features

Section 701 General

701.1 Scope

The provisions of this chapter shall govern the materials, systems and assemblies used for structural *fire resistance* and fire-resistance-rated construction separation of adjacent spaces to safeguard against the spread of fire and smoke within a building and the spread of fire to or from buildings.

701.2 Multiple Use Fire Assemblies

Fire assemblies that serve multiple purposes in a building shall comply with all of the requirements that are applicable for each of the individual fire assemblies.

Section 702 Definitions

702.1 Definitions

The following terms are defined in Chapter 2:

ANNULAR SPACE.

BUILDING ELEMENT.

CEILING RADIATION DAMPER.

COMBINATION FIRE/SMOKE DAMPER.

CORRIDOR DAMPER.

DAMPER.

DRAFTSTOP

F RATING.

FIRE BARRIER.

FIRE DAMPER.

FIRE DOOR.

FIRE DOOR ASSEMBLY.

FIRE PARTITION.

FIRE PROTECTION RATING.

FIRE-RATED GLAZING.

FIRE RESISTANCE.

FIRE-RESISTANCE RATING.

FIRE-RESISTANT JOINT SYSTEM.

FIRE SEPARATION DISTANCE.

FIRE WALL.

FIRE WINDOW ASSEMBLY.

FIREBLOCKING.

FLOOR FIRE DOOR ASSEMBLY.

HORIZONTAL ASSEMBLY.**JOINT.****L RATING.****MEMBRANE PENETRATION.****MEMBRANE-PENETRATION FIRESTOP.****MEMBRANE-PENETRATION FIRESTOP SYSTEM.****MINERAL FIBER.****MINERAL WOOL.****PENETRATION FIRESTOP.****SELF-CLOSING.****SHAFT.****SHAFT ENCLOSURE.****SMOKE BARRIER.****SMOKE COMPARTMENT.****SMOKE DAMPER.****SPLICE.****T RATING.****THROUGH PENETRATION.****THROUGH-PENETRATION FIRESTOP SYSTEM.****Section 703 Fire-Resistance Ratings and Fire Tests****703.1 Scope**

Materials prescribed herein for *fire resistance* shall conform to the requirements of this chapter.

703.2 Fire-Resistance Ratings

The *fire-resistance* of building elements, components or assemblies shall be determined in accordance with Sections 703.2.1 or 703.2.2 without the use of automatic sprinklers or any other fire suppression system being incorporated, or in accordance with Section 703.2.3.

703.2.1 Tested Assemblies

A fire-resistance rating of building elements, components or assemblies shall be determined by the test procedures set forth in ASTM E119 or UL 263. The *fire-resistance rating* of penetrations and fire-resistant joint systems shall be determined in accordance with Sections 714 and 715, respectively.

703.2.1.1 Nonsymmetrical Wall Construction

Interior walls and partitions of nonsymmetrical construction shall be tested with both faces exposed to the furnace, and the assigned *fire-resistance rating* shall be the shortest duration obtained from the two tests conducted in compliance with ASTM E119 or UL 263.

Where evidence is furnished to show that the wall was tested with the least fire-resistant side exposed to the furnace, subject to acceptance of the *building official*, the wall need not be subjected to tests from the opposite side (see Section 705.5 for *exterior walls*).

703.2.1.2 Combustible Components

Combustible aggregates are permitted in gypsum and Portland cement concrete mixtures for fire-resistance-rated construction. Any component material or admixture is permitted in assemblies if the resulting tested assembly meets the fire-resistance test requirements of this code.

703.2.1.3 Restrained Classification

Fire-resistance-rated assemblies tested under ASTM E119 or UL 263 shall not be considered to be restrained unless evidence satisfactory to the *building official* is furnished by the *registered design professional* showing that the construction qualifies for a restrained classification in accordance with ASTM E119 or UL 263. Restrained construction shall be identified on the *construction documents*.

703.2.1.4 Supplemental Features

Where materials, systems or devices that have not been tested as part of a fire-resistance-rated assembly are incorporated into the building element, component or assembly, sufficient data shall be made available to the *building official* to show that the required *fire-resistance rating* is not reduced.

703.2.1.5 Exterior Bearing Walls

In determining the *fire-resistance rating* of exterior bearing walls, compliance with the ASTM E119 or UL 263 criteria for unexposed surface temperature rise and ignition of cotton waste due to passage of flame or gases is required only for a period of time corresponding to the required *fire-resistance rating* of an exterior nonbearing wall with the same *fire separation distance*, and in a building of the same group. Where the *fire-resistance rating* determined in accordance with this exception exceeds the *fire-resistance rating* determined in accordance with ASTM E119 or UL 263, the fire exposure time period, water pressure and application duration criteria for the hose stream test of ASTM E119 or UL 263 shall be based on the *fire-resistance rating* determined in accordance with this section.

703.2.2 Analytical Methods

The fire resistance of building elements, components or assemblies established by an analytical method shall be by any of the methods listed in this section based on the fire exposure and acceptance criteria specified in ASTM E119 or UL 263.

1. Fire-resistance designs documented in approved sources.
2. Prescriptive designs of fire-resistance-rated building elements, components or assemblies as prescribed in Section 721.
3. Calculations in accordance with Section 722.
4. Engineering analysis based on a comparison of building element, component or assemblies designs having *fire-resistance ratings* as determined by the test procedures set forth in ASTM E119 or UL 263.
5. Fire-resistance designs certified by an approved agency.

703.2.3 Approved Alternative Method

The fire resistance of building elements, components or assemblies not complying with Sections 703.2.1 or 703.2.2 shall be permitted to be established by an alternative protection method in accordance with Section 104.11.

703.3

Reserved.

703.4

Reserved.

703.5 Noncombustibility Tests

The tests indicated in Section 703.5.1 shall serve as criteria for acceptance of building materials as set forth in Sections 602.2, 602.3 and 602.4 in Type I, II, III and IV construction. The term "noncombustible" does not apply to the flame spread characteristics of *interior finish* or *trim* materials. A material shall not be classified as a noncombustible building construction material if it is subject to an increase in combustibility or flame spread beyond the limitations herein established through the effects of age, moisture or other atmospheric conditions.

703.5.1 Noncombustible Materials

Materials required to be noncombustible shall be tested in accordance with ASTM E136. Alternately, materials required to be noncombustible shall be tested in accordance with ASTM E2652 using the acceptance criteria prescribed by ASTM E136.

Exception: Materials having a structural base of noncombustible material as determined in accordance with ASTM E136, or with ASTM E2652 using the acceptance criteria prescribed by ASTM E136, with a surfacing of not more than 0.125 inch (3.18 mm) in thickness having a flame spread index not greater than 50 when tested in accordance with ASTM E84 or UL 723 shall be acceptable as noncombustible.

703.6 Fire-Resistance-Rated Glazing

Fire-resistance-rated glazing, when tested in accordance with ASTM E119 or UL 263 and complying with the requirements of Section 707, shall be permitted. Fire-resistance-rated glazing shall bear a *label* marked in accordance with Table 716.3 issued by an agency and shall be permanently identified on the glazing.

703.7 Marking and Identification

Where there is an accessible concealed floor, floor-ceiling or *attic* space, *fire walls*, *fire barriers*, *fire partitions*, *smoke barriers* and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling in the concealed space. Such identification shall:

1. Be located within 15 feet (4572 mm) of the end of each wall and at intervals not exceeding 30 feet (9144 mm) measured horizontally along the wall or partition.
2. Include lettering not less than 3 inches (76 mm) in height with a minimum $\frac{3}{8}$ -inch (9.5 mm) stroke in a contrasting color incorporating the suggested wording, "FIRE AND/OR SMOKE BARRIER—PROTECT ALL OPENINGS," or other wording.

Section 704 Fire-Resistance Rating of Structural Members

704.1 Requirements

The *fire-resistance ratings* of structural members and assemblies shall comply with this section and the requirements for the type of construction as specified in Table 601. The *fire-resistance ratings* shall be not less than the ratings required for the fire-resistance-rated assemblies supported by the structural members.

Exception: *Fire barriers*, *fire partitions*, *smoke barriers* and *horizontal assemblies* as provided in Sections 707.5, 708.4, 709.4 and 711.2, respectively.

704.2 Column Protection

Where columns are required to have protection to achieve a *fire-resistance rating*, the entire column shall be provided individual encasement protection by protecting it on all sides for the full column height, including connections to other structural members, with materials having the required *fire-resistance rating*. Where the column extends through a ceiling, the encasement protection shall be continuous from the top of the foundation or floor/ceiling assembly below through the ceiling space to the top of the column.

704.3 Protection of the Primary Structural Frame Other Than Columns

Members of the primary structural frame other than columns that are required to have protection to achieve a *fire-resistance rating* and support more than two floors or one floor and roof, or support a load-bearing wall or a nonload-bearing wall more than two stories high, shall be provided individual encasement protection by protecting them on all sides for the full length, including connections to other structural members, with materials having the required *fire-resistance rating*.

Exception: Individual encasement protection on all sides shall be permitted on all exposed sides provided the extent of protection is in accordance with the required *fire-resistance rating*, as determined in Section 703.

704.4 Protection of Secondary Members

Secondary members that are required to have protection to achieve a *fire-resistance rating* shall be protected by individual encasement protection.

704.4.1 Light-Frame Construction

Studs and boundary elements that are integral elements in *load-bearing walls* of light-frame construction shall be permitted to have required *fire-resistance ratings* provided by the membrane protection provided for the *load-bearing wall*.

704.4.2 Horizontal Assemblies

Horizontal assemblies are permitted to be protected with a membrane or ceiling where the membrane or ceiling provides the required *fire-resistance rating* and is installed in accordance with Section 711.

704.5 Truss Protection

The required thickness and construction of fire-resistance-rated assemblies enclosing trusses shall be based on the results of full-scale tests or combinations of tests on truss components or on *approved* calculations based on such tests that satisfactorily demonstrate that the assembly has the required *fire resistance*.

704.6 Attachments to Structural Members

The edges of lugs, brackets, rivets and bolt heads attached to structural members shall be permitted to extend to within 1 inch (25 mm) of the surface of the fire protection.

704.6.1 Secondary Attachments to Structural Members

Where primary and secondary structural steel members require fire protection, any additional structural steel members having direct connection to the primary structural frame or secondary structural members shall be protected with the same fire-resistive material and thickness as required for the structural member. The protection shall extend away from the structural member a distance of not less than 12 inches (305 mm), or shall be applied to the entire length where the attachment is less than 12 inches (305 mm) long. Where an attachment is hollow and the ends are open, the fire-resistive material and thickness shall be applied to both exterior and interior of the hollow steel attachment.

704.7 Reinforcing

Thickness of protection for concrete or masonry reinforcement shall be measured to the outside of the reinforcement except that stirrups and spiral reinforcement ties are permitted to project not more than 0.5-inch (12.7 mm) into the protection.

704.8 Embedments and Enclosures

Pipes, wires, conduits, ducts or other service facilities shall not be embedded in the required fire protective covering of a structural member that is required to be individually encased.

704.9 Impact Protection

Where the fire protective covering of a structural member is subject to impact damage from moving vehicles, the handling of merchandise or other activity, the fire protective covering shall be protected by corner guards or by a substantial jacket of metal or other noncombustible material to a height adequate to provide full protection, but not less than 5 feet (1524 mm) from the finished floor.

Exception: Corner protection is not required on concrete columns in open or enclosed parking garages.

704.10 Exterior Structural Members

Load-bearing structural members located within the *exterior walls* or on the outside of a building or structure shall be provided with the highest *fire-resistance rating* as determined in accordance with the following:

1. As required by Table 601 for the type of building element based on the type of construction of the building;
2. As required by Table 601 for exterior bearing walls based on the type of construction; and
3. As required by Table 705.5 for *exterior walls* based on the *fire separation distance*.

704.11 Bottom Flange Protection

Fire protection is not required at the bottom flange of lintels, shelf angles and plates, spanning not more than 6 feet 4 inches (1931 mm) whether part of the primary structural frame or not, and from the bottom flange of lintels, shelf angles and plates not part of the structural frame, regardless of span.

704.12 Seismic Isolation Systems

Reserved.

704.13 Sprayed Fire-Resistive Materials (SFRM)

Sprayed fire-resistive materials (SFRM) shall comply with Sections 704.13.1 through 704.13.5.

704.13.1 Fire-Resistance Rating

The application of SFRM shall be consistent with the *fire-resistance rating* and the listing, including, but not limited to, minimum thickness and dry density of the applied SFRM, method of application, substrate surface conditions and the use of bonding adhesives, sealants, reinforcing or other materials.

704.13.2 Manufacturer's Installation Instructions

The application of SFRM shall be in accordance with the manufacturer's installation instructions. The instructions shall include, but are not limited to, substrate temperatures and surface conditions and SFRM handling, storage, mixing, conveyance, method of application, curing and ventilation.

704.13.3 Substrate Condition

The SFRM shall be applied to a substrate in compliance with Sections 704.13.3.1 through 704.13.3.2.

704.13.3.1 Surface Conditions

Substrates to receive SFRM shall be free of dirt, oil, grease, release agents, loose scale and any other condition that prevents adhesion. The substrates shall be free of primers, paints and encapsulants other than those fire tested and *listed* by a nationally recognized testing agency. Primed, painted or encapsulated steel shall be allowed, provided that testing has demonstrated that required adhesion is maintained.

704.13.3.2 Primers, Paints and Encapsulants

Where the SFRM is to be applied over primers, paints or encapsulants other than those specified in the listing, the material shall be field tested in accordance with ASTM E736. Where testing of the SFRM with primers, paints or encapsulants demonstrates that required adhesion is maintained, SFRM shall be permitted to be applied to primed, painted or encapsulated wide flange steel shapes in accordance with the following conditions:

1. The beam flange width does not exceed 12 inches (305 mm); or
2. The column flange width does not exceed 16 inches (400 mm); or
3. The beam or column web depth does not exceed 16 inches (400 mm).
4. The average and minimum bond strength values shall be determined based on a minimum of five bond tests conducted in accordance with ASTM E736. Bond tests conducted in accordance with ASTM E736 shall indicate an average bond strength of not less than 80 percent and an individual bond strength of not less than 50 percent, when compared to the bond strength of the SFRM as applied to clean uncoated $\frac{1}{8}$ -inch-thick (3.2 mm) steel plate.

704.13.4 Temperature

A minimum ambient and substrate temperature of 40°F (4.44°C) shall be maintained during and for not fewer than 24 hours after the application of the SFRM, unless the manufacturer's instructions allow otherwise.

704.13.5 Finished Condition

The finished condition of SFRM applied to structural members or assemblies shall not, upon complete drying or curing, exhibit cracks, voids, spalls, delamination or any exposure of the substrate. Surface irregularities of SFRM shall be deemed acceptable.

Section 705 Exterior Walls

705.1 General

Exterior walls shall comply with this section.

705.2 Projections

Cornices, eave overhangs, exterior balconies and similar projections extending beyond the exterior wall shall conform to the requirements of this section and Section 1406. Exterior egress balconies and exterior exit stairways and ramps shall comply with Sections 1021 and 1027, respectively. Projections shall not extend any closer to the line used to determine the fire separation distance than shown in Table 705.2.

Exception: Buildings on the same lot and considered as portions of one building in accordance with Section 705.3 are not required to comply with this section for projections between the buildings.

TABLE 705.2**MINIMUM DISTANCE OF PROJECTION**

FIRE SEPARATION DISTANCE (FSD) (feet)	MINIMUM DISTANCE FROM LINE USED TO DETERMINE FSD
0 to less than 2	Projections not permitted
2 to less than 3	24 inches
3 to less than 5	Two-thirds the FSD
5 or greater	40 inches

For SI: 1 foot = 304.8 mm; 1 inch = 25.4 mm.

705.2.1 Type I and II Construction

Projections from walls of Type I or II construction shall be of noncombustible materials or combustible materials as allowed by Sections 1406.3 and 1406.4.

705.2.2 Type III, IV or V Construction

Projections from walls of Type III, IV or V construction shall be of any *approved* material.

705.2.3 Projection Protection

Projections extending to within 5 feet (1524 mm) of the line used to determine the fire separation distance shall be one of the following:

1. Noncombustible materials.
2. Combustible materials of not less than 1-hour fireresistance-rated construction.
3. Heavy timber construction complying with Section 2304.11.
4. Fire-retardant-treated wood.
5. As permitted by Section 1406.3.

Exception: Type VB construction shall be allowed for combustible projections in Group R-3 and U occupancies with a fire separation distance greater than or equal to 5 feet (1524 mm).

705.3 Buildings on the Same Lot

For the purposes of determining the required wall and opening protection, projections and roof-covering requirements, buildings on the same lot shall be assumed to have an imaginary line between them.

Where a new building is to be erected on the same lot as an existing building, the location of the assumed imaginary line with relation to the existing building shall be such that the *exterior wall* and opening protection of the existing building meet the criteria as set forth in Sections 705.5 and 705.8.

Exceptions:

1. Two or more buildings on the same lot shall be either regulated as separate buildings or shall be considered as portions of one building if the aggregate area of such buildings is within the limits specified in Chapter 5 for a single building. Where the buildings contain different occupancy groups or are of different types of construction, the area shall be that allowed for the most restrictive occupancy or construction.

2. Where an S-2 parking garage of Construction Type I or IIA is erected on the same lot as a Group R-2 building, and there is no *fire separation distance* between these buildings, then the adjoining *exterior walls* between the buildings are permitted to have occupant use openings in accordance with Section 706.8. However, opening protectives in such openings shall only be required in the exterior wall of the S-2 parking garage, not in the exterior wall openings in the R-2 building, and these opening protectives in the exterior wall of the S-2 parking garage shall be not less than 1 $\frac{1}{2}$ -hour *fire protection rating*.

705.4 Materials

Exterior walls shall be of materials permitted by the building type of construction.

705.5 Fire-Resistance Ratings

Exterior walls shall be fire-resistance rated in accordance with Table 601 based on the type of construction and Table 705.5 based on the fire separation distance. The required *fire-resistance rating* of *exterior walls* with a *fire separation distance* of greater than 10 feet (3048 mm) shall be rated for exposure to fire from the inside. The required *fire-resistance rating* of *exterior walls* with a *fire separation distance* of less than or equal to 10 feet (3048 mm) shall be rated for exposure to fire from both sides.

TABLE 705.5

FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE^{a, d, g}

FIRE SEPARATION DISTANCE = X (feet)	TYPE OF CONSTRUCTION	OCCUPANCY GROUP H ^e	OCCUPANCY GROUP F-1, M, S-1 ^f	OCCUPANCY GROUP A, B, E, F-2, I, R, S-2, U ^h
X < 5 ^b	All	3	2	1
5 ≤ X < 10	IA	3	2	1
	Others	2	1	1
10 ≤ X < 30	IA, IB	2	1	1 ^c
	IIB, VB	1	0	0
	Others	1	1	1 ^c
X ≥ 30	All	0	0	0

For SI: 1 foot = 304.8 mm.

- a. Load-bearing exterior walls shall also comply with the fire-resistance rating requirements of Table 601.
- b. See Section 706.1.1 for party walls.
- c. Open parking garages complying with Section 406 shall not be required to have a fire-resistance rating.
- d. The fire-resistance rating of an exterior wall is determined based upon the fire separation distance of the exterior wall and the story in which the wall is located.
- e. For special requirements for Group H occupancies, see Section 415.6.
- f. For special requirements for Group S aircraft hangars, see Section 412.4.1.
- g. Where Table 705.8 permits nonbearing exterior walls with unlimited area of unprotected openings, the required fire-resistance rating for the exterior walls is 0 hours.

- h. For a building containing only a Group U occupancy private garage or carport, the exterior wall shall not be required to have a fire-resistance rating where the fire separation distance is 5 feet (1523 mm) or greater.

705.6 Structural Stability

Exterior walls shall extend to the height required by Section 705.11. Interior structural elements that brace the exterior wall but that are not located within the plane of the exterior wall shall have the minimum *fire-resistance rating* required in Table 601 for that structural element. Structural elements that brace the exterior wall but are located outside of the exterior wall or within the plane of the exterior wall shall have the minimum *fire-resistance rating* required in Tables 601 and 705.5 for the exterior wall.

705.7 Unexposed Surface Temperature

Where protected openings are not limited by Section 705.8, the limitation on the rise of temperature on the unexposed surface of *exterior walls* as required by ASTM E119 or UL 263 shall not apply. Where protected openings are limited by Section 705.8, the limitation on the rise of temperature on the unexposed surface of *exterior walls* as required by ASTM E119 or UL 263 shall not apply provided that a correction is made for radiation from the unexposed *exterior wall* surface in accordance with the following formula:

$$A_e = A + (A_f \times F_{eo})$$

(Equation 7-1)

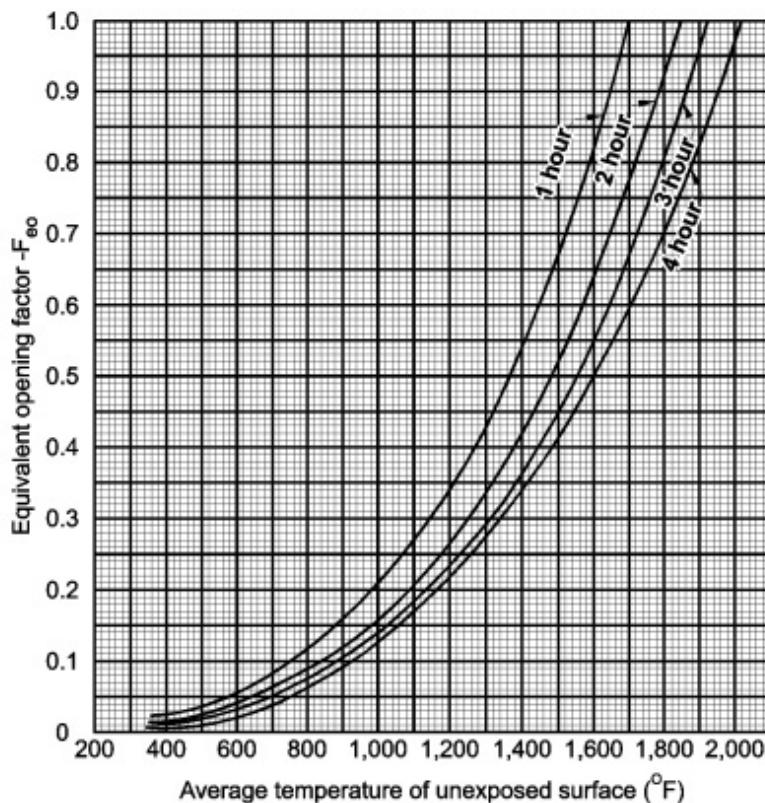
where:

A_e = Equivalent area of protected openings.

A = Actual area of protected openings.

A_f = Area of *exterior wall* surface in the story under consideration exclusive of openings, on which the temperature limitations of ASTM E119 or UL 263 for walls are exceeded.

F_{eo} = An "equivalent opening factor" derived from Figure 705.7 based on the average temperature of the unexposed wall surface and the *fire-resistance rating* of the wall.



For SI: °C = [(°F) - 32] / 1.8.

FIGURE 705.7

EQUIVALENT OPENING FACTOR**705.8 Openings**

Openings in *exterior walls* shall comply with Sections 705.8.1 through 705.8.6.

TABLE 705.8**MAXIMUM AREA OF EXTERIOR WALL OPENINGS BASED ON FIRE SEPARATION DISTANCE AND DEGREE OF OPENING PROTECTION**

FIRE SEPARATION DISTANCE (feet)	DEGREE OF OPENING PROTECTION	ALLOWABLE AREA^a
0 to less than 3 ^{b, c, k}	Unprotected, Nonsprinklered (UP, NS)	Not Permitted ^k
	Unprotected, Sprinklered (UP, S) ⁱ	Not Permitted ^k
	Protected (P)	Not Permitted ^k
3 to less than 5 ^{d, e}	Unprotected, Nonsprinklered (UP, NS)	Not Permitted
	Unprotected, Sprinklered (UP, S) ⁱ	15%
	Protected (P)	15%
5 to less than 10 ^{e, f, j}	Unprotected, Nonsprinklered (UP, NS)	10% ^h
	Unprotected, Sprinklered (UP, S) ⁱ	25%
	Protected (P)	25%
10 to less than 15 ^{e, f, g, j}	Unprotected, Nonsprinklered (UP, NS)	15% ^h
	Unprotected, Sprinklered (UP, S) ⁱ	45%
	Protected (P)	45%
15 to less than 20 ^{f, g, j}	Unprotected, Nonsprinklered (UP, NS)	25%
	Unprotected, Sprinklered (UP, S) ⁱ	75%
	Protected (P)	75%
20 to less than 25 ^{f, g, j}	Unprotected, Nonsprinklered (UP, NS)	45%
	Unprotected, Sprinklered (UP, S) ⁱ	No Limit
	Protected (P)	No Limit
25 to less than 30 ^{f, g, j}	Unprotected, Nonsprinklered (UP, NS)	70%
	Unprotected, Sprinklered (UP, S) ⁱ	No Limit
	Protected (P)	No Limit
30 or greater	Unprotected, Nonsprinklered (UP, NS)	No Limit
	Unprotected, Sprinklered (UP, S) ⁱ	No Limit
	Protected (P)	No Limit

For SI: 1 foot = 304.8 mm.

UP, NS = Unprotected openings in buildings not equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.

UP, S = Unprotected openings in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.

P = Openings protected with an opening protective assembly in accordance with Section 705.8.2.

- a. Values indicated are the percentage of the area of the exterior wall, per story.
- b. For the requirements for fire walls of buildings with differing heights, see Section 706.6.1.
- c. For openings in a fire wall for buildings on the same lot, see Section 706.8.
- d. The maximum percentage of unprotected and protected openings shall be 25 percent for Group R-3 occupancies.
- e. Unprotected openings shall not be permitted for openings with a fire separation distance of less than 15 feet for Group H-2 and H-3 occupancies.
- f. The area of unprotected and protected openings shall not be limited for Group R-3 occupancies, with a fire separation distance of 5 feet or greater.
- g. The area of openings in an open parking structure with a fire separation distance of 10 feet or greater shall not be limited.
- h. Includes buildings accessory to Group R-3.
- i. Not applicable to Group H-1, H-2 and H-3 occupancies.
- j. The area of openings in a building containing only a Group U occupancy private garage or carport with a fire separation distance of 5 feet (1523 mm) or greater shall not be limited.
- k. For openings between S-2 parking garage and Group R-2 building, see Section 705.3, Exception 2.

705.8.1 Allowable Area of Openings

The maximum area of unprotected and protected openings permitted in an *exterior wall* in any story of a building shall not exceed the percentages specified in Table 705.8.

Exceptions:

1. In other than Group H occupancies, unlimited unprotected openings are permitted in the first story above grade plane either:
 - 1.1. Where the wall faces a street and has a *fire separation distance* of more than 15 feet (4572 mm); or
 - 1.2. Where the wall faces an unoccupied space. The unoccupied space shall be on the same lot or dedicated for public use, shall be not less than 30 feet (9144 mm) in width and shall have access from a street by a posted fire lane in accordance with the *Florida Fire Prevention Code*.
2. Buildings whose exterior bearing walls, exterior nonbearing walls and exterior primary structural frame are not required to be fire-resistance rated shall be permitted to have unlimited unprotected openings.

705.8.2 Protected Openings

Where openings are required to be protected, *opening protectives* shall comply with Section 716.

Exception: Opening protectives are not required where the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 and the exterior openings are protected by a water curtain using automatic sprinklers *approved for*

705.8.3 Unprotected Openings

Where unprotected openings are permitted, windows and doors shall be constructed of any *approved* materials. Glazing shall conform to the requirements of Chapters 24 and 26.

705.8.4 Mixed Openings

Where both unprotected and protected openings are located in the *exterior wall* in any story of a building, the total area of openings shall be determined in accordance with the following:

$$(A_p/a_p) + (A_u/a_u) \leq 1 \quad (\text{Equation 7-2})$$

where:

A_p = Actual area of protected openings, or the equivalent area of protected openings, A_e (see Section 705.7).

a_p = Allowable area of protected openings.

A_u = Actual area of unprotected openings.

a_u = Allowable area of unprotected openings.

705.8.5 Vertical Separation of Openings

Openings in *exterior walls* in adjacent *stories* shall be separated vertically to protect against fire spread on the exterior of the buildings where the openings are within 5 feet (1524 mm) of each other horizontally and the opening in the lower *story* is not a protected opening with a *fire protection rating* of not less than $\frac{3}{4}$ hour. Such openings shall be separated vertically not less than 3 feet (914 mm) by spandrel girders, *exterior walls* or other similar assemblies that have a *fire-resistance rating* of not less than 1 hour, rated for exposure to fire from both sides, or by flame barriers that extend horizontally not less than 30 inches (762 mm) beyond the *exterior wall*. Flame barriers shall have a *fire-resistance rating* of not less than 1 hour. The unexposed surface temperature limitations specified in ASTM E119 or UL 263 shall not apply to the flame barriers unless otherwise required by the provisions of this code.

Exceptions:

1. This section shall not apply to buildings that are three *stories* or less above *grade plane*.
2. This section shall not apply to buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2.
3. Open parking garages.

705.8.6 Vertical Exposure

For buildings on the same lot, opening protectives having a *fire protection rating* of not less than $\frac{3}{4}$ hour shall be provided in every opening that is less than 15 feet (4572 mm) vertically above the roof of an adjacent building or structure based on assuming an imaginary line between them. The opening protectives are required where the *fire separation distance* between the imaginary line and the adjacent building or structure is less than 15 feet (4572 mm).

Exceptions:

1. Opening protectives are not required where the roof assembly of the adjacent building or structure has a *fire-resistance rating* of not less than 1 hour for a minimum distance of 10 feet (3048 mm) from the *exterior wall* facing the imaginary line and the entire length and span of the supporting elements for the fire-resistance-rated roof assembly has a *fire-resistance rating* of not less than 1 hour.

2. Buildings on the same lot and considered as portions of one building in accordance with Section 705.3 are not required to comply with Section 705.8.6.

705.9 Joints

Joints made in or between *exterior walls* required by this section to have a *fire-resistance rating* shall comply with Section 715.

Exception: Joints in *exterior walls* that are permitted to have unprotected openings.

705.9.1 Voids

The void created at the intersection of a floor/ceiling assembly and an exterior curtain wall assembly shall be protected in accordance with Section 715.4.

705.10 Ducts and Air Transfer Openings

Penetrations by air ducts and air transfer openings in fire-resistance-rated *exterior walls* required to have protected openings shall comply with Section 717.

Exception: Foundation vents installed in accordance with this code are permitted.

705.11 Parapets

Parapets shall be provided on *exterior walls* of buildings.

Exceptions: A parapet need not be provided on an *exterior wall* where any of the following conditions exist:

1. The wall is not required to be fire-resistance rated in accordance with Table 705.5 because of *fire separation distance*.
2. The building has an area of not more than 1,000 square feet (93 m^2) on any floor.
3. Walls that terminate at roofs of not less than 2-hour fire-resistance-rated construction or where the roof, including the deck or slab and supporting construction, is constructed entirely of noncombustible materials.
4. One-hour fire-resistance-rated *exterior walls* that terminate at the underside of the roof sheathing, deck or slab, provided:
 - 4.1. Where the roof/ceiling framing elements are parallel to the walls, such framing and elements supporting such framing shall not be of less than 1-hour fire-resistance-rated construction for a width of 4 feet (1220 mm) for Groups R and U and 10 feet (3048 mm) for other occupancies, measured from the interior side of the wall.
 - 4.2. Where roof/ceiling framing elements are not parallel to the wall, the entire span of such framing and elements supporting such framing shall not be of less than 1-hour fire-resistance-rated construction.
 - 4.3. Openings in the roof shall not be located within 5 feet (1524 mm) of the 1-hour fire-resistance-rated *exterior wall* for Groups R and U and 10 feet (3048 mm) for other occupancies, measured from the interior side of the wall.
 - 4.4. The entire building shall be provided with not less than a Class B roof covering.
5. In Groups R-2 and R-3 where the entire building is provided with a Class C roof covering, the *exterior wall* shall be permitted to terminate at the underside of the roof sheathing or deck in Type III, IV and V construction, provided one or both of the following criteria is met:
 - 5.1. The roof sheathing or deck is constructed of *approved* noncombustible materials or of *fire-retardant-treated wood* for a distance of 4 feet (1220 mm).
 - 5.2. The roof is protected with 0.625-inch (16 mm) Type X gypsum board directly beneath the underside of the roof sheathing or deck, supported by not less than nominal 2-inch (51 mm) ledgers attached to the sides of the roof framing members for a minimum distance of 4 feet (1220 mm).

6. Where the wall is permitted to have not less than 25 percent of the *exterior wall* areas containing unprotected openings based on *fire separation distance* as determined in accordance with Section 705.8.

705.11.1 Parapet Construction

Parapets shall have the same *fire-resistance rating* as that required for the supporting wall, and on any side adjacent to a roof surface, shall have noncombustible faces for the uppermost 18 inches (457 mm), including counterflashing and coping materials. The height of the parapet shall be not less than 30 inches (762 mm) above the point where the roof surface and the wall intersect. Where the roof slopes toward a parapet at a slope greater than two units vertical in 12 units horizontal (16.7-percent slope), the parapet shall extend to the same height as any portion of the roof within a *fire separation distance* where protection of wall openings is required, but in no case shall the height be less than 30 inches (762 mm).

Section 706 Fire Walls

706.1 General

Each portion of a building separated by one or more *fire walls* that comply with the provisions of this section shall be considered a separate building. The extent and location of such *fire walls* shall provide a complete separation. Where a *fire wall* separates occupancies that are required to be separated by a *fire barrier* wall, the most restrictive requirements of each separation shall apply.

706.1.1 Party Walls

Any wall located on a *lot line* between adjacent buildings, which is used or adapted for joint service between the two buildings, shall be constructed as a *fire wall* in accordance with Section 706. Party walls shall be constructed without openings and shall create separate buildings.

Exception: Openings in a party wall separating an *anchor building* and a mall shall be in accordance with Section 402.4.2.2.1.

706.2 Structural Stability

Fire walls shall be designed and constructed to allow collapse of the structure on either side without collapse of the wall under fire conditions. *Fire walls* designed and constructed in accordance with NFPA 221 shall be deemed to comply with this section.

706.3 Materials

Fire walls shall be of any *approved* noncombustible materials.

Exception: Buildings of Type V construction.

706.4 Fire-Resistance Rating

Fire walls shall have a *fire-resistance rating* of not less than that required by Table 706.4.

TABLE 706.4

FIRE WALL FIRE-RESISTANCE RATINGS

GROUP	FIRE-RESISTANCE RATING (hours)
A, B, E, H-4, I, R-1, R-2, U	3 ^a
F-1, H-3 ^b , H-5, M, S-1	3
H-1, H-2	4 ^b
F-2, S-2, R-3, R-4	2

a. In Type II or V construction, walls shall be permitted to have a 2-hour *fire-resistance rating*.

b. For Group H-1, H-2 or H-3 buildings, also see Sections 415.7 and 415.8.

706.4.1 Townhouse Fire Separation

706.4.1.1

Each townhouse shall be considered a separate building and shall be separated from adjoining townhouses by a party wall complying with Section 706.1.1 or by the use of separate exterior walls meeting the requirements of Tables 601 and 705.5 for zero clearance from property lines as required for the type of construction. Separate exterior walls shall include one of the following:

1. A parapet not less than 18 inches (457 mm) above the roof line.
2. Roof sheathing of noncombustible material or fire retardant treated wood, for not less than a 4 foot (1219 mm) width on each side of the exterior dividing wall.
3. One layer of $\frac{5}{8}$ inch (15.9 mm) Type X gypsum board attached to the underside of roof decking, for not less than a 4 foot (1219 mm) width on each side of the exterior dividing wall.

706.4.1.2

When not more than three stories in height, townhouses may be separated by a single wall meeting the following requirements:

1. Such wall shall provide not less than a 2-hour fire-resistance rating. Plumbing, piping, ducts, electrical or other building services shall not be installed within or through the 2-hour wall, unless such materials and methods of penetration have been tested in accordance with Section 703.
2. Such wall shall be continuous from the foundation to the underside of the roof sheathing or shall have a parapet extending not less than 18 inches (457 mm) and no less than a 4-foot (1219 mm) width on each side of the wall shall be of noncombustible material, or fire-retardant-treated wood, or one layer of $\frac{5}{8}$ -inch (15.9 mm) Type X gypsum wallboard attached to the underside of the roof decking.
3. Each dwelling unit sharing such wall shall be designed and constructed to maintain its structural integrity independent of the unit on the opposite side of the wall.

Exception: Said wall may be penetrated by roof and floor structural members provided that the fire-resistance rating and the structural integrity of the wall is maintained.

706.5 Horizontal Continuity

Fire walls shall be continuous from *exterior wall* to *exterior wall* and shall extend not less than 18 inches (457 mm) beyond the exterior surface of *exterior walls*.

Exceptions:

1. *Fire walls* shall be permitted to terminate at the interior surface of combustible exterior sheathing or siding provided the *exterior wall* has a *fire-resistance rating* of not less than 1 hour for a horizontal distance of not less than 4 feet (1220 mm) on both sides of the *fire wall*. Openings within such *exterior walls* shall be protected by opening protectives having a *fire protection rating* of not less than $\frac{3}{4}$ hour.
2. *Fire walls* shall be permitted to terminate at the interior surface of noncombustible exterior sheathing, exterior siding or other noncombustible exterior finishes provided the sheathing, siding or other exterior noncombustible finish extends a horizontal distance of not less than 4 feet (1220 mm) on both sides of the *fire wall*.
3. *Fire walls* shall be permitted to terminate at the interior surface of noncombustible exterior sheathing where the building on each side of the *fire wall* is protected by an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 or 903.3.1.2.

706.5.1 Exterior Walls

Where the *fire wall* intersects *exterior walls*, the *fire-resistance rating* and opening protection of the *exterior walls* shall comply with one of the following:

1. The *exterior walls* on both sides of the *fire wall* shall have a 1-hour *fire-resistance rating* with $\frac{3}{4}$ -hour protection where opening protection is required by Section 705.8. The *fire-resistance rating* of the *exterior wall* shall extend not less than 4 feet (1220 mm) on each side of the intersection of the *fire wall* to *exterior wall*. *Exterior wall* intersections at *fire walls* that form an angle equal to or greater than 180 degrees (3.14 rad) do not need *exterior wall* protection.
2. Buildings or spaces on both sides of the intersecting *fire wall* shall assume to have an imaginary *lot line* at the *fire wall* and extending beyond the exterior of the *fire wall*. The location of the assumed line in relation to the *exterior walls* and the *fire wall* shall be such that the *exterior wall* and opening protection meet the requirements set forth in Sections 705.5 and 705.8. Such protection is not required for *exterior walls* terminating at *fire walls* that form an angle equal to or greater than 180 degrees (3.14 rad).

706.5.2 Horizontal Projecting Elements

Fire walls shall extend to the outer edge of horizontal projecting elements such as balconies, roof overhangs, canopies, marquees and similar projections that are within 4 feet (1220 mm) of the *fire wall*.

Exceptions:

1. Horizontal projecting elements without concealed spaces, provided the *exterior wall* behind and below the projecting element has not less than 1-hour fire-resistance-rated construction for a distance not less than the depth of the projecting element on both sides of the *fire wall*. Openings within such *exterior walls* shall be protected by opening protectives having a *fire protection rating* of not less than $\frac{3}{4}$ hour.
2. Noncombustible horizontal projecting elements with concealed spaces, provided a minimum 1-hour fire-resistance-rated wall extends through the concealed space. The projecting element shall be separated from the building by not less than 1-hour fire-resistance-rated construction for a distance on each side of the *fire wall* equal to the depth of the projecting element. The wall is not required to extend under the projecting element where the building *exterior wall* is not less than 1-hour fire-resistance rated for a distance on each side of the *fire wall* equal to the depth of the projecting element. Openings within such *exterior walls* shall be protected by opening protectives having a *fire protection rating* of not less than $\frac{3}{4}$ hour.
3. For combustible horizontal projecting elements with concealed spaces, the *fire wall* need only extend through the concealed space to the outer edges of the projecting elements. The *exterior wall* behind and below the projecting element shall be of not less than 1-hour fire-resistance-rated construction for a distance not less than the depth of the projecting elements on both sides of the *fire wall*. Openings within such *exterior walls* shall be protected by opening protectives having a fire-protection rating of not less than $\frac{3}{4}$ hour.

706.6 Vertical Continuity

Fire walls shall extend from the foundation to a termination point not less than 30 inches (762 mm) above both adjacent roofs.

Exceptions:

1. Stepped buildings in accordance with Section 706.6.1.
2. Two-hour fire-resistance-rated walls shall be permitted to terminate at the underside of the roof sheathing, deck or slab, provided:
 - 2.1. The lower roof assembly within 4 feet (1220 mm) of the wall has not less than a 1-hour *fire-resistance rating* and the entire length and span of supporting elements for the rated roof assembly has a *fire-resistance rating* of not less than 1 hour.
 - 2.2. Openings in the roof shall not be located within 4 feet (1220 mm) of the *fire wall*.
 - 2.3. Each building shall be provided with not less than a Class B roof covering.

3. Walls shall be permitted to terminate at the underside of noncombustible roof sheathing, deck or slabs where both buildings are provided with not less than a Class B roof covering. Openings in the roof shall not be located within 4 feet (1220 mm) of the *fire wall*.
4. In buildings of Type III, IV and V construction, walls shall be permitted to terminate at the underside of combustible roof sheathing or decks, provided:
 - 4.1. There are no openings in the roof within 4 feet (1220 mm) of the *fire wall*,
 - 4.2. The roof is covered with a minimum Class B roof covering, and
 - 4.3. The roof sheathing or deck is constructed of *fire-retardant-treated wood* for a distance of 4 feet (1220 mm) on both sides of the wall or the roof is protected with $\frac{5}{8}$ -inch (15.9 mm) Type X gypsum board directly beneath the underside of the roof sheathing or deck, supported by not less than 2-inch (51 mm) nominal ledgers attached to the sides of the roof framing members for a distance of not less than 4 feet (1220 mm) on both sides of the *fire wall*.
5. In buildings designed in accordance with Section 510.2, *fire walls* located above the 3-hour *horizontal assembly* required by Section 510.2, Item 1 shall be permitted to extend from the top of this *horizontal assembly*.
6. Buildings with sloped roofs in accordance with Section 706.6.2.

706.6.1 Stepped Buildings

Where a *fire wall* serves as an *exterior wall* for a building and separates buildings having different roof levels, such wall shall terminate at a point not less than 30 inches (762 mm) above the lower roof level, provided the *exterior wall* for a height of 15 feet (4572 mm) above the lower roof is not less than 1-hour fire-resistance-rated construction from both sides with openings protected by fire assemblies having a *fire protection rating* of not less than $\frac{3}{4}$ hour.

Exception: Where the *fire wall* terminates at the underside of the roof sheathing, deck or slab of the lower roof, provided:

1. The lower roof assembly within 10 feet (3048 mm) of the wall has not less than a 1-hour *fire-resistance rating* and the entire length and span of supporting elements for the rated roof assembly has a *fire-resistance rating* of not less than 1 hour.
2. Openings in the lower roof shall not be located within 10 feet (3048 mm) of the *fire wall*.

706.6.2 Buildings With Sloped Roofs

Where a *fire wall* serves as an interior wall for a building, and the roof on one side or both sides of the fire wall slopes toward the fire wall at a slope greater than two units vertical in 12 units horizontal (2:12), the *fire wall* shall extend to a height equal to the height of the roof located 4 feet (1219 mm) from the *fire wall* plus 30 inches (762 mm). In no case shall the extension of the fire wall be less than 30 inches (762 mm).

706.7 Combustible Framing in Fire Walls

Adjacent combustible members entering into a concrete or masonry *fire wall* from opposite sides shall not have less than a 4-inch (102 mm) distance between embedded ends. Where combustible members frame into hollow walls or walls of hollow units, hollow spaces shall be solidly filled for the full thickness of the wall and for a distance not less than 4 inches (102 mm) above, below and between the structural members, with noncombustible materials *approved* for fireblocking.

706.8 Openings

Each opening through a *fire wall* shall be protected in accordance with Section 716 and shall not exceed 156 square feet (15 m^2). The aggregate width of openings at any floor level shall not exceed 25 percent of the length of the wall.

Exceptions:

1. Openings are not permitted in party walls constructed in accordance with Section 706.1.1.

2. Openings shall not be limited to 156 square feet (15 m^2) where both buildings are equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1.

706.9 Penetrations

Penetrations of *fire walls* shall comply with Section 714.

706.10 Joints

Joints made in or between *fire walls* shall comply with Section 715.

706.11 Ducts and Air Transfer Openings

Ducts and air transfer openings shall not penetrate *fire walls*.

Exception: Penetrations by ducts and air transfer openings of *fire walls* that are not on a *lot line* shall be allowed provided the penetrations comply with Section 717. The size and aggregate width of all openings shall not exceed the limitations of Section 706.8.

Section 707 Fire Barriers

707.1 General

Fire barriers installed as required elsewhere in this code or the *Florida Fire Prevention Code* shall comply with this section.

707.2 Materials

Fire barriers shall be of materials permitted by the building type of construction.

707.3 Fire-Resistance Rating

The *fire-resistance rating* of *fire barriers* shall comply with this section.

707.3.1 Shaft Enclosures

The *fire-resistance rating* of the *fire barrier* separating building areas from a shaft shall comply with Section 713.4.

707.3.2 Interior Exit Stairway and Ramp Construction

The *fire-resistance rating* of the *fire barrier* separating building areas from an *interior exit stairway* or *ramp* shall comply with Section 1023.1.

707.3.3 Enclosures for Exit Access Stairways

The *fire-resistance rating* of the *fire barrier* separating building areas from an *exit access stairway* or *ramp* shall comply with Section 713.4.

707.3.4 Exit Passageway

The *fire-resistance rating* of the *fire barrier* separating building areas from an *exit passageway* shall comply with Section 1024.3.

707.3.5 Horizontal Exit

The *fire-resistance rating* of the separation between building areas connected by a horizontal *exit* shall comply with Section 1026.1.

707.3.6 Atriums

The *fire-resistance rating* of the *fire barrier* separating atriums shall comply with Section 404.6.

707.3.7 Incidental Uses

The *fire barrier* separating incidental uses from other spaces in the building shall have a *fire-resistance rating* of not less than that indicated in Table 509.1.

707.3.8 Control Areas

Fire barriers separating *control areas* shall have a *fire-resistance rating* of not less than that required in Section 414.2.4.

707.3.9 Separated Occupancies

Where the provisions of Section 508.4 are applicable, the *fire barrier* separating mixed occupancies shall have a *fire-resistance rating* of not less than that indicated in Table 508.4 based on the occupancies being separated.

707.3.10 Fire Areas

The *fire barriers* or *horizontal assemblies*, or both, separating a single occupancy into different *fire areas* shall have a *fire-resistance rating* of not less than that indicated in Table 707.3.10. The *fire barriers* or *horizontal assemblies*, or both, separating *fire areas* of mixed occupancies shall have a *fire-resistance rating* of not less than the highest value indicated in Table 707.3.10 for the occupancies under consideration.

TABLE 707.3.10

FIRE-RESISTANCE RATING REQUIREMENTS FOR FIRE BARRIER ASSEMBLIES OR HORIZONTAL ASSEMBLIES BETWEEN FIRE AREAS

OCCUPANCY GROUP	FIRE-RESISTANCE RATING (hours)
H-1, H-2	4
F-1, H-3, S-1	3
A, B, E, F-2, H-4, H-5, I, M, R, S-2	2
U	1

707.4 Exterior Walls

Where exterior walls serve as a part of a required fire-resistance-rated shaft or separation or enclosure for a stairway, ramp or exit passageway, such walls shall comply with the requirements of Section 705 for exterior walls and the fire-resistance-rated enclosure or separation requirements shall not apply.

Exceptions:

1. Exterior walls required to be fire-resistance rated in accordance with Section 1021 for exterior egress balconies, Section 1023.7 for interior exit stairways and ramps, Section 1024.9 for exit passageways and Section 1027.6 for exterior exit stairways and ramp.
2. Exterior walls required to be fire-resistance rated in accordance with the *Florida Fire Prevention Code* for enclosure of energy storage systems.

707.5 Continuity

Fire barriers shall extend from the top of the foundation or floor/ceiling assembly below to the underside of the floor or roof sheathing, slab or deck above and shall be securely attached thereto. Such *fire barriers* shall be continuous through concealed space, such as the space above a suspended ceiling. Joints and voids at intersections shall comply with Sections 707.8 and 707.9.

Exceptions:

1. Shaft enclosures shall be permitted to terminate at a top enclosure complying with Section 713.12.
2. *Interior exit stairway* and *ramp* enclosures required by Section 1023 and *exit access stairway* and *ramp* enclosures required by Section 1019 shall be permitted to terminate at a top enclosure complying with Section 713.12.
3. An exit passageway enclosure required by Section 1024.3 that does not extend to the underside of the roof sheathing, slab or deck above shall be enclosed at the top with construction of the same fire-resistance rating as required for the exit passageway.

707.5.1 Supporting Construction

The supporting construction for a *fire barrier* shall be protected to afford the required *fire-resistance rating* of the *fire barrier* supported. Hollow vertical spaces within a *fire barrier* shall be fireblocked in accordance with Section 718.2 at every floor level.

Exceptions:

1. The maximum required *fire-resistance rating* for assemblies supporting *fire barriers* separating tank storage as provided for in Section 415.9.1.2 shall be 2 hours, but not less than required by Table 601 for the building construction type.

2. Supporting construction for 1-hour *fire barriers* required by Table 509.1 in buildings of Type IIB, IIIB and VB construction is not required to be *fire-resistance rated* unless required by other sections of this code.

707.6 Openings

Openings in a *fire barrier* shall be protected in accordance with Section 716. Openings shall be limited to a maximum aggregate width of 25 percent of the length of the wall, and the maximum area of any single opening shall not exceed 156 square feet (15 m^2). Openings in enclosures for *exit access stairways* and *ramps*, *interior exit stairways* and *ramps* and *exit passageways* shall also comply with Sections 1019, 1023.4 and 1024.5, respectively.

Exceptions:

1. Openings shall not be limited to 156 square feet (15 m^2) where adjoining floor areas are equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.
2. Openings shall not be limited to 156 square feet (15 m^2) or an aggregate width of 25 percent of the length of the wall where the opening protective is a fire door serving enclosures for *exit access stairways* and *ramps*, and *interior exit stairways* and *ramps*.
3. Openings shall not be limited to 156 square feet (15 m^2) or an aggregate width of 25 percent of the length of the wall where the opening protective has been tested in accordance with ASTM E119 or UL 263 and has a minimum *fire-resistance rating* not less than the *fire-resistance rating* of the wall.
4. Fire window assemblies permitted in atrium separation walls shall not be limited to a maximum aggregate width of 25 percent of the length of the wall.
5. Openings shall not be limited to 156 square feet (15 m^2) or an aggregate width of 25 percent of the length of the wall where the opening protective is a fire door assembly in a *fire barrier* separating an enclosure for *exit access stairways* and *ramps*, and *interior exit stairways* and *ramps* from an *exit passageway* in accordance with Section 1023.3.1.

707.7 Penetrations

Penetrations of *fire barriers* shall comply with Section 714.

707.7.1 Prohibited Penetrations

Penetrations into enclosures for *exit access stairways* and *ramps*, *interior exit stairways* and *ramps*, and *exit passageways* shall be allowed only where permitted by Sections 1019, 1023.5 and 1024.6, respectively.

707.8 Joints

Joints made in or between *fire barriers*, and joints made at the intersection of *fire barriers* with the under-side of a fire-resistance-rated floor or roof sheathing, slab or deck above or with other fire-resistance-rated wall assemblies, shall comply with Section 715.

707.9 Voids at Intersections

The voids created at the intersection of a *fire barrier* and a nonfire-resistance-rated roof assembly or a nonfire-resistance-rated exterior wall assembly shall be filled. An approved material or system shall be used to fill the void, and shall be securely installed in or on the intersection for its entire length so as not to dislodge, loosen or otherwise impair its ability to accommodate expected building movements and to retard the passage of fire and hot gases.

707.10 Ducts and Air Transfer Openings

Penetrations in a *fire barrier* by ducts and air transfer openings shall comply with Section 717.

Section 708 Fire Partitions

708.1 General

The following wall assemblies shall comply with this section.

1. Separation walls as required by Section 420.2 for Groups I-1, R-1, R-2 and R-3.
2. Walls separating tenant spaces in *covered and open mall buildings* as required by Section 402.4.2.1.
3. Corridor walls as required by Section 1020.2.
4. Elevator lobby separation as required by Section 3006.2.
5. Egress balconies as required by Section 1019.2.
6. Walls separating *ambulatory care facilities* from adjacent spaces, *corridors* or tenants as required by Section 422.2.
7. Walls separating *dwelling and sleeping units* in Groups R-1 and R-2 in accordance with Sections 907.2.8.1 and 907.2.9.1.
8. Vestibules in accordance with Section 1028.2.

708.2 Materials

The walls shall be of materials permitted by the building type of construction.

708.3 Fire-Resistance Rating

Fire partitions shall have a *fire-resistance rating* of not less than 1 hour.

Exceptions:

1. Corridor walls permitted to have a $\frac{1}{2}$ -hour *fire-resistance rating* by Table 1020.2.
2. *Dwelling unit* and *sleeping unit* separations in buildings of Type IIB, IIIB and VB construction shall have *fire-resistance ratings* of not less than $\frac{1}{2}$ hour in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

708.4 Continuity

Fire partitions shall extend from the top of the foundation or floor/ceiling assembly below to the underside of the floor or roof sheathing, slab or deck above or to the fire-resistance-rated floor/ceiling or roof/ceiling assembly above, and shall be securely attached thereto. In combustible construction where the *fire partitions* are not required to be continuous to the sheathing, deck or slab, the space between the ceiling and the sheathing, deck or slab above shall be fireblocked or draftstopped in accordance with Sections 718.2 and 718.3 at the partition line. The supporting construction shall be protected to afford the required *fire-resistance rating* of the wall supported, except in buildings of Type IIB, IIIB and VB construction for walls separating tenant spaces in *covered and open mall buildings*, walls separating *dwelling units*, walls separating *sleeping units*, *corridor walls*, *fire partitions* separating *dwelling and sleeping units* from Group R-1 and R-2 occupancies and *fire partitions* separating vestibules from the *level of exit discharge*.

Exceptions:

1. The wall need not be extended into the crawl space below where the floor above the crawl space has a minimum 1-hour *fire-resistance rating*.
2. Where the room-side fire-resistance-rated membrane of the *corridor* is carried through to the underside of the floor or roof sheathing, deck or slab of a fire-resistance-rated floor or roof above, the ceiling of the *corridor* shall be permitted to be protected by the use of ceiling materials as required for a 1-hour fire-resistance-rated floor or roof system.
3. Where the *corridor* ceiling is constructed as required for the *corridor walls*, the walls shall be permitted to terminate at the upper membrane of such ceiling assembly.

4. The fire partitions separating tenant spaces in a *covered or open mall building*, complying with Section 402.4.2.1, are not required to extend beyond the underside of a ceiling that is not part of a fire-resistance-rated assembly. A wall is not required in *attic* or ceiling spaces above tenant separation walls.
5. Attic fireblocking or draftstopping is not required at the partition line in Group R-2 buildings that do not exceed four *stories above grade plane*, provided the *attic* space is subdivided by draftstopping into areas not exceeding 3,000 square feet (279 m^2) or above every two *dwelling units*, whichever is smaller.
6. Fireblocking or draftstopping is not required at the partition line in buildings equipped with an *automatic sprinkler system* installed throughout in accordance with Section 903.3.1.1 or 903.3.1.2, provided that automatic sprinklers are installed in combustible floor/ceiling and roof/ceiling spaces.

708.5 Exterior Walls

Where *exterior walls* serve as a part of a required fire-resistance-rated separation, such walls shall comply with the requirements of Section 705 for *exterior walls*, and the fire-resistance-rated separation requirements shall not apply.

Exception: Exterior walls required to be fire-resistance rated in accordance with Section 1021.2 for exterior egress balconies, Section 1023.7 for interior exit stairways and ramps and Section 1027.6 for exterior exit stairways and ramps.

708.6 Openings

Openings in a *fire partition* shall be protected in accordance with Section 716.

708.7 Penetrations

Penetrations of *fire partitions* shall comply with Section 714.

708.8 Joints

Joints made in or between *fire partitions* shall comply with Section 715.

708.9 Ducts and Air Transfer Openings

Penetrations in a *fire partition* by ducts and air transfer openings shall comply with Section 717.

Section 709 Smoke Barriers

709.1 General

Vertical and horizontal *smoke barriers* shall comply with this section.

709.2 Materials

Smoke barriers shall be of materials permitted by the building type of construction.

709.3 Fire-Resistance Rating

A 1-hour *fire-resistance rating* is required for *smoke barriers*.

Exception: *Smoke barriers* constructed of minimum 0.10-inch-thick (2.5 mm) steel in Group I-3 buildings.

709.4 Continuity

Smoke barriers shall form an effective membrane continuous from the top of the foundation or floor/ceiling assembly below to the underside of the floor or roof sheathing, deck or slab above, including continuity through concealed spaces, such as those found above suspended ceilings, and interstitial structural and mechanical spaces. The supporting construction shall be protected to afford the required *fire-resistance rating* of the wall or floor supported in buildings of other than Type IIB, IIIB or VB construction. *Smoke barrier* walls used to separate smoke compartments shall comply with Section 709.4.1. *Smoke-barrier* walls used to enclose areas of refuge in accordance with Section 1009 or to enclose elevator lobbies in accordance with Section 405.4.3, 3007.6.2, or 3008.6.2 shall comply with Section 709.4.2.

Exception: *Smoke-barrier* walls are not required in interstitial spaces where such spaces are designed and constructed with ceilings or *exterior walls* that provide resistance to the passage of fire and smoke equivalent to that provided by the *smoke-barrier* walls.

709.4.1 Smoke-Barrier Assemblies Separating Smoke Compartments

Smoke-barrier assemblies used to separate smoke compartments shall form an effective membrane enclosure that is continuous from an outside wall or smoke barrier wall to an outside wall or another smoke barrier wall and horizontal assemblies.

709.4.2 Smoke-Barrier Walls Enclosing Areas of Refuge or Elevator Lobbies

Smoke-barrier walls used to enclose areas of refuge in accordance with Section 1009, or to enclose elevator lobbies in accordance with Section 405.4.3, 3007.6.2, or 3008.6.2, shall form an effective membrane enclosure that terminates at a *fire barrier* wall having a level of *fire protection rating* not less than 1 hour, another *smoke barrier* wall or an outside wall. A smoke and draft control door assembly as specified in Section 716.5.3.1 shall not be required at each elevator hoistway door opening or at each exit doorway between an area of refuge and the exit enclosure.

709.5 Openings

Openings in a *smoke barrier* shall be protected in accordance with Section 716.

Exceptions:

1. In Group I-1 Condition 2, Group I-2 and *ambulatory care facilities*, where a pair of opposite-swinging doors are installed across a corridor in accordance with Section 709.5.1, the doors shall not be required to be protected in accordance with Section 716. The doors shall be close fitting within operational tolerances, and shall not have a center mullion or undercuts in excess of $\frac{3}{4}$ inch (19.1 mm), louvers or grilles. The doors shall have head and jamb stops, and astragals or rabbets at meeting edges. Where permitted by the door manufacturer's listing, positive-latching devices are not required. Factory applied or field applied protective plates are not required to be labeled.
2. In Group I-1 Condition 2, Group I-2 and *ambulatory care facilities*, special purpose horizontal sliding, accordion or folding doors installed in accordance with Section 1010.3.3 and protected in accordance with Section 716.

709.5.1 Group I-2 and Ambulatory Care Facilities

In Group I-2 and *ambulatory care facilities*, where doors are installed across a corridor, the doors shall be automatic-closing by smoke detection in accordance with Section 716.5.9.4 and shall have a vision panel with fire-protection-rated glazing materials in fire-protection-rated frames, the area of which shall not exceed that tested.

709.6 Penetrations

Penetrations of *smoke barriers* shall comply with Section 714.

709.7 Joints

Joints made in or between *smoke barriers* shall comply with Section 715.

709.8 Ducts and Air Transfer Openings

Penetrations in a *smoke barrier* by ducts and air transfer openings shall comply with Section 717.

Section 710 Smoke Partitions

710.1 General

Smoke partitions installed as required elsewhere in the code shall comply with this section.

710.2 Materials

The walls shall be of materials permitted by the building type of construction.

710.3 Fire-Resistance Rating

Unless required elsewhere in the code, smoke partitions are not required to have a *fire-resistance rating*.

710.4 Continuity

Smoke partitions shall extend from the top of the foundation or floor below to the underside of the floor or roof sheathing, deck or slab above or to the underside of the ceiling above where the ceiling membrane is constructed to limit the transfer of smoke.

710.5 Openings

Openings in smoke partitions shall comply with Sections 710.5.1 through 710.5.3.

710.5.1 Windows

Windows in smoke partitions shall be sealed to resist the free passage of smoke or be automatic-closing upon detection of smoke.

710.5.2 Doors

Doors in smoke partitions shall comply with Sections 710.5.2.1 through 710.5.2.3.

710.5.2.1 Louvers

Doors in smoke partitions shall not include louvers.

710.5.2.2 Smoke and Draft Control Doors

Where required elsewhere in the code, doors in smoke partitions shall meet the requirements for a smoke and draft control door assembly tested in accordance with UL 1784. The air leakage rate of the door assembly shall not exceed 3.0 cubic feet per minute per square foot [$0.015424 \text{ m}^3/(\text{s} \cdot \text{m}^2)$] of door opening at 0.10 inch (24.9 Pa) of water for both the ambient temperature test and the elevated temperature exposure test. Installation of smoke doors shall be in accordance with NFPA 105.

710.5.2.2.1 Smoke and Draft Control Door Labeling

Smoke and draft control doors complying only with UL 1784 shall be permitted to show the letter "S" on the manufacturer's labeling.

710.5.2.3 Self- or Automatic-Closing Doors

Where required elsewhere in the code, doors in smoke partitions shall be self- or automatic-closing by smoke detection in accordance with Section 716.5.9.4.

710.5.3 Pass-Through Openings in Group I-2, Condition 2

Where pass-through openings are provided in *smoke partitions* in Group I-2, Condition 2 occupancies, such openings shall comply with the following:

1. The smoke compartment in which the pass through openings occur does not contain a patient care suite or sleeping room.
2. Pass-through openings are installed in a wall, door or vision panel that is not required to have a fire resistance rating.
3. The top of the pass-through opening is located a maximum of 48 inches (1219 mm) above the floor.
4. The aggregate area of all such pass-through openings within a single room shall not exceed 80 square inches (0.05 m^2).

710.6 Penetrations

The space around penetrating items shall be filled with an *approved* material to limit the free passage of smoke.

710.7 Joints

Joints shall be filled with an *approved* material to limit the free passage of smoke.

710.8 Ducts and Air Transfer Openings

The space around a duct penetrating a smoke partition shall be filled with an *approved* material to limit the free passage of smoke. Air transfer openings in smoke partitions shall be provided with a *smoke damper* complying with Section 717.3.2.2.

Exception: Where the installation of a *smoke damper* will interfere with the operation of a required smoke control system in accordance with Section 909, *approved* alternative protection shall be utilized.

Section 711 Floor and Roof Assemblies

711.1 General

Horizontal assemblies shall comply with Section 711.2. Nonfire-resistance-rated floor and roof assemblies shall comply with Section 711.3.

711.2 Horizontal Assemblies

Horizontal assemblies shall comply with Sections 711.2.1 through 711.2.6.

711.2.1 Materials

Assemblies shall be of materials permitted by the building type of construction.

711.2.2 Continuity

Assemblies shall be continuous without vertical openings, except as permitted by this section and Section 712.

711.2.3 Supporting Construction

The supporting construction shall be protected to afford the required *fire-resistance rating* of the *horizontal assembly* supported.

Exception: In buildings of Type IIB, IIIB or VB construction, the construction supporting the *horizontal assembly* is not required to be *fire-resistance rated* at the following:

1. *Horizontal assemblies* at the separations of incidental uses as specified by Table 509.1 provided the required *fire-resistance rating* does not exceed 1 hour.
2. *Horizontal assemblies* at the separations of *dwelling units* and *sleeping units* as required by Section 420.3.
3. *Horizontal assemblies* at *smoke barriers* constructed in accordance with Section 709.

711.2.4 Fire-Resistance Rating

The *fire-resistance rating* of *horizontal assemblies* shall comply with Sections 711.2.4.1 through 711.2.4.6 but shall be not less than that required by the building type of construction.

711.2.4.1 Separating Mixed Occupancies

Where the *horizontal assembly* separates mixed occupancies, the assembly shall have a *fire-resistance rating* of not less than that required by Section 508.4 based on the occupancies being separated.

711.2.4.2 Separating Fire Areas

Where the *horizontal assembly* separates a single occupancy into different fire areas, the assembly shall have a *fire-resistance rating* of not less than that required by Section 707.3.10.

711.2.4.3 Dwelling Units and Sleeping Units

Horizontal assemblies serving as dwelling or sleeping unit separations in accordance with Section 420.3 shall be not less than 1-hour *fire-resistance-rated* construction.

Exception: *Horizontal assemblies* separating *dwelling units* and *sleeping units* shall be not less than 1/2-hour *fire-resistance-rated* construction in a building of Type IIB, IIIB and VB construction, where the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

711.2.4.4 Separating Smoke Compartments

Where the *horizontal assembly* is required to be a *smoke barrier*, the assembly shall comply with Section 709.

711.2.4.5 Separating Incidental Uses

Where the *horizontal assembly* separates incidental uses from the remainder of the building, the assembly shall have a *fire-resistance rating* of not less than that required by Section 509.

711.2.4.6 Other Separations

Where a *horizontal assembly* is required by other sections of this code, the assembly shall have a *fire-resistance rating* of not less than that required by that section.

711.2.5 Ceiling Panels

Where the weight of lay-in ceiling panels, used as part of fire-resistance-rated floor/ceiling or roof/ceiling assemblies, is not adequate to resist an upward force of 1 pound per square foot (48 Pa), wire or other *approved* devices shall be installed above the panels to prevent

vertical displacement under such upward force.

711.2.6 Unusable Space

In 1-hour fire-resistance-rated floor/ceiling assemblies, the ceiling membrane is not required to be installed over unusable crawl spaces. In 1-hour fire-resistance-rated roof assemblies, the floor membrane is not required to be installed where unusable *attic* space occurs above.

711.3 Nonfire-Resistance-Rated Floor and Roof Assemblies

Nonfire-resistance-rated floor, floor/ceiling, roof and roof/ceiling assemblies shall comply with Sections 711.3.1 and 711.3.2.

711.3.1 Materials

Assemblies shall be of materials permitted by the building type of construction.

711.3.2 Continuity

Assemblies shall be continuous without vertical openings, except as permitted by Section 712.

Section 712 Vertical Openings

712.1 General

Each vertical opening shall comply in accordance with one of the protection methods in Sections 712.1.1 through 712.1.16.

712.1.1 Shaft Enclosures

Vertical openings contained entirely within a shaft enclosure complying with Section 713 shall be permitted.

712.1.2 Individual Dwelling Unit

Unconcealed vertical openings totally within an individual residential dwelling unit and connecting four stories or less shall be permitted.

712.1.3 Escalator Openings

Where a building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, vertical openings for escalators shall be permitted where protected in accordance with Section 712.1.3.1 or 712.1.3.2.

712.1.3.1 Opening Size

Protection by a draft curtain and closely spaced sprinklers in accordance with NFPA 13 shall be permitted where the area of the vertical opening between stories does not exceed twice the horizontal projected area of the escalator. In other than Groups B and M, this application is limited to openings that do not connect more than four stories.

712.1.3.2 Automatic Shutters

Protection of the vertical opening by approved shutters at every penetrated floor shall be permitted in accordance with this section. The shutters shall be of noncombustible construction and have a *fire-resistance rating* of not less than 1.5 hours. The shutter shall be so constructed as to close immediately upon the actuation of a smoke detector installed in accordance with Section 907.3.1 and shall completely shut off the well opening. Escalators shall cease operation when the shutter begins to close. The shutter shall operate at a speed of not more than 30 feet per minute (152.4 mm/s) and shall be equipped with a sensitive leading edge to arrest its progress where in contact with any obstacle, and to continue its progress on release there from.

712.1.4 Penetrations

Penetrations, concealed and unconcealed, shall be permitted where protected in accordance with Section 714.

712.1.5 Joints

Joints shall be permitted where complying with Section 712.1.5.1 or 712.1.5.2, as applicable.

712.1.5.1 Joints in or Between Horizontal Assemblies

Joints made in or between *horizontal assemblies* shall comply with Section 715. The void created at the intersection of a floor/ceiling assembly and an exterior curtain wall assembly shall be permitted where protected in accordance with Section 715.4.

712.1.5.2 Joints in or Between Nonfire-Resistance-Rated Floor Assemblies

Joints in or between floor assemblies without a required *fire-resistance rating* shall be permitted where they comply with one of the following:

1. The joint shall be concealed within the cavity of a wall.
2. The joint shall be located above a ceiling.
3. The joint shall be sealed, treated or covered with an *approved* material or system to resist the free passage of flame and the products of combustion.

Exception: Joints meeting one of the exceptions listed in Section 715.3.

712.1.6 Ducts and Air Transfer Openings

Penetrations by ducts and air transfer openings shall be protected in accordance with Section 717. Grease ducts shall be protected in accordance with the *Florida Building Code, Mechanical*.

712.1.7 Atriums

Atriums complying with Section 404 that connect two or more stories in Group I-2 or I-3 Occupancies or three or more stories in other occupancies shall be permitted.

Exceptions:

1. Atriums shall not be permitted within Group H Occupancies.
2. Balconies or stories within Groups A-1, A-4 and A-5 and mezzanines that comply with Section 505 shall not be considered a story as it applies to this section.

712.1.8 Masonry Chimney

Approved vertical openings for masonry chimneys shall be permitted where the annular space is fireblocked at each floor level in accordance with Section 718.2.5.

712.1.9 Two-Story Openings

In other than Groups I-2 and I-3, a vertical opening that is not used as one of the applications listed in this section shall be permitted if the opening complies with all of the items below:

1. Does not connect more than two stories.
2. Does not penetrate a horizontal assembly that separates fire areas or smoke barriers that separate smoke compartments.
3. Is not concealed within the construction of a wall or a floor/ceiling assembly.
4. Is not open to a corridor in Group I and R occupancies.
5. Is not open to a corridor on nonsprinklered floors.
6. Is separated from floor openings and air transfer openings serving other floors by construction conforming to required shaft enclosures.

712.1.10 Parking Garages

Vertical openings in parking garages for automobile ramps, elevators and duct systems shall comply with Section 712.1.10.1, 712.1.10.2 or 712.1.10.3, as applicable.

712.1.10.1 Automobile Ramps

Vertical openings for automobile ramps in parking garages shall be permitted where constructed in accordance with Sections 406.5 and 406.6.

712.1.10.2 Elevators

Vertical openings for elevator hoistways in open or enclosed parking garages that serve only the parking garage, and complying with Sections 406.5 and 406.6, respectively, shall be permitted.

712.1.10.3 Duct Systems

Vertical openings for mechanical exhaust or supply duct systems in open or enclosed parking garages complying with Sections 406.5 and 406.6, respectively, shall be permitted to be unenclosed where such duct system is contained within and serves only the parking garage.

712.1.11 Mezzanine

Vertical openings between a mezzanine complying with Section 505 and the floor below shall be permitted.

712.1.12 Exit Access Stairways and Ramps

Vertical openings containing *exit access stairways or ramps* in accordance with Section 1019 shall be permitted.

712.1.13 Openings

Vertical openings for floor fire doors and access doors shall be permitted where protected by Section 712.1.13.1 or 712.1.13.2.

712.1.13.1 Horizontal Fire Door Assemblies

Horizontal *fire door* assemblies used to protect openings in fire-resistance-rated *horizontal assemblies* shall be tested in accordance with NFPA 288, and shall achieve a *fire-resistance rating* not less than the assembly being penetrated. Horizontal *fire door* assemblies shall be labeled by an *approved agency*. The *label* shall be permanently affixed and shall specify the manufacturer, the test standard and the *fire-resistance rating*.

712.1.13.2 Access Doors

Access doors shall be permitted in ceilings of fire-resistance-rated floor/ceiling and roof/ceiling assemblies, provided such doors are tested in accordance with ASTM E119 or UL 263 as horizontal assemblies and labeled by an approved agency for such purpose.

712.1.14 Group I-3

In Group I-3 occupancies, vertical openings shall be permitted in accordance with Section 408.5.

712.1.15 Skylights

Skylights and other penetrations through a *fire-resistance-rated* roof deck or slab are permitted to be unprotected, provided that the structural integrity of the *fire-resistance-rated* roof assembly is maintained. Unprotected skylights shall not be permitted in roof assemblies required to be *fire-resistance rated* in accordance with Section 705.8.6. The supporting construction shall be protected to afford the required *fire-resistance rating* of the *horizontal assembly* supported.

712.1.16 Openings Otherwise Permitted

Vertical openings shall be permitted where allowed by other sections of this code.

Section 713 Shaft Enclosures

713.1 General

The provisions of this section shall apply to shafts required to protect openings and penetrations through floor/ceiling and roof/ceiling assemblies. *Interior exit stairways and ramps* shall be enclosed in accordance with Section 1023.

713.2 Construction

Shaft enclosures shall be constructed as *fire barriers* in accordance with Section 707 or horizontal assemblies in accordance with Section 711, or both.

713.3 Materials

The shaft enclosure shall be of materials permitted by the building type of construction.

713.4 Fire-Resistance Rating

Shaft enclosures shall have a *fire-resistance rating* of not less than 2 hours where connecting four *stories* or more, and not less than 1 hour where connecting less than four *stories*. The number of *stories* connected by the shaft enclosure shall include any basements but not any *mezzanines*. Shaft enclosures shall have a *fire-resistance rating* not less than the floor assembly penetrated, but need not exceed 2 hours. Shaft enclosures shall meet the requirements of Section 703.2.1.1.

713.5 Continuity

Shaft enclosures shall be constructed as *fire barriers* in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both, and shall have continuity in accordance with Section 707.5 for *fire barriers* or Section 711.2.2 for *horizontal assemblies*, as applicable.

713.6 Exterior Walls

Where *exterior walls* serve as a part of a required shaft enclosure, such walls shall comply with the requirements of Section 705 for *exterior walls* and the fire-resistance-rated enclosure requirements shall not apply.

Exception: Exterior walls required to be fire-resistance rated in accordance with Section 1021.2 for exterior egress balconies, Section 1023.7 for interior *exit* stairways and ramps and Section 1027.6 for exterior *exit* stairways and ramps.

713.7 Openings

Openings in a shaft enclosure shall be protected in accordance with Section 716 as required for *fire barriers*. Doors shall be self- or automatic-closing by smoke detection in accordance with Section 716.5.9.4.

713.7.1 Prohibited Openings

Openings other than those necessary for the purpose of the shaft shall not be permitted in shaft enclosures.

713.8 Penetrations

Penetrations in a shaft enclosure shall be protected in accordance with Section 714 as required for *fire barriers*. Structural elements, such as beams or joists, where protected in accordance with Section 714 shall be permitted to penetrate a shaft enclosure.

713.8.1 Prohibited Penetrations

Penetrations other than those necessary for the purpose of the shaft shall not be permitted in shaft enclosures.

713.8.2 Membrane Penetrations

Membrane penetrations shall be permitted on the outside of shaft enclosures. Such penetrations shall be protected in accordance with Section 714.4.2.

713.9 Joints

Joints in a shaft enclosure shall comply with Section 715.

713.10 Duct and Air Transfer Openings

Penetrations of a shaft enclosure by ducts and air transfer openings shall comply with Section 717.

713.11 Enclosure at the Bottom

Shafts that do not extend to the bottom of the building or structure shall comply with one of the following:

1. They shall be enclosed at the lowest level with construction of the same *fire-resistance rating* as the lowest floor through which the shaft passes, but not less than the rating required for the shaft enclosure.
2. They shall terminate in a room having a use related to the purpose of the shaft. The room shall be separated from the remainder of the building by *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. The *fire-resistance rating* and opening protectives shall be not less than the protection required for the shaft enclosure.
3. They shall be protected by *approved fire dampers* installed in accordance with their listing at the lowest floor level within the shaft enclosure.

Exceptions:

1. The fire-resistance-rated room separation is not required, provided there are no openings in or penetrations of the shaft enclosure to the interior of the building except at the bottom. The bottom of the shaft shall be closed off around the penetrating items with materials permitted by Section 718.3.1 for draftstopping, or the room shall be provided with an *approved automatic sprinkler system*.
2. A shaft enclosure containing a waste or linen chute shall not be used for any other purpose and shall discharge in a room protected in accordance with Section 713.13.4.
3. The fire-resistance-rated room separation and the protection at the bottom of the shaft are not required provided there are no combustibles in the shaft and there are no openings or other penetrations through the shaft enclosure to the interior of the building.

713.12 Enclosure at Top

The top of shaft enclosures shall comply with one of the following:

1. Extend to the underside of the roof sheathing, deck or slab and the roof assembly shall comply with the requirements for the type of construction as specified in Table 601.
2. Terminate below the roof assembly and be enclosed at the top with construction of the same *fire-resistance rating* as the topmost floor penetrated by the shaft, but not less than the *fire-resistance rating* required for the shaft enclosure.
3. Extend past the roof assembly and comply with the requirements of Section 1510.

713.12.1 Penthouse Mechanical Rooms

A fire/smoke damper shall not be required at the penetration of the roof-top structure where shaft enclosures extend up through the roof assembly into a rooftop structure conforming to Section 1510. All ductwork in the shaft shall be connected directly to HVAC equipment.

713.13 Waste and Linen Chutes and Incinerator Rooms

Waste and linen chutes shall comply with the provisions of NFPA 82, Chapter 6 and shall meet the requirements of Sections 712 and 713.13.1 through 713.13.6. Incinerator rooms shall meet the provisions of Sections 713.13.4 through 713.13.5.

Exception: Chutes serving and contained within a single dwelling unit.

713.13.1 Waste and Linen

A shaft enclosure containing a recycling, or waste or linen chute shall not be used for any other purpose and shall be enclosed in accordance with Section 713.4. A shaft enclosure shall be permitted to contain recycling and waste chutes. Openings into the shaft, from access rooms and discharge rooms, shall be protected in accordance with this section and Section 716. Openings into chutes shall not be located in *corridors*. Doors into chutes shall be self-closing. Discharge doors shall be self- or automatic-closing upon the actuation of a smoke detector in accordance with Section 716.5.9.4, except that heat-activated closing devices shall be permitted between the shaft and the discharge room.

713.13.2 Materials

A shaft enclosure containing a waste, recycling, or linen chute shall be constructed of materials as permitted by the building type of construction.

713.13.3 Chute Access Rooms

Access openings for waste or linen chutes shall be located in rooms or compartments enclosed by not less than 1-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. Openings into the access rooms shall be protected by opening protectives having a *fire protection rating* of not less than $\frac{3}{4}$ hour. Doors shall be self- or automatic-closing upon the detection of smoke in accordance with Section 716.5.9.4.

713.13.4 Chute Discharge Room

Waste or linen chutes shall discharge into an enclosed room separated by *fire barriers* with a *fire-resistance rating* not less than the required fire rating of the shaft enclosure and constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. Openings into the discharge room from the remainder of the building shall be protected by opening

protectives having a *fire protection rating* equal to the protection required for the shaft enclosure. Doors shall be self- or automatic-closing upon the detection of smoke in accordance with Section 716.5.9.4. Waste chutes shall not terminate in an incinerator room. Waste and linen rooms that are not provided with chutes need only comply with Table 509.1.

713.13.5 Incinerator Room

Incinerator rooms shall comply with Table 509.1.

713.13.6 Automatic Sprinkler System

An *approved automatic sprinkler system* shall be installed in accordance with Section 903.2.11.2.

713.14 Elevator, Dumbwaiter and Other Hoistways

Elevator, dumbwaiter and other hoistway enclosures shall be constructed in accordance with Sections 712 and 713 and Chapter 30.

Section 714 Penetrations

714.1 Scope

The provisions of this section shall govern the materials and methods of construction used to protect *through penetrations* and *membrane penetrations* of *horizontal assemblies* and fire-resistance-rated wall assemblies.

714.1.1 Ducts and Air Transfer Openings

Penetrations of fire-resistance-rated walls by ducts that are not protected with *dampers* shall comply with Sections 714.3 through 714.4.3. Penetrations of *horizontal assemblies* not protected with a shaft as permitted by Section 717.6, and not required to be protected with fire *dampers* by other sections of this code, shall comply with Sections 714.5 through 714.6.2. Ducts and air transfer openings that are protected with *dampers* shall comply with Section 717.

714.2 Installation

A listed penetration firestop system shall be installed in accordance with the manufacturer's installation instructions and the listing criteria.

714.3 Installation Details

Where sleeves are used, they shall be securely fastened to the assembly penetrated. The space between the item contained in the sleeve and the sleeve itself and any space between the sleeve and the assembly penetrated shall be protected in accordance with this section. Insulation and coverings on or in the penetrating item shall not penetrate the assembly unless the specific material used has been tested as part of the assembly in accordance with this section.

714.4 Fire-Resistance-Rated Walls

Penetrations into or through *fire walls*, *fire barriers*, *smoke barrier walls* and *fire partitions* shall comply with Sections 714.4.1 through 714.4.3. Penetrations in *smoke barrier walls* shall also comply with Section 714.5.4.

714.4.1 Through Penetrations

Through penetrations of fire-resistance-rated walls shall comply with Section 714.4.1.1 or 714.4.1.2.

Exception: Where the penetrating items are steel, ferrous or copper pipes, tubes or conduits, the *annular space* between the penetrating item and the fire-resistance-rated wall is permitted to be protected by either of the following measures:

1. In concrete or masonry walls where the penetrating item is a maximum 6-inch (152 mm) nominal diameter and the area of the opening through the wall does not exceed 144 square inches (0.0929 m^2), concrete, grout or mortar is permitted where installed the full thickness of the wall or the thickness required to maintain the *fire-resistance rating*.
2. The material used to fill the *annular space* shall prevent the passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E119 or UL 263 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water at the location of the penetration for the time period equivalent to the *fire-resistance rating* of the construction penetrated.

714.4.1.1 Fire-Resistance-Rated Assemblies

Through penetrations shall be protected using systems installed as tested in the *approved* fire-resistance-rated assembly.

714.4.1.2 Through-Penetration Firestop System

Through penetrations shall be protected by an *approved* penetration firestop system installed as tested in accordance with ASTM E814 or UL 1479, with a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water and shall have an F rating of not less than the required *fire-resistance rating* of the wall penetrated.

714.4.2 Membrane Penetrations

Membrane penetrations shall comply with Section 714.4.1. Where walls or partitions are required to have a *fire-resistance rating*, recessed fixtures shall be installed such that the required fire resistance will not be reduced.

Exceptions:

1. Membrane penetrations of maximum 2-hour fire-resistance-rated walls and partitions by steel electrical boxes that do not exceed 16 square inches (0.0103 m^2) in area, provided the aggregate area of the openings through the membrane does not exceed 100 square inches (0.0645 m^2) in any 100 square feet (9.29 m^2) of wall area. The *annular space* between the wall membrane and the box shall not exceed $\frac{1}{8}$ inch (3.2 mm). Such boxes on opposite sides of the wall or partition shall be separated by one of the following:
 - 1.1. By a horizontal distance of not less than 24 inches (610 mm) where the wall or partition is constructed with individual noncommunicating stud cavities;
 - 1.2. By a horizontal distance of not less than the depth of the wall cavity where the wall cavity is filled with cellulose loose-fill, rockwool or slag mineral wool insulation;
 - 1.3. By solid fireblocking in accordance with Section 718.2.1;
 - 1.4. By protecting both outlet boxes with *listed* putty pads; or
 - 1.5. By other *listed* materials and methods.
2. Membrane penetrations by *listed* electrical boxes of any material, provided such boxes have been tested for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the listing. The *annular space* between the wall membrane and the box shall not exceed $\frac{1}{8}$ inch (3.2 mm) unless *listed* otherwise. Such boxes on opposite sides of the wall or partition shall be separated by one of the following:
 - 2.1. By the horizontal distance specified in the listing of the electrical boxes;
 - 2.2. By solid fireblocking in accordance with Section 718.2.1;
 - 2.3. By protecting both boxes with *listed* putty pads; or
 - 2.4. By other *listed* materials and methods.
3. Membrane penetrations by electrical boxes of any size or type, that have been *listed* as part of a wall opening protective material system for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the listing.
4. Membrane penetrations by boxes other than electrical boxes, provided such penetrating items and the *annular space* between the wall membrane and the box, are protected by an *approved membrane penetration* firestop system installed as tested in accordance with ASTM E814 or UL 1479, with a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water, and shall have an F and T rating of not less than the required *fire-resistance rating* of the wall penetrated and be installed in accordance with their listing.
5. The *annular space* created by the penetration of an automatic sprinkler, provided it is covered by a metal escutcheon plate.
6. Membrane penetrations of maximum 2-hour *fire resistance-rated* walls and partitions by steel electrical boxes that exceed 16 square inches (0.0103 m^2) in area, or steel electrical boxes of any size having an aggregate area through the membrane exceeding 100 square inches (0.0645 m^2) in any 100 square feet (9.29 m^2) of wall area, provided such penetrating items are protected by listed putty pads or other listed materials and methods, and installed in accordance with the listing.

714.4.3 Dissimilar Materials

Noncombustible penetrating items shall not connect to combustible items beyond the point of firestopping unless it can be demonstrated that the fire-resistance integrity of the wall is maintained.

714.5 Horizontal Assemblies

Penetrations of a *fire-resistance-rated* floor, floor/ceiling assembly or the ceiling membrane of a roof/ceiling assembly not required to be enclosed in a shaft by Section 712.1 shall be protected in accordance with Sections 714.5.1 through 714.5.4.

714.5.1 Through Penetrations

Through penetrations of *horizontal assemblies* shall comply with Section 714.5.1.1 or 714.5.1.2.

Exceptions:

1. Penetrations by steel, ferrous or copper conduits, pipes, tubes or vents or concrete or masonry items through a single fire-resistance-rated floor assembly where the *annular space* is protected with materials that prevent the passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E119 or UL 263 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water at the location of the penetration for the time period equivalent to the *fire-resistance rating* of the construction penetrated. Penetrating items with a maximum 6-inch (152 mm) nominal diameter shall not be limited to the penetration of a single fire-resistance-rated floor assembly, provided the aggregate area of the openings through the assembly does not exceed 144 square inches (92 900 mm²) in any 100 square feet (9.3 m²) of floor area.
2. Penetrations in a single concrete floor by steel, ferrous or copper conduits, pipes, tubes or vents with a maximum 6-inch (152 mm) nominal diameter, provided the concrete, grout or mortar is installed the full thickness of the floor or the thickness required to maintain the *fire-resistance rating*. The penetrating items shall not be limited to the penetration of a single concrete floor, provided the area of the opening through each floor does not exceed 144 square inches (92 900 mm²).
3. Penetrations by *listed* electrical boxes of any material, provided such boxes have been tested for use in fire-resistance-rated assemblies and installed in accordance with the instructions included in the listing.

714.5.1.1 Fire-Resistance-Rated Assemblies

Through penetrations shall be protected using systems installed as tested in the *approved* fire-resistance-rated assembly.

714.5.1.2 Through-Penetration Firestop System

Through penetrations shall be protected by an *approved through-penetration firestop system* installed and tested in accordance with ASTM E814 or UL 1479, with a minimum positive pressure differential of 0.01 inch of water (2.49 Pa). The system shall have an F rating/T rating of not less than 1 hour but not less than the required rating of the floor penetrated.

Exceptions:

1. Floor penetrations contained and located within the cavity of a wall above the floor or below the floor do not require a T rating.
2. Floor penetrations by floor drains, tub drains or shower drains contained and located within the concealed space of a horizontal assembly do not require a T rating.
3. Floor penetrations of maximum 4-inch (102 mm) nominal diameter metal conduit or tubing penetrating directly into metal-enclosed electrical power switchgear do not require a T rating.

714.5.2 Membrane Penetrations

Penetrations of membranes that are part of a *horizontal assembly* shall comply with Section 714.5.1.1 or 714.5.1.2. Where floor/ceiling assemblies are required to have a *fire-resistance rating*, recessed fixtures shall be installed such that the required *fire resistance* will not be reduced.

Exceptions:

1. *Membrane penetrations* by steel, ferrous or copper conduits, pipes, tubes or vents, or concrete or masonry items where the *annular space* is protected either in accordance with Section 714.4.1 or to prevent the free passage of flame and the products of combustion. The aggregate area of the openings through the membrane shall not exceed 100 square inches ($64\ 500\ mm^2$) in any 100 square feet ($9.3\ m^2$) of ceiling area in assemblies tested without penetrations.
2. Ceiling *membrane penetrations* of maximum 2-hour *horizontal assemblies* by steel electrical boxes that do not exceed 16 square inches ($10\ 323\ mm^2$) in area, provided the aggregate area of such penetrations does not exceed 100 square inches ($44\ 500\ mm^2$) in any 100 square feet ($9.29\ m^2$) of ceiling area, and the *annular space* between the ceiling membrane and the box does not exceed $\frac{1}{8}$ inch (3.2 mm).
3. *Membrane penetrations* by electrical boxes of any size or type, that have been *listed* as part of an opening protective material system for use in *horizontal assemblies* and are installed in accordance with the instructions included in the listing.
4. *Membrane penetrations* by *listed* electrical boxes of any material, provided such boxes have been tested for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the listing. The *annular space* between the ceiling membrane and the box shall not exceed $\frac{1}{8}$ inch (3.2 mm) unless *listed* otherwise.
5. The *annular space* created by the penetration of a fire sprinkler, provided it is covered by a metal escutcheon plate.
6. Noncombustible items that are cast into concrete building elements and that do not penetrate both top and bottom surfaces of the element.
7. The ceiling membrane of a maximum 2-hour *fire-resistance-rated horizontal assemblies* is permitted to be interrupted with the double wood top plate of a wall assembly that is sheathed with Type X gypsum wallboard, provided that all penetrating items through the double top plates are protected in accordance with Section 714.5.1.1 or 714.5.1.2 and the ceiling membrane is tight to the top plates.
8. Ceiling membrane penetrations by *listed* luminaires (light fixtures) or by luminaires protected with *listed* materials, which have been tested for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the listing.

714.5.3 Dissimilar Materials

Noncombustible penetrating items shall not connect to combustible materials beyond the point of firestopping unless it can be demonstrated that the fire-resistance integrity of the *horizontal assembly* is maintained.

714.5.4 Penetrations in Smoke Barriers

Penetrations in *smoke barriers* shall be protected by an approved *through-penetration firestop system* installed and tested in accordance with the requirements of UL 1479 for air leakage. The *L rating* of the system measured at 0.30 inch (7.47 Pa) of water in both the ambient temperature and elevated temperature tests shall not exceed:

1. 5.0 cfm per square foot ($0.025\ m^3/s \cdot m^2$) of penetration opening for each *through-penetration firestop system*; or
2. A total cumulative leakage of 50 cfm ($0.024\ m^3/s$) for any 100 square feet ($9.3\ m^2$) of wall area, or floor area.

714.6 Nonfire-Resistance-Rated Assemblies

Penetrations of nonfire-resistance-rated floor or floor/ceiling assemblies or the ceiling membrane of a nonfire-resistance-rated roof/ceiling assembly shall meet the requirements of Section 713 or shall comply with Section 714.6.1 or 714.6.2.

714.6.1 Noncombustible Penetrating Items

Noncombustible penetrating items that connect not more than five *stories* are permitted, provided that the *annular space* is filled to resist the free passage of flame and the products of combustion with an *approved* noncombustible material or with a fill, void or cavity material that is tested and classified for use in *through-penetration firestop systems*.

714.6.2 Penetrating Items

Penetrating items that connect not more than two stories are permitted, provided that the *annular space* is filled with an *approved* material to resist the free passage of flame and the products of combustion.

Section 715 Joints and Voids

715.1 General

The provisions of this section shall govern the materials and methods of construction used to protect joints and voids in or between horizontal and vertical assemblies.

715.2 Installation

Systems or materials protecting joints and voids shall be securely installed in accordance with the manufacturer's installation instructions in or on the joint or void for its entire length so as not to dislodge, loosen or otherwise impair its ability to accommodate expected building movements and to resist the passage of fire and hot gases. Fire-resistant joint systems or systems used to protect voids at exterior curtain walls and fire-resistance-rated floor intersections shall also be installed in accordance with the listing criteria.

715.3 Fire-Resistance-Rated Assembly Intersections

Joints installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies shall be protected by an approved *fire-resistant joint system* designed to resist the passage of fire for a time period not less than the required *fire-resistance rating* of the wall, floor or roof in or between which the system is installed.

Exception: *Fire-resistant joint systems* shall not be required for joints in all of the following locations:

1. Floors within a single *dwelling unit*.
2. Floors where the joint is protected by a shaft enclosure in accordance with Section 713.
3. Floors within atriums where the space adjacent to the atrium is included in the volume of the atrium for smoke control purposes.
4. Floors within malls.
5. Floors and ramps within open and enclosed parking garages or structures constructed in accordance with Sections 406.5 and 406.6, respectively.
6. Mezzanine floors.
7. Walls that are permitted to have unprotected openings.
8. Roofs where openings are permitted.
9. Control joints not exceeding a maximum width of 0.625 inch (15.9 mm) and tested in accordance with ASTM E119 or UL 263.
10. The intersection of exterior curtain wall assemblies and the roof slab or roof deck.

715.3.1 Fire Test Criteria

Fire-resistant joint systems shall be tested in accordance with the requirements of either ASTM E1966 or UL 2079. Nonsymmetrical wall joint systems shall be tested with both faces exposed to the furnace, and the assigned *fire-resistance rating* shall be the shortest duration obtained from the two tests. Where evidence is furnished to show that the wall was tested with the least fire-resistant side exposed to the furnace, subject to acceptance of the *building official*, the wall need not be subjected to tests from the opposite side.

Exception: For *exterior walls* with a horizontal *fire separation distance* greater than 10 feet (3048 mm), the joint system shall be required to be tested for interior fire exposure only.

715.4 Exterior Curtain Wall/Floor Intersection

Where fire resistance-rated floor or floor/ceiling assemblies are required, voids created at the intersection of the exterior curtain wall assemblies and such floor assemblies shall be sealed with an *approved* system to prevent the interior spread of fire. Such systems shall be securely installed and tested in accordance with ASTM E2307 to provide an *F rating* for a time period not less than the *fire-resistance rating* of the floor assembly.

Exception: Voids created at the intersection of the exterior curtain wall assemblies and such floor assemblies where the vision glass extends to the finished floor level shall be permitted to be sealed with an approved material to prevent the interior spread of fire. Such material shall be securely installed and capable of preventing the passage of flame and hot gases sufficient to ignite cotton waste where subjected to ASTM E119 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inch (0.254 mm) of water column (2.5 Pa) for the time period not less than the *fire-resistance rating* of the floor assembly.

715.5 Exterior Curtain Wall/Nonfire-Resistance-Rated Floor Assembly Intersections

Voids created at the intersection of exterior curtain wall assemblies and nonfire-resistance-rated floor or floor/ceiling assemblies shall be sealed with an *approved* material or system to retard the interior spread of fire and hot gases between *stories*.

715.6 Exterior Curtain Wall/Vertical Fire Barrier Intersections

Voids created at the intersection of nonfire-resistance-rated exterior curtain wall assemblies and vertical *fire barriers* shall be filled with an approved material or system to retard the interior spread of fire and hot gases.

715.7 Curtain Wall Spandrels

Height and fire-resistance requirements for curtain wall spandrels shall comply with Section 705.8.5. Where Section 705.8.5 does not require a fire-resistance-rated spandrel wall, the requirements of Sections 715.4 and 715.5 shall still apply to the intersection between the spandrel wall and the floor.

715.8 Joints and Voids in Smoke Barriers

Fire-resistant joint systems protecting joints in *smoke barriers*, and systems protecting voids at the intersection of a horizontal *smoke barrier* and an exterior curtain wall, shall be tested in accordance with the requirements of UL 2079 for air leakage. The *L rating* of the joint system shall not exceed 5 cfm per linear foot (0.00775 m³/s m) of joint at 0.30 inch (74.7 Pa) of water for both the ambient temperature and elevated temperature tests.

Section 716 Opening Protectives

716.1 General

Opening protectives required by other sections of this code shall comply with the provisions of this section and shall be installed in accordance with NFPA 80.

716.2 Fire-Resistance-Rated Glazing

Fire-resistance-rated glazing tested as part of a *fire-resistance-rated* wall or floor/ceiling assembly in accordance with ASTM E119 or UL 263 and labeled in accordance with Section 703.6 shall not otherwise be required to comply with this section where used as part of a wall or floor/ceiling assembly. *Fire-resistance-rated* glazing shall be permitted in fire door and *fire window assemblies* where tested and installed in accordance with their listings and where in compliance with the requirements of this section.

716.3 Marking Fire-Rated Glazing Assemblies

Fire-rated glazing assemblies shall be marked in accordance with Tables 716.3, 716.5 and 716.6.

TABLE 716.3

MARKING FIRE-RATED GLAZING ASSEMBLIES

FIRE TEST STANDARD	MARKING	DEFINITION OF MARKING
ASTM E119 or UL 263	W	Meets wall assembly criteria.
ASTM E119 or UL 263	FC	Meets floor/ceiling criteria. ^a
NFPA 257 or UL 9	OH	Meets fire window assembly criteria including the hose stream test.
NFPA 252 or UL 10B or UL 10C	D	Meets fire door assembly criteria.
	H	Meets fire door assembly hose stream test.

	T	Meets 450°F temperature rise criteria for 30 minutes.
	XXX	The time in minutes of the fire resistance or fire protection rating of the glazing assembly.

For SI: $^{\circ}\text{C} = [({}^{\circ}\text{F}) - 32]/1.8$.

a. See Section 2409.1.

716.3.1 Fire-Rated Glazing Identification

For *fire-rated glazing*, the *label* shall bear the identification required in Tables 716.3 and 716.5. "D" indicates that the glazing is permitted to be used in *fire door* assemblies and that the glazing meets the fire protection requirements of NFPA 252, UL 10B or UL 10C. "H" shall indicate that the glazing meets the hose stream requirements of NFPA 252, UL 10B or UL 10C. "T" shall indicate that the glazing meets the temperature requirements of Section 716.5.5.1. The placeholder "XXX" represents the fire-rating period, in minutes.

716.3.2 Fire-Protection-Rated Glazing Identification

For *fire-protection-rated glazing*, the *label* shall bear the following identification required in Tables 716.3 and 716.6: "OH — XXX." "OH" indicates that the glazing meets both the fire protection and the hose-stream requirements of NFPA 257 or UL 9 and is permitted to be used in fire window openings. The placeholder "XXX" represents the fire-rating period, in minutes.

716.3.3 Fire-Rated Glazing That Exceeds the Code Requirements

Fire-rated glazing assemblies marked as complying with hose stream requirements (H) shall be permitted in applications that do not require compliance with hose stream requirements. *Fire-rated glazing* assemblies marked as complying with temperature rise requirements (T) shall be permitted in applications that do not require compliance with temperature rise requirements. *Fire-rated glazing* assemblies marked with ratings (XXX) that exceed the ratings required by this code shall be permitted.

716.4 Alternative Methods for Determining Fire Protection Ratings

The application of any of the alternative methods *listed* in this section shall be based on the fire exposure and acceptance criteria specified in NFPA 252, NFPA 257 or UL 9. The required *fire resistance* of an opening protective shall be permitted to be established by any of the following methods or procedures:

1. Designs documented in *approved* sources.
2. Calculations performed in an *approved* manner.
3. Engineering analysis based on a comparison of opening protective designs having *fire protection ratings* as determined by the test procedures set forth in NFPA 252, NFPA 257 or UL 9.
4. Alternative protection methods as allowed by Section 104.11.

716.5 Fire Door and Shutter Assemblies

Approved *fire door* and fire shutter assemblies shall be constructed of any material or assembly of component materials that conforms to the test requirements of Section 716.5.1, 716.5.2 or 716.5.3 and the *fire protection rating* indicated in Table 716.5. *Fire door* frames with transom lights, sidelights or both shall be permitted in accordance with Section 716.5.6.

Exceptions:

1. Labeled protective assemblies that conform to the requirements of this section or UL 10A, UL 14B and UL 14C for tin-clad *fire door* assemblies.
2. Floor *fire door* assemblies in accordance with Section 712.1.13.1.

TABLE 716.5**OPENING FIRE PROTECTION ASSEMBLIES, RATINGS AND MARKINGS**

TYPE OF ASSEMBLY	REQUIRED WALL ASSEMBLY RATING (hours)	MINIMUM FIRE DOOR AND FIRE SHUTTER ASSEMBLY RATING (hours)	DOOR VISION PANEL SIZE ^a	FIRE-RATED GLAZING MARKING DOOR VISION PANEL ^{c, e}	MINIMUM SIDELIGHT/TRANSOM ASSEMBLY RATING (hours)		FIRE-RATED GLAZING MARKING SIDELIGHT/TRANSOM PANEL		
					Fire protection	Fire resistance	Fire protection	Fire resistance	
Fire walls and fire barriers having a required fire-resistance rating greater than 1 hour	4	3	See Note b	D-H-W-240	Not Permitted	4	Not Permitted	W-240	
	3	3 ^a	See Note b	D-H-W-180	Not Permitted	3	Not Permitted	W-180	
	2	1 ^{1/2}	100 sq. in.	≤100 sq. in. = D-H-90 >100 sq. in. = D-H-W-90	Not Permitted	2	Not Permitted	W-120	
	1 ^{1/2}	1 ^{1/2}	100 sq. in.	≤100 sq. in. = D-H-90 >100 sq. in. = D-H-W-90	Not Permitted	1 ^{1/2}	Not Permitted	W-90	
Double fire walls constructed in accordance with NFPA 221	Single-wall assembly rating (hours) ^f	Each wall of the double-wall assembly (hours) ^g	—						
	4	3	3	See Note b	D-H-W-180	Permitted Not	3	Not Permitted	W-180
	3	2	1 ^{1/2}	100 sq. in.	≤ 100 sq. in. = D-H-90 >100 sq. in. = D-H-W-90	Not Permitted	2	Not Permitted	W-120
	2	1	1	100 sq. in.	≤ 100 sq. in. = D-H-60 > 100 sq. in. = D-H-W-60	Not Permitted	1	Not Permitted	W-60
Enclosures for shafts, interior	2	1 ^{1/2}	100 sq. in. ^b	≤100 sq. in. = D-H-90	Not Permitted	2	Not Permitted	W-120	

exit stairways and interior exit ramps.				> 100 sq. in.= D-H-T-W- 90				
Horizontal exits in fire walls ^d	4	3	100 sq. in.	≤100 sq. in. = D-H- 180 > 100 sq. in.= D-H-W- 240	Not Permitted	4	Not Permitted	W-240
	3	3 ^a	100 sq. in.	≤100 sq. in. = D-H- 180 > 100 sq. in.= D-H-W- 180	Not Permitted	3	Not Permitted	W-180
Fire barriers having a required fire- resistance rating of 1 hour: Enclosures for shafts, exit access stairways, exit access ramps, interior exit stairways and interior exit ramps; and exit passageway walls	1	1	100 sq. in.	≤100 sq. in. = D-H- 60 >100 sq. in.= D-H-T-W- 60	Not Permitted	1	Not Permitted	W-60
					Fire protection			
Other fire barriers	1	3/4	Maximum size tested	D-H	3/4	D-H ^h		
Fire partitions: Corridor walls	1	1/3 ^b	Maximum size tested	D-20	3/4 ^b	D-H-OH-45		
	0.5	1/3 ^b	Maximum size tested	D-20	1/3	D-H-OH-20		

Other fire partitions	1	$\frac{3}{4}$ ^e	Maximum size tested	D-H-45	$\frac{3}{4}$		D-H-45	
	0.5	$\frac{1}{3}$	Maximum size tested	D-H-20	$\frac{1}{3}$		D-H-20	
Exterior walls	3	$1\frac{1}{2}$	100 sq. in. ^b	≤ 100 sq. in. = D-H-90 > 100 sq. in = D-H-W-90	Not Permitted	3	Not Permitted	W-180
	2	$1\frac{1}{2}$	Maximum size tested	D-H-90 or D-H-W-90	$1\frac{1}{2}$ ^h	2	D-H-OH-90 ^h	W-120
					Fire protection			
	1	$\frac{3}{4}$	Maximum size tested	D-H-45	$\frac{3}{4}$ ^h		D-H-45 ^h	
Smoke barriers					Fire protection			
	1	$\frac{1}{3}$	Maximum size tested	D-20	$\frac{3}{4}$		D-H-OH-45	

For SI: 1 square inch = 645.2 mm.

- a. Two doors, each with a fire protection rating of $1\frac{1}{2}$ hours, installed on opposite sides of the same opening in a fire wall, shall be deemed equivalent in fire protection rating to one 3-hour fire door.
- b. Fire-resistance-rated glazing tested to ASTM E119 in accordance with Section 716.2 shall be permitted, in the maximum size tested.
- c. Under the column heading "Fire-rated glazing marking door vision panel," W refers to the fire-resistance rating of the glazing, not the frame.
- d. See Section 716.5.8.1.2.1.
- e. See Section 716.3.1 and Table 716.3 for additional permitted markings.
- f. As required in Section 706.4.
- g. As allowed in NFPA 221 Section 4.6.
- h. Fire-protection-rated glazing is not permitted for fire barriers required by the Florida Fire Prevention Code to enclose energy storage systems. Fire-resistance-rated glazing assemblies tested to ASTM E119 or UL 263, as specified in Section 716.2, shall be permitted.

716.5.1 Side-Hinged or Pivoted Swinging Doors

Fire door assemblies with side-hinged and pivoted swinging doors shall be tested in accordance with NFPA 252 or UL 10C. After 5 minutes into the NFPA 252 test, the neutral pressure level in the furnace shall be established at 40 inches (1016 mm) or less above the sill.

716.5.2 Other Types of Assemblies

Fire door assemblies with other types of doors, including swinging elevator doors, horizontal sliding fire doors, rolling steel fire doors, fire shutters, bottom and side-hinged chute intake doors, and top-hinged chute discharge doors, shall be tested in accordance with NFPA 252 or UL 10B. The pressure in the furnace shall be maintained as nearly equal to the atmospheric pressure as possible. Once established, the pressure shall be maintained during the entire test period.

716.5.3 Door Assemblies in Corridors and Smoke Barriers

Fire door assemblies required to have a minimum *fire protection rating* of 20 minutes where located in *corridor walls* or *smoke barrier walls* having a *fire-resistance rating* in accordance with Table 716.5 shall be tested in accordance with NFPA 252 or UL 10C without the hose stream test.

Exceptions:

1. Viewports that require a hole not larger than 1 inch (25 mm) in diameter through the door, have not less than a 0.25-inch-thick (6.4 mm) glass disc and the holder is of metal that will not melt out where subject to temperatures of 1,700°F (927°C).
2. *Corridor* door assemblies in occupancies of Group I-2 shall be in accordance with Section 407.3.1.
3. Unprotected openings shall be permitted for *corridors* in multitheater complexes where each motion picture auditorium has not fewer than one-half of its required *exit* or *exit access doorways* opening directly to the exterior or into an *exit passageway*.
4. Horizontal sliding doors in *smoke barriers* that comply with Sections 408.6 and 408.8.4 in occupancies in Group I-3.

716.5.3.1 Smoke and Draft Control

Fire door assemblies shall meet the requirements for a smoke and draft control door assembly tested in accordance with UL 1784. The air leakage rate of the door assembly shall not exceed 3.0 cubic feet per minute per square foot ($0.01524 \text{ m}^3/\text{s} \cdot \text{m}^2$) of door opening at 0.10 inch (24.9 Pa) of water for both the ambient temperature and elevated temperature tests. Louvers shall be prohibited. Installation of smoke doors shall be in accordance with NFPA 105. Terminated stops shall be prohibited on doors required by Section 405.4.3 to comply with Section 716.5.3 and prohibited on doors required by Sections 3006.3 Item 3, 3007.6.3, or 3008.6.3 to comply with Section 716.5.3.1.

Exception: Elevator hoistway door openings protected in accordance with Section 3006.3

716.5.3.2 Glazing in Door Assemblies

In a 20-minute *fire door assembly*, the glazing material in the door itself shall have a minimum fire-protection-rated glazing of 20 minutes and shall be exempt from the hose stream test. Glazing material in any other part of the door assembly, including transom lights and sidelights, shall be tested in accordance with NFPA 257 or UL 9, including the hose stream test, in accordance with Section 716.6.

716.5.4 Door Assemblies in Other Fire Partitions

Fire door assemblies required to have a minimum fire protection rating of 20 minutes where located in other *fire partitions* having a fire-resistance rating of 0.5 hour in accordance with Table 716.5 shall be tested in accordance with NFPA 252, UL 10B or UL 10C with the hose stream test.

716.5.5 Doors in Interior Exit Stairways and Ramps and Exit Passageways

Fire door assemblies in interior exit stairways and ramps and exit passageways shall have a maximum transmitted temperature rise of not more than 450°F (250°C) above ambient at the end of 30 minutes of standard fire test exposure.

Exception: The maximum transmitted temperature rise is not required in buildings equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 or 903.3.1.2.

716.5.5.1 Glazing in Doors

Fire-protection-rated glazing in excess of 100 square inches (0.065 m^2) is not permitted. Fire-resistance-rated glazing in excess of 100 square inches (0.065 m^2) shall be permitted in *fire doors*. Listed *fire-resistance-rated* glazing in a *fire door* shall have a maximum transmitted temperature rise in accordance with Section 716.5.5 when the *fire door* is tested in accordance with NFPA 252, UL 10B or UL 10C.

716.5.6 Fire Door Frames With Transom Lights and Sidelights

Door frames with transom lights, sidelights or both, shall be permitted where a $\frac{3}{4}$ -hour *fire protection rating* or less is required in accordance with Table 716.5. *Fire door* frames with transom lights, sidelights, or both, installed with fire-resistance-rated glazing tested as an assembly in accordance with ASTM E119 or UL 263 shall be permitted where a fire protection rating exceeding $\frac{3}{4}$ hour is required in accordance with Table 716.5.

716.5.6.1 Energy Storage System Separation

Fire-protection-rated glazing shall not be permitted in fire door frames with transom lights and sidelights in fire barriers required by the *Florida Fire Prevention Code* to enclose energy storage systems.

716.5.7 Labeled Protective Assemblies

Fire door assemblies shall be labeled by an *approved agency*. The *labels* shall comply with NFPA 80, and shall be permanently affixed to the door or frame.

716.5.7.1 Fire Door Labeling Requirements

Fire doors shall be labeled showing the name of the manufacturer or other identification readily traceable back to the manufacturer, the name or trademark of the thirdparty inspection agency, the *fire protection rating* and, where required for *fire doors* in interior exit stairways and ramps and exit passageways by Section 716.5.5, the maximum transmitted temperature end point. Smoke and draft control doors complying with UL 1784 shall be labeled as such and shall comply with Section 716.5.7.3. Labels shall be approved and permanently affixed. The label shall be applied at the factory or location where fabrication and assembly are performed.

716.5.7.1.1 Light Kits, Louvers and Components

Listed light kits and louvers and their required preparations shall be considered as part of the labeled door where such installations are done under the listing program of the third-party agency. *Fire doors* and door assemblies shall be permitted to consist of components, including glazing, vision light kits and hardware that are listed or classified and labeled for such use by different third-party agencies.

716.5.7.2 Oversized Doors

Oversized *fire doors* shall bear an oversized *fire door label* by an *approved agency* or shall be provided with a certificate of inspection furnished by an *approved* testing agency. Where a certificate of inspection is furnished by an *approved* testing agency, the certificate shall state that the door conforms to the requirements of design, materials and construction, but has not been subjected to the fire test.

716.5.7.3 Smoke and Draft Control Door Labeling Requirements

Smoke and draft control doors complying with UL 1784 shall be labeled in accordance with Section 716.5.7.1 and shall show the letter "S" on the fire-rating *label* of the door. This marking shall indicate that the door and frame assembly are in compliance where *listed* or labeled gasketing is installed.

716.5.7.4 Fire Door Frame Labeling Requirements

Fire door frames shall be labeled showing the names of the manufacturer and the third-party inspection agency.

716.5.7.5 Fire Door Operator Labeling Requirements

Fire door operators for horizontal sliding doors shall be labeled and listed for use with the assembly.

716.5.8 Glazing Material

Fire-rated glazing and *fire-resistance-rated* glazing conforming to the opening protection requirements in Section 716.5 shall be permitted in *fire door* assemblies.

716.5.8.1 Size Limitations

Fire-resistance-rated glazing shall comply with the size limitations in Section 716.5.8.1.1. Fire-protection-rated glazing shall comply with the size limitations of NFPA 80, and as provided in Section 716.5.8.1.2.

716.5.8.1.1 Fire-Resistance-Rated Glazing in Door Assemblies in Fire Walls and Fire Barriers Rated Greater Than 1 Hour

Fire-resistance-rated glazing tested to ASTM E119 or UL 263 and NFPA 252, UL 10B or UL 10C shall be permitted in *fire door assemblies* located in *fire walls* and in *fire barriers* in accordance with Table 716.5 to the maximum size tested and in accordance with their listings.

716.5.8.1.2 Fire-Protection-Rated Glazing in Door Assemblies in Fire Walls and Fire Barriers Rated Greater Than 1 Hour

Fire-protection-rated glazing shall be prohibited in *fire walls* and *fire barriers* except as provided in Sections 716.5.8.1.2.1 and 716.5.8.1.2.2.

716.5.8.1.2.1 Horizontal Exits

Fire-protection-rated glazing shall be permitted as vision panels in *self-closing* swinging *fire door* assemblies serving as horizontal exits in *fire walls* where limited to 100 square inches (0.065 m²).

716.5.8.1.2.2 Fire Barriers

Fire-protection-rated glazing shall be permitted in *fire doors* having a 1½-hour *fire protection rating* intended for installation in *fire barriers*, where limited to 100 square inches (0.065 m²).

716.5.8.2 Elevator, Stairway and Ramp Protectives

Approved fire-protection-rated glazing used in *fire door* assemblies in elevator, stairway and ramp enclosures shall be so located as to furnish clear vision of the passageway or approach to the elevator, stairway or ramp.

716.5.8.3 Labeling

Fire-rated glazing shall bear a *label* or other identification showing the name of the manufacturer, the test standard and information required in Table 716.3 that shall be issued by an *approved agency* and shall be permanently identified on the glazing.

716.5.8.4 Safety Glazing

Fire-protection-rated glazing and *fire-resistance-rated glazing* installed in *fire door* assemblies shall comply with the safety glazing requirements of Chapter 24 where applicable.

716.5.9 Door Closing

Fire doors shall be latching and self- or automatic-closing in accordance with this section.

Exceptions:

1. *Fire doors* located in common walls separating *sleeping units* in Group R-1 shall be permitted without automatic- or *self-closing* devices.
2. The elevator car doors and the associated hoistway enclosure doors at the floor level designated for recall in accordance with Section 3003.2 shall be permitted to remain open during Phase I emergency recall operation.

716.5.9.1 Latch Required

Unless otherwise specifically permitted, single side-hinged swinging *fire doors* and both leaves of pairs of side-hinged swinging *fire doors* shall be provided with an active latch bolt that will secure the door when it is closed.

716.5.9.1.1 Chute Intake Door Latching

Chute intake doors shall be positive latching, remaining latched and closed in the event of latch spring failure during a fire emergency.

716.5.9.2 Automatic-Closing Fire Door Assemblies

Automatic-closing *fire door* assemblies shall be *self-closing* in accordance with NFPA 80.

716.5.9.3 Delayed Action Closers

Doors required to be self-closing and not required to be automatic closing shall be permitted to be equipped with delayed action closers.

716.5.9.4 Smoke-Activated Doors

Automatic-closing doors installed in the following locations shall be permitted to have hold-open devices. Doors shall automatically close by the actuation of smoke detectors installed in accordance with Section 907.3 or by loss of power to the smoke detector or hold-open device. Doors that are automatic-closing by smoke detection shall not have more than a 10-second delay before the door starts to close after the smoke detector is actuated. Automatic-closing doors that protect openings installed in the following locations shall comply with this section:

1. In walls that separate incidental uses in accordance with Section 509.4.
2. In *fire walls* in accordance with Section 706.8.
3. In *fire barriers* in accordance with Section 707.6.
4. In *fire partitions* in accordance with Section 708.6.
5. In smoke barriers in accordance with Section 709.5.
6. In smoke partitions in accordance with Section 710.5.2.3.
7. In shaft enclosures in accordance with Section 713.7.
8. In waste and linen chutes, discharge openings and access and discharge rooms in accordance with Section 713.13. Loading doors installed in waste and linen chutes shall meet the requirements of Sections 716.5.9 and 716.5.9.1.1.

716.5.9.5 Doors in Pedestrian Ways

Vertical sliding fire doors or rolling steel *fire doors* in openings through which pedestrians travel shall be heat activated or activated by smoke detectors with alarm verification.

716.5.10 Swinging Fire Shutters

Where fire shutters of the swinging type are installed in exterior openings, not less than one row in every three vertical rows shall be arranged to be readily opened from the outside, and shall be identified by distinguishing marks or letters not less than 6 inches (152 mm) high.

716.5.11 Rolling Fire Shutters

Where fire shutters of the rolling type are installed, such shutters shall include *approved* automatic-closing devices.

716.6 Fire-Protection-Rated Glazing

Glazing in *fire window assemblies* shall be fire protection rated in accordance with this section and Table 716.6. Glazing in *fire door* assemblies shall comply with Section 716.5.8. Fire-protection-rated glazing in fire window assemblies shall be tested in accordance with and shall meet the acceptance criteria of NFPA 257 or UL 9. Openings in nonfire-resistance-rated *exterior wall* assemblies that require protection in accordance with Section 705.3, 705.8, 705.8.5 or 705.8.6 shall have a fire protection rating of not less than $\frac{3}{4}$ hour. Fire-protection-rated glazing in 0.5-hour fire-resistance-rated partitions is permitted to have an 0.33-hour fire protection rating.

TABLE 716.6

FIRE WINDOW ASSEMBLY FIRE PROTECTION RATINGS

TYPE OF WALL ASSEMBLY	REQUIRED WALL ASSEMBLY RATING (hours)	MINIMUM FIRE WINDOW ASSEMBLY RATING (hours)	FIRE-RATED GLAZING MARKING
Interior walls			
Fire walls	All	NP ^a	W-XXX ^b
Fire barriers	>1	NP ^a	W-XXX ^b

	1	NP ^a	W-XXX ^b
Incidental use areas (Section 707.3.7), ^c	1	3/4	OH-45 or W-60
Mixed occupancy separations (Section 707.3.9)			
Fire partitions	1	3/4	OH-45 or W-60
	0.5	1/3	OH-20 or W-30
Smoke barriers	1	3/4	OH-45 or W-60
Exterior walls	>1	1 1/2	OH-90 or W-XXX ^b
	1	3/4	OH-45 or W-60
	0.5	1/3	OH-20 or W-30
Party wall	All	NP	Not Applicable

NP = Not Permitted.

- a. Not permitted except fire-resistance-rated glazing assemblies tested to ASTM E119 or UL 263, as specified in Section 716.2.
- b. XXX = The fire rating duration period in minutes, which shall be equal to the *fire-resistance rating* required for the wall assembly.
- c. Fire-protection-rated glazing is not permitted for fire barriers required by the Florida Fire Prevention Code to enclose energy storage systems. Fire-resistance-rated glazing assemblies tested to ASTM E119 or UL 263, as specified in Section 716.2, shall be permitted.

716.6.1 Testing Under Positive Pressure

NFPA 257 or UL 9 shall evaluate fire-protection-rated glazing under positive pressure. Within the first 10 minutes of a test, the pressure in the furnace shall be adjusted so not less than two-thirds of the test specimen is above the neutral pressure plane, and the neutral pressure plane shall be maintained at that height for the balance of the test.

716.6.2 Nonsymmetrical Glazing Systems

Nonsymmetrical fire-protection-rated glazing systems in *fire partitions*, in *fire barriers* or in *exterior walls* with a *fire separation distance* of 10 feet (3048 mm) or less pursuant to Section 705 shall be tested with both faces exposed to the furnace, and the assigned *fire protection rating* shall be the shortest duration obtained from the two tests conducted in compliance with NFPA 257 or UL 9.

716.6.3 Safety Glazing

Fire-protection-rated glazing and *fire-resistance-rated glazing* installed in *fire window assemblies* shall comply with the safety glazing requirements of Chapter 24 where applicable.

716.6.4 Glass and Glazing

Glazing in *fire window assemblies* shall be fire-protection-rated glazing installed in accordance with and complying with the size limitations set forth in NFPA 80.

716.6.5 Installation

Fire-protection-rated glazing shall be in the fixed position or be automatic-closing and shall be installed in *approved frames*.

716.6.6 Window Mullions

Metal mullions that exceed a nominal height of 12 feet (3658 mm) shall be protected with materials to afford the same *fire-resistance rating* as required for the wall construction in which the protective is located.

716.6.7 Interior Fire Window Assemblies

Fire-protection-rated glazing used in *fire window assemblies* located in *fire partitions* and *fire barriers* shall be limited to use in assemblies with a maximum *fire-resistance rating* of 1 hour in accordance with this section.

716.6.7.1 Where 3/4-Hour Fire Protection Window Assemblies Permitted

Fire-protection-rated glazing requiring 45-minute opening protection in accordance with Table 716.6 shall be limited to *fire partitions* designed in accordance with Section 708 and *fire barriers* utilized in the applications set forth in Sections 707.3.6, 707.3.7 and 707.3.9 where the *fire-resistance rating* does not exceed 1 hour. Fire-resistance-rated glazing assemblies tested in accordance with ASTM E119 or UL 263 shall not be subject to the limitations of this section.

716.6.7.1.1 Energy Storage System Separation

Fire-protection-rated glazing is not permitted for use in fire window assemblies in fire barriers required by the *Florida Fire Prevention Code* to enclose energy storage systems.

716.6.7.2 Area Limitations

The total area of the glazing in fire-protection-rated window assemblies shall not exceed 25 percent of the area of a common wall with any room.

716.6.7.3 Where 1/3-Hour Fire-Protection Window Assemblies Permitted

Fire-protection-rated glazing shall be permitted in window assemblies tested to NFPA 257 or UL 9 in *smoke barriers* and *fire partitions* requiring $\frac{1}{3}$ -hour opening protection in accordance with Table 716.6.

716.6.8 Labeling Requirements

Fire-protection-rated glazing shall bear a label or other identification showing the name of the manufacturer, the test standard and information required in Section 716.3.2 and Table 716.6 that shall be issued by an approved agency and permanently identified on the glazing.

Section 717 Ducts and Air Transfer Openings

717.1 General

The provisions of this section shall govern the protection of duct penetrations and air transfer openings in assemblies required to be protected and duct penetrations in nonfire-resistance-rated floor assemblies.

717.1.1 Ducts and Air Transfer Openings

Ducts transitioning horizontally between shafts shall not require a shaft enclosure provided that the duct penetration into each associated shaft is protected with *dampers* complying with this section.

717.1.2 Ducts That Penetrate Fire-Resistance-Rated Assemblies Without Dampers

Ducts that penetrate fire-resistance-rated assemblies and are not required by this section to have *dampers* shall comply with the requirements of Sections 714.3 through 714.4.3. Ducts that penetrate *horizontal assemblies* not required to be contained within a shaft and not required by this section to have *dampers* shall comply with the requirements of Sections 714.5 through 714.6.2.

717.1.2.1 Ducts That Penetrate Nonfire-Resistance-Rated Assemblies

The space around a duct penetrating a nonfire-resistance-rated floor assembly shall comply with Section 717.6.3.

717.2 Installation

Fire dampers, *smoke dampers*, *combination fire/smoke dampers* and *ceiling radiation dampers* located within air distribution and smoke control systems shall be installed in accordance with the manufacturer's instructions, the *dampers'* listing and Sections 717.2.1 through 717.2.3.

717.2.1 Smoke Control System

Where the installation of a *fire damper* will interfere with the operation of a required smoke control system in accordance with Section 909, *approved alternative protection* shall be utilized. Where mechanical systems including ducts and *dampers* utilized for normal building ventilation serve as part of the smoke control system, the expected performance of these systems in smoke control mode shall be addressed in the rational analysis required by Section 909.4.

717.2.2 Hazardous Exhaust Ducts

Fire dampers for hazardous exhaust duct systems shall comply with the Florida Building Code, Mechanical.

717.2.3 Static Dampers

Fire dampers and ceiling radiation dampers that are listed for use in static systems shall only be installed in heating, ventilation and air-conditioning systems that are automatically shut down in the event of a fire.

717.3 Damper Testing, Ratings and Actuation

Damper testing, ratings and actuation shall be in accordance with Sections 717.3.1 through 717.3.3.

717.3.1 Damper Testing

Dampers shall be listed and labeled in accordance with the standards in this section.

1. *Fire dampers* shall comply with the requirements of UL 555.
2. *Smoke dampers* shall comply with the requirements of UL 555S.
3. *Combination fire/smoke dampers* shall comply with the requirements of both UL 555 and UL 555S.
4. *Ceiling radiation dampers* shall comply with the requirements of UL 555C or shall be tested as part of a fire-resistance-rated floor/ceiling or roof/ceiling assembly in accordance with ASTM E119 or UL 263.
5. *Corridor dampers* shall comply with requirements of both UL 555 and UL 555S. *Corridor dampers* shall demonstrate acceptable closure performance when subjected to 150 feet per minute (0.76 mps) velocity across the face of the damper during the UL 555 fire exposure test.

717.3.2 Damper Rating

Damper ratings shall be in accordance with Sections 717.3.2.1 through 717.3.2.4.

717.3.2.1 Fire Damper Ratings

Fire dampers shall have the minimum *fire protection rating* specified in Table 717.3.2.1 for the type of penetration.

TABLE 717.3.2.1

FIRE DAMPER RATING

TYPE OF PENETRATION	MINIMUM DAMPER RATING (hours)
Less than 3-hour fire-resistance-rated assemblies	1.5
3-hour or greater fire-resistance-rated assemblies	3

717.3.2.2 Smoke Damper Ratings

Smoke damper leakage ratings shall be Class I or II. Elevated temperature ratings shall be not less than 250°F (121°C).

717.3.2.3 Combination Fire/Smoke Damper Ratings

Combination fire/smoke dampers shall have the minimum *fire protection rating* specified for *fire dampers* in Table 717.3.2.1 for the type of penetration and shall have a minimum *smoke damper* rating as specified in Section 717.3.2.2.

717.3.2.4 Corridor Damper Ratings

Corridor dampers shall have the following minimum ratings:

1. One hour *fire-resistance rating*.

2. Class I or II leakage rating as specified in Section 717.3.2.2.

717.3.3 Damper Actuation

Damper actuation shall be in accordance with Sections 717.3.3.1 through 717.3.3.5 as applicable.

717.3.3.1 Fire Damper Actuation

Primary heat responsive devices used to actuate fire shall meet one of the following requirements:

1. The operating temperature shall be approximately 50°F (10°C) above the normal temperature within the duct system, but not less than 160°F (71°C).
2. The operating temperature shall be not more than 350°F (177°C) where located in a smoke control system complying with Section 909.

717.3.3.2 Smoke Damper Actuation

The *smoke damper* shall close upon actuation of a *listed* smoke detector or detectors installed in accordance with Section 907.3 and one of the following methods, as applicable:

1. Where a *smoke damper* is installed within a duct, a smoke detector shall be installed inside the duct or outside the duct with sampling tubes protruding into the duct. The detector or tubes within the duct shall be within 5 feet (1524 mm) of the *damper*. Air outlets and inlets shall not be located between the detector or tubes and the *damper*. The detector shall be *listed* for the air velocity, temperature and humidity anticipated at the point where it is installed. Other than in mechanical smoke control systems, *dampers* shall be closed upon fan shutdown where local smoke detectors require a minimum velocity to operate.
2. Where a *smoke damper* is installed above *smoke barrier* doors in a *smoke barrier*, a spot-type detector shall be installed on either side of the *smoke barrier* door opening. The detector shall be listed for releasing service if used for direct interface with the damper.
3. Where a *smoke damper* is installed within an air transfer opening in a wall, a spot-type detector shall be installed within 5 feet (1524 mm) horizontally of the *damper*. The detector shall be listed for releasing service if used for direct interface with the damper.
4. Where a *smoke damper* is installed in a *corridor* wall or ceiling, the *damper* shall be permitted to be controlled by a smoke detection system installed in the *corridor*.
5. Where a smoke detection system is installed in all areas served by the duct in which the damper will be located, the *smoke dampers* shall be permitted to be controlled by the smoke detection system.

717.3.3.3 Combination Fire/Smoke Damper Actuation

Combination fire/smoke damper actuation shall be in accordance with Sections 717.3.3.1 and 717.3.3.2. *Combination fire/smoke dampers* installed in smoke control system shaft penetrations shall not be activated by local area smoke detection unless it is secondary to the smoke management system controls.

717.3.3.4 Ceiling Radiation Damper Actuation

The operating temperature of a *ceiling radiation damper* actuation device shall be 50°F (27.8°C) above the normal temperature within the duct system, but not less than 160°F (71°C).

717.3.3.5 Corridor Damper Actuation

Corridor damper actuation shall be in accordance with Sections 717.3.3.1 and 717.3.3.2.

717.4 Access and Identification

Access and identification of fire and smoke dampers shall comply with Sections 717.4.1 through 717.4.2.

717.4.1 Access

Fire and smoke *dampers* shall be provided with an *approved* means of access that is large enough to *permit* inspection and maintenance of the *damper* and its operating parts. Dampers equipped with fusible links, internal operators or both shall be provided with an access door that is not less than 12 inches (305 mm) square or provided with a removable duct section.

717.4.1.1 Access Openings

The access shall not affect the integrity of fire-resistance-rated assemblies. The access openings shall not reduce the *fire-resistance rating* of the assembly. Access doors in ducts shall be tight fitting and suitable for the required duct construction.

717.4.1.2 Restricted Access

Where space constraints or physical barriers restrict access to a damper for periodic inspection and testing, the damper shall be a single- or multi-blade type damper and shall comply with the remote inspection requirements of NFPA 80 or NFPA 105.

717.4.2 Identification

Access points shall be permanently identified on the exterior by a *label* having letters not less than $\frac{1}{2}$ inch (12.7 mm) in height reading: FIRE/SMOKE DAMPER, SMOKE DAMPER or FIRE DAMPER.

717.5 Where Required

Fire, dampers, smoke dampers, combination fire/smoke dampers, ceiling radiation dampers and corridor dampers shall be provided at the locations prescribed in Sections 717.5.1 through 717.5.7 and 717.6. Where an assembly is required to have both *fire dampers* and *smoke dampers, combination fire/smoke dampers* or a *fire damper* and a *smoke damper* shall be provided.

717.5.1 Fire Walls

Ducts and air transfer openings permitted in *fire walls* in accordance with Section 706.11 shall be protected with *listed fire dampers* installed in accordance with their listing.

717.5.1.1 Horizontal Exits

A *listed smoke damper* designed to resist the passage of smoke shall be provided at each point a duct or air transfer opening penetrates a *fire wall* that serves as a horizontal exit.

717.5.2 Fire Barriers

Ducts and air transfer openings of *fire barriers* shall be protected with listed fire dampers installed in accordance with their listing. Ducts and air transfer openings shall not penetrate enclosures for *interior exit stairways* and *ramps* and *exit passageways*, except as permitted by Sections 1023.5 and 1024.6, respectively.

Exception: *Fire dampers* are not required at penetrations of *fire barriers* where any of the following apply:

1. Penetrations are tested in accordance with ASTM E119 or UL 263 as part of the fire-resistance-rated assembly.
2. Ducts are used as part of an *approved* smoke control system in accordance with Section 909 and where the use of a *fire damper* would interfere with the operation of a smoke control system.
3. Such walls are penetrated by fully ducted HVAC systems, have a required *fire-resistance rating* of 1 hour or less, are in areas of other than Group H and are in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2. For the purposes of this exception, a fully ducted HVAC system shall be a duct system for conveying supply, return or exhaust air as part of the structure's HVAC system. Such a duct system shall be constructed of sheet steel not less than No. 26 gage thickness and shall be continuous from the airhandling appliance or equipment to the air outlet and inlet terminals. Flexible air connectors shall be permitted in the following locations:
 - 3.1. Nonmetal flex connections shall be permitted at the duct connection to the air handling unit or equipment located within the mechanical room in accordance with Section 603.9 of the *Florida Building Code, Mechanical*.

3.2. Nonmetal flex connections shall be permitted from an overhead metal duct to a ceiling diffuser within the same room in accordance with Section 603.6.2 of the *Florida Building Code, Mechanical*.

717.5.2.1 Horizontal Exits

A *listed smoke damper* designed to resist the passage of smoke shall be provided at each point a duct or air transfer opening penetrates a *fire barrier* that serves as a horizontal exit.

717.5.3 Shaft Enclosures

Shaft enclosures that are permitted to be penetrated by ducts and air transfer openings shall be protected with listed fire and smoke *dampers* installed in accordance with their listing.

Exceptions:

1. *Fire dampers* are not required at penetrations of shafts where any of the following criteria are met:

1.1. Steel exhaust subducts having a wall thickness of not less than 0.0187 inch (0.4712 mm) are extended not less than 22 inches (559 mm) vertically in exhaust shafts, and an exhaust fan is installed at the upper terminus of the shaft that is powered continuously in accordance with Section 909.11, so as to maintain a continuous upward airflow to the outdoors.

1.2. Penetrations are tested in accordance with ASTM E119 or UL 263 as part of the fire-resistance-rated assembly.

1.3. Ducts are used as part of an *approved* smoke control system designed and installed in accordance with Section 909 and where the *fire damper* will interfere with the operation of the smoke control system.

1.4. The penetrations are in parking garage exhaust or supply shafts that are separated from other building shafts by not less than 2-hour fire-resistance-rated construction.

2. In Group B and R occupancies equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, *smoke dampers* are not required at penetrations of shafts where all of the following criteria are met:

2.1. Kitchen, clothes dryer, bathroom and toilet room exhaust openings are installed with steel exhaust subducts, having a wall thickness of not less than 0.0187-inch (0.4712 mm).

2.2. The subducts extend not less than 22 inches (559 mm) vertically.

2.3. An exhaust fan is installed at the upper terminus of the shaft that is powered continuously in accordance with the provisions of Section 909.11, so as to maintain a continuous upward airflow to the outdoors.

3. *Smoke dampers* are not required at penetration of exhaust or supply shafts in parking garages that are separated from other building shafts by not less than 2-hour fire-resistance-rated construction.

4. *Smoke dampers* are not required at penetrations of shafts where ducts are used as part of an *approved* mechanical smoke control system designed in accordance with Section 909 and where the *smoke damper* will interfere with the operation of the smoke control system.

5. *Fire dampers* and *combination fire/smoke dampers* are not required in kitchen and clothes dryer exhaust systems where installed in accordance with the *Florida Building Code, Mechanical*.

717.5.3.1 Continuous Upward Airflow

Fire dampers and smoke dampers shall not be installed in shafts that are required to maintain a continuous upward airflow path where closure of the damper would result in the loss of the airflow.

717.5.4 Fire Partitions

Ducts and air transfer openings that penetrate *fire partitions* shall be protected with *listed fire dampers* installed in accordance with their listing.

Exceptions: In occupancies other than Group H, *fire dampers* are not required where any of the following apply:

1. Corridor walls in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2 and the duct is protected as a *through penetration* in accordance with Section 714.
2. Tenant partitions in *covered and open mall buildings* where the walls are not required by provisions elsewhere in the code to extend to the underside of the floor or roof sheathing, slab or deck above.
3. The duct system is constructed of *approved* materials in accordance with the *Florida Building Code, Mechanical* and the duct penetrating the wall complies with all of the following requirements:
 - 3.1. The duct shall not exceed 100 square inches (0.06 m²).
 - 3.2. The duct shall be constructed of steel not less than 0.0217 inch (0.55 mm) in thickness.
 - 3.3. The duct shall not have openings that communicate the *corridor* with adjacent spaces or rooms.
 - 3.4. The duct shall be installed above a ceiling.
 - 3.5. The duct shall not terminate at a wall register in the fire-resistance-rated wall.
 - 3.6. A minimum 12-inch-long (305 mm) by 0.060-inch-thick (1.52 mm) steel sleeve shall be centered in each duct opening. The sleeve shall be secured to both sides of the wall and all four sides of the sleeve with minimum 1½-inch by 1½-inch by 0.060-inch (38 mm by 38 mm by 1.52 mm) steel retaining angles. The retaining angles shall be secured to the sleeve and the wall with No. 10 (M5) screws. The *annular space* between the steel sleeve and the wall opening shall be filled with *mineral wool* battening on all sides.
4. Such walls are penetrated by ducted HVAC systems, have a required *fire-resistance rating* of 1 hour or less, and are in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2. For the purposes of this exception, a ducted HVAC system shall be a duct system for conveying supply, return or exhaust air as part of the structure's HVAC system. Such a duct system shall be constructed of sheet steel not less than No. 26 gage thickness and shall be continuous from the air-handling appliance or equipment to the air outlet and inlet terminals.

717.5.4.1 Corridors

Duct and air transfer openings that penetrate *corridors* shall be protected with dampers as follows:

1. A *corridor damper* shall be provided where corridor ceilings, constructed as required for the corridor walls as permitted in Section 708.4, Exception 3, are penetrated.
2. A *ceiling radiation damper* shall be provided where the ceiling membrane of a *fire-resistance-rated* floor-ceiling or roof-ceiling assembly, constructed as permitted in Section 708.4, Exception 2, is penetrated.
3. A listed smoke damper designed to resist the passage of smoke shall be provided at each point a duct or air transfer opening penetrates a corridor enclosure required to have smoke and draft control doors in accordance with Section 716.5.3.

Exceptions:

1. *Smoke dampers* are not required where the building is equipped throughout with an *approved* smoke control system in accordance with Section 909, and *smoke dampers* are not necessary for the operation and control of the system.
2. *Smoke dampers* are not required in *corridor* penetrations where the duct is constructed of steel not less than 0.019 inch (0.48 mm) in thickness and there are no openings serving the *corridor*.

717.5.5 Smoke Barriers

A *listed smoke damper* designed to resist the passage of smoke shall be provided at each point a duct or air transfer opening penetrates a *smoke barrier*. *Smoke dampers* and *smoke damper* actuation methods shall comply with Section 717.3.3.2.

Exceptions:

1. *Smoke dampers* are not required where the openings in ducts are limited to a single *smoke compartment* and the ducts are constructed of steel.
2. *Smoke dampers* are not required in *smoke barriers* required by Section 407.5 for Group I-2, Condition 2—where the HVAC system is fully ducted in accordance with Section 603 of the *Florida Building Code, Mechanical* and where buildings are equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 and equipped with quick-response sprinklers in accordance with Section 903.3.2.

717.5.6 Exterior Walls

Ducts and air transfer openings in fire-resistance-rated *exterior walls* required to have protected openings in accordance with Section 705.10 shall be protected with *listed fire dampers* installed in accordance with their listing.

717.5.7 Smoke Partitions

A *listed smoke damper* designed to resist the passage of smoke shall be provided at each point that an air transfer opening penetrates a smoke partition. *Smoke dampers* and *smoke damper* actuation methods shall comply with Section 717.3.3.2.

Exception: Where the installation of a *smoke damper* will interfere with the operation of a required smoke control system in accordance with Section 909, *approved* alternative protection shall be utilized.

717.6 Horizontal Assemblies

Penetrations by ducts and air transfer openings of a floor, floor/ceiling assembly or the ceiling membrane of a roof/ceiling assembly shall be protected by a shaft enclosure that complies with Section 713 or shall comply with Sections 717.6.1 through 717.6.3.

717.6.1 Through Penetrations

In occupancies other than Groups I-2 and I-3, a duct constructed of *approved* materials in accordance with the *Florida Building Code, Mechanical* that penetrates a fire-resistance-rated floor/ceiling assembly that connects not more than two *stories* is permitted without shaft enclosure protection, provided a *listed fire damper* is installed at the floor line or the duct is protected in accordance with Section 714.5. For air transfer openings, see Section 712.1.9.

Exception: A duct is permitted to penetrate three floors or less without a *fire damper* at each floor, provided such duct meets all of the following requirements:

1. The duct shall be contained and located within the cavity of a wall and shall be constructed of steel having a minimum wall thickness of 0.0187 inches (0.4712 mm) (No. 26 gage).
2. The duct shall open into only one *dwelling or sleeping unit* and the duct system shall be continuous from the unit to the exterior of the building.
3. The duct shall not exceed 4-inch (102 mm) nominal diameter and the total area of such ducts shall not exceed 100 square inches (0.065 m²) in any 100 square feet (9.3 m²) of floor area.
4. The *annular space* around the duct is protected with materials that prevent the passage of flame and hot gases sufficient to ignite cotton waste where subjected to ASTM E119 or UL 263 time-temperature conditions under a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water at the location of the penetration for the time period equivalent to the *fire-resistance rating* of the construction penetrated.
5. Grille openings located in a ceiling of a fire-resistance-rated floor/ceiling or roof/ceiling assembly shall be protected with a *listed ceiling radiation damper* installed in accordance with Section 717.6.2.1.

717.6.2 Membrane Penetrations

Ducts and air transfer openings constructed of *approved* materials in accordance with the *Florida Building Code, Mechanical* that penetrate the ceiling membrane of a fire-resistance-rated floor/ceiling or roof/ceiling assembly shall be protected with one of the following:

1. A shaft enclosure in accordance with Section 713.
2. A *listed ceiling radiation damper* installed at the ceiling line where a duct penetrates the ceiling of a fire-resistance-rated floor/ceiling or roof/ceiling assembly.
3. A *listed ceiling radiation damper* installed at the ceiling line where a diffuser with no duct attached penetrates the ceiling of a fire-resistance-rated floor/ceiling or roof/ceiling assembly.

717.6.2.1 Ceiling Radiation Dampers

Ceiling radiation dampers shall be tested in accordance with Section 717.3.1. *Ceiling radiation dampers* shall be installed in accordance with the details *listed* in the fire-resistance-rated assembly and the manufacturer's instructions and the listing. *Ceiling radiation dampers* are not required where one of the following applies:

1. Tests in accordance with ASTM E119 or UL 263 have shown that *ceiling radiation dampers* are not necessary in order to maintain the *fire-resistance rating* of the assembly.
2. Where exhaust duct penetrations are protected in accordance with Section 714.5.2, are located within the cavity of a wall and do not pass through another *dwelling unit* or tenant space.
3. Where duct and air transfer openings are protected with a duct outlet protection system tested as part of a *fire-resistance-rated* assembly in accordance with ASTM E119 or UL 263.

717.6.3 Nonfire-Resistance-Rated Floor Assemblies

Duct systems constructed of *approved* materials in accordance with the *Florida Building Code, Mechanical* that penetrate nonfire-resistance-rated floor assemblies shall be protected by any of the following methods:

1. A shaft enclosure in accordance with Section 713.
2. The duct connects not more than two stories, and the *annular space* around the penetrating duct is protected with an *approved* noncombustible material that resists the free passage of flame and the products of combustion.
3. In floor assemblies composed of noncombustible materials, a shaft shall not be required where the duct connects not more than three stories, the annular space around the penetrating duct is protected with an approved noncombustible material that resists the free passage of flame and the products of combustion and a *fire damper* is installed at each floor line.

Exception: *Fire dampers* are not required in ducts within individual residential *dwelling units*.

717.7 Flexible Ducts and Air Connectors

Flexible ducts and air connectors shall not pass through any fire-resistance-rated assembly. Flexible air connectors shall not pass through any wall, floor or ceiling.

Section 718 Concealed Spaces**718.1 General**

Fireblocking and draftstopping shall be installed in combustible concealed locations in accordance with this section. *Fireblocking* shall comply with Section 718.2. Draftstopping in floor/ceiling spaces and *attic* spaces shall comply with Sections 718.3 and 718.4, respectively. The

permitted use of combustible materials in concealed spaces of buildings of Type I or II construction shall be limited to the applications indicated in Section 718.5.

718.2 Fireblocking

In combustible construction, *fireblocking* shall be installed to cut off concealed draft openings (both vertical and horizontal) and shall form an effective barrier between floors, between a top *story* and a roof or *attic* space. *Fireblocking* shall be installed in the locations specified in Sections 718.2.2 through 718.2.7.

718.2.1 Fireblocking Materials

Fireblocking shall consist of the following materials:

1. Two-inch (51 mm) nominal lumber.
2. Two thicknesses of 1-inch (25 mm) nominal lumber with broken lap joints.
3. One thickness of 0.719-inch (18.3 mm) wood structural panels with joints backed by 0.719-inch (18.3 mm) wood structural panels.
4. One thickness of 0.75-inch (19.1 mm) particleboard with joints backed by 0.75-inch (19 mm) particleboard.
5. One-half-inch (12.7 mm) gypsum board.
6. One-fourth-inch (6.4 mm) cement-based millboard.
7. Batts or blankets of *mineral wool*, *mineral fiber* or other *approved* materials installed in such a manner as to be securely retained in place.
8. Cellulose insulation installed as tested for the specific application.
9. Mass timber complying with Section 2304.11.

718.2.1.1 Batts or Blankets of Mineral Wool or Mineral Fiber

Batts or blankets of *mineral wool* or *mineral fiber* or other *approved* nonrigid materials shall be permitted for compliance with the 10-foot (3048 mm) horizontal *fireblocking* in walls constructed using parallel rows of studs or staggered studs.

718.2.1.2 Unfaced Fiberglass

Unfaced fiberglass batt insulation used as *fireblocking* shall fill the entire cross section of the wall cavity to a minimum height of 16 inches (406 mm) measured vertically. Where piping, conduit or similar obstructions are encountered, the insulation shall be packed tightly around the obstruction.

718.2.1.3 Loose-Fill Insulation Material

Loose-fill insulation material, insulating foam sealants and caulk materials shall not be used as a fireblock unless specifically tested in the form and manner intended for use to demonstrate its ability to remain in place and to retard the spread of fire and hot gases.

718.2.1.4 Fireblocking Integrity

The integrity of fireblocks shall be maintained.

718.2.1.5 Double Stud Walls

Batts or blankets of mineral or glass fiber or other *approved* nonrigid materials shall be allowed as *fireblocking* in walls constructed using parallel rows of studs or staggered studs.

718.2.2 Concealed Wall Spaces

Fireblocking shall be provided in concealed spaces of stud walls and partitions, including furred spaces, and parallel rows of studs or staggered studs, as follows:

1. Vertically at the ceiling and floor levels.
2. Horizontally at intervals not exceeding 10 feet (3048 mm).

718.2.3 Connections Between Horizontal and Vertical Spaces

Fireblocking shall be provided at interconnections between concealed vertical stud wall or partition spaces and concealed horizontal spaces created by an assembly of floor joists or trusses, and between concealed vertical and horizontal spaces such as occur at soffits, drop ceilings, cove ceilings and similar locations.

718.2.4 Stairways

Fireblocking shall be provided in concealed spaces between *stair* stringers at the top and bottom of the run. Enclosed spaces under *stairways* shall comply with Section 1011.7.3.

718.2.5 Ceiling and Floor Openings

Where required by Section 712.1.8, Exception 1 of Section 714.5.1.2 or Section 714.6, *fireblocking* of the *annular space* around vents, pipes, ducts, chimneys and fireplaces at ceilings and floor levels shall be installed with a material specifically tested in the form and manner intended for use to demonstrate its ability to remain in place and resist the free passage of flame and the products of combustion.

718.2.5.1 Factory-Built Chimneys and Fireplaces

Factory-built chimneys and fireplaces shall be fireblocked in accordance with UL 103 and UL 127.

718.2.6 Exterior Wall Coverings

Fireblocking shall be installed within concealed spaces of exterior wall coverings and other exterior architectural elements where permitted to be of combustible construction as specified in Section 1406 or where erected with combustible frames. *Fireblocking* shall be installed at maximum intervals of 20 feet (6096 mm) in either dimension so that there will be no concealed space exceeding 100 square feet (9.3 m²) between fireblocking. Where wood furring strips are used, they shall be of approved wood of natural decay resistance or preservative-treated wood. If noncontinuous, such elements shall have closed ends, with not less than 4 inches (102 mm) of separation between sections.

Exceptions:

1. *Fireblocking* of cornices is not required in single-family *dwellings*. *Fireblocking* of cornices of a two-family *dwelling* is required only at the line of *dwelling unit* separation.
2. *Fireblocking* shall not be required where the exterior wall covering is installed on noncombustible framing and the face of the exterior wall covering exposed to the concealed space is covered by one of the following materials:
 - 2.1. Aluminum having a minimum thickness of 0.019 inch (0.5 mm).
 - 2.2. Corrosion-resistant steel having a base metal thickness not less than 0.016 inch (0.4 mm) at any point.
 - 2.3. Other *approved* noncombustible materials.
3. *Fireblocking* shall not be required where the exterior wall covering has been tested in accordance with, and complies with the acceptance criteria of, NFPA 285. The exterior wall covering shall be installed as tested in accordance with NFPA 285.

718.2.7 Concealed Sleeper Spaces

Where wood sleepers are used for laying wood flooring on masonry or concrete fire-resistance-rated floors, the space between the floor slab and the underside of the wood flooring shall be filled with an *approved* material to resist the free passage of flame and products of combustion or fireblocked in such a manner that there will be no open spaces under the flooring that will exceed 100 square feet (9.3 m²) in area and such space shall be filled solidly under permanent partitions so that there is no communication under the flooring between adjoining rooms.

Exceptions:

1. *Fireblocking* is not required for slab-on-grade floors in gymnasiums.
2. *Fireblocking* is required only at the juncture of each alternate lane and at the ends of each lane in a bowling facility.

718.3 Draftstopping in Floors

In combustible construction, draftstopping shall be installed to subdivide floor/ceiling assemblies in the locations prescribed in Sections 718.3.2 through 718.3.3.

718.3.1 Draftstopping Materials

Draftstopping materials shall be not less than $\frac{1}{2}$ -inch (12.7 mm) gypsum board, $\frac{3}{8}$ -inch (9.5 mm) wood structural panel, $\frac{3}{8}$ -inch (9.5 mm) particleboard, 1-inch (25-mm) nominal lumber, cement fiberboard, batts or blankets of *mineral wool* or glass fiber, or other *approved* materials adequately supported. The integrity of *draftstops* shall be maintained.

718.3.2 Groups R-1, R-2, R-3 and R-4

Draftstopping shall be provided in floor/ceiling spaces in Group R-1 buildings, in Group R-2 buildings with three or more *dwelling units*, in Group R-3 buildings with two *dwelling units* and in Group R-4 buildings. Draftstopping shall be located above and in line with the *dwelling unit* and *sleeping unit* separations.

Exceptions:

1. Draftstopping is not required in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.
2. Draftstopping is not required in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.2, provided that automatic sprinklers are installed in the combustible concealed spaces where the draftstopping is being omitted.

718.3.3 Other Groups

In other groups, draftstopping shall be installed so that horizontal floor areas do not exceed 1,000 square feet (93 m^2).

Exception: Draftstopping is not required in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

718.4 Draftstopping in Attics

In combustible construction, draftstopping shall be installed to subdivide *attic* spaces and concealed roof spaces in the locations prescribed in Sections 718.4.2 and 718.4.3. Ventilation of concealed roof spaces shall be maintained in accordance with Section 1203.2.

718.4.1 Draftstopping Materials

Materials utilized for draftstopping of *attic* spaces shall comply with Section 718.3.1.

718.4.1.1 Openings

Openings in the partitions shall be protected by *self-closing* doors with automatic latches constructed as required for the partitions.

718.4.2 Groups R-1 and R-2

Draftstopping shall be provided in *attics*, mansards, overhangs or other concealed roof spaces of Group R-2 buildings with three or more *dwelling units* and in all Group R-1 buildings. Draftstopping shall be installed above, and in line with, *sleeping unit* and *dwelling unit* separation walls that do not extend to the underside of the roof sheathing above.

Exceptions:

1. Where *corridor* walls provide a *sleeping unit* or *dwelling unit* separation, draftstopping shall only be required above one of the *corridor* walls.

2. Draftstopping is not required in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.
3. In occupancies in Group R-2 that do not exceed four stories *above grade plane*, the *attic* space shall be subdivided by *draftstops* into areas not exceeding 3,000 square feet (279 m^2) or above every two *dwelling units*, whichever is smaller.
4. Draftstopping is not required in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.2, provided that automatic sprinklers are installed in the combustible concealed space where the draftstopping is being omitted.

718.4.3 Other Groups

Draftstopping shall be installed in *attics* and concealed roof spaces, such that any horizontal area does not exceed 3,000 square feet (279 m^2).

Exception: Draftstopping is not required in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

718.5 Combustible Materials in Concealed Spaces in Type I or II Construction

Combustible materials shall not be permitted in concealed spaces of buildings of Type I or II construction.

Exceptions:

1. Combustible materials in accordance with Section 603.
2. Combustible materials exposed within plenums complying with Section 602 of the *Florida Building Code, Mechanical*.
3. Class A *interior finish* materials classified in accordance with Section 803.
4. Combustible piping within partitions or shaft enclosures installed in accordance with the provisions of this code.
5. Combustible piping within concealed ceiling spaces installed in accordance with the *Florida Building Code, Mechanical* and the *Florida Building Code, Plumbing*.
6. Combustible insulation and covering on pipe and tubing, installed in concealed spaces other than plenums, complying with Section 720.7.

Section 719 Fire-Resistance Requirements for Plaster

719.1 Thickness of Plaster

The minimum thickness of gypsum plaster or Portland cement plaster used in a fire-resistance-rated system shall be determined by the prescribed fire tests. The plaster thickness shall be measured from the face of the lath where applied to gypsum lath or metal lath.

719.2 Plaster Equivalents

For fire-resistance purposes, $\frac{1}{2}$ inch (12.7 mm) of unsanded gypsum plaster shall be deemed equivalent to $\frac{3}{4}$ inch (19.1 mm) of one-to-three gypsum sand plaster or 1 inch (25 mm) of Portland cement sand plaster.

719.3 Noncombustible Furring

In buildings of Type I and II construction, plaster shall be applied directly on concrete or masonry or on *approved* noncombustible plastering base and furring.

719.4 Double Reinforcement

Plaster protection more than 1 inch (25 mm) in thickness shall be reinforced with an additional layer of *approved* lath embedded not less than $\frac{3}{4}$ inch (19.1 mm) from the outer surface and fixed securely in place.

Exception: Solid plaster partitions or where otherwise determined by fire tests.

719.5 Plaster Alternatives for Concrete

In reinforced concrete construction, gypsum plaster or Portland cement plaster is permitted to be substituted for $\frac{1}{2}$ inch (12.7 mm) of the required poured concrete protection, except that a minimum thickness of $\frac{3}{8}$ inch (9.5 mm) of poured concrete shall be provided in reinforced concrete floors and 1 inch (25 mm) in reinforced concrete columns in addition to the plaster finish. The concrete base shall be prepared in accordance with Section 2510.7.

Section 720 Thermal- And Sound-Insulating Materials

720.1 General

Insulating materials, including facings such as vapor retarders and *vapor-permeable membranes*, similar coverings and all layers of single and multilayer reflective foil insulations, shall comply with the requirements of this section. Where a flame spread index or a smoke-developed index is specified in this section, such index shall be determined in accordance with ASTM E84 or UL 723. Any material that is subject to an increase in flame spread index or smoke-developed index beyond the limits herein established through the effects of age, moisture or other atmospheric conditions shall not be permitted.

Exceptions:

1. Fiberboard insulation shall comply with Chapter 23.
2. Foam plastic insulation shall comply with Chapter 26.
3. Duct and pipe insulation and duct and pipe coverings and linings in plenums shall comply with the *Florida Building Code, Mechanical*.
4. All layers of single and multilayer reflective plastic core insulation shall comply with Section 2613.

720.2 Concealed Installation

Insulating materials, where concealed as installed in buildings of any type of construction, shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 450.

Exception: Cellulosic fiber loose-fill insulation complying with the requirements of Section 720.6 shall not be required to meet a flame spread index requirement but shall be required to meet a smoke-developed index of not more than 450 when tested in accordance with CAN/ULC S102.2.

720.2.1 Facings

Where such materials are installed in concealed spaces in buildings of Type III, IV or V construction, the flame spread and smoke-developed limitations do not apply to facings, coverings, and layers of reflective foil insulation that are installed behind and in substantial contact with the unexposed surface of the ceiling, wall or floor finish.

Exception: All layers of single and multilayer reflective plastic core insulation shall comply with Section 2613.

720.3 Exposed Installation

Insulating materials, where exposed as installed in buildings of any type of construction, shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 450.

Exception: Cellulosic fiber loose-fill insulation complying with the requirements of Section 720.6 shall not be required to meet a flame spread index requirement but shall be required to meet a smoke-developed index of not more than 450 when tested in accordance with CAN/ULC S102.2.

720.3.1 Attic Floors

Exposed insulation materials installed on *attic* floors shall have a critical radiant flux of not less than 0.12 watt per square centimeter when tested in accordance with ASTM E970.

720.4 Loose-Fill Insulation

Loose-fill insulation materials that cannot be mounted in the ASTM E84 or UL 723 apparatus without a screen or artificial supports shall comply with the flame spread and smoke-developed limits of Sections 720.2 and 720.3 when tested in accordance with CAN/ULC S102.2.

Exception: Cellulosic fiber loose-fill insulation shall not be required to meet a flame spread index requirement when tested in accordance with CAN/ULC S102.2, provided such insulation has a smoke-developed index of not more than 450 and complies with the requirements of Section 720.6.

720.5 Roof Insulation

The use of combustible roof insulation not complying with Sections 720.2 and 720.3 shall be permitted in any type of construction provided that insulation is covered with *approved* roof coverings directly applied thereto.

720.6 Cellulosic Fiber Loose-Fill Insulation and Self-Supported Spray-Applied Cellulosic Insulation

Cellulosic fiber loose-fill insulation and self-supported spray-applied cellulosic insulation shall comply with CPSC 16 CFR Parts 1209 and 1404. Each package of such insulating material shall be clearly labeled in accordance with CPSC 16 CFR Parts 1209 and 1404.

720.7 Insulation and Covering on Pipe and Tubing

Insulation and covering on pipe and tubing shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 450.

Exception: Insulation and covering on pipe and tubing installed in plenums shall comply with the *Florida Building Code, Mechanical*.

Section 721 Prescriptive Fire Resistance

721.1 General

The provisions of this section contain prescriptive details of fire-resistance-rated building elements, components or assemblies. The materials of construction listed in Tables 721.1(1), 721.1(2), and 721.1(3) shall be assumed to have the *fire-resistance ratings* prescribed therein. Where materials that change the capacity for heat dissipation are incorporated into a fire-resistance-rated assembly, fire test results or other substantiating data shall be made available to the *building official* to show that the required fire-resistance-rating time period is not reduced.

TABLE 721.1(1)

MINIMUM PROTECTION OF STRUCTURAL PARTS BASED ON TIME PERIODS FOR VARIOUS NONCOMBUSTIBLE INSULATING MATERIALS^m

STRUCTURAL PARTS TO BE PROTECTED	ITEM NUMBER	INSULATING MATERIAL USED	MINIMUM THICKNESS OF INSULATING MATERIAL FOR THE FOLLOWING FIRE-RESISTANCE PERIODS (inches)			
			4 hours	3 hours	2 hours	1 hour
1. Steel columns and all of primary trusses	1-1.1	Carbonate, lightweight and sand-lightweight aggregate concrete, members 6" x 6" or greater (not including sandstone, granite and siliceous gravel). ^a	2 ^{1/2}	2	1 ^{1/2}	1
	1-1.2	Carbonate, lightweight and sand-lightweight aggregate concrete, members 8" x 8" or greater (not including sandstone, granite and siliceous gravel). ^a	2	1 ^{1/2}	1	1
	1-1.3	Carbonate, lightweight and sand-lightweight aggregate concrete, members 12" x 12" or greater (not including sandstone, granite and siliceous gravel). ^a	1 ^{1/2}	1	1	1
	1-1.4	Siliceous aggregate concrete and concrete excluded in Item 1-1.1, members 6" x 6" or greater. ^a	3	2	1 ^{1/2}	1
	1-1.5	Siliceous aggregate concrete and concrete excluded in Item 1-1.1, members 8" x 8" or greater. ^a	2 ^{1/2}	2	1	1

1-1.6	Siliceous aggregate concrete and concrete excluded in Item 1-1.1, members 12" x 12" or greater. ^a	2	1	1	1
1-2.1	Clay or shale brick with brick and mortar fill. ^a	3 ³ / ₄	—	—	2 ¹ / ₄
1-3.1	4" hollow clay tile in two 2" layers; 1/2" mortar between tile and column; 3/8" metal mesh 0.046" wire diameter in horizontal joints; tile fill. ^a	4	—	—	—
1-3.2	2" hollow clay tile; 3/4" mortar between tile and column; 3/8" metal mesh 0.046" wire diameter in horizontal joints; limestone concrete fill ^a ; plastered with 3/4" gypsum plaster.	3	—	—	—
1-3.3	2" hollow clay tile with outside wire ties 0.08" diameter at each course of tile or 3/8" metal mesh 0.046" diameter wire in horizontal joints; limestone or trap-rock concrete fill ^a extending 1" outside column on all sides.	—	—	3	—
1-3.4	2" hollow clay tile with outside wire ties 0.08" diameter at each course of tile with or without concrete fill; 3/4" mortar between tile and column.	—	—	—	2
1-4.1	Cement plaster over metal lath wire tied to 3/4" cold-rolled vertical channels with 0.049" (No. 18 B.W. gage) wire ties spaced 3" to 6" on center. Plaster mixed 1:2 1/2 by volume, cement to sand.	—	—	2 ¹ / ₂ ^b	7/8
1-5.1	Vermiculite concrete, 1:4 mix by volume over paperbacked wire fabric lath wrapped directly around column with additional 2" x 2" 0.065"/0.065" (No. 16/16 B.W. gage) wire fabric placed 3/4" from outer concrete surface. Wire fabric tied with 0.049" (No. 18 B.W. gage) wire spaced 6" on center for inner layer and 2" on center for outer layer.	2	—	—	—
1-6.1	Perlite or vermiculite gypsum plaster over metal lath wrapped around column and furred 1 1/4" from column flanges. Sheets lapped at ends and tied at 6" intervals with 0.049" (No. 18 B.W. gage) tie wire. Plaster pushed through to flanges.	1 ¹ / ₂	1	—	—
1-6.2	Perlite or vermiculite gypsum plaster over self-furring metal lath wrapped directly around column, lapped 1" and tied at 6" intervals with 0.049" (No. 18 B.W. gage) wire.	1 ³ / ₄	1 ³ / ₈	1	—
1-6.3	Perlite or vermiculite gypsum plaster on metal lath applied to 3/4" cold-rolled channels spaced 24" apart vertically and wrapped flatwise around column.	1 ¹ / ₂	—	—	—
1-6.4	Perlite or vermiculite gypsum plaster over two layers of 1/2" plain full-length gypsum lath applied tight to column flanges. Lath wrapped with 1" hexagonal mesh of No. 20 gage wire and tied with doubled 0.035" diameter (No. 18 B.W. gage) wire ties spaced 23" on center. For three-coat work, the plaster mix for the second coat shall not exceed 100 pounds of gypsum to 2 ¹ / ₂ cubic feet of aggregate for the 3-hour system.	2 ¹ / ₂	2	—	—
1-6.5	Perlite or vermiculite gypsum plaster over one layer of 1/2" plain full-length gypsum lath applied tight to column flanges. Lath tied with doubled 0.049" (No. 18 B.W. gage) wire ties spaced 23" on center and scratch coat wrapped with 1" hexagonal mesh 0.035" (No. 20 B.W. gage) wire fabric. For three-coat work, the plaster mix for the second coat shall not exceed 100 pounds of gypsum to 2 ¹ / ₂ cubic feet of aggregate.	—	2	—	—

	1-7.1	Multiple layers of $\frac{1}{2}$ " gypsum wallboard ^c adhesively ^d secured to column flanges and successive layers. Wallboard applied without horizontal joints. Corner edges of each layer staggered. Wallboard layer below outer layer secured to column with doubled 0.049" (No. 18 B.W. gage) steel wire ties spaced 15" on center. Exposed corners taped and treated.	—	—	2	1
	1-7.2	Three layers of $\frac{5}{8}$ " Type X gypsum wallboard. ^c First and second layer held in place by $\frac{1}{8}$ " diameter by $1\frac{3}{8}$ " long ring shank nails with $\frac{5}{16}$ " diameter heads spaced 24" on center at corners. Middle layer also secured with metal straps at mid-height and 18" from each end, and by metal corner bead at each corner held by the metal straps. Third layer attached to corner bead with 1" long gypsum wallboard screws spaced 12" on center.	—	—	$1\frac{7}{8}$	—
	1-7.3	Three layers of $\frac{5}{8}$ " Type X gypsum wallboard, ^c each layer screw attached to $1\frac{5}{8}$ " steel studs 0.018" thick (No. 25 carbon sheet steel gage) at each corner of column. Middle layer also secured with 0.049" (No. 18 B.W. gage) double-strand steel wire ties, 24" on center. Screws are No. 6 by 1" spaced 24" on center for inner layer, No. 6 by $1\frac{5}{8}$ " spaced 12" on center for middle layer and No. 8 by $2\frac{1}{4}$ " spaced 12" on center for outer layer.	—	$1\frac{7}{8}$	—	—
	1-8.1	Wood-fibered gypsum plaster mixed 1:1 by weight gypsum-to-sand aggregate applied over metal lath. Lath lapped 1" and tied 6" on center at all end, edges and spacers with 0.049" (No. 18 B.W. gage) steel tie wires. Lath applied over $\frac{1}{2}$ " spacers made of $\frac{3}{4}$ " furring channel with 2" legs bent around each corner. Spacers located 1" from top and bottom of member and a maximum of 40" on center and wire tied with a single strand of 0.049" (No. 18 B.W. gage) steel tie wires. Corner bead tied to the lath at 6" on center along each corner to provide plaster thickness.	—	—	$1\frac{5}{8}$	—
	1-9.1	Minimum W8x35 wide flange steel column ($w/d \geq 0.75$) with each web cavity filled even with the flange tip with normal weight carbonate or siliceous aggregate concrete (3,000 psi minimum compressive strength with $145 \text{ pcf} \pm 3 \text{ pcf}$ unit weight). Reinforce the concrete in each web cavity with a minimum No. 4 deformed reinforcing bar installed vertically and centered in the cavity, and secured to the column web with a minimum No. 2 horizontal deformed reinforcing bar welded to the web every 18" on center vertically. As an alternative to the No. 4 rebar, $\frac{3}{4}$ " diameter by 3" long headed studs, spaced at 12" on center vertically, shall be welded on each side of the web midway between the column flanges.	—	—	—	See Note n
2. Webs or flanges of steel beams and girders	2-1.1	Carbonate, lightweight and sand-lightweight aggregate concrete (not including sandstone, granite and siliceous gravel) with 3" or finer metal mesh placed 1" from the finished surface anchored to the top flange and providing not less than 0.025 square inch of steel area per foot in each direction.	2	$1\frac{1}{2}$	1	1
	2-1.2	Siliceous aggregate concrete and concrete excluded in Item 2-1.1 with 3" or finer metal mesh placed 1" from the finished surface anchored to the top flange and providing not less than 0.025 square inch of steel area per foot in each direction.	$2\frac{1}{2}$	2	$1\frac{1}{2}$	1
	2-2.1	Cement plaster on metal lath attached to $\frac{3}{4}$ " cold-rolled channels with 0.04" (No. 18 B.W. gage) wire ties spaced 3" to 6" on center. Plaster mixed 1:2 $1\frac{1}{2}$ by volume, cement to sand.	—	—	$2\frac{1}{2}$ ^b	$\frac{7}{8}$

	2-3.1	Vermiculite gypsum plaster on a metal lath cage, wire tied to 0.165" diameter (No. 8 B.W. gage) steel wire hangers wrapped around beam and spaced 16" on center. Metal lath ties spaced approximately 5" on center at cage sides and bottom.	—	$\frac{7}{8}$	—	—
	2-4.1	Two layers of $\frac{5}{8}$ " Type X gypsum wallboard ^c are attached to U-shaped brackets spaced 24" on center. 0.018" thick (No. 25 carbon sheet steel gage) $1\frac{5}{8}$ " deep by 1" galvanized steel runner channels are first installed parallel to and on each side of the top beam flange to provide a $\frac{1}{2}$ " clearance to the flange. The channel runners are attached to steel deck or concrete floor construction with approved fasteners spaced 12" on center. U-shaped brackets are formed from members identical to the channel runners. At the bent portion of the U-shaped bracket, the flanges of the channel are cut out so that $1\frac{5}{8}$ " deep corner channels can be inserted without attachment parallel to each side of the lower flange. As an alternative, 0.021" thick (No. 24 carbon sheet steel gage) 1" × 2" runner and corner angles shall be used in lieu of channels, and the web cutouts in the U-shaped brackets shall not be required. Each angle is attached to the bracket with $\frac{1}{2}$ "-long No. 8 self-drilling screws. The vertical legs of the U-shaped bracket are attached to the runners with one $\frac{1}{2}$ " long No. 8 self-drilling screw. The completed steel framing provides a $2\frac{1}{8}$ " and $1\frac{1}{2}$ " space between the inner layer of wallboard and the sides and bottom of the steel beam, respectively. The inner layer of wallboard is attached to the top runners and bottom corner channels or corner angles with $1\frac{1}{4}$ "-long No. 6 self-drilling screws spaced 16" on center. The outer layer of wallboard is applied with $1\frac{3}{4}$ "-long No. 6 self-drilling screws spaced 8" on center. The bottom corners are reinforced with metal corner beads.	—	—	$1\frac{1}{4}$	—
	2-4.2	Three layers of $\frac{5}{8}$ " Type X gypsum wallboard ^c attached to a steel suspension system as described immediately above utilizing the 0.018" thick (No. 25 carbon sheet steel gage) 1" × 2" lower corner angles. The framing is located so that a $2\frac{1}{8}$ " and 2" space is provided between the inner layer of wallboard and the sides and bottom of the beam, respectively. The first two layers of wallboard are attached as described immediately above. A layer of 0.035" thick (No. 20 B.W. gage) 1" hexagonal galvanized wire mesh is applied under the soffit of the middle layer and up the sides approximately 2". The mesh is held in position with the No. 6 $1\frac{5}{8}$ "-long screws installed in the vertical leg of the bottom corner angles. The outer layer of wallboard is attached with No. 6 $2\frac{1}{4}$ "-long screws spaced 8" on center. One screw is also installed at the mid-depth of the bracket in each layer. Bottom corners are finished as described above.	—	$1\frac{7}{8}$	—	—
3. Bonded pretensioned reinforcement in prestressed concrete ^e	3-1.1	Carbonate, lightweight, sand-lightweight and siliceous ^f aggregate concrete Beams or girders	4 ^g	3 ^g	$2\frac{1}{2}$	$1\frac{1}{2}$
		Solid ^h		2	$1\frac{1}{2}$	1
4. Bonded or unbonded posttensioned tendons in prestressed concrete ^{e, i}	4-1.1	Carbonate, lightweight, sand-lightweight and siliceous ^f aggregate concrete				
		Unrestrained members:				
		Solid slabs ^h	—	2	$1\frac{1}{2}$	—
		Beams and girders ^j				

		8" wide		$4\frac{1}{2}$	$2\frac{1}{2}$	$1\frac{3}{4}$
		greater than 12" wide	3	$2\frac{1}{2}$	2	$1\frac{1}{2}$
4-1.2	4-1.2	Carbonate, lightweight, sand-lightweight and siliceous aggregate				
		Unrestrained members: ^k				
		Solid slabs ^h	$1\frac{1}{4}$	1	$\frac{3}{4}$	—
		Beams and girders ^j				
		8" wide	$2\frac{1}{2}$	2	$1\frac{3}{4}$	—
		greater than 12" wide	2	$1\frac{3}{4}$	$1\frac{1}{2}$	—
5. Reinforcing steel in reinforced concrete columns, beams girders and trusses	5-1.1	Carbonate, lightweight and sand-lightweight aggregate concrete, members 12" or larger, square or round. (Size limit does not apply to beams and girders monolithic with floors.)	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$
		Siliceous aggregate concrete, members 12" or larger, square or round. (Size limit does not apply to beams and girders monolithic with floors.)	2	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$
6. Reinforcing steel in reinforced concrete joists ¹	6-1.1	Carbonate, lightweight and sand-lightweight aggregate concrete	$1\frac{1}{4}$	$1\frac{1}{4}$	1	$\frac{3}{4}$
	6-1.2	Siliceous aggregate concrete	$1\frac{3}{4}$	$1\frac{1}{2}$	1	$\frac{3}{4}$
7. Reinforcing and tie rods in floor and roof slabs ¹	7-1.1	Carbonate, lightweight and sand-lightweight aggregate concrete	1	1	$\frac{3}{4}$	$\frac{3}{4}$
	7-1.2	Siliceous aggregate concrete	$1\frac{1}{4}$	1	1	$\frac{3}{4}$

For SI: 1 inch = 25.4 mm, 1 square inch = 645.2 mm², 1 cubic foot = 0.0283 m³, 1 pound per cubic foot = 16.02 kg/m³.

- a. Reentrant parts of protected members to be filled solidly.
- b. Two layers of equal thickness with a $\frac{3}{4}$ -inch airspace between.
- c. For all of the construction with gypsum wallboard described in Table 721.1(1), gypsum base for veneer plaster of the same size, thickness and core type shall be permitted to be substituted for gypsum wallboard, provided attachment is identical to that specified for the wallboard and the joints on the face layer are reinforced, and the entire surface is covered with not less than $\frac{1}{16}$ -inch gypsum veneer plaster.
- d. An approved adhesive qualified under ASTM E119 or UL 263.
- e. Where lightweight or sand-lightweight concrete having an oven-dry weight of 110 pounds per cubic foot or less is used, the tabulated minimum cover shall be permitted to be reduced 25 percent, except that in no case shall the cover be less than $\frac{3}{4}$ inch in slabs or $1\frac{1}{2}$ inches in beams or girders.
- f. For solid slabs of siliceous aggregate concrete, increase tendon cover 20 percent.
- g. Adequate provisions against spalling shall be provided by U-shaped or hooped stirrups spaced not to exceed the depth of the member with a clear cover of 1 inch.
- h. Prestressed slabs shall have a thickness not less than that required in Table 721.1(3) for the respective fire-resistance time period.

- i. Fire coverage and end anchorages shall be as follows: Cover to the prestressing steel at the anchor shall be $\frac{1}{2}$ inch greater than that required away from the anchor. Minimum cover to steel-bearing plate shall be 1 inch in beams and $\frac{3}{4}$ inch in slabs.
- j. For beam widths between 8 inches and 12 inches, cover thickness shall be permitted to be determined by interpolation.
- k. Interior spans of continuous slabs, beams and girders shall be permitted to be considered restrained.
- l. For use with concrete slabs having a comparable fire endurance where members are framed into the structure in such a manner as to provide equivalent performance to that of monolithic concrete construction.
- m. Generic *fire-resistance ratings* (those not designated as PROPRIETARY* in the listing) in GA 600 shall be accepted as if herein listed.
- n. No additional insulating material is required on the exposed outside face of the column flange to achieve a 1-hour *fire-resistance rating*.

TABLE 721.1(2)**RATED FIRE-RESISTANCE PERIODS FOR VARIOUS WALLS AND PARTITIONS^{a, o, p}**

MATERIAL	ITEM NUMBER	CONSTRUCTION	MINIMUM FINISHED THICKNESS FACE-TO-FACE ^b (inches)			
			4 hours	3 hours	2 hours	1 hour
1. Brick of clay or shale	1-1.1	Solid brick of clay or shale. ^c	6	4.9	3.8	2.7
	1-1.2	Hollow brick, not filled.	5.0	4.3	3.4	2.3
	1-1.3	Hollow brick unit wall, grout or filled with perlite vermiculite or expanded shale aggregate.	6.6	5.5	4.4	3.0
	1-2.1	4" nominal thick units not less than 75 percent solid backed with a hat-shaped metal furring channel $\frac{3}{4}$ " thick formed from 0.021" sheet metal attached to the brick wall on 24" centers with approved fasteners, and $\frac{1}{2}$ " Type X gypsum wallboard attached to the metal furring strips with 1"-long Type S screws spaced 8" on center.	—	—	5 ^d	—
2. Combination of clay brick and load-bearing hollow clay tile	2-1.1	4" solid brick and 4" tile (not less than 40 percent solid).	—	8	—	—
	2-1.2	4" solid brick and 8" tile (not less than 40 percent solid).	12	—	—	—
3. Concrete masonry units	3-1.1 ^{f, g}	Expanded slag or pumice.	4.7	4.0	3.2	2.1
	3-1.2 ^{f, g}	Expanded clay, shale or slate.	5.1	4.4	3.6	2.6
	3-1.3 ^f	Limestone, cinders or air-cooled slag.	5.9	5.0	4.0	2.7
	3-1.4 ^{f, g}	Calcareous or siliceous gravel.	6.2	5.3	4.2	2.8
4. Solid concrete ^{h, i}	4-1.1	Siliceous aggregate concrete.	7.0	6.2	5.0	3.5
		Carbonate aggregate concrete.	6.6	5.7	4.6	3.2

		Sand-lightweight concrete.	5.4	4.6	3.8	2.7
		Lightweight concrete.	5.1	4.4	3.6	2.5
5. Glazed or unglazed facing tile, nonload-bearing	5-1.1	One 2" unit cored 15 percent maximum and one 4" unit cored 25 percent maximum with $\frac{3}{4}$ " mortar-filled collar joint. Unit positions reversed in alternate courses.	—	$6\frac{3}{8}$	—	—
	5-1.2	One 2" unit cored 15 percent maximum and one 4" unit cored 40 percent maximum with $\frac{3}{4}$ " mortar-filled collar joint. Unit positions side with $\frac{3}{4}$ " gypsum plaster. Two wythes tied together every fourth course with No. 22 gage corrugated metal ties.	—	$6\frac{3}{4}$	—	—
	5-1.3	One unit with three cells in wall thickness, cored 29 percent maximum.	—	—	6	—
	5-1.4	One 2" unit cored 22 percent maximum and one 4" unit cored 41 percent maximum with $\frac{1}{4}$ " mortar-filled collar joint. Two wythes tied together every third course with 0.030" (No. 22 galvanized sheet steel gage) corrugated metal ties.	—	—	6	—
	5-1.5	One 4" unit cored 25 percent maximum with $\frac{3}{4}$ " gypsum plaster on one side.	—	—	$4\frac{3}{4}$	—
	5-1.6	One 4" unit with two cells in wall thickness, cored 22 percent maximum.	—	—	—	4
	5-1.7	One 4" unit cored 30 percent maximum with $\frac{3}{4}$ " vermiculite gypsum plaster on one side.	—	—	$4\frac{1}{2}$	—
	5-1.8	One 4" unit cored 39 percent maximum with $\frac{3}{4}$ " gypsum plaster on one side.	—	—	—	$4\frac{1}{2}$
6. Solid gypsum plaster	6-1.1	$\frac{3}{4}$ " by 0.055" (No. 16 carbon sheet steel gage) vertical cold-rolled channels, 16" on center with 2.6-pound flat metal lath applied to one face and tied with 0.049" (No. 18 B.W. gage) wire at 6" spacing. Gypsum plaster each side mixed 1:2 by weight, gypsum to sand aggregate.	—	—	—	2^d
	6-1.2	$\frac{3}{4}$ " by 0.05" (No. 16 carbon sheet steel gage) cold-rolled channels 16" on center with metal lath applied to one face and tied with 0.049" (No. 18 B.W. gage) wire at 6" spacing. Perlite or vermiculite gypsum plaster each side. For three-coat work, the plaster mix for the second coat shall not exceed 100 pounds of gypsum to $2\frac{1}{2}$ cubic feet of aggregate for the 1-hour system.	—	—	$2\frac{1}{2}^d$	2^d
	6-1.3	$\frac{3}{4}$ " by 0.055" (No. 16 carbon sheet steel gage) vertical cold-rolled channels, 16" on center with $\frac{3}{8}$ " gypsum lath applied to one face and attached with sheet metal clips. Gypsum plaster each side mixed 1:2 by weight, gypsum to sand aggregate.	—	—	—	2^d
	6-2.1	Studless with $\frac{1}{2}$ " full-length plain gypsum lath and gypsum plaster each side. Plaster mixed 1:1 for scratch coat and 1:2 for brown coat, by weight, gypsum to sand aggregate.	—	—	—	2^d
	6-2.2	Studless with $\frac{1}{2}$ " full-length plain gypsum lath and perlite or vermiculite gypsum plaster each side.	—	—	$2\frac{1}{2}^d$	2^d
	6-2.3	Studless partition with $\frac{3}{8}$ " rib metal lath installed vertically adjacent edges tied 6" on center with No. 18 gage wire ties, gypsum plaster each side mixed 1:2 by weight, gypsum to sand aggregate.	—	—	—	2^d

7. Solid perlite and Portland cement	7-1.1	Perlite mixed in the ratio of 3 cubic feet to 100 pounds of Portland cement and machine applied to stud side of $1\frac{1}{2}$ " mesh by 0.058-inch (No. 17 B.W. gage) paper-backed woven wire fabric lath wire-tied to 4"-deep steel trussed wire ^j studs 16" on center. Wire ties of 0.049" (No. 18 B.W. gage) galvanized steel wire 6" on center vertically.	—	—	$3\frac{1}{8}^d$	—
8. Solid neat wood fibered gypsum plaster	8-1.1	$\frac{3}{4}$ " by 0.055-inch (No. 16 carbon sheet steel gage) cold-rolled channels, 12" on center with 2.5-pound flat metal lath applied to one face and tied with 0.049" (No. 18 B.W. gage) wire at 6" spacing. Neat gypsum plaster applied each side.	—	—	2^d	—
9. Solid wallboard partition	9-1.1	One full-length layer $\frac{1}{2}$ " Type X gypsum wallboard ^e laminated to each side of 1" full-length V-edge gypsum coreboard with approved laminating compound. Vertical joints of face layer and coreboard staggered not less than 3".	—	—	2^d	—
10. Hollow (studless) gypsum wallboard partition	10-1.1	One full-length layer of $\frac{5}{8}$ " Type X gypsum wallboard ^e attached to both sides of wood or metal top and bottom runners laminated to each side of 1" × 6" full-length gypsum coreboard ribs spaced 2" on center with approved laminating compound. Ribs centered at vertical joints of face plies and joints staggered 24" in opposing faces. Ribs may be recessed 6" from the top and bottom.	—	—	—	$2\frac{1}{4}^d$
	10-1.2	1" regular gypsum V-edge full-length backing board attached to both sides of wood or metal top and bottom runners with nails or $1\frac{5}{8}$ " drywall screws at 24" on center. Minimum width of runners $1\frac{5}{8}$ ". Face layer of $\frac{1}{2}$ " regular full-length gypsum wallboard laminated to outer faces of backing board with approved laminating compound.	—	—	$4\frac{5}{8}^d$	—
11. Noncombustible studs-interior partition with plaster each side	11-1.1	$3\frac{1}{4}" \times 0.044"$ (No. 18 carbon sheet steel gage) steel studs spaced 24" on center. $\frac{5}{8}$ " gypsum plaster on metal lath each side mixed 1:2 by weight, gypsum to sand aggregate.	—	—	—	$4\frac{3}{4}^d$
	11-1.2	$3\frac{3}{8}" \times 0.055"$ (No. 16 carbon sheet steel gage) approved nailable ^k studs spaced 24" on center. $\frac{5}{8}$ " neat gypsum wood-fibered plaster each side over $\frac{3}{8}$ " rib metal lath nailed to studs with 6d common nails, 8" on center. Nails driven $1\frac{1}{4}$ " and bent over.	—	—	$5\frac{5}{8}$	—
	11-1.3	4" × 0.044" (No. 18 carbon sheet steel gage) channel-shaped steel studs at 16" on center. On each side approved resilient clips pressed onto stud flange at 16" vertical spacing, $\frac{1}{4}$ " pencil rods snapped into or wire tied onto outer loop of clips, metal lath wire-tied to pencil rods at 6" intervals, 1" perlite gypsum plaster, each side.	—	$7\frac{5}{8}^d$	—	—
	11-1.4	$2\frac{1}{2}" \times 0.044"$ (No. 18 carbon sheet steel gage) steel studs spaced 16" on center. Wood fibered gypsum plaster mixed 1:1 by weight gypsum to sand aggregate applied on $\frac{3}{4}$ -pound metal lath wire tied to studs, each side. $\frac{3}{4}$ " plaster applied over each face, including finish coat.	—	—	$4\frac{1}{4}^d$	—
12. Wood studs-interior partition with plaster each side	12-1.1 ^{l,m}	2" × 4" wood studs 16" on center with $\frac{5}{8}$ " gypsum plaster on metal lath. Lath attached by 4d common nails bent over or No. 14 gage by $1\frac{1}{4}$ " by $\frac{3}{4}$ " crown width staples spaced 6" on center. Plaster mixed 1:1 $\frac{1}{2}$ for scratch coat and 1:3 for brown coat, by weight, gypsum to sand aggregate.	—	—	—	$5\frac{1}{8}$

	12-1.2 ^l	2" × 4" wood studs 16" on center with metal lath and $\frac{7}{8}$ " neat wood-fibered gypsum plaster each side. Lath attached by 6d common nails, 7" on center. Nails driven $1\frac{1}{4}$ " and bent over.	—	—	$5\frac{1}{2}^d$	—
	12-1.3 ^l	2" × 4" wood studs 16" on center with $\frac{3}{8}$ " perforated or plain gypsum lath and $\frac{1}{2}$ " gypsum plaster each side. Lath nailed with $1\frac{1}{8}$ " by No. 13 gage by $\frac{19}{64}$ " head plasterboard blued nails, 4" on center. Plaster mixed 1:2 by weight, gypsum to sand aggregate.	—	—	—	$5\frac{1}{4}$
	12-1.4 ^l	2" × 4" wood studs 16" on center with $\frac{3}{8}$ " Type X gypsum lath and $\frac{1}{2}$ " gypsum plaster each side. Lath nailed with $1\frac{1}{8}$ " by No. 13 gage by $\frac{19}{64}$ " head plasterboard blued nails, 5" on center. Plaster mixed 1:2 by weight, gypsum to sand aggregate.	—	—	—	$5\frac{1}{4}$
13. Noncombustible studs-interior partition with gypsum wallboard each side	13-1.1	0.018" (No. 25 carbon sheet steel gage) channel-shaped studs 24" on center with one full-length layer of $\frac{5}{8}$ " Type X gypsum wallboard ^e applied vertically attached with 1"-long No. 6 drywall screws to each stud. Screws are 8" on center around the perimeter and 12" on center on the intermediate stud. Where applied horizontally, the Type X gypsum wallboard shall be attached to $3\frac{5}{8}$ " studs and the horizontal joints shall be staggered with those on the opposite side. Screws for the horizontal application shall be 8" on center at vertical edges and 12" on center at intermediate studs.	—	—	—	$2\frac{7}{8}^d$
	13-1.2	0.018" (No. 25 carbon sheet steel gage) channel-shaped studs 25" on center with two full-length layers of $\frac{1}{2}$ " Type X gypsum wallboard ^e applied vertically each side. First layer attached with 1"-long, No. 6 drywall screws, 8" on center around the perimeter and 12" on center on the intermediate stud. Second layer applied with vertical joints offset one stud space from first layer using $1\frac{5}{8}$ " long, No. 6 drywall screws spaced 9" on center along vertical joints, 12" on center at intermediate studs and 24" on center along top and bottom runners.	—	—	$3\frac{5}{8}^d$	—
	13-1.3	0.055" (No. 16 carbon sheet steel gage) approved nailable metal studs ^e 24" on center with full-length $\frac{5}{8}$ " Type X gypsum wallboard ^e applied vertically and nailed 7" on center with 6d cement-coated common nails. Approved metal fastener grips used with nails at vertical butt joints along studs.	—	—	—	$4\frac{7}{8}$
14. Wood studs- interior partition with gypsum wallboard each side	14-1.1 ^{h, m}	2" × 4" wood studs 16" on center with two layers of $\frac{3}{8}$ " regular gypsum wallboard ^e each side, 4d cooler ⁿ or wallboard ⁿ nails at 8" on center first layer, 5d cooler ⁿ or wallboard ⁿ nails at 8" on center second layer with laminating compound between layers, joints staggered. First layer applied full length vertically, second layer applied horizontally or vertically.	—	—	—	5
	14-1.2 ^{l,m}	2" × 4" wood studs 16" on center with two layers $\frac{1}{2}$ " regular gypsum wallboard ^e applied vertically or horizontally each side, ^k joints staggered. Nail base layer with 5d cooler ⁿ or wallboard ⁿ nails at 8" on center face layer with 8d cooler ⁿ or wallboard ⁿ nails at 8" on center.	—	—	—	$5\frac{1}{2}$
	14-1.3 ^{l,m}	2" × 4" wood studs 24" on center with $\frac{5}{8}$ " Type X gypsum wallboard ^e applied vertically or horizontally nailed with 6d cooler ⁿ or wallboard ⁿ nails at 7" on center with end joints on nailing members. Stagger joints each side.	—	—	—	$4\frac{3}{4}$
	14-1.4 ^l	2" × 4" fire-retardant-treated wood studs spaced 24" on center with one layer of $\frac{5}{8}$ " Type X gypsum wallboard ^e applied with	—	—	—	$4\frac{3}{4}^d$

		face paper grain (long dimension) parallel to studs. Wallboard attached with 6d cooler ⁿ or wallboard ⁿ nails at 7" on center.				
	14-1.5 ^{l, m}	2" × 4" wood studs 16" on center with two layers $\frac{5}{8}$ " Type X gypsum wallboard ^e each side. Base layers applied vertically and nailed with 6d cooler ⁿ or wallboard ⁿ nails at 9" on center. Face layer applied vertically or horizontally and nailed with 8d cooler ⁿ or wallboard ⁿ nails at 7" on center. For nail-adhesive application, base layers are nailed 6" on center. Face layers applied with coating of approved wallboard adhesive and nailed 12" on center.	—	—	6	—
	14-1.6 ^l	2" × 3" fire-retardant-treated wood studs spaced 24" on center with one layer of $\frac{5}{8}$ " Type X gypsum wallboard ^e applied with face paper grain (long dimension) at right angles to studs. Wallboard attached with 6d cement-coated box nails spaced 7" on center.	—	—	—	$3\frac{5}{8}$ ^d
15. Exterior or interior walls	15-1.1 ^{l, m}	Exterior surface with $\frac{3}{4}$ " drop siding over $\frac{1}{2}$ " gypsum sheathing on 2" × 4" wood studs at 16" on center, interior surface treatment as required for 1-hour-rated exterior or interior 2" × 4" wood stud partitions. Gypsum sheathing nailed with $1\frac{3}{4}$ " by No. 11 gage by $\frac{7}{16}$ " head galvanized nails at 8" on center. Siding nailed with 7d galvanized smooth box nails.	—	—	—	Varies
	15-1.2 ^{l, m}	2" × 4" wood studs 16" on center with metal lath and $\frac{3}{4}$ " cement plaster on each side. Lath attached with 6d common nails 7" on center driven to 1" minimum penetration and bent over. Plaster mix 1:4 for scratch coat and 1:5 for brown coat, by volume , cement to sand.	—	—	—	$5\frac{3}{8}$
	15-1.3 ^{l, m}	2" × 4" wood studs 16" on center with $\frac{7}{8}$ " cement plaster (measured from the face of studs) on the exterior surface with interior surface treatment as required for interior wood stud partitions in this table. Plaster mix 1:4 for scratch coat and 1:5 for brown coat, by volume, cement to sand.	—	—	—	Varies
	15-1.4	$3\frac{5}{8}$ " No. 16 gage noncombustible studs 16" on center with $\frac{7}{8}$ " cement plaster (measured from the face of the studs) on the exterior surface with interior surface treatment as required for interior, nonbearing, noncombustible stud partitions in this table. Plaster mix 1:4 for scratch coat and 1:5 for brown coat, by volume, cement to sand.	—	—	—	Varies ^d
	15-1.5 ^m	$2\frac{1}{4}$ " × $3\frac{3}{4}$ " clay face brick with cored holes over $\frac{1}{2}$ " gypsum sheathing on exterior surface of 2" × 4" wood studs at 16" on center and two layers $\frac{5}{8}$ " Type X gypsum wallboard ^e on interior surface. Sheathing placed horizontally or vertically with vertical joints over studs nailed 6" on center with $1\frac{3}{4}$ " × No. 11 gage by $\frac{7}{16}$ " head galvanized nails. Inner layer of wallboard placed horizontally or vertically and nailed 8" on center with 6d cooler ⁿ or wallboard ⁿ nails. Outer layer of wallboard placed horizontally or vertically and nailed 8" on center with 8d cooler ⁿ or wallboard ⁿ nails. Joints staggered with vertical joints over studs. Outer layer joints taped and finished with compound. Nail heads covered with joint compound. 0.035 inch (No. 20 galvanized sheet gage) corrugated galvanized steel wall ties $\frac{3}{4}$ " by $6\frac{5}{8}$ " attached to each stud with two 8d cooler ⁿ or wallboard ⁿ nails every sixth course of bricks.	—	—	10	—
	15-1.6 ^{l, m}	2" × 6" fire-retardant-treated wood studs 16" on center. Interior face has two layers of $\frac{5}{8}$ " Type X gypsum with the	—	—	$8\frac{1}{4}$	—

		base layer placed vertically and attached with 6d box nails 12" on center. The face layer is placed horizontally and attached with 8d box nails 8" on center at joints and 12" on center elsewhere. The exterior face has a base layer of $\frac{5}{8}$ " Type X gypsum sheathing placed vertically with 6d box nails 8" on center at joints and 12" on center elsewhere. An approved building paper is next applied, followed by self-furred exterior lath attached with $2\frac{1}{2}$ ", No. 12 gage galvanized roofing nails with a $\frac{3}{8}$ " diameter head and spaced 6" on center along each stud. Cement plaster consisting of a $\frac{1}{2}$ " brown coat is then applied. The scratch coat is mixed in the proportion of 1:3 by weight, cement to sand with 10 pounds of hydrated lime and 3 pounds of approved additives or admixtures per sack of cement. The brown coat is mixed in the proportion of 1:4 by weight, cement to sand with the same amounts of hydrated lime and approved additives or admixtures used in the scratch coat.				
15-1.7 ^{l, m}		2" × 6" wood studs 16" on center. The exterior face has a layer of $\frac{5}{8}$ " Type X gypsum sheathing placed vertically with 6d box nails 8" on center at joints and 12" on center elsewhere. An approved building paper is next applied, followed by 1" by No. 18 gage self-furred exterior lath attached with 8d by $2\frac{1}{2}$ " long galvanized roofing nails spaced 6" on center along each stud. Cement plaster consisting of a $\frac{1}{2}$ " scratch coat, a bonding agent and a $\frac{1}{2}$ " brown coat and a finish coat is then applied. The scratch coat is mixed in the proportion of 1:3 by weight, cement to sand with 10 pounds of hydrated lime and 3 pounds of approved additives or admixtures per sack of cement. The brown coat is mixed in the proportion of 1:4 by weight, cement to sand with the same amounts of hydrated lime and approved additives or admixtures used in the scratch coat. The interior is covered with $\frac{3}{8}$ " gypsum lath with 1" hexagonal mesh of 0.035 inch (No. 20 B.W. gage) woven wire lath furred out $\frac{5}{16}$ " and 1" perlite or vermiculite gypsum plaster. Lath nailed with $1\frac{1}{8}$ " by No. 13 gage by $\frac{19}{64}$ " head plasterboard glued nails spaced 5" on center. Mesh attached by $1\frac{3}{4}$ " by No. 12 gage by $\frac{3}{8}$ " head nails with $\frac{3}{8}$ " furrings, spaced 8" on center. The plaster mix shall not exceed 100 pounds of gypsum to $2\frac{1}{2}$ cubic feet of aggregate.	—	—	$8\frac{3}{8}$	—
15-1.8 ^{l, m}		2" × 6" wood studs 16" on center. The exterior face has a layer of $\frac{5}{8}$ " Type X gypsum sheathing placed vertically with 6d box nails 8" on center at joints and 12" on center elsewhere. An approved building paper is next applied, followed by $1\frac{1}{2}$ " by No. 17 gage self-furred exterior lath attached with 8d by $2\frac{1}{2}$ " long galvanized roofing nails spaced 6" on center along each stud. Cement plaster consisting of a $\frac{1}{2}$ " scratch coat, and a $\frac{1}{2}$ " brown coat is then applied. The plaster may be placed by machine. The scratch coat is mixed in the proportion of 1:4 by weight, plastic cement to sand. The brown coat is mixed in the proportion of 1:5 by weight, plastic cement to sand. The interior is covered with $\frac{3}{8}$ " gypsum lath with 1" hexagonal mesh of No. 20 gage woven wire lath furred out $\frac{5}{16}$ " and 1" perlite or vermiculite gypsum plaster. Lath nailed with $1\frac{1}{8}$ " by No. 13 gage by $\frac{19}{64}$ " head plasterboard glued nails spaced 5" on center. Mesh attached by $1\frac{3}{4}$ " by No. 12 gage by $\frac{3}{8}$ " head nails with $\frac{3}{8}$ " furrings, spaced 8" on center. The plaster mix shall not exceed 100 pounds of gypsum to $2\frac{1}{2}$ cubic feet of aggregate.	—	—	$8\frac{3}{8}$	—

15-1.9	4" No. 18 gage, nonload-bearing metal studs, 16" on center, with 1" Portland cement lime plaster (measured from the back side of the 3/4-pound expanded metal lath) on the exterior surface. Interior surface to be covered with 1" of gypsum plaster on 3/4-pound expanded metal lath proportioned by weight-1:2 for scratch coat, 1:3 for brown, gypsum to sand. Lath on one side of the partition fastened to 1/4" diameter pencil rods supported by No. 20 gage metal clips, located 16" on center vertically, on each stud. 3" thick mineral fiber insulating batts friction fitted between the studs.	—	—	6 ^{1/2} ^d	—
15-1.10	Steel studs 0.060" thick, 4" deep or 6" at 16" or 24" centers, with 1/2" Glass Fiber Reinforced Concrete (GFRC) on the exterior surface. GFRC is attached with flex anchors at 24" on center, with 5" leg welded to studs with two 1/2"-long flare-bevel welds, and 4" foot attached to the GFRC skin with 5/8" thick GFRC bonding pads that extend 2 ^{1/2} " beyond the flex anchor foot on both sides. Interior surface to have two layers of 1/2" Type X gypsum wallboard. ^e The first layer of wallboard to be attached with 1"-long Type S buglehead screws spaced 24" on center and the second layer is attached with 1 ^{5/8} "-long Type S screws spaced at 12" on center. Cavity is to be filled with 5" of 4 pcf (nominal) mineral fiber batts. GFRC has 1 ^{1/2} " returns packed with mineral fiber and caulked on the exterior.	—	—	6 ^{1/2}	—
15-1.11	Steel studs 0.060" thick, 4" deep or 6" at 16" or 24" centers, respectively, with 1/2" Glass Fiber Reinforced Concrete (GFRC) on the exterior surface. GFRC is attached with flex anchors at 24" on center, with 5" leg welded to studs with two 1/2"-long flare-bevel welds, and 4" foot attached to the GFRC skin with 5/8" -thick GFRC bonding pads that extend 2 ^{1/2} " beyond the flex anchor foot on both sides. Interior surface to have one layer of 5/8" Type X gypsum wallboard ^e , attached with 1 ^{1/4} "-long Type S buglehead screws spaced 12" on center. Cavity is to be filled with 5" of 4 pcf (nominal) mineral fiber batts. GFRC has 1 ^{1/2} " returns packed with mineral fiber and caulked on the exterior.	—	—	—	6 ^{1/8}
15-1.12 ^q	2" × 6" wood studs at 16" with double top plates, single bottom plate; interior and exterior sides covered with 5/8" Type X gypsum wallboard, 4' wide, applied horizontally or vertically with vertical joints over studs, and fastened with 2 ^{1/4} " Type S drywall screws, spaced 12" on center. Cavity to be filled with 5 ^{1/2} " mineral wool insulation.	—	—	—	6 ^{3/4}
15-1.13 ^q	2" × 6" wood studs at 16" with double top plates, single bottom plate; interior and exterior sides covered with 5/8" Type X gypsum wallboard, 4' wide, applied vertically with all joints over framing or blocking and fastened with 2 ^{1/4} " Type S drywall screws, spaced 12" on center. R-19 mineral fiber insulation installed in stud cavity.	—	—	—	6 ^{3/4}
15-1.14 ^q	2" × 6" wood studs at 16" with double top plates, single bottom plate; interior and exterior sides covered with 5/8" Type X gypsum wallboard, 4' wide, applied horizontally or vertically with vertical joints over studs, and fastened with 2 ^{1/4} " Type S drywall screws, spaced 7" on center.	—	—	—	6 ^{3/4}
15-1.15 ^q	2" × 4" wood studs at 16" with double top plates, single bottom plate; interior and exterior sides covered with 5/8" Type X gypsum wallboard and sheathing, respectively, 4' wide, applied horizontally or vertically with vertical joints over studs, and	—	—	—	4 ^{3/4}

		fastened with 2 ¹ / ₄ " Type S drywall screws, spaced 12" on center. Cavity to be filled with 3 ¹ / ₂ " mineral wool insulation.				
15-1.16 ^q	2" × 6" wood studs at 24" centers with double top plates, single bottom plate; interior and exterior side covered with two layers of 5 ¹ / ₈ " Type X gypsum wallboard, 4' wide, applied horizontally with vertical joints over studs. Base layer fastened with 2 ¹ / ₄ " Type S drywall screws, spaced 24" on center and face layer fastened with Type S drywall screws, spaced 8" on center, wallboard joints covered with paper tape and joint compound, fastener heads covered with joint compound. Cavity to be filled with 5 ¹ / ₂ " mineral wool insulation.	—	—	8	—	
15-2.1 ^d	3 ⁵ / ₈ " No. 16 gage steel studs at 24" on center or 2" × 4" wood studs at 24" on center. Metal lath attached to the exterior side of studs with minimum 1" long No. 6 drywall screws at 6" on center and covered with minimum 3 ¹ / ₄ " thick Portland cement plaster. Thin veneer brick units of clay or shale complying with ASTM C1088, Grade TBS or better, installed in running bond in accordance with Section 1405.10. Combined total thickness of the Portland cement plaster, mortar and thin veneer brick units shall be not less than 1 ³ / ₄ ". Interior side covered with one layer of 5 ¹ / ₈ " thick Type X gypsum wallboard attached to studs with 1" long No. 6 drywall screws at 12" on center.	—	—	—	6	
15-2.2 ^d	3 ⁵ / ₈ " No. 16 gage steel studs at 24" on center or 2" × 4" wood studs at 24" on center. Metal lath attached to the exterior side of studs with minimum 1" long No. 6 drywall screws at 6" on center and covered with minimum 3 ¹ / ₄ " thick Portland cement plaster. Thin veneer brick units of clay or shale complying with ASTM C1088, Grade TBS or better, installed in running bond in accordance with Section 1405.10. Combined total thickness of the Portland cement plaster, mortar and thin veneer brick units shall be not less than 2". Interior side covered with two layers of 5 ¹ / ₈ " thick Type X gypsum wallboard. Bottom layer attached to studs with 1" long No. 6 drywall screws at 24" on center. Top layer attached to studs with 1 ⁵ / ₈ " long No. 6 drywall screws at 12" on center.	—	—	6 ⁷ / ₈	—	
15-2.3 ^d	3 ⁵ / ₈ " No. 16 gage steel studs at 16" on center or 2" × 4" wood studs at 16" on center. Where metal lath is used, attach to the exterior side of studs with minimum 1" long No. 6 drywall screws at 6" on center. Brick units of clay or shale not less than 2 ⁵ / ₈ " thick complying with ASTM C216 installed in accordance with Section 1405.6 with a minimum 1" airspace. Interior side covered with one layer of 5 ¹ / ₈ " thick Type X gypsum wallboard attached to studs with 1" long No. 6 drywall screws at 12" on center.	—	—	—	7 ⁷ / ₈	
15-2.4 ^d	3 ⁵ / ₈ " No. 16 gage steel studs at 16" on center or 2" × 4" wood studs at 16" on center. Where metal lath is used, attach to the exterior side of studs with minimum 1" long No. 6 drywall screws at 6" on center. Brick units of clay or shale not less than 2 ⁵ / ₈ " thick complying with ASTM C216 installed in accordance with Section 1405.6 with a minimum 1" airspace. Interior side covered with two layers of 5 ¹ / ₈ " thick Type X gypsum wallboard. Bottom layer attached to studs with 1" long No. 6 drywall screws at 24" on center. Top layer attached to studs with 1 ⁵ / ₈ " long No. 6 drywall screws at 12" on center.	—	—	8 ¹ / ₂	—	

16. Exterior walls rated for fire resistance from the inside only in accordance with Section 705.5.	16-1.1 ^q	2" × 4" wood studs at 16" centers with double top plates, single bottom plate; interior side covered with 5/8" Type X gypsum wallboard, 4" wide, applied horizontally unblocked, and fastened with 2 1/4" Type S drywall screws, spaced 12" on center, wallboard joints covered with paper tape and joint compound, fastener heads covered with joint compound. Exterior covered with 3/8" wood structural panels, applied vertically, horizontal joints blocked and fastened with 6d common nails (bright) — 12" on center in the field, and 6" on center panel edges. Cavity to be filled with 3 1/2" mineral wool insulation. Rating established for exposure from interior side only.	—	—	—	4 1/2
	16-1.2 ^q	2" × 6" wood studs at 16" centers with double top plates, single bottom plate; interior side covered with 5/8" Type X gypsum wallboard, 4" wide, applied horizontally or vertically with vertical joints over studs and fastened with 2 1/4" Type S drywall screws, spaced 12" on center, wallboard joints covered with paper tape and joint compound, fastener heads covered with joint compound, exterior side covered with 7/16" wood structural panels fastened with 6d common nails (bright) spaced 12" on center in the field and 6" on center along the panel edges. Cavity to be filled with 5 1/2" mineral wool insulation. Rating established from the gypsum-covered side only.	—	—	—	6 9/16
	16-1.3 ^q	2" × 6" wood studs at 16" centers with double top plates, single bottom plates; interior side covered with 5/8" Type X gypsum wallboard, 4" wide, applied vertically with all joints over framing or blocking and fastened with 2 1/4" Type S drywall screws spaced 7" on center. Joints to be covered with tape and joint compound. Exterior covered with 3/8" wood structural panels, applied vertically with edges over framing or blocking and fastened with 6d common nails (bright) at 12" on center in the field and 6" on center on panel edges. R-19 mineral fiber insulation installed in stud cavity. Rating established from the gypsum-covered side only.	—	—	—	6 1/2

For SI: 1 inch = 25.4 mm, 1 square inch = 645.2 mm², 1 cubic foot = 0.0283 m³.

- a. Staples with equivalent holding power and penetration shall be permitted to be used as alternate fasteners to nails for attachment to wood framing.
- b. Thickness shown for brick and clay tile is nominal thicknesses unless plastered, in which case thicknesses are net. Thickness shown for concrete masonry and clay masonry is equivalent thickness defined in Section 722.3.1 for concrete masonry and Section 722.4.1.1 for clay masonry. Where all cells are solid grouted or filled with silicone-treated perlite loose-fill insulation; vermiculite loose-fill insulation; or expanded clay, shale or slate lightweight aggregate, the equivalent thickness shall be the thickness of the block or brick using specified dimensions as defined in Chapter 21. Equivalent thickness shall include the thickness of applied plaster and lath or gypsum wallboard, where specified.
- c. For units in which the net cross-sectional area of cored brick in any plane parallel to the surface containing the cores is not less than 75 percent of the gross cross-sectional area measured in the same plane.
- d. Shall be used for nonbearing purposes only.
- e. For all of the construction with gypsum wallboard described in this table, gypsum base for veneer plaster of the same size, thickness and core type shall be permitted to be substituted for gypsum wallboard, provided attachment is identical to that

specified for the wallboard, and the joints on the face layer are reinforced and the entire surface is covered with not less than $\frac{1}{16}$ -inch gypsum veneer plaster.

- f. The fire-resistance time period for concrete masonry units meeting the equivalent thicknesses required for a 2-hour *fire-resistance rating* in Item 3, and having a thickness of not less than $\frac{75}{8}$ inches is 4 hours where cores that are not grouted are filled with silicone-treated perlite loose-fill insulation; vermiculite loose-fill insulation; or expanded clay, shale or slate lightweight aggregate, sand or slag having a maximum particle size of $\frac{3}{8}$ inch.
- g. The *fire-resistance rating* of concrete masonry units composed of a combination of aggregate types or where plaster is applied directly to the concrete masonry shall be determined in accordance with ACI 216.1/TMS 0216. Lightweight aggregates shall have a maximum combined density of 65 pounds per cubic foot.
- h. See Note b. The equivalent thickness shall be permitted to include the thickness of cement plaster or 1.5 times the thickness of gypsum plaster applied in accordance with the requirements of Chapter 25.
- i. Concrete walls shall be reinforced with horizontal and vertical temperature reinforcement as required by Chapter 19.
- j. Studs are welded truss wire studs with 0.18 inch (No. 7 B.W. gage) flange wire and 0.18 inch (No. 7 B.W. gage) truss wires.
- k. Nailable metal studs consist of two channel studs spot welded back to back with a crimped web forming a nailing groove.
- l. Wood structural panels shall be permitted to be installed between the fire protection and the wood studs on either the interior or exterior side of the wood frame assemblies in this table, provided the length of the fasteners used to attach the fire protection is increased by an amount not less than the thickness of the wood structural panel.
- m. For studs with a slenderness ratio, l_e/d , greater than 33, the design stress shall be reduced to 78 percent of allowable F'_c . For studs with a slenderness ratio, l_e/d , not exceeding 33, the design stress shall be reduced to 78 percent of the adjusted stress F'_c calculated for studs having a slenderness ratio l_e/d of 33.
- n. For properties of cooler or wallboard nails, see ASTM C514, ASTM C547 or ASTM F1667.
- o. Generic *fire-resistance ratings* (those not designated as PROPRIETARY* in the listing) in the GA 600 shall be accepted as if herein listed.
- p. NCMA TEK 5-8A shall be permitted for the design of fire walls.
- q. The design stress of studs shall be equal to a maximum of 100 percent of the allowable F'_c calculated in accordance with Section 2306.

TABLE 721.1(3)

MINIMUM PROTECTION FOR FLOOR AND ROOF SYSTEMS^{a, q}

FLOOR OR ROOF CONSTRUCTION	ITEM NUMBER	CEILING CONSTRUCTION	THICKNESS OF FLOOR OR ROOF SLAB (inches)				MINIMUM THICKNESS OF CEILING (inches)			
			4 hours	3 hours	2 hours	1 hour	4 hours	3 hours	2 hours	1 hour
1. Siliceous aggregate concrete	1-1.1	Slab (no ceiling required). Minimum cover over non prestressed	7.0	6.2	5.0	3.5	—	—	—	—

2. Carbonate aggregate concrete	2-1.1	reinforcement shall be not less than $\frac{3}{4}$ ". ^b	6.6	5.7	4.6	3.2	—	—	—	—
3. Sand-lightweight concrete	3-1.1		5.4	4.6	3.8	2.7	—	—	—	—
4. Lightweight concrete	4-1.1		5.1	4.4	3.6	2.5	—	—	—	—
5. Reinforced concrete	5-1.1	Slab with suspended ceiling of vermiculite gypsum plaster over metal lath attached to $\frac{3}{4}$ " cold-rolled channels spaced 12" on center. Ceiling located 6" minimum below joists.	3	2	—	—	1	$\frac{3}{4}$	—	—

		<p>5/8" Type X gypsum wallboard^c attached to 0.018 inch (No. 25 carbon sheet steel gage) by 7/8" deep by 2⁵/₈" hat-shaped galvanized steel channels with 1"-long No. 6 screws. The channels are spaced 24" on center, span 35" and are supported along their length at 35" intervals by 0.033" (No. 21 galvanized sheet gage) galvanized steel flat strap hangers having formed edges that engage the lips of the channel. The strap hangers are attached to the side of the concrete joists with 5/32" by 1¹/₄" long power-driven fasteners. The wallboard is installed with the long dimension perpendicular to the channels. End joints occur on channels and supplementary channels are installed parallel to the main channels, 12" each side, at end joint occurrences. The finished ceiling is located approximately 12" below the soffit of the floor slab.</p>	—	—	2 ¹ / ₂	—	—	—	5/8	—
6. Steel joists constructed with a poured reinforced concrete slab on metal lath forms or steel form units ^{d, e}	6-1.1	Gypsum plaster on metal lath attached to the bottom cord with single No. 16 gage or doubled No. 18 gage wire ties spaced 6" on center. Plaster mixed 1:2 for scratch coat, 1:3 for brown coat, by weight, gypsum-to-sand aggregate for 2-hour system. For 3-hour system plaster is neat.	—	—	2 ¹ / ₂	2 ¹ / ₄	—	—	3/4	5/8

		Vermiculite gypsum plaster on metal lath attached to the bottom chord with single No.16 gage or doubled 0.049-inch (No. 18 B.W. gage) wire ties 6" on center.	—	2	—	—	—	$\frac{5}{8}$	—	—
	6-3.1	Cement plaster over metal lath attached to the bottom chord of joists with single No. 16 gage or doubled 0.049" (No. 18 B.W. gage) wire ties spaced 6" on center. Plaster mixed 1:2 for scratch coat, 1:3 for brown coat for 1-hour system and 1:1 for scratch coat, 1:1 $\frac{1}{2}$ for brown coat for 2-hour system , by weight, cement to sand.	—	—	—	2	—	—	—	$\frac{5}{8}$ ^f
	6-4.1	Ceiling of $\frac{5}{8}$ " Type X wallboard ^c attached to $\frac{7}{8}$ " deep by $2\frac{5}{8}$ " by 0.021 inch (No. 25 carbon sheet steel gage) hat-shaped furring channels 12" on center with 1" long No. 6 wallboard screws at 8" on center. Channels wire tied to bottom chord of joists with doubled 0.049 inch (No. 18 B.W. gage) wire or suspended below joists on wire hangers. ^g	—	—	$2\frac{1}{2}$	—	—	—	$\frac{5}{8}$	—
	6-5.1	Wood-fibered gypsum plaster mixed 1:1 by weight gypsum to sand aggregate applied over metal lath. Lath tied 6" on center to $\frac{3}{4}$ " channels spaced $13\frac{1}{2}$ " on center. Channels secured to joists at each intersection with two strands of 0.049 inch	—	—	$2\frac{1}{2}$	—	—	—	$\frac{3}{4}$	—

		(No. 18 B.W. gage) galvanized wire.							
7. Reinforced concrete slabs and joists with hollow clay tile fillers laid end to end in rows $2\frac{1}{2}$ " or more apart; reinforcement placed between rows and concrete cast around and over tile.	7-1.1	$\frac{5}{8}$ " gypsum plaster on bottom of floor or roof construction.	—	—	8 ^h	—	—	—	$\frac{5}{8}$
	7-1.2	None	—	—	—	5 $\frac{1}{2}$ ⁱ	—	—	—
8. Steel joists constructed with a reinforced concrete slab on top poured on a $\frac{1}{2}$ " deep steel deck. ^e	8-1.1	Vermiculite gypsum plaster on metal lath attached to $\frac{3}{4}$ " cold-rolled channels with 0.049" (No. 18 B.W. gage) wire ties spaced 6" on center.	2 $\frac{1}{2}$ ^j	—	—	—	$\frac{3}{4}$	—	—
9. 3" deep cellular steel deck with concrete slab on top. Slab thickness measured to top.	9-1.1	Suspended ceiling of vermiculite gypsum plaster base coat and vermiculite acoustical plaster on metal lath attached at 6" intervals to $\frac{3}{4}$ " cold-rolled channels spaced 12" on center and secured to $1\frac{1}{2}$ " cold-rolled channels spaced 36" on center with 0.065" (No. 16 B.W. gage) wire. $1\frac{1}{2}$ " channels supported by No. 8 gage wire hangers at 36" on center. Beams within envelope and with a $2\frac{1}{2}$ " airspace between beam soffit and lath have a 4-hour rating.	2 $\frac{1}{2}$	—	—	—	1 $\frac{1}{8}$ ^k	—	—
10. $1\frac{1}{2}$ "-deep steel roof deck on steel framing. Insulation board, 30 pcf density, composed of wood fibers with cement binders of thickness shown bonded to deck with unified asphalt adhesive. Covered with a Class A or B roof covering.	10-1.1	Ceiling of gypsum plaster on metal lath. Lath attached to $\frac{3}{4}$ " furring channels with 0.049" (No. 18 B.W. gage) wire ties spaced 6" on center. $\frac{3}{4}$ " channel saddle tied to 2" channels with doubled 0.065" (No. 16 B.W. gage) wire ties. 2" channels spaced 36" on center suspended 2" below steel framing and saddle-tied with	—	—	1 $\frac{7}{8}$	1	—	—	$\frac{3}{4}$ ^l

		0.165" (No. 8 B.W. gage) wire. Plaster mixed 1:2 by weight, gypsum-to-sand aggregate.							
11. 1½"-deep steel roof deck on steel-framing wood fiber insulation board, 17.5 pcf density on top applied over a 15-lb asphalt-saturated felt. Class A or B roof covering.	11-1.1	Ceiling of gypsum plaster on metal lath. Lath attached to ¾" furring channels with 0.049" (No. 18 B.W. gage) wire ties spaced 6" on center. ¾" channels saddle tied to 2" channels with doubled 0.065" (No. 16 B.W. gage) wire ties. 2" channels spaced 36" on center suspended 2" below steel framing and saddle tied with 0.165" (No. 8 B.W. gage) wire. Plaster mixed 1:2 for scratch coat and 1:3 for brown coat, by weight, gypsum-to-sand aggregate for 1-hour system. For 2-hour system, plaster mix is 1:2 by weight, gypsum-to-sand aggregate.	—	—	1½	1	—	—	7/8 ^g ¾ ¹
12. 1½" deep steel roof deck on steel-framing insulation of rigid board consisting of expanded perlite and fibers impregnated with integral asphalt waterproofing; density 9 to 12 pcf secured to metal roof deck by ½" wide ribbons of waterproof, cold-process liquid adhesive spaced 6" apart. Steel joist or light steel construction with metal roof deck, insulation, and Class A or B built-up roof covering. ^e	12-1.1	Gypsum-vermiculite plaster on metal lath wire tied at 6" intervals to ¾" furring channels spaced 12" on center and wire tied to 2" runner channels spaced 32" on center. Runners wire tied to bottom chord of steel joists.	—	—	1	—	—	—	7/8 —
13. Double wood floor over wood joists spaced 16" on center. ^{m,n}	13-1.1	Gypsum plaster over ⅜" Type X gypsum lath. Lath initially applied with not less than four 1⅛" by No. 13 gage by 19/64" head	—	—	—	—	—	—	—

		plasterboard blued nails per bearing. Continuous stripping over lath along all joist lines. Stripping consists of 3" wide strips of metal lath attached by 1½" by No. 11 gage by ½" head roofing nails spaced 6" on center. Alternate stripping consists of 3" wide 0.049" diameter wire stripping weighing 1 pound per square yard and attached by No.16 gage by 1½" by ¾" crown width staples, spaced 4" on center. Where alternate stripping is used, the lath nailing shall consist of two nails at each end and one nail at each intermediate bearing. Plaster mixed 1:2 by weight, gypsum-to-sand aggregate.							
	13-1.2	Cement or gypsum plaster on metal lath. Lath fastened with 1½" by No. 11 gage by 7/16" head barbed shank roofing nails spaced 5" on center. Plaster mixed 1:2 for scratch coat and 1:3 for brown coat, by weight, cement to sand aggregate.	—	—	—	—	—	—	—
	13-1.3	Perlite or vermiculite gypsum plaster on metal lath secured to joists with 1½" by No. 11 gage by 7/16" head barbed shank roofing nails spaced 5" on center.	—	—	—	—	—	—	—
	13-1.4	½" Type X gypsum wallboard ^c nailed to joists with 5d cooler ^o or wallboard ^o nails at 6" on center. End joints of wallboard centered on joists.	—	—	—	—	—	—	—

14. Plywood stressed skin panels consisting of $\frac{5}{8}$ "-thick interior C-D (exterior glue) top stressed skin on 2" × 6" nominal (minimum) stringers. Adjacent panel edges joined with 8d common wire nails spaced 6" on center. Stringers spaced 12" maximum on center.	14-1.1	$\frac{1}{2}$ " -thick wood fiberboard weighing 15 to 18 pounds per cubic foot installed with long dimension parallel to stringers or $\frac{3}{8}$ " C-D (exterior glue) plywood glued and/or nailed to stringers. Nailing to be with 5d cooler ^o or wallboard ^o nails at 12" on center. Second layer of $\frac{1}{2}$ " Type X gypsum wallboard ^c applied with long dimension perpendicular to joists and attached with 8d cooler ^o or wallboard ^o nails at 6" on center at end joints and 8" on center elsewhere. Wallboard joints staggered with respect to fiberboard joints.	—	—	—	—	—	—	—	—	1
15. Vermiculite concrete slab proportioned 1:4 (Portland cement to vermiculite aggregate) on a $1\frac{1}{2}$ " -deep steel deck supported on individually protected steel framing. Maximum span of deck 6'-10" where deck is less than 0.019 inch (No. 26 carbon steel sheet gage) or greater. Slab reinforced with 4" × 8" 0.109/0.083" (No. $12/14$ B.W. gage) welded wire mesh.	15-1.1	None	—	—	—	3 ^j	—	—	—	—	—
16. Perlite concrete slab proportioned 1:6 (Portland cement to perlite aggregate) on a $1\frac{1}{4}$ "-deep steel deck supported on individually protected steel framing. Slab reinforced with 4" × 8" 0.109/0.083" (No. $12/14$ B.W. gage) welded wire mesh.	16-1.1	None	—	—	—	$3\frac{1}{2}^j$	—	—	—	—	—

17. Perlite concrete slab proportioned 1:6 (Portland cement to perlite aggregate) on a $\frac{9}{16}$ "-deep steel deck supported by steel joists 4' on center. Class A or B roof covering on top.	17-1.1	Perlite gypsum plaster on metal lath wire tied to $\frac{3}{4}$ " furring channels attached with 0.065" (No. 16 B.W. gage) wire ties to lower chord of joists.	—	2 ^P	2 ^P	—	—	$\frac{7}{8}$	$\frac{3}{4}$	—
18. Perlite concrete slab proportioned 1:6 (Portland cement to perlite aggregate) on $1\frac{1}{4}$ "-deep steel deck supported on individually protected steel framing. Maximum span of deck 6'-10" where deck is less than 0.019" (No. 26 carbon sheet steel gage) and 8'-0" where deck is 0.019" (No. 26 carbon sheet steel gage) or greater. Slab reinforced with 0.042" (No. 19 B.W. gage) hexagonal wire mesh. Class A or B roof covering on top.	18-1.1	None	—	$2\frac{1}{4}^P$	$2\frac{1}{4}^P$	—	—	—	—	—
19. Floor and beam construction consisting of 3" -deep cellular steel floor unit mounted on steel members with 1:4 (proportion of Portland cement to perlite aggregate) perlite-concrete floor slab on top.	19-1.1	Suspended envelope ceiling of perlite gypsum plaster on metal lath attached to $\frac{3}{4}$ " cold-rolled channels, secured to $1\frac{1}{2}$ " cold-rolled channels spaced 42" on center supported by 0.203 inch (No. 6 B.W. gage) wire 36" on center. Beams in envelope with 3" minimum airspace between beam soffit and lath have a 4-hour rating.	2 ^P	—	—	—	—	1 ^I	—	—
20. Perlite concrete proportioned 1:6 (Portland cement to perlite aggregate) poured to $\frac{1}{8}$ " thickness above top of corrugations of $1\frac{5}{16}$ " - deep galvanized steel deck maximum span 8'-0" for 0.024" (No. 24	20-1.1	None	—	—	Varies	—	—	—	—	—

<p>galvanized sheet gage) or 6' 0" for 0.019" (No. 26 galvanized sheet gage) with deck supported by individually protected steel framing. Approved polystyrene foam plastic insulation board having a flame spread not exceeding 75 (1" to 4" thickness) with vent holes that approximate 3 percent of the board surface area placed on top of perlite slurry. A 2' by 4' insulation board contains six 2³/₄" diameter holes. Board covered with 2¹/₄" minimum perlite concrete slab. Slab reinforced with mesh consisting of 0.042" (No. 19 B.W. gage) galvanized steel wire twisted together to form 2" hexagons with straight 0.065" (No. 16 B.W. gage) galvanized steel wire woven into mesh and spaced 3". Alternate slab reinforcement shall be permitted to consist of 4" × 8", 0.109/0.238" (No. 12/4 B.W. gage), or 2" × 2", 0.083/0.083" (No. 14/14 B.W. gage) welded wire fabric. Class A or B roof covering on top.</p>											
<p>21. Wood joists, wood I-joists, floor trusses and flat or pitched roof trusses spaced a maximum 24" o.c. with 1¹/₂" wood structural panels with exterior glue applied at right angles to top of joist or top chord of trusses with 8d nails. The wood structural panel thickness shall be not less than nominal 1¹/₂" nor less than required by Chapter 23.</p>	21-1.1	<p>Base layer 5¹/₈" Type X gypsum wallboard applied at right angles to joist or truss 24" o.c. with 1¹/₄" Type S or Type W drywall screws 24" o.c. Face layer 5¹/₈" Type X gypsum wallboard or veneer base applied at right angles to joist or truss through base layer with 1⁷/₈" Type S or Type W drywall screws 12" o.c. at joints and intermediate joist or</p>	—	—	—	Varies	—	—	—	—	1 ¹ / ₄

		truss. Face layer Type G drywall screws placed 2" back on either side of face layer end joints, 12" o.c.								
22. Steel joists, floor trusses and flat or pitched roof trusses spaced a maximum 24" o.c. with 1/2" wood structural panels with exterior glue applied at right angles to top of joist or top chord of trusses with No. 8 screws. The wood structural panel thickness shall be not less than nominal 1/2" nor less than required by Chapter 23.	22-1.1	Base layer 5/8" Type X gypsum board applied at right angles to steel framing 24" on center with 1" Type S drywall screws spaced 24" on center. Face layer 5/8" Type X gypsum board applied at right angles to steel framing attached through base layer with 1 5/8" Type S drywall screws 12" on center at end joints and intermediate joints and 1 1/2" Type G drywall screws 12 inches on center placed 2" back on either side of face layer end joints. Joints of the face layer are offset 24" from the joints of the base layer.	—	—	—	Varies	—	—	—	1 1/4
23. Wood I-joint (minimum joist depth 9 1/4" with a minimum flange depth of 15/16" and a minimum flange cross-sectional area of 2.25 square inches) at 24" o.c. spacing with a minimum 1 x 4 (3/4" x 3.5" actual) ledger strip applied parallel to and covering the bottom of the bottom flange of each member, tacked in place. 2" mineral wool insulation, 3.5 pcf (nominal) installed adjacent to the bottom flange of the I-joint and supported by the 1 x 4 ledger strip.	23-1.1	1/2" deep single leg resilient channel 16" on center (channels doubled at wallboard end joints), placed perpendicular to the furring strip and joist and attached to each joist by 1 7/8" Type S drywall screws. 5/8" Type C gypsum wallboard applied perpendicular to the channel with end joints staggered not less than 4' and fastened with 1 1/8" Type S drywall screws spaced 7" on center. Wallboard joints to be taped and covered with joint compound.	—	—	—	Varies	—	—	—	5/8
24. Wood I-joint (minimum I-joint depth 9 1/4" with a minimum flange depth of 1 1/2"	24-1.1	Minimum 0.026" thick hat-shaped channel 16" o.c. (channels doubled at wallboard	—	—	—	Varies	—	—	—	5/8

and a minimum flange cross-sectional area of 5.25 square inches; minimum web thickness of $\frac{3}{8}$ " @ 24" o.c., $1\frac{1}{2}$ " mineral wool insulation (2.5 pcf-nominal) resting on hat-shaped furring channels.		end joints), placed perpendicular to the joist and attached to each joist by $1\frac{1}{4}$ " Type S drywall screws. $\frac{5}{8}$ " Type C gypsum wallboard applied perpendicular to the channel with end joints staggered and fastened with $1\frac{1}{8}$ " Type S drywall screws spaced 12" o.c. in the field and 8" o.c. at the wallboard ends. Wallboard joints to be taped and covered with joint compound.							
25. Wood I-joist (minimum I-joist depth $9\frac{1}{4}$ " with a minimum flange depth of $1\frac{1}{2}$ " and a minimum flange cross-sectional area of 5.25 square inches; minimum web thickness of $\frac{7}{16}$ " @ 24" o.c., $1\frac{1}{2}$ " mineral wool insulation (2.5 pcf-nominal) resting on resilient channels.	25-1.1	Minimum 0.019" thick resilient channel 16" o.c. (channels doubled at wallboard end joints), placed perpendicular to the joist and attached to each joist by $1\frac{5}{8}$ " Type S drywall screws. $\frac{5}{8}$ " Type C gypsum wallboard applied perpendicular to the channel with end joints staggered and fastened with 1" Type S drywall screws spaced 12" o.c. in the field and 8" o.c. at the wallboard ends. Wallboard joints to be taped and covered with joint compound.	—	—	—	Varies	—	—	—
26. Wood I-joist (minimum I-joist depth $9\frac{1}{4}$ " with a minimum flange thickness of $1\frac{1}{2}$ " and a minimum flange cross-sectional area of 2.25 square inches; minimum web thickness of $\frac{3}{8}$ " @ 24" o.c.	26-1.1	Two layers of $1\frac{1}{2}$ " Type X gypsum wallboard applied with the long dimension perpendicular to the I-joists with end joints staggered. The base layer is fastened with $1\frac{5}{8}$ " Type S drywall screws spaced 12" o.c. and the face layer is fastened with 2" Type S drywall screws spaced 12" o.c. in the field and 8" o.c. on the edges. Face layer end joints shall not occur on the same I-joist as	—	—	—	Varies	—	—	—

		base layer end joints and edge joints shall be offset 24" from base layer joints. Face layer to also be attached to base layer with 1 $\frac{1}{2}$ " Type G drywall screws spaced 8" o.c. placed 6" from face layer end joints. Face layer wallboard joints to be taped and covered with joint compound.							
27. Wood I-joist (minimum I-joist depth 9 $\frac{1}{2}$ " with a minimum flange depth of 1 $\frac{5}{16}$ " and a minimum flange cross-sectional area of 1.95 square inches; minimum web thickness of $\frac{3}{8}$ ") @ 24" o.c.	27-1.1	Minimum 0.019" thick resilient channel 16" o.c. (channels doubled at wallboard end joints), placed perpendicular to the joist and attached to each joist by 1 $\frac{1}{4}$ " Type S drywall screws. Two layers of 1 $\frac{1}{2}$ " Type X gypsum wallboard applied with the long dimension perpendicular to the resilient channels with end joints staggered. The base layer is fastened with 1 $\frac{1}{4}$ " Type S drywall screws spaced 12" o.c. and the face layer is fastened with 1 $\frac{5}{8}$ " Type S drywall screws spaced 12" o.c. Face layer end joints shall not occur on the same I-joist as base layer end joints and edge joints shall be offset 24" from base layer joints. Face layer to also be attached to base layer with 1 $\frac{1}{2}$ " Type G drywall screws spaced 8" o.c. placed 6" from face layer end joints. Face layer wallboard joints to be taped and covered with joint compound.	—	—	—	Varies	—	—	—
28. Wood I-joist (minimum I-joist depth 9 $\frac{1}{4}$ " with a minimum flange depth of 1 $\frac{1}{2}$ "	28-1.1	Base layer of $\frac{5}{8}$ " Type C gypsum wallboard attached directly to I-joists with 1 $\frac{5}{8}$ " Type S	—	—	—	Varies	—	—	2 $\frac{3}{4}$

and a minimum flange cross-sectional area of 2.25 square inches; minimum web thickness of $\frac{3}{8}$ " @ 24" o.c. Unfaced fiberglass insulation or mineral wool insulation is installed between the I-joists supported on the upper surface of the flange by stay wires spaced 12" o.c .		drywall screws spaced 12" o.c. with ends staggered. Minimum 0.0179" thick hat-shaped $\frac{7}{8}$ -inch furring channel 16" o.c. (channels doubled at wallboard end joints), placed perpendicular to the joist and attached to each joist by $1\frac{5}{8}$ " Type S drywall screws after the base layer of gypsum wallboard has been applied. The middle and face layers of $\frac{5}{8}$ " Type C gypsum wallboard applied perpendicular to the channel with end joints staggered. The middle layer is fastened with 1" Type S drywall screws spaced 12" o.c. The face layer is applied parallel to the middle layer but with the edge joints offset 24" from those of the middle layer and fastened with $1\frac{5}{8}$ " Type S drywall screws 8" o.c. The joints shall be taped and covered with joint compound.						
29. Channel-shaped 18 gage steel joists (minimum depth 8") spaced a maximum 24" o.c. supporting tongue-and-groove wood structural panels (nominal minimum $\frac{3}{4}$ " thick) applied perpendicular to framing members. Structural panels attached with $1\frac{5}{8}$ " Type S-12 screws spaced 12" o.c.	29-1.1	Base layer $\frac{5}{8}$ " Type X gypsum board applied perpendicular to bottom of framing members with $1\frac{1}{8}$ " Type S-12 screws spaced 12" o.c. Second layer $\frac{5}{8}$ " Type X gypsum board attached perpendicular to framing members with $1\frac{5}{8}$ " Type S-12 screws spaced 12" o.c. Second layer joints offset 24" from base layer. Third layer $\frac{5}{8}$ " Type X gypsum board attached perpendicular to framing members with $2\frac{3}{8}$ " Type S-12	—	—	Varies	—	—	$3\frac{3}{8}$

		screws spaced 12" o.c. Third layer joints offset 12" from second layer joints. Hat-shaped 7/8-inch rigid furring channels applied at right angles to framing members over third layer with two 2 ³ / ₈ " Type S-12 screws at each framing member. Face layer 5/8" Type X gypsum board applied at right angles to furring channels with 1 ¹ / ₈ " Type S screws spaced 12" o.c.								
30. Wood I-joist (minimum I-joist depth 9 ¹ / ₂ " with a minimum flange depth of 1 ¹ / ₂ " and a minimum flange cross-sectional area of 2.25 square inches; minimum web thickness of 3/8") @ 24" o.c. Fiberglass insulation placed between I-joists supported by the resilient channels.	30-1.1	Minimum 0.019" thick resilient channel 16" o.c. (channels doubled at wallboard end joints), placed perpendicular to the joists and attached to each joist by 1 ¹ / ₄ " Type S drywall screws. Two layers of 1 ¹ / ₂ " Type X gypsum wallboard applied with the long dimension perpendicular to the resilient channels with end joints staggered. The base layer is fastened with 1 ¹ / ₄ " Type S drywall screws spaced 12" o.c. and the face layer is fastened with 1 ⁵ / ₈ " Type S drywall screws spaced 12" o.c. Face layer end joints shall not occur on the same I-joist as base layer end joints and edge joints shall be offset 24" from base layer joints. Face layer to be attached to base layer with 1 ¹ / ₂ " Type G drywall screws spaced 8" o.c. placed 6" from face layer end joints. Face layer wallboard joints to be taped and covered with joint compound.	—	—	—	Varies	—	—	—	1

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound = 0.454 kg, 1 cubic foot = 0.0283 m³, 1 pound per square inch = 6.895 kPa, 1 pound per linear foot = 1.4882 kg/m.

- a. Staples with equivalent holding power and penetration shall be permitted to be used as alternate fasteners to nails for attachment to wood framing.
- b. Where the slab is in an unrestrained condition, minimum reinforcement cover shall be not less than 1⁵/₈ inches for 4 hours (siliceous aggregate only); 1¹/₄ inches for 4 and 3 hours; 1 inch for 2 hours (siliceous aggregate only); and 3³/₄ inch for all other restrained and unrestrained conditions.
- c. For all of the construction with gypsum wallboard described in this table, gypsum base for veneer plaster of the same size, thickness and core type shall be permitted to be substituted for gypsum wallboard, provided attachment is identical to that specified for the wallboard, and the joints on the face layer are reinforced and the entire surface is covered with not less than 1¹/₁₆-inch gypsum veneer plaster.
- d. Slab thickness over steel joists measured at the joists for metal lath form and at the top of the form for steel form units.
- e.
 - (a) The maximum allowable stress level for H-Series joists shall not exceed 22,000 psi.
 - (b) The allowable stress for K-Series joists shall not exceed 26,000 psi, the nominal depth of such joist shall be not less than 10 inches and the nominal joist weight shall be not less than 5 pounds per linear foot.
- f. Cement plaster with 15 pounds of hydrated lime and 3 pounds of approved additives or admixtures per bag of cement.
- g. Gypsum wallboard ceilings attached to steel framing shall be permitted to be suspended with 1¹/₂-inch cold-formed carrying channels spaced 48 inches on center, that are suspended with No. 8 SWG galvanized wire hangers spaced 48 inches on center. Cross-furring channels are tied to the carrying channels with No. 18 SWG galvanized wire hangers spaced 48 inches on center. Cross-furring channels are tied to the carrying channels with No. 18 SWG galvanized wire (double strand) and spaced as required for direct attachment to the framing. This alternative is applicable to those steel framing assemblies recognized under Note q.
- h. Six-inch hollow clay tile with 2-inch concrete slab above.
- i. Four-inch hollow clay tile with 1¹/₂-inch concrete slab above.
- j. Thickness measured to bottom of steel form units.
- k. Five-eighths inch of vermiculite gypsum plaster plus 1¹/₂ inch of approved vermiculite acoustical plastic.
- l. Furring channels spaced 12 inches on center.
- m. Double wood floor shall be permitted to be either of the following:
 - (a) Subfloor of 1-inch nominal boarding, a layer of asbestos paper weighing not less than 14 pounds per 100 square feet and a layer of 1-inch nominal tongue-and-groove finished flooring; or

(b) Subfloor of 1-inch nominal tongue-and-groove boarding or $\frac{15}{32}$ -inch wood structural panels with exterior glue and a layer of 1-inch nominal tongue-and-groove finished flooring or $\frac{19}{32}$ -inch wood structural panel finish flooring or a layer of Type I Grade M-1 particleboard not less than $\frac{5}{8}$ -inch thick.

n. The ceiling shall be permitted to be omitted over unusable space, and flooring shall be permitted to be omitted where unusable space occurs above.

o. For properties of cooler or wallboard nails, see ASTM C514, ASTM C547 or ASTM F1667.

p. Thickness measured on top of steel deck unit.

q. Generic *fire-resistance ratings* (those not designated as PROPRIETARY* in the listing) in the GA 600 shall be accepted as if herein listed.

721.1.1 Thickness of Protective Coverings

The thickness of fire-resistant materials required for protection of structural members shall be not less than set forth in Table 721.1(1), except as modified in this section. The figures shown shall be the net thickness of the protecting materials and shall not include any hollow space in back of the protection.

721.1.2 Unit Masonry Protection

Where required, metal ties shall be embedded in bed joints of unit masonry for protection of steel columns. Such ties shall be as set forth in Table 721.1(1) or be equivalent thereto.

721.1.3 Reinforcement for Cast-in-Place Concrete Column Protection

Cast-in-place concrete protection for steel columns shall be reinforced at the edges of such members with wire ties of not less than 0.18 inch (4.6 mm) in diameter wound spirally around the columns on a pitch of not more than 8 inches (203 mm) or by equivalent reinforcement.

721.1.4 Plaster Application

The finish coat is not required for plaster protective coatings where those coatings comply with the design mix and thickness requirements of Tables 721.1(1), 721.1(2) and 721.1(3).

721.1.5 Bonded Prestressed Concrete Tendons

For members having a single tendon or more than one tendon installed with equal concrete cover measured from the nearest surface, the cover shall be not less than that set forth in Table 721.1(1). For members having multiple tendons installed with variable concrete cover, the average tendon cover shall be not less than that set forth in Table 721.1(1), provided:

1. The clearance from each tendon to the nearest exposed surface is used to determine the average cover.

2. In no case can the clear cover for individual tendons be less than one-half of that set forth in Table 721.1(1). A minimum cover of $\frac{3}{4}$ inch (19.1 mm) for slabs and 1 inch (25 mm) for beams is required for any aggregate concrete.

3. For the purpose of establishing a *fire-resistance rating*, tendons having a clear covering less than that set forth in Table 721.1(1) shall not contribute more than 50 percent of the required ultimate moment capacity for members less than 350 square inches (0.226 m^2) in cross-sectional area and 65 percent for larger members. For structural design purposes, however, tendons having a reduced cover are assumed to be fully effective.

Section 722 Calculated Fire Resistance

722.1 General

The provisions of this section contain procedures by which the *fire resistance* of specific materials or combinations of materials is established by calculations. These procedures apply only to the information contained in this section and shall not be otherwise used. The calculated *fire resistance* of specific materials or combinations of materials shall be established by one of the following:

1. Concrete, concrete masonry and clay masonry assemblies shall be permitted in accordance with ACI 216.1/TMS 0216.
2. Precast and precast, prestressed concrete assemblies shall be permitted in accordance with PCI 124.
3. Steel assemblies shall be permitted in accordance with Chapter 5 of ASCE 29.
4. Exposed wood members and wood decking shall be permitted in accordance with Chapter 16 of ANSI/AWC *National Design Specification for Wood Construction (NDS)*.

722.1.1 Definitions

The following terms are defined in Chapter 2:

CERAMIC FIBER BLANKET.

CONCRETE, CARBONATE AGGREGATE.

CONCRETE, CELLULAR.

CONCRETE, LIGHTWEIGHT AGGREGATE.

CONCRETE, PERLITE.

CONCRETE, SAND-LIGHTWEIGHT.

CONCRETE, SILICEOUS AGGREGATE.

CONCRETE, VERMICULITE.

GLASS FIBERBOARD.

MINERAL BOARD.

722.2 Concrete Assemblies

The provisions of this section contain procedures by which the *fire-resistance ratings* of concrete assemblies are established by calculations.

722.2.1 Concrete Walls

Cast-in-place and precast concrete walls shall comply with Section 722.2.1.1. Multiwythe concrete walls shall comply with Section 722.2.1.2. Joints between precast panels shall comply with Section 722.2.1.3. Concrete walls with gypsum wallboard or plaster finish shall comply with Section 722.2.1.4.

722.2.1.1 Cast-in-Place or Precast Walls

The minimum equivalent thicknesses of cast-in-place or precast concrete walls for *fire-resistance ratings* of 1 hour to 4 hours are shown in Table 722.2.1.1. For solid walls with flat vertical surfaces, the equivalent thickness is the same as the actual thickness. The values in Table 722.2.1.1 apply to plain, reinforced or prestressed concrete walls.

TABLE 722.2.1.1

MINIMUM EQUIVALENT THICKNESS OF CAST-IN-PLACE OR PRECAST CONCRETE WALLS, LOAD-BEARING OR NONLOAD-BEARING

CONCRETE TYPE	MINIMUM SLAB THICKNESS (inches) FOR FIRE-RESISTANCE RATING OF				
	1 hour	1½ hours	2 hours	3 hours	4 hours
Siliceous	3.5	4.3	5.0	6.2	7.0

Carbonate	3.2	4.0	4.6	5.7	6.6
Sand-lightweight	2.7	3.3	3.8	4.6	5.4
Lightweight	2.5	3.1	3.6	4.4	5.1

For SI: 1 inch = 25.4 mm.

722.2.1.1.1 Hollow-Core Precast Wall Panels

For hollow-core precast concrete wall panels in which the cores are of constant cross section throughout the length, calculation of the equivalent thickness by dividing the net cross-sectional area (the gross cross section minus the area of the cores) of the panel by its width shall be permitted.

722.2.1.1.2 Core Spaces Filled

Where all of the core spaces of hollow-core wall panels are filled with loose-fill material, such as expanded shale, clay or slag, or vermiculite or perlite, the *fire-resistance rating* of the wall is the same as that of a solid wall of the same concrete type and of the same overall thickness.

722.2.1.1.3 Tapered Cross Sections

The thickness of panels with tapered cross sections shall be that determined at a distance $2t$ or 6 inches (152 mm), whichever is less, from the point of minimum thickness, where t is the minimum thickness.

722.2.1.1.4 Ribbed or Undulating Surfaces

The equivalent thickness of panels with ribbed or undulating surfaces shall be determined by one of the following expressions:

For $s \geq 4t$, the thickness to be used shall be t

For $s \leq 2t$, the thickness to be used shall be t_e

For $4t > s > 2t$, the thickness to be used shall be

$$t + \left(\frac{4t}{s} - 1 \right) (t_e - t) \quad (\text{Equation 7-3})$$

where:

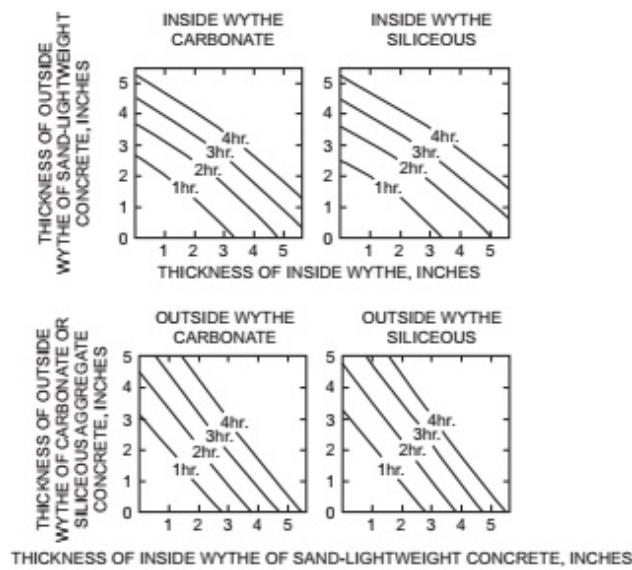
s = Spacing of ribs or undulations.

t = Minimum thickness.

t_e = Equivalent thickness of the panel calculated as the net cross-sectional area of the panel divided by the width, in which the maximum thickness used in the calculation shall not exceed $2t$.

722.2.1.2 Multiwythe Walls

For walls that consist of two wythes of different types of concrete, the *fire-resistance ratings* shall be permitted to be determined from Figure 722.2.1.2.



For SI: 1 inch = 25.4 mm.

FIGURE 722.2.1.2

FIRE-RESISTANCE RATINGS OF TWO-WYTHE CONCRETE WALLS

TABLE 722.2.1.2(1)

VALUES OF $R_n^{0.59}$ FOR USE IN EQUATION 7-4

TYPE OF MATERIAL	THICKNESS OF MATERIAL (inches)											
	1 $\frac{1}{2}$	2	2 $\frac{1}{2}$	3	3 $\frac{1}{2}$	4	4 $\frac{1}{2}$	5	5 $\frac{1}{2}$	6	6 $\frac{1}{2}$	7
Siliceous aggregate concrete	5.3	6.5	8.1	9.5	11.3	13.0	14.9	16.9	18.8	20.7	22.8	25.1
Carbonate aggregate concrete	5.5	7.1	8.9	10.4	12.0	14.0	16.2	18.1	20.3	21.9	24.7	27.2 ^c
Sand-lightweight concrete	6.5	8.2	10.5	12.8	15.5	18.1	20.7	23.3	26.0 ^c	Note c	Note c	Note c
Lightweight concrete	6.6	8.8	11.2	13.7	16.5	19.1	21.9	24.7	27.8 ^c	Note c	Note c	Note c
Insulating concrete ^a	9.3	13.3	16.6	18.3	23.1	26.5 ^c	Note c	Note c	Note c	Note c	Note c	Note c
Airspace ^b	—	—	—	—	—	—	—	—	—	—	—	—

For SI: 1 inch = 25.4 mm, 1 pound per cubic foot = 16.02 kg/m³.

a. Dry unit weight of 35 pcf or less and consisting of cellular, perlite or vermiculite concrete.

b. The $R_n^{0.59}$ value for one 1 $\frac{1}{2}$ " to 3 $\frac{1}{2}$ " airspace is 3.3. The $R_n^{0.59}$ value for two 1 $\frac{1}{2}$ " to 3 $\frac{1}{2}$ " airspaces is 6.7.

c. The *fire-resistance rating* for this thickness exceeds 4 hours.

TABLE 722.2.1.2(2)

FIRE-RESISTANCE RATINGS BASED ON $R^{0.59}$

R^a (minutes)	$R^{0.59}$
60	11.20
120	16.85
180	21.41
240	25.37

a. Based on Equation 7-4.

722.2.1.2.1 Two or More Wythes

The *fire-resistance rating* for wall panels consisting of two or more wythes shall be permitted to be determined by the formula:

$$R = (R_1^{0.59} + R_2^{0.59} + \dots + R_n^{0.59})^{1.7}$$

(Equation 7-4)

where:

R = The fire endurance of the assembly, minutes.

R_1 , R_2 , and R_n = The fire endurances of the individual wythes, minutes. Values of $R_n^{0.59}$ for use in Equation 7-4 are given in Table 722.2.1.2(1). Calculated *fire-resistance ratings* are shown in Table 722.2.1.2(2).

722.2.1.2.2 Foam Plastic Insulation

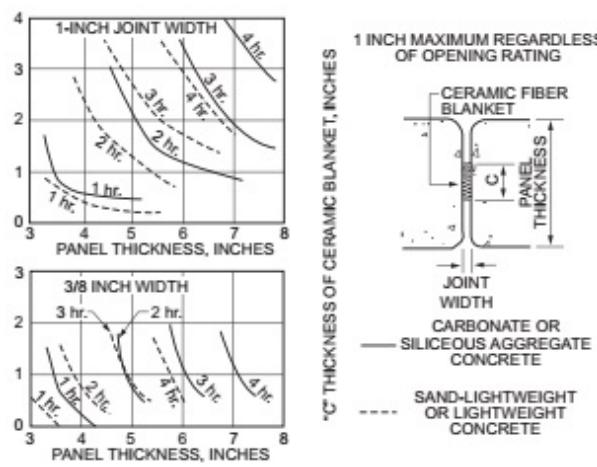
The *fire-resistance ratings* of precast concrete wall panels consisting of a layer of foam plastic insulation sandwiched between two wythes of concrete shall be permitted to be determined by use of Equation 7-4. Foam plastic insulation with a total thickness of less than 1 inch (25 mm) shall be disregarded. The R_n value for thickness of foam plastic insulation of 1 inch (25 mm) or greater, for use in the calculation, is 5 minutes; therefore $R_n^{0.59} = 2.5$.

722.2.1.3 Joints Between Precast Wall Panels

Joints between precast concrete wall panels that are not insulated as required by this section shall be considered as openings in walls. Uninsulated joints shall be included in determining the percentage of openings permitted by Table 705.8. Where openings are not permitted or are required by this code to be protected, the provisions of this section shall be used to determine the amount of joint insulation required. Insulated joints shall not be considered openings for purposes of determining compliance with the allowable percentage of openings in Table 705.8.

722.2.1.3.1 Ceramic Fiber Joint Protection

Figure 722.2.1.3.1 shows thicknesses of *ceramic fiber blankets* to be used to insulate joints between precast concrete wall panels for various panel thicknesses and for joint widths of $\frac{3}{8}$ inch (9.5 mm) and 1 inch (25 mm) for *fire-resistance ratings* of 1 hour to 4 hours. For joint widths between $\frac{3}{8}$ inch (9.5 mm) and 1 inch (25 mm), the thickness of *ceramic fiber blanket* is allowed to be determined by direct interpolation. Other tested and labeled materials are acceptable in place of *ceramic fiber blankets*.



For SI: 1 inch = 25.4 mm.

FIGURE 722.2.1.3.1

CERAMIC FIBER JOINT PROTECTION

722.2.1.4 Walls With Gypsum Wallboard or Plaster Finishes

The *fire-resistance rating* of cast-in-place or precast concrete walls with finishes of gypsum wallboard or plaster applied to one or both sides shall be permitted to be calculated in accordance with the provisions of this section.

TABLE 722.2.1.4(1)

MULTIPLYING FACTOR FOR FINISHES ON NONFIRE-EXPOSED SIDE OF WALL

TYPE OF FINISH APPLIED TO CONCRETE OR CONCRETE MASONRY WALL	TYPE OF AGGREGATE USED IN CONCRETE OR CONCRETE MASONRY			
	Concrete: siliceous or carbonate Concrete Masonry: siliceous or carbonate; solid clay brick	Concrete: sand-lightweight Concrete Masonry: clay tile; hollow clay brick; concrete masonry units of expanded shale and < 20% sand	Concrete: lightweight Concrete Masonry: concrete masonry units of expanded shale, expanded clay, expanded slag, or pumice < 20% sand	Concrete Masonry: concrete masonry units of expanded slag, expanded clay, or pumice
Portland cement-sand plaster	1.00	0.75 ^a	0.75 ^a	0.50 ^a
Gypsum-sand plaster	1.25	1.00	1.00	1.00
Gypsum-vermiculite or perlite plaster	1.75	1.50	1.25	1.25
Gypsum wallboard	3.00	2.25	2.25	2.25

For SI: 1 inch = 25.4 mm.

- a. For Portland cement-sand plaster $\frac{5}{8}$ inch or less in thickness and applied directly to the concrete or concrete masonry on the nonfire-exposed side of the wall, the multiplying factor shall be 1.00.

TABLE 722.2.1.4(2)

TIME ASSIGNED TO FINISH MATERIALS ON FIRE-EXPOSED SIDE OF WALL

FINISH DESCRIPTION	TIME (minutes)
Gypsum wallboard	
3/8 inch	10
1/2 inch	15
5/8 inch	20
2 layers of 3/8 inch	25
1 layer of 3/8 inch, 1 layer of 1/2 inch	35
2 layers of 1/2 inch	40
Type X gypsum wallboard	
1/2 inch	25
5/8 inch	40
Portland cement-sand plaster applied directly to concrete masonry	See Note a
Portland cement-sand plaster on metal lath	
3/4 inch	20
7/8 inch	25
1 inch	30
Gypsum sand plaster on 3/8-inch gypsum lath	
1/2 inch	35
5/8 inch	40
3/4 inch	50
Gypsum sand plaster on metal lath	
3/4 inch	50
7/8 inch	60
1 inch	80

For SI: 1 inch = 25.4 mm.

- a. The actual thickness of Portland cement-sand plaster, provided it is 5/8 inch or less in thickness, shall be permitted to be included in determining the equivalent thickness of the masonry for use in Table 722.3.2.

722.2.1.4.1 Nonfire-Exposed Side

Where the finish of gypsum wallboard or plaster is applied to the side of the wall not exposed to fire, the contribution of the finish to the total *fire-resistance rating* shall be determined as follows: The thickness of the finish shall first be corrected by multiplying the actual thickness of the finish by the applicable factor determined from Table 722.2.1.4(1) based on the type of aggregate in the concrete. The corrected thickness of finish shall then be added to the actual or equivalent thickness of concrete and *fire-resistance rating* of the concrete and finish determined from Tables 722.2.1.1 and 722.2.1.2(1) and Figure 722.2.1.2.

722.2.1.4.2 Fire-Exposed Side

Where gypsum wallboard or plaster is applied to the fire-exposed side of the wall, the contribution of the finish to the total *fire-resistance rating* shall be determined as follows: The time assigned to the finish as established by Table 722.2.1.4(2) shall be added to the *fire-resistance rating* determined from Tables 722.2.1.1 and 722.2.1.2(1) and Figure 722.2.1.2 for the concrete alone, or to the rating determined in Section 722.2.1.4.1 for the concrete and finish on the nonfire-exposed side.

722.2.1.4.3 Nonsymmetrical Assemblies

For a wall having no finish on one side or different types or thicknesses of finish on each side, the calculation procedures of Sections 722.2.1.4.1 and 722.2.1.4.2 shall be performed twice, assuming either side of the wall to be the fire-exposed side. The *fire-resistance rating* of the wall shall not exceed the lower of the two values.

Exception: For an exterior wall with a *fire separation distance* greater than 5 feet (1524 mm) the fire shall be assumed to occur on the interior side only.

722.2.1.4.4 Minimum Concrete Fire-Resistance Rating

Where finishes applied to one or both sides of a concrete wall contribute to the *fire-resistance rating*, the concrete alone shall provide not less than one-half of the total required *fire-resistance rating*. Additionally, the contribution to the *fire resistance* of the finish on the nonfire-exposed side of a *load-bearing wall* shall not exceed one-half the contribution of the concrete alone.

722.2.1.4.5 Concrete Finishes

Finishes on concrete walls that are assumed to contribute to the total *fire-resistance rating* of the wall shall comply with the installation requirements of Section 722.3.2.5.

722.2 Concrete Floor and Roof Slabs

Reinforced and prestressed floors and roofs shall comply with Section 722.2.2.1. Multicourse floors and roofs shall comply with Sections 722.2.2 and 722.2.2.3, respectively.

722.2.2.1 Reinforced and Prestressed Floors and Roofs

The minimum thicknesses of reinforced and prestressed concrete floor or roof slabs for *fire-resistance ratings* of 1 hour to 4 hours are shown in Table 722.2.2.1.

Exception: Minimum thickness shall not be required for floors and ramps within open and enclosed parking garages constructed in accordance with Sections 406.5 and 406.6, respectively.

TABLE 722.2.2.1

MINIMUM SLAB THICKNESS (inches)

CONCRETE TYPE	FIRE-RESISTANCE RATING (hours)				
	1	1½	2	3	4
Siliceous	3.5	4.3	5	6.2	7
Carbonate	3.2	4	4.6	5.7	6.6
Sand-lightweight	2.7	3.3	3.8	4.6	5.4
Lightweight	2.5	3.1	3.6	4.4	5.1

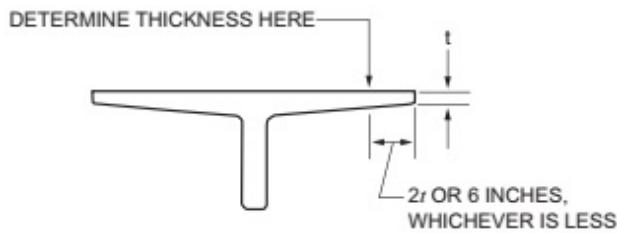
For SI: 1 inch = 25.4 mm.

722.2.2.1.1 Hollow-Core Prestressed Slabs

For hollow-core prestressed concrete slabs in which the cores are of constant cross section throughout the length, the equivalent thickness shall be permitted to be obtained by dividing the net cross-sectional area of the slab including grout in the joints, by its width.

722.2.2.1.2 Slabs With Sloping Soffits

The thickness of slabs with sloping soffits (see Figure 722.2.2.1.2) shall be determined at a distance $2t$ or 6 inches (152 mm), whichever is less, from the point of minimum thickness, where t is the minimum thickness.



For SI: 1 inch = 25.4 mm.

FIGURE 722.2.2.1.2

DETERMINATION OF SLAB THICKNESS FOR SLOPING SOFFITS

722.2.2.1.3 Slabs With Ribbed Soffits

The thickness of slabs with ribbed or undulating soffits (see Figure 722.2.2.1.3) shall be determined by one of the following expressions, whichever is applicable:

For $s > 4t$, the thickness to be used shall be t

For $s \leq 2t$, the thickness to be used shall be t_e

For $4t > s > 2t$, the thickness to be used shall be

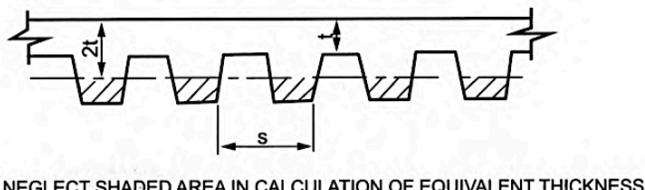
$$t + \left(\frac{4t}{s} - 1 \right) (t_e - t) \quad (\text{Equation 7-5})$$

where:

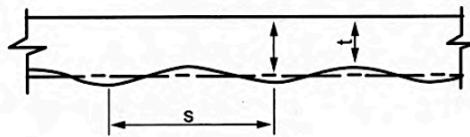
s = Spacing of ribs or undulations.

t = Minimum thickness.

t_e = Equivalent thickness of the slab calculated as the net area of the slab divided by the width, in which the maximum thickness used in the calculation shall not exceed $2t$.



NEGLECT SHADED AREA IN CALCULATION OF EQUIVALENT THICKNESS



For SI: 1 inch = 25.4 mm.

FIGURE 722.2.2.1.3

SLABS WITH RIBBED OR UNDULATING SOFFITS

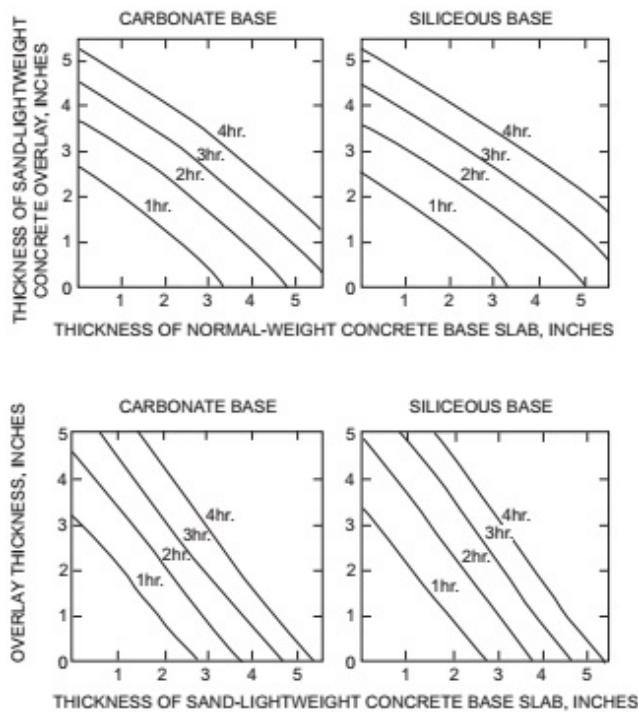
722.2.2.1.4 Flat Plate Concrete Slabs With Uniformly Spaced Hollow Voids

Table 722.2.2.1 shall be used to determine the fire resistance of 1 hour and 2 hours for flat plate concrete slabs with uniformly spaced hollow voids. The equivalent thickness of the slab shall be determined by dividing the net concrete volume of the slab by the

floor area. The net concrete volume of the slab shall be equal to the volume of concrete of a solid slab minus the average concrete volume displaced by the hollow voids.

722.2.2.2 Multicourse Floors

The *fire-resistance ratings* of floors that consist of a base slab of concrete with a topping (overlay) of a different type of concrete shall comply with Figure 722.2.2.2.



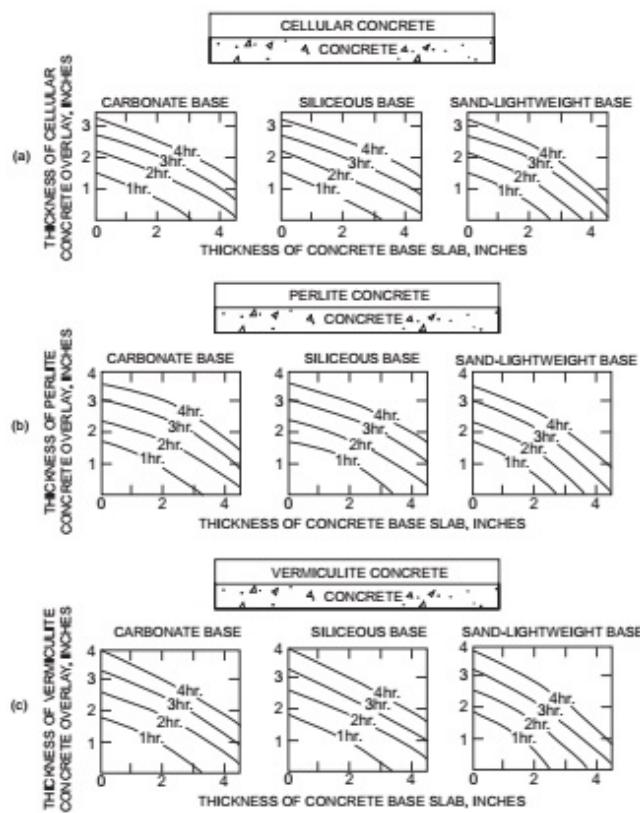
For SI: 1 inch = 25.4 mm.

FIGURE 722.2.2.2

FIRE-RESISTANCE RATINGS FOR TWO-COURSE CONCRETE FLOORS

722.2.2.3 Multicourse Roofs

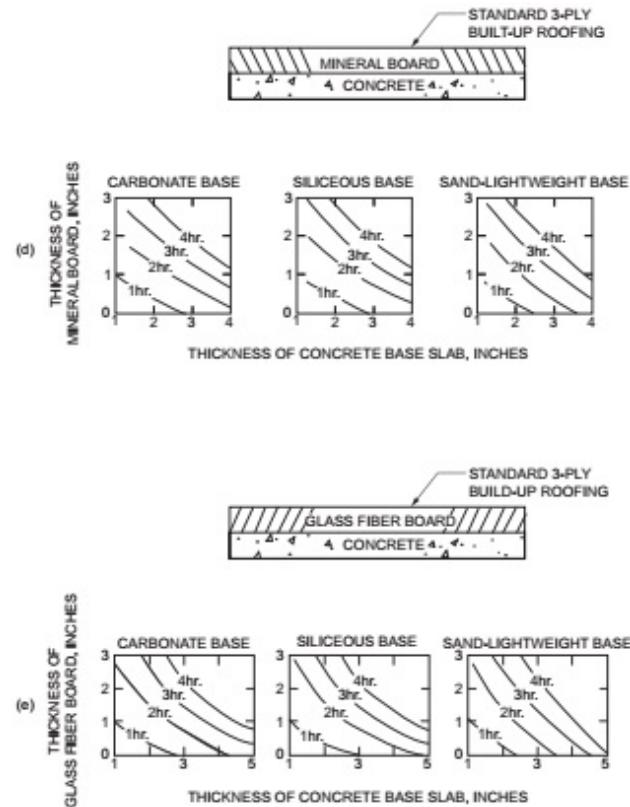
The *fire-resistance ratings* of roofs that consist of a base slab of concrete with a topping (overlay) of an insulating concrete or with an insulating board and built-up roofing shall comply with Figures 722.2.2.3(1) and 722.2.2.3(2).



For SI: 1 inch = 25.4 mm.

FIGURE 722.2.2.3(1)

FIRE-RESISTANCE RATINGS FOR CONCRETE ROOF ASSEMBLIES



For SI: 1 inch = 25.4 mm.

FIGURE 722.2.2.3(2)

FIRE-RESISTANCE RATINGS FOR CONCRETE ROOF ASSEMBLIES**722.2.2.3.1 Heat Transfer**

For the transfer of heat, three-ply built-up roofing contributes 10 minutes to the *fire-resistance rating*. The *fire-resistance rating* for concrete assemblies such as those shown in Figure 722.2.2.3(1) shall be increased by 10 minutes. This increase is not applicable to those shown in Figure 722.2.2.3(2).

722.2.2.4 Joints in Precast Slabs

Joints between adjacent precast concrete slabs need not be considered in calculating the slab thickness provided that a concrete topping not less than 1 inch (25 mm) thick is used. Where no concrete topping is used, joints must be grouted to a depth of not less than one-third the slab thickness at the joint, but not less than 1 inch (25 mm), or the joints must be made fire resistant by other *approved* methods.

722.2.3 Concrete Cover Over Reinforcement

The minimum thickness of concrete cover over reinforcement in concrete slabs, reinforced beams and prestressed beams shall comply with this section.

TABLE 722.2.3(1)**COVER THICKNESS FOR REINFORCED CONCRETE FLOOR OR ROOF SLABS (inches)**

CONCRETE AGGREGATE TYPE	FIRE-RESISTANCE RATING (hours)									
	Restrained					Unrestrained				
	1	1½	2	3	4	1	1½	2	3	4
Siliceous	3/4	3/4	3/4	3/4	3/4	3/4	3/4	1	1 1/4	1 5/8
Carbonate	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	1 1/4	1 1/4
Sand-lightweight or lightweight	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	1 1/4	1 1/4

For SI: 1 inch = 25.4 mm.

TABLE 722.2.3(2)**COVER THICKNESS FOR PRESTRESSED CONCRETE FLOOR OR ROOF SLABS (inches)**

CONCRETE AGGREGATE TYPE	FIRE-RESISTANCE RATING (hours)									
	Restrained					Unrestrained				
	1	1½	2	3	4	1	1½	2	3	4
Siliceous	3/4	3/4	3/4	3/4	3/4	1 1/8	1 1/2	1 3/4	2 3/8	2 3/4
Carbonate	3/4	3/4	3/4	3/4	3/4	1	1 3/8	1 5/8	2 1/8	2 1/4
Sand-lightweight or lightweight	3/4	3/4	3/4	3/4	3/4	1	1 3/8	1 1/2	2	2 1/4

For SI: 1 inch = 25.4 mm.

TABLE 722.2.3(3)**MINIMUM COVER FOR MAIN REINFORCING BARS OF REINFORCED CONCRETE BEAMS^c**

(APPLICABLE TO ALL TYPES OF STRUCTURAL CONCRETE)

RESTRAINED OR UNRESTRAINED ^a	BEAM WIDTH ^b (inches)	FIRE-RESISTANCE RATING (hours)				
		1	1½	2	3	4

	5	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	1 ^a	$1\frac{1}{4}$ ^a
Restrained	7	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$
	≥ 10	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$
Unrestrained	5	$\frac{3}{4}$	1	$1\frac{1}{4}$	—	—
	7	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$1\frac{3}{4}$	3
	≥ 10	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	1	$1\frac{3}{4}$

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

- a. Tabulated values for restrained assemblies apply to beams spaced more than 4 feet on center. For restrained beams spaced 4 feet or less on center, minimum cover of $\frac{3}{4}$ inch is adequate for ratings of 4 hours or less.
- b. For beam widths between the tabulated values, the minimum cover thickness can be determined by direct interpolation.
- c. The cover for an individual reinforcing bar is the minimum thickness of concrete between the surface of the bar and the fire-exposed surface of the beam. For beams in which several bars are used, the cover for corner bars used in the calculation shall be reduced to one-half of the actual value. The cover for an individual bar must be not less than one-half of the value given in Table 722.2.3(3) nor less than $\frac{3}{4}$ inch.

TABLE 722.2.3(4)

MINIMUM COVER FOR PRESTRESSED CONCRETE BEAMS 8 INCHES OR GREATER IN WIDTH^b

RESTRAINED OR UNRESTRAINED ^a	CONCRETE AGGREGATE TYPE	BEAM WIDTH (inches)	FIRE-RESISTANCE RATING (hours)				
			1	$1\frac{1}{2}$	2	3	4
Restrained	Carbonate or siliceous	8	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{3}{4}$ ^a	$2\frac{1}{2}$ ^a
	Carbonate or siliceous	≥ 12	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{7}{8}$ ^a
	Sand lightweight	8	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	2^a
	Sand lightweight	≥ 12	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{5}{8}$ ^a
Unrestrained	Carbonate or siliceous	8	$1\frac{1}{2}$	$1\frac{3}{4}$	$2\frac{1}{2}$	5 ^c	—
	Carbonate or siliceous	≥ 12	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{7}{8}$ ^a	$2\frac{1}{2}$	3
	Sand lightweight	8	$1\frac{1}{2}$	$1\frac{1}{2}$	2	$3\frac{1}{4}$	—
	Sand lightweight	≥ 12	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{5}{8}$	2	$2\frac{1}{2}$

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

- a. Tabulated values for restrained assemblies apply to beams spaced more than 4 feet on center. For restrained beams spaced 4 feet or less on center, minimum cover of $\frac{3}{4}$ inch is adequate for 4-hour ratings or less.
- b. For beam widths between 8 inches and 12 inches, minimum cover thickness can be determined by direct interpolation.
- c. Not practical for 8-inch-wide beam but shown for purposes of interpolation.

TABLE 722.2.3(5)**MINIMUM COVER FOR PRESTRESSED CONCRETE BEAMS OF ALL WIDTHS**

RESTRAINED OR UNRESTRAINED ^a	CONCRETE AGGREGATE TYPE	BEAM AREA ^b A (square inches)	FIRE-RESISTANCE RATING (hours)				
			1	1½	2	3	4
Restrained	All	40 ≤ A ≤ 150	1½	1½	2	2½	—
	Carbonate or siliceous	150 < A ≤ 300	1½	1½	1½	1¾	2½
		300 < A	1½	1½	1½	1½	2
	Sand lightweight	150 < A	1½	1½	1½	1½	2
Unrestrained	All	40 ≤ A ≤ 150	2	2½	—	—	—
	Carbonate or siliceous	150 < A ≤ 300	1½	1¾	2½	—	—
		300 < A	1½	1½	2	3 ^c	4 ^c
	Sand lightweight	150 < A	1½	1½	2	3 ^c	4 ^c

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

- a. Tabulated values for restrained assemblies apply to beams spaced more than 4 feet on center. For restrained beams spaced 4 feet or less on center, minimum cover of $\frac{3}{4}$ inch is adequate for 4-hour ratings or less.
- b. The cross-sectional area of a stem is permitted to include a portion of the area in the flange, provided the width of the flange used in the calculation does not exceed three times the average width of the stem.
- c. U-shaped or hooped stirrups spaced not to exceed the depth of the member and having a minimum cover of 1 inch shall be provided.

722.2.3.1 Slab Cover

The minimum thickness of concrete cover to the positive moment reinforcement shall comply with Table 722.2.3(1) for reinforced concrete and Table 722.2.3(2) for prestressed concrete. These tables are applicable for solid or hollow-core one-way or two-way slabs with flat undersurfaces. These tables are applicable to slabs that are either cast in place or precast. For precast prestressed concrete not covered elsewhere, the procedures contained in PCI 124 shall be acceptable.

722.2.3.2 Reinforced Beam Cover

The minimum thickness of concrete cover to the positive moment reinforcement (bottom steel) for reinforced concrete beams is shown in Table 722.2.3(3) for fire-resistance ratings of 1 hour to 4 hours.

722.2.3.3 Prestressed Beam Cover

The minimum thickness of concrete cover to the positive moment prestressing tendons (bottom steel) for restrained and unrestrained prestressed concrete beams and stemmed units shall comply with the values shown in Tables 722.2.3(4) and 722.2.3(5) for fire-resistance ratings of 1 hour to 4 hours. Values in Table 722.2.3(4) apply to beams 8 inches (203 mm) or greater in width. Values in Table 722.2.3(5) apply to beams or stems of any width, provided the cross-section area is not less than 40 square inches (25 806 mm²). In case of differences between the values determined from Table 722.2.3(4) or 722.2.3(5), it is permitted to use the smaller value. The concrete cover shall be calculated in accordance with Section 722.2.3.3.1. The minimum concrete cover for nonprestressed reinforcement in prestressed concrete beams shall comply with Section 722.2.3.2.

722.2.3.3.1 Calculating Concrete Cover

The concrete cover for an individual tendon is the minimum thickness of concrete between the surface of the tendon and the fire-exposed surface of the beam, except that for ungrouted ducts, the assumed cover thickness is the minimum thickness of concrete between the surface of the duct and the fire-exposed surface of the beam. For beams in which two or more tendons are used, the

cover is assumed to be the average of the minimum cover of the individual tendons. For corner tendons (tendons equal distance from the bottom and side), the minimum cover used in the calculation shall be one-half the actual value. For stemmed members with two or more prestressing tendons located along the vertical centerline of the stem, the average cover shall be the distance from the bottom of the member to the centroid of the tendons. The actual cover for any individual tendon shall be not less than one-half the smaller value shown in Tables 722.2.3(4) and 722.2.3(5), or 1 inch (25 mm), whichever is greater.

722.2.4 Concrete Columns

Concrete columns shall comply with this section.

TABLE 722.2.4

MINIMUM DIMENSION OF CONCRETE COLUMNS (inches)

TYPES OF CONCRETE	FIRE-RESISTANCE RATING (hours)				
	1	1$\frac{1}{2}$	2^a	3^a	4^b
Siliceous	8	9	10	12	14
Carbonate	8	9	10	11	12
Sand-lightweight	8	8 $\frac{1}{2}$	9	10 $\frac{1}{2}$	12

For SI: 1 inch = 25 mm.

- a. The minimum dimension is permitted to be reduced to 8 inches for rectangular columns with two parallel sides not less than 36 inches in length.
- b. The minimum dimension is permitted to be reduced to 10 inches for rectangular columns with two parallel sides not less than 36 inches in length.

722.2.4.1 Minimum Size

The minimum overall dimensions of reinforced concrete columns for *fire-resistance ratings* of 1 hour to 4 hours for exposure to fire on all sides shall comply with this section.

722.2.4.1.1 Concrete Strength Less Than or Equal to 12,000 psi

For columns made with concrete having a specified compressive strength, f'_{c} , of less than or equal to 12,000 psi (82.7 MPa), the minimum dimension shall comply with Table 722.2.4.

722.2.4.1.2 Concrete Strength Greater Than 12,000 psi

For columns made with concrete having a specified compressive strength, f'_{c} , greater than 12,000 psi (82.7 MPa), for *fire-resistance ratings* of 1 hour to 4 hours the minimum dimension shall be 24 inches (610 mm).

722.2.4.2 Minimum Cover for R/C Columns

The minimum thickness of concrete cover to the main longitudinal reinforcement in columns, regardless of the type of aggregate used in the concrete and the specified compressive strength of concrete, f'_{c} , shall be not less than 1 inch (25 mm) times the number of hours of required *fire resistance* or 2 inches (51 mm), whichever is less.

722.2.4.3 Tie and Spiral Reinforcement

For concrete columns made with concrete having a specified compressive strength, f'_{c} , greater than 12,000 psi (82.7 MPa), tie and spiral reinforcement shall comply with the following:

1. The free ends of rectangular ties shall terminate with a 135-degree (2.4 rad) standard tie hook.
2. The free ends of circular ties shall terminate with a 90-degree (1.6 rad) standard tie hook.

3. The free ends of spirals, including at lap splices, shall terminate with a 90-degree (1.6 rad) standard tie hook.

The hook extension at the free end of ties and spirals shall be the larger of six bar diameters and the extension required by Section 7.1.3 of ACI 318. Hooks shall project into the core of the column.

722.2.4.4 Columns Built Into Walls

The minimum dimensions of Table 722.2.4 do not apply to a reinforced concrete column that is built into a concrete or masonry wall provided all of the following are met:

1. The *fire-resistance rating* for the wall is equal to or greater than the required rating of the column;
2. The main longitudinal reinforcing in the column has cover not less than that required by Section 722.2.4.2; and
3. Openings in the wall are protected in accordance with Section 716.

Where openings in the wall are not protected as required by Section 716, the minimum dimension of columns required to have a *fire-resistance rating* of 3 hours or less shall be 8 inches (203 mm), and 10 inches (254 mm) for columns required to have a *fire-resistance rating* of 4 hours, regardless of the type of aggregate used in the concrete.

722.2.4.5 Precast Cover Units for Steel Columns

See Section 722.5.1.4.

722.3 Concrete Masonry

The provisions of this section contain procedures by which the *fire-resistance ratings* of concrete masonry are established by calculations.

722.3.1 Equivalent Thickness

The equivalent thickness of concrete masonry construction shall be determined in accordance with the provisions of this section.

722.3.1.1 Concrete Masonry Unit Plus Finishes

The equivalent thickness of concrete masonry assemblies, T_{ea} , shall be computed as the sum of the equivalent thickness of the concrete masonry unit, T_e , as determined by Section 722.3.1.2, 722.3.1.3 or 722.3.1.4, plus the equivalent thickness of finishes, T_{ef} , determined in accordance with Section 722.3.2:

$$T_{ea} = T_e + T_{ef} \quad (\text{Equation 7-6})$$

722.3.1.2 UngROUTed or Partially Grouted Construction

T_e shall be the value obtained for the concrete masonry unit determined in accordance with ASTM C140.

722.3.1.3 Solid Grouted Construction

The equivalent thickness, T_e , of solid grouted concrete masonry units is the actual thickness of the unit.

722.3.1.4 Airspaces and Cells Filled With Loose-Fill Material

The equivalent thickness of completely filled hollow concrete masonry is the actual thickness of the unit where loose-fill materials are: sand, pea gravel, crushed stone, or slag that meet ASTM C33 requirements; pumice, scoria, expanded shale, expanded clay, expanded slate, expanded slag, expanded fly ash, or cinders that comply with ASTM C331; or perlite or vermiculite meeting the requirements of ASTM C549 and ASTM C516, respectively.

722.3.2 Concrete Masonry Walls

The *fire-resistance rating* of walls and partitions constructed of concrete masonry units shall be determined from Table 722.3.2. The rating shall be based on the equivalent thickness of the masonry and type of aggregate used.

TABLE 722.3.2

MINIMUM EQUIVALENT THICKNESS (inches) OF BEARING OR NONBEARING CONCRETE MASONRY WALLS^{a, b, c, d}

TYPE OF AGGREGATE	FIRE-RESISTANCE RATING (hours)														
	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4
Pumice or expanded slag	1.5	1.9	2.1	2.5	2.7	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4	4.5	4.7
Expanded shale, clay or slate	1.8	2.2	2.6	2.9	3.3	3.4	3.6	3.8	4.0	4.2	4.4	4.6	4.8	4.9	5.1
Limestone, cinders or unexpanded slag	1.9	2.3	2.7	3.1	3.4	3.7	4.0	4.3	4.5	4.8	5.0	5.2	5.5	5.7	5.9
Calcareous or siliceous gravel	2.0	2.4	2.8	3.2	3.6	3.9	4.2	4.5	4.8	5.0	5.3	5.5	5.8	6.0	6.2

For SI: 1 inch = 25.4 mm.

- a. Values between those shown in the table can be determined by direct interpolation.
- b. Where combustible members are framed into the wall, the thickness of solid material between the end of each member and the opposite face of the wall, or between members set in from opposite sides, shall be not less than 93 percent of the thickness shown in the table.
- c. Requirements of ASTM C55, ASTM C73, ASTM C90 or ASTM C744 shall apply.
- d. Minimum required equivalent thickness corresponding to the hourly *fire-resistance rating* for units with a combination of aggregate shall be determined by linear interpolation based on the percent by volume of each aggregate used in manufacture.

722.3.2.1 Finish on Nonfire-Exposed Side

Where plaster or gypsum wallboard is applied to the side of the wall not exposed to fire, the contribution of the finish to the total *fire-resistance rating* shall be determined as follows: The thickness of gypsum wallboard or plaster shall be corrected by multiplying the actual thickness of the finish by applicable factor determined from Table 722.2.1.4(1). This corrected thickness of finish shall be added to the equivalent thickness of masonry and the *fire-resistance rating* of the masonry and finish determined from Table 722.3.2.

722.3.2.2 Finish on Fire-Exposed Side

Where plaster or gypsum wallboard is applied to the fire-exposed side of the wall, the contribution of the finish to the total *fire-resistance rating* shall be determined as follows: The time assigned to the finish as established by Table 722.2.1.4(2) shall be added to the *fire-resistance rating* determined in Section 722.3.2 for the masonry alone, or in Section 722.3.2.1 for the masonry and finish on the nonfire-exposed side.

722.3.2.3 Nonsymmetrical Assemblies

For a wall having no finish on one side or having different types or thicknesses of finish on each side, the calculation procedures of this section shall be performed twice, assuming either side of the wall to be the fire-exposed side. The *fire-resistance rating* of the wall shall not exceed the lower of the two values calculated.

Exception: For exterior walls with a *fire separation distance* greater than 5 feet (1524 mm), the fire shall be assumed to occur on the interior side only.

722.3.2.4 Minimum Concrete Masonry Fire-Resistance Rating

Where the finish applied to a concrete masonry wall contributes to its *fire-resistance rating*, the masonry alone shall provide not less than one-half the total required *fire-resistance rating*.

722.3.2.5 Attachment of Finishes

Installation of finishes shall be as follows:

1. Gypsum wallboard and gypsum lath applied to concrete masonry or concrete walls shall be secured to wood or steel furring members spaced not more than 16 inches (406 mm) on center (o.c.).
2. Gypsum wallboard shall be installed with the long dimension parallel to the furring members and shall have all joints finished.
3. Other aspects of the installation of finishes shall comply with the applicable provisions of Chapters 7 and 25.

722.3.3 Multiwythe Masonry Walls

The *fire-resistance rating* of wall assemblies constructed of multiple wythes of masonry materials shall be permitted to be based on the *fire-resistance rating* period of each wythe and the continuous airspace between each wythe in accordance with the following formula:

$$R_A = (R_1^{0.59} + R_2^{0.59} + \dots + R_n^{0.59} + A_1 + A_2 + \dots + A_n)^{1/7} \quad (\text{Equation 7-7})$$

where:

R_A = *Fire-resistance rating* of the assembly (hours).

R_1, R_2, \dots, R_n = *Fire-resistance rating* of wythes for 1, 2, n (hours), respectively.

A_1, A_2, \dots, A_n = 0.30, factor for each continuous airspace for 1, 2, ..., n , respectively, having a depth of $1/2$ inch (12.7 mm) or more between wythes.

722.3.4 Concrete Masonry Lintels

Fire-resistance ratings for concrete masonry lintels shall be determined based upon the nominal thickness of the lintel and the minimum thickness of concrete masonry or concrete, or any combination thereof, covering the main reinforcing bars, as determined in accordance with Table 722.3.4, or by *approved* alternate methods.

TABLE 722.3.4

MINIMUM COVER OF LONGITUDINAL REINFORCEMENT IN FIRE-RESISTANCE-RATED REINFORCED CONCRETE MASONRY LINTELS (inches)

NOMINAL WIDTH OF LINTEL (inches)	FIRE-RESISTANCE RATING (hours)			
	1	2	3	4
6	1 $\frac{1}{2}$	2	—	—
8	1 $\frac{1}{2}$	1 $\frac{1}{2}$	1 $\frac{3}{4}$	3
10 or greater	1 $\frac{1}{2}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$	1 $\frac{3}{4}$

For SI: 1 inch = 25.4 mm.

722.3.5 Concrete Masonry Columns

The *fire-resistance rating* of concrete masonry columns shall be determined based upon the least plan dimension of the column in accordance with Table 722.3.5 or by *approved* alternate methods.

TABLE 722.3.5

MINIMUM DIMENSION OF CONCRETE MASONRY COLUMNS (inches)

FIRE-RESISTANCE RATING (hours)			
1	2	3	4
8 inches	10 inches	12 inches	14 inches

For SI: 1 inch = 25.4 mm.

722.4 Clay Brick and Tile Masonry

The provisions of this section contain procedures by which the *fire-resistance ratings* of clay brick and tile masonry are established by calculations.

722.4.1 Masonry Walls

The *fire-resistance rating* of masonry walls shall be based upon the equivalent thickness as calculated in accordance with this section. The calculation shall take into account finishes applied to the wall and airspaces between wythes in multiwythe construction.

TABLE 722.4.1(1)

FIRE-RESISTANCE PERIODS OF CLAY MASONRY WALLS

MATERIAL TYPE	MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE RESISTANCE^{a, b, c} (inches)			
	1 hour	2 hours	3 hours	4 hours
Solid brick or clay or shale ^d	2.7	3.8	4.9	6.0
Hollow brick or tile of clay or shale, unfilled	2.3	3.4	4.3	5.0
Hollow brick or tile of clay or shale, grouted or filled with materials specified in Section 722.4.1.1.3	3.0	4.4	5.5	6.6

For SI: 1 inch = 25.4 mm.

a. Equivalent thickness as determined from Section 722.4.1.1.

b. Calculated fire resistance between the hourly increments listed shall be determined by linear interpolation.

c. Where combustible members are framed in the wall, the thickness of solid material between the end of each member and the opposite face of the wall, or between members set in from opposite sides, shall be not less than 93 percent of the thickness shown.

d. For units in which the net cross-sectional area of cored brick in any plane parallel to the surface containing the cores is not less than 75 percent of the gross cross-sectional area measured in the same plane.

TABLE 722.4.1(2)

FIRE-RESISTANCE RATINGS FOR BEARING STEEL FRAME BRICK VENEER WALLS OR PARTITIONS

WALL OR PARTITION ASSEMBLY	PLASTER SIDE EXPOSED (hours)	BRICK FACED SIDE EXPOSED (hours)
Outside facing of steel studs: 1/2" wood fiberboard sheathing next to studs, 3/4" airspace formed with 3/4" x 1 5/8" wood strips placed over the fiberboard and secured to the studs; metal or wire lath nailed to such strips, 3 3/4" brick veneer held in place by filling 3/4" airspace between the brick and lath with mortar. Inside facing of studs: 3/4" unsanded gypsum plaster on metal or wire lath attached to 5/16" wood strips secured to edges of the studs.	1.5	4
Outside facing of steel studs: 1" insulation board sheathing attached to studs, 1" airspace, and 3 3/4" brick veneer attached to steel frame with metal ties every 5th course. Inside facing of studs: 7/8" sanded gypsum plaster (1:2 mix) applied on metal or wire lath attached directly to the studs.	1.5	4

Same as above except use $\frac{7}{8}$ " vermiculite-gypsum plaster or 1" sanded gypsum plaster (1:2 mix) applied to metal or wire.	2	4
Outside facing of steel studs: $\frac{1}{2}$ " gypsum sheathing board, attached to studs, and $3\frac{3}{4}$ " brick veneer attached to steel frame with metal ties every 5th course. Inside facing of studs: $\frac{1}{2}$ " sanded gypsum plaster (1:2 mix) applied to $\frac{1}{2}$ " perforated gypsum lath securely attached to studs and having strips of metal lath 3 inches wide applied to all horizontal joints of gypsum lath.	2	4

For SI: 1 inch = 25.4 mm.

TABLE 722.4.1(3)

VALUES OF $R_n^{0.59}$

$R_n^{0.59}$	R (hours)
1	1.0
2	1.50
3	1.91
4	2.27

TABLE 722.4.1(4)

COEFFICIENTS FOR PLASTER, p^a

THICKNESS OF PLASTER (inch)	ONE SIDE	TWO SIDES
$\frac{1}{2}$	0.3	0.6
$\frac{5}{8}$	0.37	0.75
$\frac{3}{4}$	0.45	0.90

For SI: 1 inch = 25.4 mm.

- a. Values listed in the table are for 1:3 sanded gypsum plaster.

TABLE 722.4.1(5)

REINFORCED MASONRY LINTELS

NOMINAL LINTEL WIDTH (inches)	MINIMUM LONGITUDINAL REINFORCEMENT COVER FOR FIRE RESISTANCE (inches)			
	1 hour	2 hours	3 hours	4 hours
6	$1\frac{1}{2}$	2	NP	NP
8	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{3}{4}$	3
10 or more	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{3}{4}$

For SI: 1 inch = 25.4 mm.

NP = Not permitted.

TABLE 722.4.1(6)

REINFORCED CLAY MASONRY COLUMNS

COLUMN SIZE	FIRE-RESISTANCE RATING (hours)			
	1	2	3	4
Minimum column dimension (inches)	8	10	12	14

For SI: 1 inch = 25.4 mm.

722.4.1.1 Equivalent Thickness

The *fire-resistance ratings* of walls or partitions constructed of solid or hollow clay masonry units shall be determined from Table 722.4.1(1) or 722.4.1(2). The equivalent thickness of the clay masonry unit shall be determined by Equation 7-8 where using Table 722.4.1(1). The *fire-resistance rating* determined from Table 722.4.1(1) shall be permitted to be used in the calculated *fire-resistance rating* procedure in Section 722.4.2.

$$T_e = V_n/LH \quad (\text{Equation 7-8})$$

where:

T_e = The equivalent thickness of the clay masonry unit (inches).

V_n = The net volume of the clay masonry unit (inch^3).

L = The specified length of the clay masonry unit (inches).

H = The specified height of the clay masonry unit (inches).

722.4.1.1.1 Hollow Clay Units

The equivalent thickness, T_e , shall be the value obtained for hollow clay units as determined in accordance with Equation 7-8. The net volume, V_n , of the units shall be determined using the gross volume and percentage of void area determined in accordance with ASTM C67.

722.4.1.1.2 Solid Grouted Clay Units

The equivalent thickness of solid grouted clay masonry units shall be taken as the actual thickness of the units.

722.4.1.1.3 Units With Filled Cores

The equivalent thickness of the hollow clay masonry units is the actual thickness of the unit where completely filled with loose-fill materials of: sand, pea gravel, crushed stone, or slag that meet ASTM C33 requirements; pumice, scoria, expanded shale, expanded clay, expanded slate, expanded slag, expanded fly ash, or cinders in compliance with ASTM C331; or perlite or vermiculite meeting the requirements of ASTM C549 and ASTM C516, respectively.

722.4.1.2 Plaster Finishes

Where plaster is applied to the wall, the total *fire-resistance rating* shall be determined by the formula:

$$R = (R_n^{0.59} + pl)^{1.7} \quad (\text{Equation 7-9})$$

where:

R = The *fire-resistance rating* of the assembly (hours).

R_n = The *fire-resistance rating* of the individual wall (hours).

pl = Coefficient for thickness of plaster.

Values for $R_n^{0.59}$ for use in Equation 7-9 are given in Table 722.4.1(3). Coefficients for thickness of plaster shall be selected from Table 722.4.1(4) based on the actual thickness of plaster applied to the wall or partition and whether one or two sides of the wall are plastered.

722.4.1.3 Multiwythe Walls With Airspace

Where a continuous airspace separates multiple wythes of the wall or partition, the total *fire-resistance rating* shall be determined by the formula:

$$R = (R_1^{0.59} + R_2^{0.59} + \dots + R_n^{0.59} + as)^{1.7} \quad (\text{Equation 7-10})$$

where:

R = The *fire-resistance rating* of the assembly (hours).

R_1, R_2 and R_n = The *fire-resistance rating* of the individual wythes (hours).

as = Coefficient for continuous airspace.

Values for $R_n^{0.59}$ for use in Equation 7-10 are given in Table 722.4.1(3). The coefficient for each continuous airspace of $\frac{1}{2}$ inch to $3\frac{1}{2}$ inches (12.7 to 89 mm) separating two individual wythes shall be 0.3.

722.4.1.4 Nonsymmetrical Assemblies

For a wall having no finish on one side or having different types or thicknesses of finish on each side, the calculation procedures of this section shall be performed twice, assuming either side to be the fire-exposed side of the wall. The *fire resistance* of the wall shall not exceed the lower of the two values determined.

Exception: For exterior walls with a *fire separation distance* greater than 5 feet (1524 mm), the fire shall be assumed to occur on the interior side only.

722.4.2 Multiwythe Walls

The *fire-resistance rating* for walls or partitions consisting of two or more dissimilar wythes shall be permitted to be determined by the formula:

$$R = (R_1^{0.59} + R_2^{0.59} + \dots + R_n^{0.59})^{1.7} \quad (\text{Equation 7-11})$$

where:

R = The *fire-resistance rating* of the assembly (hours).

R_1, R_2 and R_n = The *fire-resistance rating* of the individual wythes (hours).

Values for $R_n^{0.59}$ for use in Equation 7-11 are given in Table 722.4.1(3).

722.4.2.1 Multiwythe Walls of Different Material

For walls that consist of two or more wythes of different materials (concrete or concrete masonry units) in combination with clay masonry units, the *fire-resistance rating* of the different materials shall be permitted to be determined from Table 722.2.1.1 for concrete; Table 722.3.2 for concrete masonry units or Table 722.4.1(1) or 722.4.1(2) for clay and tile masonry units.

722.4.3 Reinforced Clay Masonry Lintels

Fire-resistance ratings for clay masonry lintels shall be determined based on the nominal width of the lintel and the minimum covering for the longitudinal reinforcement in accordance with Table 722.4.1(5).

722.4.4 Reinforced Clay Masonry Columns

The *fire-resistance ratings* shall be determined based on the last plan dimension of the column in accordance with Table 722.4.1(6). The minimum cover for longitudinal reinforcement shall be 2 inches (51 mm).

722.5 Steel Assemblies

The provisions of this section contain procedures by which the *fire-resistance ratings* of steel assemblies are established by calculations.

722.5.1 Structural Steel Columns

The *fire-resistance ratings* of structural steel columns shall be based on the size of the element and the type of protection provided in accordance with this section.

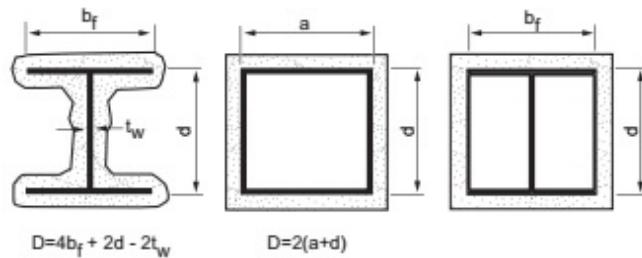


FIGURE 722.5.1(1)

DETERMINATION OF THE HEATED PERIMETER OF STRUCTURAL STEEL COLUMNS

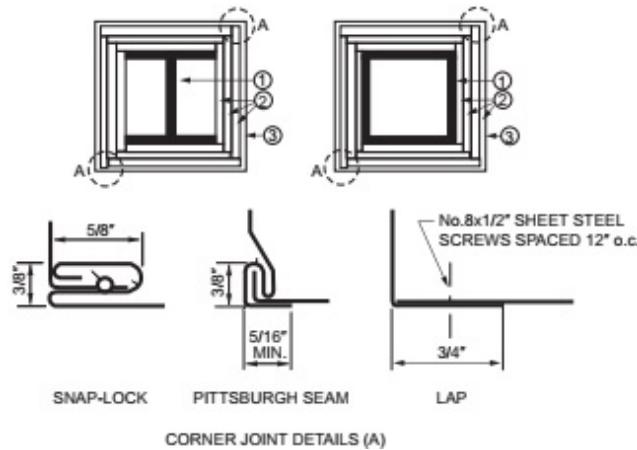


FIGURE 722.5.1(2)

GYPSUM-PROTECTED STRUCTURAL STEEL COLUMNS WITH SHEET STEEL COLUMN COVERS

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm.

1. Structural steel column, either wide flange or tubular shapes.
2. Type X gypsum board or gypsum panel products in accordance with ASTM C1177, C1178, C1278, C1396 or C1658. The total thickness of gypsum board or gypsum panel products calculated as h in Section 722.5.1.2 shall be applied vertically to an individual column using one of the following methods:
 1. As a single layer with no horizontal joints.
 2. As multiple layers with no horizontal joints permitted in any layer.
 3. As multiple layers with horizontal joints staggered not less than 12 inches vertically between layers and not less than 8 feet vertically in any single layer. The total required thickness of gypsum board or gypsum panel products shall be determined on the basis of the specified *fire-resistance rating* and the weight-to-heated-perimeter ratio (W/D) of the column. For *fire-resistance ratings* of 2 hours or less, one of the required layers of gypsum board or gypsum panel product may be applied to the exterior of the sheet steel column covers with 1-inch long Type S screws spaced 1 inch from the wallboard edge and 8 inches on center. For such installations, 0.0149-inch minimum thickness galvanized steel corner beads with 1½-inch legs shall be attached to the wallboard with Type S screws spaced 12 inches on center.
3. For *fire-resistance ratings* of 3 hours or less, the column covers shall be fabricated from 0.0239-inch minimum thickness galvanized or stainless steel. For 4-hour *fire-resistance ratings*, the column covers shall be fabricated from 0.0239-inch minimum thickness stainless steel. The column covers shall be erected with the Snap Lock or Pittsburgh joint details.

For *fire-resistance ratings* of 2 hours or less, column covers fabricated from 0.0269-inch minimum thickness galvanized or stainless steel shall be permitted to be erected with lap joints. The lap joints shall be permitted to be located anywhere around

the perimeter of the column cover. The lap joints shall be secured with $\frac{1}{2}$ -inch-long No. 8 sheet metal screws spaced 12 inches on center.

The column covers shall be provided with a minimum expansion clearance of $\frac{1}{8}$ inch per linear foot between the ends of the cover and any restraining construction.

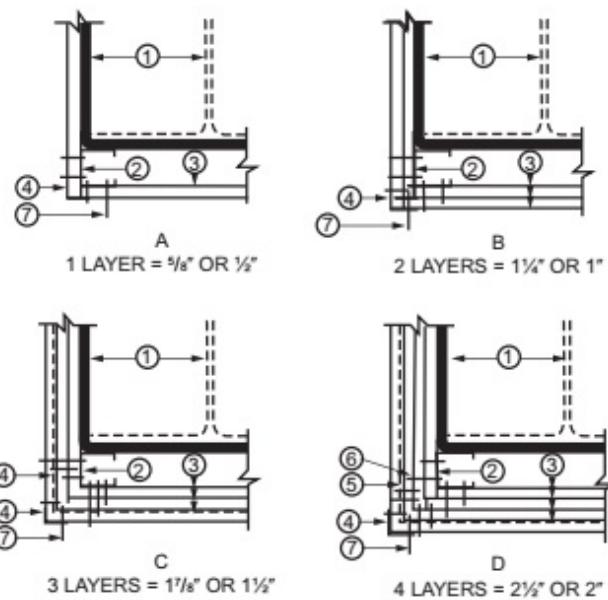


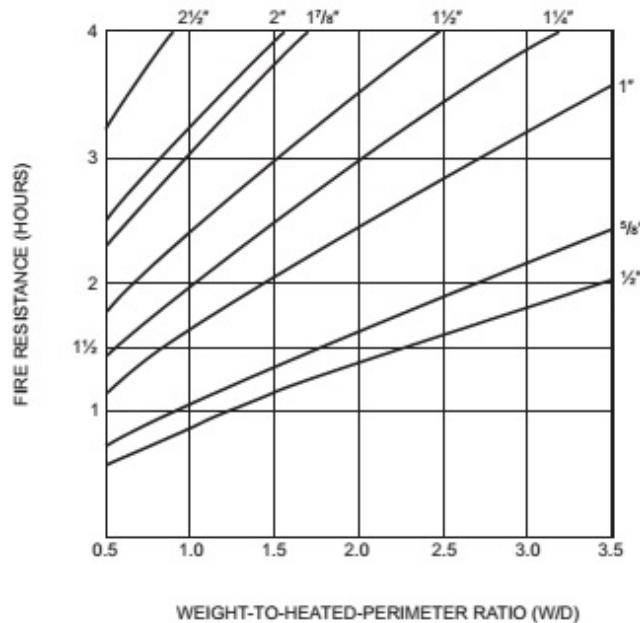
FIGURE 722.5.1(3)

GYPSUM-PROTECTED STRUCTURAL STEEL COLUMNS WITH STEEL STUD/SCREW ATTACHMENT SYSTEM

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm.

1. Structural steel column, either wide flange or tubular shapes.
2. $1\frac{5}{8}$ -inch deep studs fabricated from 0.0179-inch minimum thickness galvanized steel with $1\frac{5}{16}$ or $1\frac{7}{16}$ -inch legs. The length of the steel studs shall be $\frac{1}{2}$ inch less than the height of the assembly.
3. Type X gypsum board or gypsum panel products in accordance with ASTM C1177, C1178, C1278, C1396 or C1658. The total thickness of gypsum board or gypsum panel products calculated as h in Section 722.5.1.2 shall be applied vertically to an individual column using one of the following methods:
 1. As a single layer with no horizontal joints.
 2. As multiple layers with no horizontal joints permitted in any layer.
 3. As multiple layers with horizontal joints staggered not less than 12 inches vertically between layers and not less than 8 feet vertically in any single layer. The total required thickness of gypsum board or gypsum panel products shall be determined on the basis of the specified *fire-resistance rating* and the weight-to-heated-perimeter ratio (W/D) of the column.
4. Galvanized 0.0149-inch minimum thickness steel corner beads with $1\frac{1}{2}$ -inch legs attached to the gypsum board or gypsum panel products with 1-inch-long Type S screws spaced 12 inches on center.
5. No. 18 SWG steel tie wires spaced 24 inches on center.
6. Sheet metal angles with 2-inch legs fabricated from 0.0221-inch minimum thickness galvanized steel.

7. Type S screws, 1 inch long, shall be used for attaching the first layer of gypsum board or gypsum panel product to the steel studs and the third layer to the sheet metal angles at 24 inches on center. Type S screws 1 $\frac{3}{4}$ -inch long shall be used for attaching the second layer of gypsum board or gypsum panel product to the steel studs and the fourth layer to the sheet metal angles at 12 inches on center. Type S screws 2 $\frac{1}{4}$ inches long shall be used for attaching the third layer of gypsum board or gypsum panel product to the steel studs at 12 inches on center.



For SI: 1 inch = 25.4 mm, 1 pound per linear foot/inch = 0.059 kg/m/mm.

FIGURE 722.5.1(4)

FIRE RESISTANCE OF STRUCTURAL STEEL COLUMNS PROTECTED WITH VARIOUS THICKNESSES OF TYPE X GYPSUM WALLBOARD

- a. The W/D ratios for typical wide flange columns are listed in Table 722.5.1(1). For other column shapes, the W/D ratios shall be determined in accordance with Section 722.5.1.1.

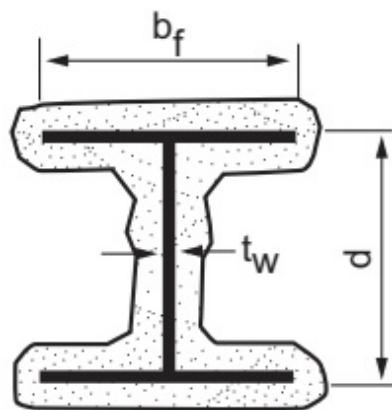


FIGURE 722.5.1(5)

WIDE FLANGE STRUCTURAL STEEL COLUMNS WITH SPRAYED FIRE-RESISTANT MATERIALS

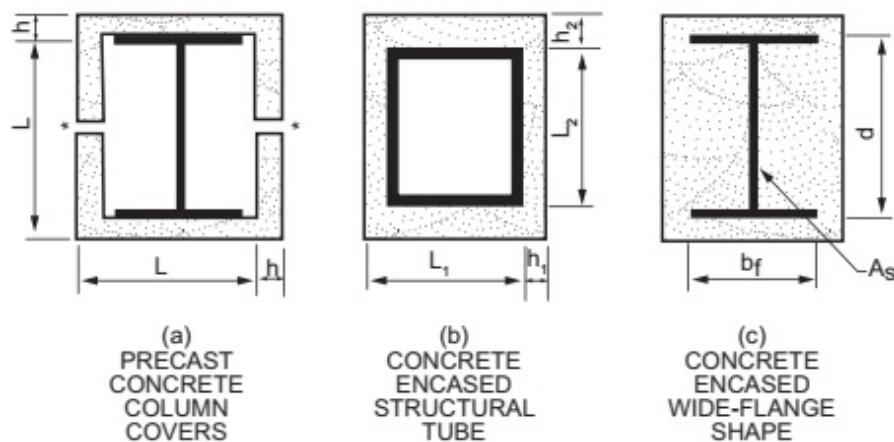


FIGURE 722.5.1(6)

CONCRETE PROTECTED STRUCTURAL STEEL COLUMNS^{a,b}

- a. When the inside perimeter of the concrete protection is not square, L shall be taken as the average of L_1 and L_2 . When the thickness of concrete cover is not constant, h shall be taken as the average of h_1 and h_2 .
- b. Joints shall be protected with a minimum 1 inch thickness of ceramic fiber blanket but in no case less than one-half the thickness of the column cover (see Section 722.2.1.3).

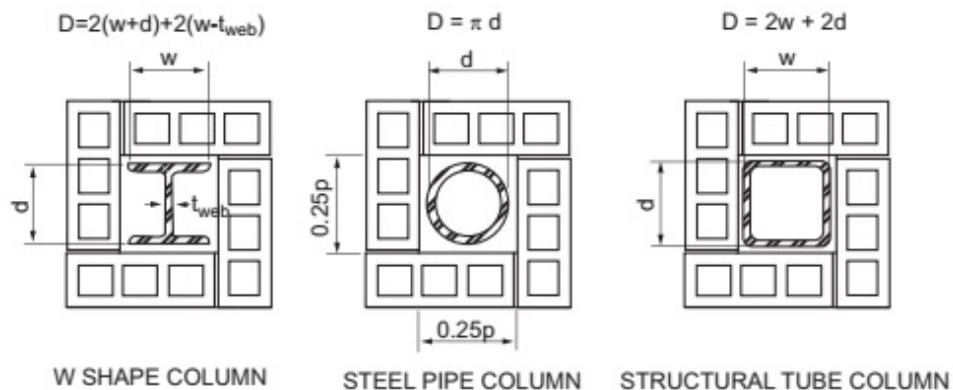


FIGURE 722.5.1(7)

CONCRETE OR CLAY MASONRY PROTECTED STRUCTURAL STEEL COLUMNS

For SI: 1 inch = 25.4 mm.

d = Depth of a wide flange column, outside diameter of pipe column, or outside dimension of structural tubing column (inches).

t_{web} = Thickness of web of wide flange column (inches).

w = Width of flange of wide flange column (inches).

TABLE 722.5.1(1)

W/D RATIOS FOR STEEL COLUMNS

STRUCTURAL SHAPE	CONTOUR PROFILE	BOX PROFILE	STRUCTURAL SHAPE	CONTOUR PROFILE	BOX PROFILE
W14 × 233	2.55	3.65	W10 × 112	1.81	2.57
× 211	2.32	3.35	× 100	1.64	2.33

× 193	2.14	3.09	× 88	1.45	2.08
× 176	1.96	2.85	× 77	1.28	1.85
× 159	1.78	2.60	× 68	1.15	1.66
× 145	1.64	2.39	× 60	1.01	1.48
× 132	1.56	2.25	× 54	0.922	1.34
× 120	1.42	2.06	× 49	0.84	1.23
× 109	1.29	1.88	× 45	0.888	1.24
× 99	1.18	1.72	× 39	0.78	1.09
× 90	1.08	1.58	× 33	0.661	0.93
× 82	1.23	1.68			
× 74	1.12	1.53	W8 × 67	1.37	1.94
× 68	1.04	1.41	× 58	1.20	1.71
× 61	0.928	1.28	× 48	1.00	1.44
× 53	0.915	1.21	× 40	0.849	1.23
× 48	0.835	1.10	× 35	0.749	1.08
× 43	0.752	0.99	× 31	0.665	0.97
			× 28	0.688	0.96
W12 × 190	2.50	3.51	× 24	0.591	0.83
× 170	2.26	3.20	× 21	0.577	0.77
× 152	2.04	2.90	× 18	0.499	0.67
× 136	1.86	2.63			
× 120	1.65	2.36	W6 × 25	0.696	1.00
× 106	1.47	2.11	× 20	0.563	0.82
× 96	1.34	1.93	× 16	0.584	0.78
× 87	1.22	1.76	× 15	0.431	0.63
× 79	1.11	1.61	× 12	0.448	0.60
× 72	1.02	1.48	× 9	0.338	0.46
× 65	0.925	1.35			
× 58	0.925	1.31	W5 × 19	0.644	0.93
× 53	0.855	1.20	× 16	0.55	0.80
× 50	0.909	1.23			
× 45	0.829	1.12	W4 × 13	0.556	0.79
× 40	0.734	1.00			

For SI: 1 pound per linear foot per inch = 0.059 kg/m/mm.

TABLE 722.5.1(2)**PROPERTIES OF CONCRETE**

PROPERTY	NORMAL-WEIGHT CONCRETE	STRUCTURAL LIGHTWEIGHT CONCRETE
Thermal conductivity (k_c)	0.95 Btu/hr × ft × °F	0.35 Btu/hr × ft × °F
Specific heat (c_c)	0.20 Btu/lb °F	0.20 Btu/lb °F
Density (P_c)	145 lb/ft ³	110 lb/ft ³
Equilibrium (free) moisture content (m) by volume	4%	5%

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 lb/ft³ = 16.0185 kg/m³, Btu/hr × ft × °F = 1.731 W/(m × K).

TABLE 722.5.1(3)**THERMAL CONDUCTIVITY OF CONCRETE OR CLAY MASONRY UNITS**

DENSITY (d_m) OF UNITS (lb/ft ³)	THERMAL CONDUCTIVITY (K) OF UNITS (Btu/hr × ft × °F)
Concrete Masonry Units	
80	0.207
85	0.228
90	0.252
95	0.278
100	0.308
105	0.340
110	0.376
115	0.416
120	0.459
125	0.508
130	0.561
135	0.620
140	0.685
145	0.758
150	0.837
Clay Masonry Units	
120	1.25
130	2.25

For SI: 1 pound per cubic foot = 16.0185 kg/m³, Btu/hr × ft × °F = 1.731 W/(m × K).

TABLE 722.5.1(4)

WEIGHT-TO-HEATED-PERIMETER RATIOS (W/D) FOR TYPICAL WIDE FLANGE BEAM AND GIRDER SHAPES

STRUCTURAL SHAPE	CONTOUR PROFILE	BOX PROFILE	STRUCTURAL SHAPE	CONTOUR PROFILE	BOX PROFILE
W36 × 300	2.50	3.33	W24 × 68	0.942	1.21
× 280	2.35	3.12	× 62	0.934	1.14
× 260	2.18	2.92	× 55	0.828	1.02
× 245	2.08	2.76			
× 230	1.95	2.61	W21 × 147	1.87	2.60
× 210	1.96	2.45	× 132	1.68	2.35
× 194	1.81	2.28	× 122	1.57	2.19
× 182	1.72	2.15	× 111	1.43	2.01
× 170	1.60	2.01	× 101	1.30	1.84
× 160	1.51	1.90	× 93	1.40	1.80
× 150	1.43	1.79	× 83	1.26	1.62
× 135	1.29	1.63	× 73	1.11	1.44
			× 68	1.04	1.35
W33 × 241	2.13	2.86	W21 × 62	0.952	1.23
× 221	1.97	2.64	× 57	0.952	1.17
× 201	1.79	2.42	× 50	0.838	1.04
× 152	1.53	1.94	× 44	0.746	0.92
× 141	1.43	1.80			
× 130	1.32	1.67	W18 × 119	1.72	2.42
× 118	1.21	1.53	× 106	1.55	2.18
			× 97	1.42	2.01
W30 × 211	2.01	2.74	× 86	1.27	1.80
× 191	1.85	2.50	× 76	1.13	1.60
× 173	1.66	2.28	× 71	1.22	1.59
× 132	1.47	1.85	× 65	1.13	1.47
× 124	1.39	1.75	× 60	1.04	1.36
× 116	1.30	1.65	× 55	0.963	1.26
× 108	1.21	1.54	× 50	0.88	1.15
× 99	1.12	1.42	× 46	0.878	1.09
			× 40	0.768	0.96
W27 × 178	1.87	2.55	× 35	0.672	0.85
× 161	1.70	2.33			

× 146	1.55	2.12	W16 × 100	1.59	2.25
× 114	1.39	1.76	× 89	1.43	2.03
× 102	1.24	1.59	× 77	1.25	1.78
× 94	1.15	1.47	× 67	1.09	1.56
× 84	1.03	1.33	× 57	1.09	1.43
			× 50	0.962	1.26
			× 45	0.870	1.15
W24 × 162	1.88	2.57	× 40	0.780	1.03
× 146	1.70	2.34	× 36	0.702	0.93
× 131	1.54	2.12	× 31	0.661	0.83
× 117	1.38	1.91	× 26	0.558	0.70
× 104	1.24	1.71			
× 94	1.28	1.63	W14 × 132	1.89	3.00
× 84	1.15	1.47	× 120	1.71	2.75
× 76	1.05	1.34	× 109	1.57	2.52
W14 × 99	1.43	2.31	W10 × 30	0.806	1.12
× 90	1.31	2.11	× 26	0.708	0.98
× 82	1.45	2.12	× 22	0.606	0.84
× 74	1.32	1.93	× 19	0.607	0.78
× 68	1.22	1.78	× 17	0.543	0.70
× 61	1.10	1.61	× 15	0.484	0.63
× 53	1.06	1.48	× 12	0.392	0.51
× 48	0.970	1.35			
W14 × 43	0.874	1.22	W8 × 67	1.65	2.55
× 38	0.809	1.09	× 58	1.44	2.26
× 34	0.725	0.98	× 48	1.21	1.91
× 30	0.644	0.87	× 40	1.03	1.63
× 26	0.628	0.79	× 35	0.907	1.44
× 22	0.534	0.68	× 31	0.803	1.29
			× 28	0.819	1.24
W12 × 87	1.47	2.34	× 24	0.704	1.07
× 79	1.34	2.14	× 21	0.675	0.96
× 72	1.23	1.97	× 18	0.583	0.84

× 65	1.11	1.79	× 15	0.551	0.74
× 58	1.10	1.69	× 13	0.483	0.65
× 53	1.02	1.55	× 10	0.375	0.51
× 50	1.06	1.54			
× 45	0.974	1.40	W6 × 25	0.839	1.33
× 40	0.860	1.25	× 20	0.678	1.09
× 35	0.810	1.11	× 16	0.684	0.96
× 30	0.699	0.96	× 15	0.521	0.83
× 26	0.612	0.84	× 12	0.526	0.75
× 22	0.623	0.77	× 9	0.398	0.57
× 19	0.540	0.67			
× 16	0.457	0.57	W5 × 19	0.776	1.24
× 14	0.405	0.50	× 16	0.664	1.07
W10 × 112	2.17	3.38	W4 × 13	0.670	1.05
× 100	1.97	3.07			
× 88	1.74	2.75			
× 77	1.54	2.45			
× 68	1.38	2.20			
× 60	1.22	1.97			
× 54	1.11	1.79			
× 49	1.01	1.64			
× 45	1.06	1.59			
× 39	0.94	1.40			
× 33	0.77	1.20			

For SI: 1 pound per linear foot per inch = 0.059 kg/m/mm.

TABLE 722.5.1(5)
FIRE RESISTANCE OF CONCRETE MASONRY PROTECTED STEEL COLUMNS

COLUMN SIZE	CONCRETE MASONRY DENSITY POUNDS PER CUBIC FOOT	MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE-RESISTANCE RATING OF CONCRETE MASONRY PROTECTION ASSEMBLY, T_e (inches)				COLUMN SIZE	CONCRETE MASONRY DENSITY POUNDS PER CUBIC FOOT	MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE-RESISTANCE RATING OF CONCRETE MASONRY PROTECTION ASSEMBLY, T_e (inches)			
		1 hour	2 hours	3 hours	4 hours			1 hour	2 hours	3 hours	4 hours

W14 × 82	80	0.74	1.61	2.36	3.04	W10 × 68	80	0.72	1.58	2.33	3.01
	100	0.89	1.85	2.67	3.40		100	0.87	1.83	2.65	3.38
	110	0.96	1.97	2.81	3.57		110	0.94	1.95	2.79	3.55
	120	1.03	2.08	2.95	3.73		120	1.01	2.06	2.94	3.72
W14 × 68	80	0.83	1.70	2.45	3.13	W10 × 54	80	0.88	1.76	2.53	3.21
	100	0.99	1.95	2.76	3.49		100	1.04	2.01	2.83	3.57
	110	1.06	2.06	2.91	3.66		110	1.11	2.12	2.98	3.73
	120	1.14	2.18	3.05	3.82		120	1.19	2.24	3.12	3.90
W14 × 53	80	0.91	1.81	2.58	3.27	W10 × 45	80	0.92	1.83	2.60	3.30
	100	1.07	2.05	2.88	3.62		100	1.08	2.07	2.90	3.64
	110	1.15	2.17	3.02	3.78		110	1.16	2.18	3.04	3.80
	120	1.22	2.28	3.16	3.94		120	1.23	2.29	3.18	3.96
W14 × 43	80	1.01	1.93	2.71	3.41	W10 × 33	80	1.06	2.00	2.79	3.49
	100	1.17	2.17	3.00	3.74		100	1.22	2.23	3.07	3.81
	110	1.25	2.28	3.14	3.90		110	1.30	2.34	3.20	3.96
	120	1.32	2.38	3.27	4.05		120	1.37	2.44	3.33	4.12
W12 × 72	80	0.81	1.66	2.41	3.09	W8 × 40	80	0.94	1.85	2.63	3.33
	100	0.91	1.88	2.70	3.43		100	1.10	2.10	2.93	3.67
	110	0.99	1.99	2.84	3.60		110	1.18	2.21	3.07	3.83
	120	1.06	2.10	2.98	3.76		120	1.25	2.32	3.20	3.99
W12 × 58	80	0.88	1.76	2.52	3.21	W8 × 31	80	1.06	2.00	2.78	3.49
	100	1.04	2.01	2.83	3.56		100	1.22	2.23	3.07	3.81
	110	1.11	2.12	2.97	3.73		110	1.29	2.33	3.20	3.97
	120	1.19	2.23	3.11	3.89		120	1.36	2.44	3.33	4.12
W12 × 50	80	0.91	1.81	2.58	3.27	W8 × 24	80	1.14	2.09	2.89	3.59
	100	1.07	2.05	2.88	3.62		100	1.29	2.31	3.16	3.90
	110	1.15	2.17	3.02	3.78		110	1.36	2.42	3.28	4.05
	120	1.22	2.28	3.16	3.94		120	1.43	2.52	3.41	4.20
W12 × 40	80	1.01	1.94	2.72	3.41	W8 × 18	80	1.22	2.20	3.01	3.72
	100	1.17	2.17	3.01	3.75		100	1.36	2.40	3.25	4.01
	110	1.25	2.28	3.14	3.90		110	1.42	2.50	3.37	4.14
	120	1.32	2.39	3.27	4.06		120	1.48	2.59	3.49	4.28
4 × 4 × 1½ wall	80	0.93	1.90	2.71	3.43	4 double extra	80	0.80	1.75	2.56	3.28

thickness	100	1.08	2.13	2.99	3.76	strong 0.674 wall thickness	100	0.95	1.99	2.85	3.62
	110	1.16	2.24	3.13	3.91		110	1.02	2.10	2.99	3.78
	120	1.22	2.34	3.26	4.06		120	1.09	2.20	3.12	3.93
$4 \times 4 \times \frac{3}{8}$ wall thickness	80	1.05	2.03	2.84	3.57	4 extra strong 0.337 wall thickness	80	1.12	2.11	2.93	3.65
	100	1.20	2.25	3.11	3.88		100	1.26	2.32	3.19	3.95
	110	1.27	2.35	3.24	4.02		110	1.33	2.42	3.31	4.09
	120	1.34	2.45	3.37	4.17		120	1.40	2.52	3.43	4.23
$4 \times 4 \times \frac{1}{4}$ wall thickness	80	1.21	2.20	3.01	3.73	4 standard 0.237 wall thickness	80	1.26	2.25	3.07	3.79
	100	1.35	2.40	3.26	4.02		100	1.40	2.45	3.31	4.07
	110	1.41	2.50	3.38	4.16		110	1.46	2.55	3.43	4.21
	120	1.48	2.59	3.50	4.30		120	1.53	2.64	3.54	4.34
$6 \times 6 \times \frac{1}{2}$ wall thickness	80	0.82	1.75	2.54	3.25	5 double extra strong 0.750 wall thickness	80	0.70	1.61	2.40	3.12
	100	0.98	1.99	2.84	3.59		100	0.85	1.86	2.71	3.47
	110	1.05	2.10	2.98	3.75		110	0.91	1.97	2.85	3.63
	120	1.12	2.21	3.11	3.91		120	0.98	2.02	2.99	3.79
$6 \times 6 \times \frac{3}{8}$ wall thickness	80	0.96	1.91	2.71	3.42	5 extra strong 0.375 wall thickness	80	1.04	2.01	2.83	3.54
	100	1.12	2.14	3.00	3.75		100	1.19	2.23	3.09	3.85
	110	1.19	2.25	3.13	3.90		110	1.26	2.34	3.22	4.00
	120	1.26	2.35	3.26	4.05		120	1.32	2.44	3.34	4.14
$6 \times 6 \times \frac{1}{4}$ wall thickness	80	1.14	2.11	2.92	3.63	5 standard 0.258 wall thickness	80	1.20	2.19	3.00	3.72
	100	1.29	2.32	3.18	3.93		100	1.34	2.39	3.25	4.00
	110	1.36	2.43	3.30	4.08		110	1.41	2.49	3.37	4.14
	120	1.42	2.52	3.43	4.22		120	1.47	2.58	3.49	4.28
$8 \times 8 \times \frac{1}{2}$ wall thickness	80	0.77	1.66	2.44	3.13	6 double extra strong 0.864 wall thickness	80	0.59	1.46	2.23	2.92
	100	0.92	1.91	2.75	3.49		100	0.73	1.71	2.54	3.29
	110	1.00	2.02	2.89	3.66		110	0.80	1.82	2.69	3.47
	120	1.07	2.14	3.03	3.82		120	0.86	1.93	2.83	3.63
$8 \times 8 \times \frac{3}{8}$ wall thickness	80	0.91	1.84	2.63	3.33	6 extra strong 0.432 wall thickness	80	0.94	1.90	2.70	3.42
	100	1.07	2.08	2.92	3.67		100	1.10	2.13	2.98	3.74
	110	1.14	2.19	3.06	3.83		110	1.17	2.23	3.11	3.89
	120	1.21	2.29	3.19	3.98		120	1.24	2.34	3.24	4.04
$8 \times 8 \times \frac{1}{4}$ wall thickness	80	1.10	2.06	2.86	3.57	6 standard 0.280 wall thickness	80	1.14	2.12	2.93	3.64
	100	1.25	2.28	3.13	3.87		100	1.29	2.33	3.19	3.94

	110	1.32	2.38	3.25	4.02		110	1.36	2.43	3.31	4.08
	120	1.39	2.48	3.38	4.17		120	1.42	2.53	3.43	4.22

For SI: 1 inch = 25.4 mm, 1 pound per cubic feet = 16.02 kg/m³.

Note: Tabulated values assume 1-inch air gap between masonry and steel section.

TABLE 722.5.1(6)

FIRE RESISTANCE OF CLAY MASONRY PROTECTED STEEL COLUMNS

COLUMN SIZE	CLAY MASONRY DENSITY, POUNDS PER CUBIC FOOT	MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE-RESISTANCE RATING OF CLAY MASONRY PROTECTION ASSEMBLY, T_e (inches)				COLUMN SIZE	CLAY MASONRY DENSITY, POUNDS PER CUBIC FOOT	MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE-RESISTANCE RATING OF CLAY MASONRY PROTECTION ASSEMBLY, T_e (inches)			
		1 hour	2 hours	3 hours	4 hours			1 hour	2 hours	3 hours	4 hours
W14 × 82	120	1.23	2.42	3.41	4.29	W10 × 68	120	1.27	2.46	3.26	4.35
	130	1.40	2.70	3.78	4.74		130	1.44	2.75	3.83	4.80
W14 × 68	120	1.34	2.54	3.54	4.43	W10 × 54	120	1.40	2.61	3.62	4.51
	130	1.51	2.82	3.91	4.87		130	1.58	2.89	3.98	4.95
W14 × 53	120	1.43	2.65	3.65	4.54	W10 × 45	120	1.44	2.66	3.67	4.57
	130	1.61	2.93	4.02	4.98		130	1.62	2.95	4.04	5.01
W14 × 43	120	1.54	2.76	3.77	4.66	W10 × 33	120	1.59	2.82	3.84	4.73
	130	1.72	3.04	4.13	5.09		130	1.77	3.10	4.20	5.13
W12 × 72	120	1.32	2.52	3.51	4.40	W8 × 40	120	1.47	2.70	3.71	4.61
	130	1.50	2.80	3.88	4.84		130	1.65	2.98	4.08	5.04
W12 × 58	120	1.40	2.61	3.61	4.50	W8 × 31	120	1.59	2.82	3.84	4.73
	130	1.57	2.89	3.98	4.94		130	1.77	3.10	4.20	5.17
W12 × 50	120	1.43	2.65	3.66	4.55	W8 × 24	120	1.66	2.90	3.92	4.82
	130	1.61	2.93	4.02	4.99		130	1.84	3.18	4.28	5.25
W12 × 40	120	1.54	2.77	3.78	4.67	W8 × 18	120	1.75	3.00	4.01	4.91
	130	1.72	3.05	4.14	5.10		130	1.93	3.27	4.37	5.34
STEEL TUBING							STEEL PIPE				
NOMINAL TUBE SIZE (inches)	CLAY MASONRY DENSITY, POUNDS PER CUBIC FOOT	MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE-RESISTANCE RATING OF CLAY MASONRY PROTECTION ASSEMBLY, T_e (inches)				NOMINAL PIPE SIZE (inches)	CLAY MASONRY DENSITY, POUNDS PER CUBIC FOOT	MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE-RESISTANCE RATING OF CLAY MASONRY PROTECTION ASSEMBLY, T_e (inches)			

		1 hour	2 hours	3 hours	4 hours			1 hour	2 hours	3 hours	4 hours
4 × 4 × 1/2 wall thickness	120	1.44	2.72	3.76	4.68	4 double extra strong 0.674 wall thickness	120	1.26	2.55	3.60	4.52
	130	1.62	3.00	4.12	5.11		130	1.42	2.82	3.96	4.95
4 × 4 × 3/8 wall thickness	120	1.56	2.84	3.88	4.78	4 extra strong 0.337 wall thickness	120	1.60	2.89	3.92	4.83
	130	1.74	3.12	4.23	5.21		130	1.77	3.16	4.28	5.25
4 × 4 × 1/4 wall thickness	120	1.72	2.99	4.02	4.92	4 standard 0.237 wall thickness	120	1.74	3.02	4.05	4.95
	130	1.89	3.26	4.37	5.34		130	1.92	3.29	4.40	5.37
6 × 6 × 1/2 wall thickness	120	1.33	2.58	3.62	4.52	5 double extra strong 0.750 wall thickness	120	1.17	2.44	3.48	4.40
	130	1.50	2.86	3.98	4.96		130	1.33	2.72	3.84	4.83
6 × 6 × 3/8 wall thickness	120	1.48	2.74	3.76	4.67	5 extra strong 0.375 wall thickness	120	1.55	2.82	3.85	4.76
	130	1.65	3.01	4.13	5.10		130	1.72	3.09	4.21	5.18
6 × 6 × 1/4 wall thickness	120	1.66	2.91	3.94	4.84	5 standard 0.258 wall thickness	120	1.71	2.97	4.00	4.90
	130	1.83	3.19	4.30	5.27		130	1.88	3.24	4.35	5.32
8 × 8 × 1/2 wall thickness	120	1.27	2.50	3.52	4.42	6 double extra strong 0.864 wall thickness	120	1.04	2.28	3.32	4.23
	130	1.44	2.78	3.89	4.86		130	1.19	2.60	3.68	4.67
8 × 8 × 3/8 wall thickness	120	1.43	2.67	3.69	4.59	6 extra strong 0.432 wall thickness	120	1.45	2.71	3.75	4.65
	130	1.60	2.95	4.05	5.02		130	1.62	2.99	4.10	5.08
8 × 8 × 1/4 wall thickness	120	1.62	2.87	3.89	4.78	6 standard 0.280 wall thickness	120	1.65	2.91	3.94	4.84
	130	1.79	3.14	4.24	5.21		130	1.82	3.19	4.30	5.27

For SI: 1 inch = 25.4 mm, 1 pound per cubic foot = 16.02 kg/m³.

TABLE 722.5.1(7)

MINIMUM COVER (inch) FOR STEEL COLUMNS ENCASED IN NORMAL-WEIGHT CONCRETE^a [FIGURE 722.5.1(6)(c)]

STRUCTURAL SHAPE	FIRE-RESISTANCE RATING (hours)				
	1	1½	2	3	4

W14 x 233	1	1	1	1½	2	
× 176					2½	
× 132			2			
× 90			1½			
× 61				2½	3	
× 48						
× 43						
W12 x 152	1	1	1	2	2½	
× 96						
× 65		1½	1½	2½	3	
× 50						
× 40						
W10 x 88	1	1½	1½	2	3	
× 49				2½		
× 45			2	3½		
× 39					2½	
× 33						
W8 x 67	1	1	1½	2½	3	
× 58						
× 48			2	3	3½	
× 31		1½				
× 21			3		4	
× 18						
W6 x 25	1	1½	2	3	3½	
× 20						
× 16		2	2½	3½	4	
× 15						
× 9		1½				

For SI: 1 inch = 25.4 mm.

a. The tabulated thicknesses are based upon the assumed properties of normal-weight concrete given in Table 722.5.1(2).

TABLE 722.5.1(8)

MINIMUM COVER (inch) FOR STEEL COLUMNS ENCASED IN STRUCTURAL LIGHTWEIGHT CONCRETE^a [FIGURE 722.5.1(6)(c)]

STRUCTURAL SHAPE	FIRE-RESISTANCE RATING (HOURS)				
	1	1½	2	3	4
W14 × 233	1	1	1	1	1½
× 193					
× 74				1½	2
× 61			1½	2	2½
× 43					
W12 × 65	1	1	1	1½	2
× 53					
× 40			1½		2½
W10 × 112	1	1	1	1½	2
× 88					
× 60			1½	2	2½
× 33					
W8 × 35	1	1	1½	2	2½
× 28					
× 24			1½		2½
× 18			1½		3

For SI: 1 inch = 25.4 mm.

- a. The tabulated thicknesses are based upon the assumed properties of structural lightweight concrete given in Table 722.5.1(2).

TABLE 722.5.1(9)

MINIMUM COVER (inch) FOR STEEL COLUMNS IN NORMAL-WEIGHT PRECAST COVERS^a [FIGURE 722.5.1(6)(a)]

STRUCTURAL SHAPE	FIRE-RESISTANCE RATING (hours)				
	1	1½	2	3	4
W14 × 233	1½	1½	1½	2½	3
× 211					
× 176			2		
× 145					
× 109		2	2½	3	
× 99					
× 61				3½	4

$\times 43$					$4\frac{1}{2}$
W12 $\times 190$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$2\frac{1}{2}$	$3\frac{1}{2}$
$\times 152$			2	3	4
$\times 120$					
$\times 96$					
$\times 87$		2	$2\frac{1}{2}$	$3\frac{1}{2}$	$4\frac{1}{2}$
$\times 58$					
$\times 40$					
W10 $\times 112$		$1\frac{1}{2}$	2	3	$3\frac{1}{2}$
$\times 88$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	4	4
$\times 77$					
$\times 54$					
$\times 33$				$3\frac{1}{2}$	$4\frac{1}{2}$
W8 $\times 67$	$1\frac{1}{2}$	$1\frac{1}{2}$	2	3	4
$\times 58$		2	$2\frac{1}{2}$	$3\frac{1}{2}$	
$\times 48$					
$\times 28$		$2\frac{1}{2}$	3	4	$4\frac{1}{2}$
$\times 21$					
$\times 18$					
W6 $\times 25$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	$3\frac{1}{2}$	$4\frac{1}{2}$
$\times 20$		$2\frac{1}{2}$	3	4	
$\times 16$					
$\times 12$					
$\times 9$					5

For SI: 1 inch = 25.4 mm.

a. The tabulated thicknesses are based upon the assumed properties of normal-weight concrete given in Table 722.5.1(2).

TABLE 722.5.1(10)

MINIMUM COVER (inch) FOR STEEL COLUMNS IN STRUCTURAL LIGHTWEIGHT PRECAST COVERS^a [FIGURE 722.5.1(6)(a)]

STRUCTURAL SHAPE	FIRE-RESISTANCE RATING (hours)				
	1	$1\frac{1}{2}$	2	3	4
W14 $\times 233$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$

$\times 176$					
$\times 145$					3
$\times 132$				$2\frac{1}{2}$	
$\times 109$			$2\frac{1}{2}$		
$\times 99$					
$\times 68$			2		$3\frac{1}{2}$
$\times 43$				3	
W12 \times 190					$2\frac{1}{2}$
$\times 152$				2	
$\times 136$			$1\frac{1}{2}$		3
$\times 106$					
$\times 96$				$2\frac{1}{2}$	
$\times 87$					$3\frac{1}{2}$
$\times 65$			2		
$\times 40$				3	
W10 \times 112				2	
$\times 100$			$1\frac{1}{2}$		3
$\times 88$					
$\times 77$		$1\frac{1}{2}$		$2\frac{1}{2}$	
$\times 60$				2	
$\times 39$					$3\frac{1}{2}$
$\times 33$		2		3	
W8 \times 67			$1\frac{1}{2}$	$2\frac{1}{2}$	3
$\times 48$					
$\times 35$		$1\frac{1}{2}$	2		$3\frac{1}{2}$
$\times 28$				3	
$\times 18$		2	$2\frac{1}{2}$		4
W6 \times 25			2		$3\frac{1}{2}$
$\times 15$		$1\frac{1}{2}$		3	
$\times 9$		2	$2\frac{1}{2}$		4
				$3\frac{1}{2}$	

For SI: 1 inch = 25.4 mm.

a. The tabulated thicknesses are based upon the assumed properties of structural lightweight concrete given in Table

722.5.1(2).

722.5.1.1 General

These procedures establish a basis for determining the *fire resistance* of column assemblies as a function of the thickness of fire-resistant material and, the weight, W , and heated perimeter, D , of structural steel columns. As used in these sections, W is the average weight of a structural steel column in pounds per linear foot. The heated perimeter, D , is the inside perimeter of the fire-resistant material in inches as illustrated in Figure 722.5.1(1).

722.5.1.1.1 Nonload-Bearing Protection

The application of these procedures shall be limited to column assemblies in which the fire-resistant material is not designed to carry any of the load acting on the column.

722.5.1.1.2 Embedments

In the absence of substantiating fire-endurance test results, ducts, conduit, piping, and similar mechanical, electrical, and plumbing installations shall not be embedded in any required fire-resistant materials.

722.5.1.1.3 Weight-to-Perimeter Ratio

Table 722.5.1(1) contains weight-to-heated-perimeter ratios (W/D) for both contour and box fire-resistant profiles, for the wide flange shapes most often used as columns. For different fire-resistant protection profiles or column cross sections, the weight-to-heated-perimeter ratios (W/D) shall be determined in accordance with the definitions given in this section.

722.5.1.2 Gypsum Wallboard Protection

The *fire resistance* of structural steel columns with weight-to-heated-perimeter ratios (W/D) less than or equal to 3.65 and that are protected with Type X gypsum wallboard shall be permitted to be determined from the following expression:

$$R = 130 \left[\frac{h(W'/D)}{2} \right]^{0.75} \quad (\text{Equation 7-12})$$

where:

R = Fire resistance (minutes).

h = Total thickness of gypsum wallboard (inches).

D = Heated perimeter of the structural steel column (inches).

W' = Total weight of the structural steel column and gypsum wallboard protection (pounds per linear foot).

W' = $W + 50hD/144$.

722.5.1.2.1 Attachment

The gypsum board or gypsum panel products shall be supported as illustrated in either Figure 722.5.1(2) for *fire-resistance ratings* of 4 hours or less, or Figure 722.5.1(3) for *fire-resistance ratings* of 3 hours or less.

722.5.1.2.2 Gypsum Wallboard Equivalent to Concrete

The determination of the *fire resistance* of structural steel columns from Figure 722.5.1(4) is permitted for various thicknesses of gypsum wallboard as a function of the weight-to-heated-perimeter ratio (W/D) of the column. For structural steel columns with weight-to-heated-perimeter ratios (W/D) greater than 3.65, the thickness of gypsum wallboard required for specified *fire-resistance ratings* shall be the same as the thickness determined for a W14 x 233 wide flange shape.

722.5.1.3 Sprayed Fire-Resistant Materials

The *fire resistance* of wide-flange structural steel columns protected with sprayed fire-resistant materials, as illustrated in Figure 722.5.1(5), shall be permitted to be determined from the following expression:

$$R = [C_1(W/D) + C_2]h \quad (\text{Equation 7-13})$$

where:

- R = Fire resistance (minutes).
- h = Thickness of sprayed fire-resistant material (inches).
- D = Heated perimeter of the structural steel column (inches).
- C_1 and C_2 = Material-dependent constants.
- W = Weight of structural steel columns (pounds per linear foot).

The *fire resistance* of structural steel columns protected with intumescent *fire-resistive materials* shall be determined on the basis of fire-resistance tests in accordance with Section 703.2.

722.5.1.3.1 Material-Dependent Constants

The material-dependent constants, C_1 and C_2 , shall be determined for specific fire-resistant materials on the basis of standard fire endurance tests in accordance with Section 703.2. Unless evidence is submitted to the *building official* substantiating a broader application, this expression shall be limited to determining the *fire resistance* of structural steel columns with weight-to-heated-perimeter ratios (W/D) between the largest and smallest columns for which standard fire-resistance test results are available.

722.5.1.3.2 Identification

Sprayed fire-resistant materials shall be identified by density and thickness required for a given *fire-resistance rating*.

722.5.1.4 Concrete-Protected Columns

The *fire resistance* of structural steel columns protected with concrete, as illustrated in Figure 722.5.1(6)(a) and (b), shall be permitted to be determined from the following expression:

$$R = R_o(1 + 0.03m) \quad (\text{Equation 7-14})$$

where:

$$R_o = 10(W/D)^{0.7} + 17(h^{1.6}/k_c^{0.2}) \times [1 + 26\{H/p_c c_c h(L + h)\}^{0.8}]$$

As used in these expressions:

- R = Fire endurance at equilibrium moisture conditions (minutes).
- R_o = Fire endurance at zero moisture content (minutes).
- m = Equilibrium moisture content of the concrete by volume (percent).
- W = Average weight of the structural steel column (pounds per linear foot).
- D = Heated perimeter of the structural steel column (inches).
- h = Thickness of the concrete cover (inches).
- k_c = Ambient temperature thermal conductivity of the concrete (Btu/hr ft °F).
- H = Ambient temperature thermal capacity of the steel column = $0.11W$ (Btu/ft °F).
- p_c = Concrete density (pounds per cubic foot).
- c_c = Ambient temperature specific heat of concrete (Btu/lb °F).
- L = Interior dimension of one side of a square concrete box protection (inches).

722.5.1.4.1 Reentrant Space Filled

For wide-flange structural steel columns completely encased in concrete with all reentrant spaces filled [Figure 722.5.1(6)(c)], the thermal capacity of the concrete within the reentrant spaces shall be permitted to be added to the thermal capacity of the steel column, as follows:

$$H = 0.11 W + (p_c c_d / 144) (b_f d - A_s) \quad (\text{Equation 7-15})$$

where:

- b_f = Flange width of the structural steel column (inches).
- d = Depth of the structural steel column (inches).
- A_s = Cross-sectional area of the steel column (square inches).

722.5.1.4.2 Concrete Properties Unknown

If specific data on the properties of concrete are not available, the values given in Table 722.5.1(2) are permitted.

722.5.1.4.3 Minimum Concrete Cover

For structural steel column encased in concrete with all reentrant spaces filled, Figure 722.5.1(6)(c) and Tables 722.5.1(7) and 722.5.1(8) indicate the thickness of concrete cover required for various *fire-resistance ratings* for typical wide-flange sections. The thicknesses of concrete indicated in these tables apply to structural steel columns larger than those listed.

722.5.1.4.4 Minimum Precast Concrete Cover

For structural steel columns protected with precast concrete column covers as shown in Figure 722.5.1(6)(a), Tables 722.5.1(9) and 722.5.1(10) indicate the thickness of the column covers required for various *fire-resistance ratings* for typical wide-flange shapes. The thicknesses of concrete given in these tables apply to structural steel columns larger than those listed.

722.5.1.4.5 Masonry Protection

The *fire resistance* of structural steel columns protected with concrete masonry units or clay masonry units as illustrated in Figure 722.5.1(7) shall be permitted to be determined from the following expression:

$$R = 0.17 (W/D)^{0.7} + [0.285 (T_e^{1.6}/K^{0.2})] [1.0 + 42.7 \{(A_s/d_m T_e)/(0.25p + T_e)\}^{0.8}] \quad (\text{Equation 7-16})$$

where:

- R = *Fire-resistance rating* of column assembly (hours).
- W = Average weight of structural steel column (pounds per foot).
- D = Heated perimeter of structural steel column (inches) [see Figure 722.5.1(7)].
- T_e = Equivalent thickness of concrete or clay masonry unit (inches) (see Table 722.3.2 Note a or Section 722.4.1).
- K = Thermal conductivity of concrete or clay masonry unit (Btu/hr • ft • °F) [see Table 722.5.1(3)].
- A_s = Cross-sectional area of structural steel column (square inches).
- d_m = Density of the concrete or clay masonry unit (pounds per cubic foot).
- p = Inner perimeter of concrete or clay masonry protection (inches) [see Figure 722.5.1(7)].

722.5.1.4.6 Equivalent Concrete Masonry Thickness

For structural steel columns protected with concrete masonry, Table 722.5.1(5) gives the equivalent thickness of concrete masonry required for various *fire-resistance ratings* for typical column shapes. For structural steel columns protected with clay masonry, Table 722.5.1(6) gives the equivalent thickness of concrete masonry required for various *fire-resistance ratings* for typical column shapes.

722.5.2 Structural Steel Beams and Girders

The *fire-resistance ratings* of structural steel beams and girders shall be based upon the size of the element and the type of protection provided in accordance with this section.

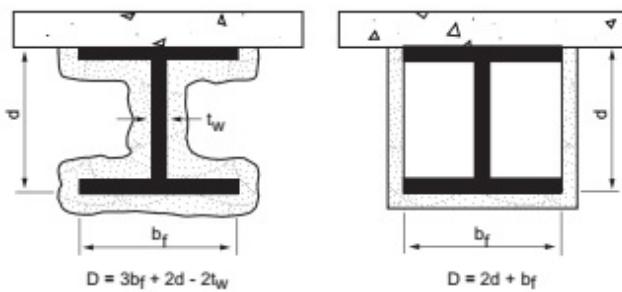


FIGURE 722.5.2

DETERMINATION OF THE HEATED PERIMETER OF STRUCTURAL STEEL BEAMS AND GIRDERS

722.5.2.1 Determination of Fire Resistance

These procedures establish a basis for determining resistance of structural steel beams and girders that differ in size from that specified in *approved* fire-resistance-rated assemblies as a function of the thickness of fire-resistant material and the weight (*W*) and heated perimeter (*D*) of the beam or girder. As used in these sections, *W* is the average weight of a *structural steel element* in pounds per linear foot (plf). The heated perimeter, *D*, is the inside perimeter of the fire-resistant material in inches as illustrated in Figure 722.5.2.

722.5.2.1.1 Weight-to-Heated Perimeter

The weight-to-heated-perimeter ratios (*W/D*), for both contour and box fire-resistant protection profiles, for the wide flange shapes most often used as beams or girders are given in Table 722.5.1(4). For different shapes, the weight-to-heated-perimeter ratios (*W/D*) shall be determined in accordance with the definitions given in this section.

722.5.2.1.2 Beam and Girder Substitutions

Except as provided for in Section 722.5.2.2, structural steel beams in *approved* fire-resistance-rated assemblies shall be considered the minimum permissible size. Other beam or girder shapes shall be permitted to be substituted provided that the weight-to-heated-perimeter ratio (*W/D*) of the substitute beam is equal to or greater than that of the beam specified in the *approved* assembly.

722.5.2.2 Sprayed Fire-Resistant Materials

The provisions in this section apply to structural steel beams and girders protected with sprayed fire-resistant materials. Larger or smaller beam and girder shapes shall be permitted to be substituted for beams specified in *approved* unrestrained or restrained fire-resistance-rated assemblies, provided that the thickness of the fire-resistant material is adjusted in accordance with the following expression:

$$h_2 = h_1 [(W_1 / D_1) + 0.60] / [(W_2 / D_2) + 0.60] \quad (\text{Equation 7-17})$$

where:

h = Thickness of sprayed fire-resistant material in inches.

W = Weight of the structural steel beam or girder in pounds per linear foot.

D = Heated perimeter of the structural steel beam in inches.

Subscript 1 refers to the beam and fire-resistant material thickness in the *approved* assembly.

Subscript 2 refers to the substitute beam or girder and the required thickness of fire-resistant material.

The *fire resistance* of structural steel beams and girders protected with intumescent *fire-resistive materials* shall be determined on the basis of fire-resistance tests in accordance with Section 703.2.

722.5.2.2.1 Minimum Thickness

The use of Equation 7-17 is subject to the following conditions:

1. The weight-to-heated-perimeter ratio for the substitute beam or girder (*W₂/D₂*) shall be not less than 0.37.

2. The thickness of fire protection materials calculated for the substitute beam or girder (T_1) shall be not less than $\frac{3}{8}$ inch (9.5 mm).
3. The unrestrained or restrained beam rating shall be not less than 1 hour.
4. Where used to adjust the material thickness for a restrained beam, the use of this procedure is limited to structural steel sections classified as compact in accordance with AISC 360.

722.5.2.3 Structural Steel Trusses

The *fire resistance* of structural steel trusses protected with fire-resistant materials sprayed to each of the individual truss elements shall be permitted to be determined in accordance with this section. The thickness of the fire-resistant material shall be determined in accordance with Section 722.5.1.3. The weight-to-heated-perimeter ratio (W/D) of truss elements that can be simultaneously exposed to fire on all sides shall be determined on the same basis as columns, as specified in Section 722.5.1.1. The weight-to-heated-perimeter ratio (W/D) of truss elements that directly support floor or roof assembly shall be determined on the same basis as beams and girders, as specified in Section 722.5.2.1.

The *fire resistance* of structural steel trusses protected with intumescent *fire-resistive materials* shall be determined on the basis of fire-resistance tests in accordance with Section 703.2.

722.6 Wood Assemblies

The provisions of this section contain procedures by which the *fire-resistance ratings* of wood assemblies are established by calculations.

722.6.1 General

This section contains procedures for calculating the *fire-resistance ratings* of walls, floor/ceiling and roof/ceiling assemblies based in part on the standard method of testing referenced in Section 703.2.

722.6.1.1 Maximum Fire-Resistance Rating

Fire-resistance ratings calculated for assemblies using the methods in Section 722.6 shall be limited to a maximum of 1 hour.

722.6.1.2 Dissimilar Membranes

Where dissimilar membranes are used on a wall assembly that requires consideration of fire exposure from both sides, the calculation shall be made from the least fire-resistant (weaker) side.

722.6.2 Walls, Floors and Roofs

These procedures apply to both load-bearing and nonload-bearing assemblies.

TABLE 722.6.2(1)

TIME ASSIGNED TO WALLBOARD MEMBRANES^{a, b, c, d}

DESCRIPTION OF FINISH	TIME^e(minutes)
$\frac{3}{8}$ -inch wood structural panel bonded with exterior glue	5
$\frac{15}{32}$ -inch wood structural panel bonded with exterior glue	10
$\frac{19}{32}$ -inch wood structural panel bonded with exterior glue	15
$\frac{3}{8}$ -inch gypsum wallboard	10
$\frac{1}{2}$ -inch gypsum wallboard	15
$\frac{5}{8}$ -inch gypsum wallboard	30
$\frac{1}{2}$ -inch Type X gypsum wallboard	25

$\frac{5}{8}$ -inch Type X gypsum wallboard	40
Double $\frac{3}{8}$ -inch gypsum wallboard	25
$\frac{1}{2}$ -inch + $\frac{3}{8}$ -inch gypsum wallboard	35
Double $\frac{1}{2}$ -inch gypsum wallboard	40

For SI: 1 inch = 25.4 mm.

- a. These values apply only where membranes are installed on framing members that are spaced 16 inches o.c. or less.
- b. Gypsum wallboard installed over framing or furring shall be installed so that all edges are supported, except $\frac{5}{8}$ -inch Type X gypsum wallboard shall be permitted to be installed horizontally with the horizontal joints staggered 24 inches each side and unsupported but finished.
- c. On wood frame floor/ceiling or roof/ceiling assemblies, gypsum board shall be installed with the long dimension perpendicular to framing members and shall have all joints finished.
- d. The membrane on the unexposed side shall not be included in determining the fire resistance of the assembly. Where dissimilar membranes are used on a wall assembly, the calculation shall be made from the least fire-resistant (weaker) side.
- e. The time assigned is not a finished rating.

TABLE 722.6.2(2)

TIME ASSIGNED FOR CONTRIBUTION OF WOOD FRAME^{a, b, c}

DESCRIPTION	TIME ASSIGNED TO FRAME (minutes)
Wood studs 16 inches o.c.	20
Wood floor and roof joists 16 inches o.c.	10

For SI: 1 inch = 25.4 mm.

- a. This table does not apply to studs or joists spaced more than 16 inches o.c.
- b. All studs shall be nominal 2 × 4 and all joists shall have a nominal thickness of not less than 2 inches.
- c. Allowable spans for joists shall be determined in accordance with Chapter 23.

TABLE 722.6.2(3)

MEMBRANE^a ON EXTERIOR FACE OF WOOD STUD WALLS

SHEATHING	PAPER	EXTERIOR FINISH
$\frac{5}{8}$ -inch T & G lumber $\frac{5}{16}$ -inch exterior glue wood structural panel $\frac{1}{2}$ -inch gypsum wallboard $\frac{5}{8}$ -inch gypsum wallboard $\frac{1}{2}$ -inch fiberboard	Sheathing paper	Lumber siding Wood shingles and shakes $\frac{1}{4}$ -inch fiber-cement lap, panel or shingle siding $\frac{1}{4}$ -inch wood structural panels-exterior type $\frac{1}{4}$ -inch hardboard

		Metal siding Stucco on metal lath Masonry veneer Vinyl siding
None	—	$\frac{3}{8}$ -inch exterior-grade wood structural panels

For SI: 1 inch = 25.4 mm.

- a. Any combination of sheathing, paper and exterior finish is permitted.

TABLE 722.6.2(4)

FLOORING OR ROOFING OVER WOOD FRAMING^a

ASSEMBLY	STRUCTURAL MEMBERS	SUBFLOOR OR ROOF DECK	FINISHED FLOORING OR ROOFING
Floor	Wood	$\frac{15}{32}$ -inch wood structural panels or $\frac{11}{16}$ -inch T & G softwood	Hardwood or softwood flooring on building paper resilient flooring, parquet floor felted-synthetic fiber floor coverings, carpeting, or ceramic tile on $\frac{1}{4}$ -inch-thick fiber-cement underlayment or $\frac{3}{8}$ -inch-thick panel-type underlayment Ceramic tile on $\frac{1}{4}$ -inch mortar bed
Roof	Wood	$\frac{15}{32}$ -inch wood structural panels or $\frac{11}{16}$ -inch T & G softwood	Finished roofing material with or without insulation

For SI: 1 inch = 25.4 mm.

- a. This table applies only to wood joist construction. It is not applicable to wood truss construction.

TABLE 722.6.2(5)

TIME ASSIGNED FOR ADDITIONAL PROTECTION

DESCRIPTION OF ADDITIONAL PROTECTION	FIRE RESISTANCE (minutes)
Add to the <i>fire-resistance rating</i> of wood stud walls if the spaces between the studs are completely filled with glass fiber mineral wool batts weighing not less than 2 pounds per cubic foot (0.6 pound per square foot of wall surface) or rockwool or slag material wool batts weighing not less than 3.3 pounds per cubic foot (1 pound per square foot of wall surface), or cellulose insulation having a nominal density not less than 2.6 pounds per cubic foot.	15

For SI: 1 pound/cubic foot = 16.0185 kg/m³.

722.6.2.1 Fire-Resistance Rating of Wood Frame Assemblies

The *fire-resistance rating* of a wood frame assembly is equal to the sum of the time assigned to the membrane on the fire-exposed side, the time assigned to the framing members and the time assigned for additional contribution by other protective measures such as insulation. The membrane on the unexposed side shall not be included in determining the *fire resistance* of the assembly.

722.6.2.2 Time Assigned to Membranes

Table 722.6.2(1) indicates the time assigned to membranes on the fire-exposed side.

722.6.2.3 Exterior Walls

For an exterior wall with a *fire separation distance* greater than 10 feet (3048 mm), the wall is assigned a rating dependent on the interior membrane and the framing as described in Tables 722.6.2(1) and 722.6.2(2). The membrane on the outside of the nonfire-exposed side of exterior walls with a *fire separation distance* greater than 10 feet (3048 mm) shall consist of sheathing, sheathing paper and siding as described in Table 722.6.2(3).

722.6.2.4 Floors and Roofs

In the case of a floor or roof, the standard test provides only for testing for fire exposure from below. Except as noted in Section 703.2.3, floor or roof assemblies of wood framing shall have an upper membrane consisting of a subfloor and finished floor conforming to Table 722.6.2(4) or any other membrane that has a contribution to *fire resistance* of not less than 15 minutes in Table 722.6.2(1).

722.6.2.5 Additional Protection

Table 722.6.2(5) indicates the time increments to be added to the *fire resistance* where glass fiber, rockwool, slag mineral wool or cellulose insulation is incorporated in the assembly.

722.6.2.6 Fastening

Fastening of wood frame assemblies and the fastening of membranes to the wood framing members shall be done in accordance with Chapter 23.

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Chapter 8 Interior Finishes and Decorative Materials

Section 801 General

801.1 Scope

The provisions of this chapter shall govern the use of materials used as *interior finishes, trim and decorative materials*.

801.2 Interior Wall and Ceiling Finish

The provisions of Section 803 shall limit the allowable fire performance and smoke development of *interior wall and ceiling finish* materials based on occupancy classification.

801.3 Interior Floor Finish

The provisions of Section 804 shall limit the allowable fire performance of *interior floor finish* materials based on occupancy classification.

[F] 801.4 Decorative Materials and Trim

Decorative materials and trim shall be restricted by combustibility, fire performance or flame propagation performance criteria in accordance with Section 806 for the interior of the building and Section 809 for the exterior of the building.

801.5 Applicability

For buildings in flood hazard areas as established in Section 1612.3, *interior finishes, trim and decorative materials* below the elevation required by Section 1612 shall be flood-damage-resistant materials.

801.6 Application

Combustible materials shall be permitted to be used as finish for walls, ceilings, floors and other interior surfaces of buildings.

801.7 Windows

Show windows in the exterior walls of the first *story* above grade plane shall be permitted to be of wood or of unprotected metal framing.

801.8 Foam Plastics

Foam plastics shall not be used as *interior finish* except as provided in Section 803.4. Foam plastics shall not be used as interior *trim* except as provided in Section 806.5 or 2604.2. This section shall apply both to exposed foam plastics and to foam plastics used in conjunction with a textile or vinyl facing or cover.

Section 802 Definitions

802.1 Definitions

The following terms are defined in Chapter 2:

EXPANDED VINYL WALL COVERING.

FLAME SPREAD.

FLAME SPREAD INDEX.

INTERIOR FINISH.

INTERIOR FLOOR FINISH.

INTERIOR FLOOR-WALL BASE.

INTERIOR WALL AND CEILING FINISH.

SITE-FABRICATED STRETCH SYSTEM.

SMOKE-DEVELOPED INDEX.

TRIM.**Section 803 Wall and Ceiling Finishes****803.1 General**

Interior wall and ceiling finish materials shall be classified for fire performance and smoke development in accordance with Section 803.1.1 or 803.1.2, except as shown in Sections 803.2 through 803.13. Materials tested in accordance with Section 803.1.2 shall not be required to be tested in accordance with Section 803.1.1.

803.1.1 Interior Wall and Ceiling Finish Materials

Interior wall and ceiling finish materials shall be classified in accordance with ASTM E84 or UL 723. Such *interior finish* materials shall be grouped in the following classes in accordance with their flame spread and *smoke-developed indexes*.

Class A:	=	Flame spread index 0-25; smoke-developed index 0-450.
Class B:	=	Flame spread index 26-75; smoke-developed index 0-450.
Class C:	=	Flame spread index 76-200; smoke-developed index 0-450.

Exception: Materials tested in accordance with Section 803.1.2.

803.1.2 Room Corner Test for Interior Wall or Ceiling Finish Materials

Interior wall or ceiling finish materials shall be permitted to be tested in accordance with NFPA 286. Interior wall or ceiling finish materials tested in accordance with NFPA 286 shall comply with Section 803.1.2.1.

803.1.2.1 Acceptance Criteria for NFPA 286

The interior finish shall comply with the following:

1. During the 40 kW exposure, flames shall not spread to the ceiling.
2. The flame shall not spread to the outer extremity of the sample on any wall or ceiling.
3. Flashover, as defined in NFPA 286, shall not occur.
4. The peak heat release rate throughout the test shall not exceed 800 kW.
5. The total smoke released throughout the test shall not exceed 1,000 m².

803.1.3 Room Corner Test for Textile Wall Coverings and Expanded Vinyl Wall Coverings

Textile wall coverings and expanded vinyl wall coverings shall meet the criteria of Section 803.1.3.1 when tested in the manner intended for use in accordance with the Method B protocol of NFPA 265 using the product-mounting system, including adhesive.

803.1.3.1 Acceptance Criteria for NFPA 265

The interior finish shall comply with the following:

1. During the 40 kW exposure, flames shall not spread to the ceiling.
2. The flame shall not spread to the outer extremities of the samples on the 8-foot by 12-foot (203 by 305 mm) walls.
3. Flashover, as defined in NFPA 265, shall not occur.

4. The total smoke released throughout the test shall not exceed 1,000 m².

803.1.4 Acceptance Criteria for Textile and Expanded Vinyl Wall or Ceiling Coverings Tested to ASTM E84 or UL 723

Textile wall and ceiling coverings and expanded vinyl wall and ceiling coverings shall have a Class A flame spread index in accordance with ASTM E84 or UL 723 and be protected by an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 or 903.3.1.2. Test specimen preparation and mounting shall be in accordance with ASTM E2404.

803.2 Thickness Exemption

Materials having a thickness less than 0.036 inch (0.9 mm) applied directly to the surface of walls or ceilings shall not be required to be tested.

803.3 Heavy Timber Exemption

Exposed portions of building elements complying with the requirements for buildings of heavy timber construction in Section 602.4 or Section 2304.11 shall not be subject to *interior finish* requirements, except in interior exit stairways, interior exit ramps and exit passageways.

803.4 Foam Plastics

Foam plastics shall not be used as *interior finish* except as provided in Section 2603.9. This section shall apply both to exposed foam plastics and to foam plastics used in conjunction with a textile or vinyl facing or cover.

803.5 Textile Wall Coverings

Where used as interior wall finish materials, textile wall coverings, including materials having woven or nonwoven, napped, tufted, looped or similar surface and carpet and similar textile materials, shall be tested in the manner intended for use, using the product mounting system, including adhesive, and shall comply with the requirements of Section 803.1.2, 803.1.3 or 803.1.4.

803.6 Textile Ceiling Coverings

Where used as interior ceiling finish materials, textile ceiling coverings, including materials having woven or nonwoven, napped, tufted, looped or similar surface and carpet and similar textile materials, shall be tested in the manner intended for use, using the product mounting system, including adhesive, and shall comply with the requirements of Section 803.1.2 or 803.1.4.

803.7 Expanded Vinyl Wall Coverings

Where used as interior wall finish materials, expanded vinyl wall coverings shall be tested in the manner intended for use, using the product mounting system, including adhesive, and shall comply with the requirements of Section 803.1.2, 803.1.3 or 803.1.4.

803.8 Expanded Vinyl Ceiling Coverings

Where used as interior ceiling finish materials, expanded vinyl ceiling coverings shall be tested in the manner intended for use, using the product mounting system, including adhesive, and shall comply with the requirements of Section 803.1.2 or 803.1.4.

803.9 High-Density Polyethylene (HDPE) and Polypropylene (PP)

Where high-density polyethylene or polypropylene is used as an interior finish it shall comply with Section 803.1.2.

803.10 Site-Fabricated Stretch Systems

Where used as interior wall or interior ceiling finish materials, site-fabricated stretch systems containing all three components described in the definition in Chapter 2 shall be tested in the manner intended for use, and shall comply with the requirements of Section 803.1.2 or with the requirements of Class A in accordance with Section 803.1.1. If the materials are tested in accordance with ASTM E84 or UL 723, specimen preparation and mounting shall be in accordance with ASTM E2573.

803.11 Interior Finish Requirements Based on Group

Interior wall and ceiling finish shall have a flame spread index not greater than that specified in Table 803.11 for the group and location designated. *Interior wall and ceiling finish* materials tested in accordance with NFPA 286 and meeting the acceptance criteria of Section 803.1.2.1, shall be permitted to be used where a Class A classification in accordance with ASTM E84 or UL 723 is required.

TABLE 803.11

INTERIOR WALL AND CEILING FINISH REQUIREMENTS BY OCCUPANCY^K

GROUP	SPRINKLERED ⁱ			NONSPRINKLERED		
	Interior exit stairways and ramps and exit passageways ^{a, b}	Corridors and enclosure for exit access stairways and ramps	Rooms and enclosed spaces ^c	Interior exit stairways and ramps and exit passageways ^{a, b}	Corridors and enclosure for exit access stairways and ramps	Rooms and enclosed spaces ^c
A-1 & A-2	B	B	C	A	A ^d	B ^e
A-3 ^f , A-4, A-5	B	B	C	A	A ^d	C
B, E, M, R-1	B	C	C	A	B	C
R-4	B	C	C	A	B	B
F	C	C	C	B	C	C
H	B	B	C ^g	A	A	B
I-1	B	C	C	A	B	B
I-2	B	B	B ^{h, i}	A	A	B
I-3	A	A ^j	C	A	A	B
I-4	B	B	B ^{h, i}	A	A	B
R-2	C	C	C	B	B	C
R-3	C	C	C	C	C	C
S	C	C	C	B	B	C
U	No restrictions			No restrictions		

For SI: 1 inch = 25.4 mm, 1 square foot = 0.0929 m².

- a. Class C interior finish materials shall be permitted for wainscotting or paneling of not more than 1,000 square feet of applied surface area in the grade lobby where applied directly to a noncombustible base or over furring strips applied to a noncombustible base and fireblocked as required by Section 803.13.1.
- b. In other than Group I-3 occupancies in buildings less than three stories above grade plane, Class B interior finish for nonsprinklered buildings and Class C interior finish for sprinklered buildings shall be permitted in interior exit stairways and ramps.
- c. Requirements for rooms and enclosed spaces shall be based upon spaces enclosed by partitions. Where a fire-resistance rating is required for structural elements, the enclosing partitions shall extend from the floor to the ceiling. Partitions that do not comply with this shall be considered enclosing spaces and the rooms or spaces on both sides shall be considered one. In determining the applicable requirements for rooms and enclosed spaces, the specific occupancy thereof shall be the governing factor regardless of the group classification of the building or structure.
- d. Lobby areas in Group A-1, A-2 and A-3 occupancies shall not be less than Class B materials.
- e. Class C interior finish materials shall be permitted in places of assembly with an occupant load of 300 persons or less.

- f. For places of religious worship, wood used for ornamental purposes, trusses, paneling or chancel furnishing shall be permitted.
- g. Class B material is required where the building exceeds two stories.
- h. Class C interior finish materials shall be permitted in administrative spaces.
- i. Class C interior finish materials shall be permitted in rooms with a capacity of four persons or less.
- j. Class B materials shall be permitted as wainscotting extending not more than 48 inches above the finished floor in corridors and exit access stairways and ramps.
- k. Finish materials as provided for in other sections of this code.
- l. Applies when protected by an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2.

803.12 Stability

Interior finish materials regulated by this chapter shall be applied or otherwise fastened in such a manner that such materials will not readily become detached where subjected to room temperatures of 200°F (93°C) for not less than 30 minutes.

803.13 Application of Interior Finish Materials to Fire-Resistance-Rated or Noncombustible Building Elements

Where *interior finish* materials are applied on walls, ceilings or structural elements required to have a *fire-resistance rating* or to be of noncombustible construction, these finish materials shall comply with the provisions of this section.

803.13.1 Direct Attachment and Furred Construction

Where walls and ceilings are required by any provision in this code to be of fire-resistance-rated or noncombustible construction, the *interior finish* material shall be applied directly against such construction or to furring strips not exceeding 1 $\frac{3}{4}$ inches (44 mm), applied directly against such surfaces.

803.13.1.1 Furred Construction

If the interior finish material is applied to furring strips, the intervening spaces between such furring strips shall comply with one of the following:

1. Be filled with material that is inorganic or noncombustible;
2. Be filled with material that meets the requirements of a Class A material in accordance with Section 803.1.1 or 803.1.2; or
3. Be fireblocked at a maximum of 8 feet (2438 mm) in every direction in accordance with Section 718.

803.13.2 Set-Out Construction

Where walls and ceilings are required to be of fire-resistance-rated or noncombustible construction and walls are set out or ceilings are dropped distances greater than specified in Section 803.13.1, Class A finish materials, in accordance with Section 803.1.1 or 803.1.2, shall be used.

Exceptions:

1. Where *interior finish* materials are protected on both sides by an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2.
2. Where *interior finish* materials are attached to noncombustible backing or furring strips installed as specified in Section

803.13.2.1 Hangers and Assembly Members

The hangers and assembly members of such dropped ceilings that are below the horizontal fire-resistance-rated floor or roof assemblies shall be of noncombustible materials. The construction of each set-out wall and horizontal fire-resistance-rated floor or roof assembly shall be of fire-resistance-rated construction as required elsewhere in this code.

Exception: In Type III and V construction, *fire-retardant-treated wood* shall be permitted for use as hangers and assembly members of dropped ceilings.

803.13.3 Heavy Timber Construction

Wall and ceiling finishes of all classes as permitted in this chapter that are installed directly against the wood decking or planking of heavy timber construction in Section 602.4.2 or 2304.11 or to wood furring strips applied directly to the wood decking or planking shall be fireblocked as specified in Section 803.13.1.1.

803.13.4 Materials

An interior wall or ceiling finish material that is not more than $\frac{1}{4}$ inch (6.4 mm) thick shall be applied directly onto the wall, ceiling or structural element without the use of furring strips and shall not be suspended away from the building element to which that finish material it is applied.

Exceptions:

1. Noncombustible interior finish materials.
2. Materials that meet the requirements of Class A materials in accordance with Section 803.1.1 or 803.1.2 where the qualifying tests were made with the material furred out from the noncombustible backing shall be permitted to be used with furring strips.
3. Materials that meet the requirements of Class A materials in accordance with Section 803.1.1 or 803.1.2 where the qualifying tests were made with the material suspended away from the noncombustible backing shall be permitted to be used suspended away from the building element.

Section 804 Interior Floor Finish

804.1 General

Interior floor finish and floor covering materials shall comply with Sections 804.2 through 804.4.2.

Exception: Floor finishes and coverings of a traditional type, such as wood, vinyl, linoleum or terrazzo, and resilient floor covering materials that are not comprised of fibers.

804.2 Classification

Interior floor finish and floor covering materials required by Section 804.4.2 to be of Class I or II materials shall be classified in accordance with ASTM E648 or NFPA 253. The classification referred to herein corresponds to the classifications determined by ASTM E648 or NFPA 253 as follows: Class I, 0.45 watts/cm² or greater; Class II, 0.22 watts/cm² or greater.

804.3 Testing and Identification

Interior floor finish and floor covering materials shall be tested by an agency in accordance with ASTM E648 or NFPA 253 and identified by a hang tag or other suitable method so as to identify the manufacturer or supplier and style, and shall indicate the *interior floor finish* or floor covering classification in accordance with Section 804.2. Carpet-type floor coverings shall be tested as proposed for use, including underlayment. Test reports confirming the information provided in the manufacturer's product identification shall be furnished to the building official upon request.

804.4 Interior Floor Finish Requirements

Interior floor covering materials shall comply with Sections 804.4.1 and 804.4.2 and interior floor finish materials shall comply with Section 804.4.2.

804.4.1 Test Requirement

In all occupancies, interior floor covering materials shall comply with the requirements of the DOC FF-1 "pill test" (CPSC 16 CFR Part 1630) or with ASTM D2859.

804.4.2 Minimum Critical Radiant Flux

In all occupancies, interior floor finish and floor covering materials in enclosures for stairways and ramps, exit passageways, corridors and rooms or spaces not separated from corridors by partitions extending from the floor to the underside of the ceiling shall withstand a minimum critical radiant flux. The minimum critical radiant flux shall be not less than Class I in Groups I-1, I-2 and I-3 and not less than Class II in Groups A, B, E, H, I-4, M, R-1, R-2 and S.

Exception: Where a building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2, Class II materials are permitted in any area where Class I materials are required, and materials complying with DOC FF-1 "pill test" (CPSC 16 CFR Part 1630) or with ASTM D2859 are permitted in any area where Class II materials are required.

Section 805 Combustible Materials in Types I and II Construction

805.1 Application

Combustible materials installed on or embedded in floors of buildings of Type I or II construction shall comply with Sections 805.1.1 through 805.1.3.

Exception: Stages and platforms constructed in accordance with Sections 410.3 and 410.4, respectively.

805.1.1 Subfloor Construction

Floor sleepers, bucks and nailing blocks shall not be constructed of combustible materials, unless the space between the fire-resistance-rated floor assembly and the flooring is either solidly filled with noncombustible materials or fireblocked in accordance with Section 718, and provided that such open spaces shall not extend under or through permanent partitions or walls.

805.1.2 Wood Finish Flooring

Wood finish flooring is permitted to be attached directly to the embedded or fire-blocked wood sleepers and shall be permitted where cemented directly to the top surface of fire-resistance-rated floor assemblies or directly to a wood subfloor attached to sleepers as provided for in Section 805.1.1.

805.1.3 Insulating Boards

Combustible insulating boards not more than $\frac{1}{2}$ inch (12.7 mm) thick and covered with finish flooring are permitted where attached directly to a noncombustible floor assembly or to wood subflooring attached to sleepers as provided for in Section 805.1.1.

Section 806 Decorative Materials and Trim

[F] 806.1 General

Combustible decorative materials, other than decorative vegetation, shall comply with Sections 806.2 through 806.8.

[F] 806.2 Noncombustible Materials

The permissible amount of noncombustible materials shall not be limited.

[F] 806.3 Combustible Decorative Materials

In other than Group I-3, curtains, draperies, fabric hangings and similar combustible decorative materials suspended from walls or ceilings shall comply with Section 806.4 and shall not exceed 10 percent of the specific wall or ceiling area to which such materials are attached.

Fixed or movable walls and partitions, paneling, wall pads and crash pads applied structurally or for decoration, acoustical correction, surface insulation or other purposes shall be considered *interior finish* shall comply with Section 803 and shall not be considered *decorative materials* or furnishings.

Exceptions:

1. In auditoriums in Group A, the permissible amount of curtains, draperies, fabric hangings and similar combustible decorative materials suspended from walls or ceilings shall not exceed 75 percent of the aggregate wall area where the building is equipped throughout with an *approved automatic sprinkler system* in accordance with Section 903.3.1.1, and where the material is installed in accordance with Section 803.13 of this code.
2. In Group R-2 dormitories, within sleeping units and dwelling units, the permissible amount of curtains, draperies, fabric hangings and similar decorative materials suspended from walls or ceiling shall not exceed 50 percent of the aggregate wall areas where the building is equipped throughout with an *approved automatic sprinkler system* installed in accordance with Section 903.3.1.
3. In Group B and M occupancies, the amount of combustible fabric partitions suspended from the ceiling and not supported by the floor shall comply with Section 806.4 and shall not be limited.

[F] 806.4 Acceptance Criteria and Reports

Where required to exhibit improved fire performance, curtains, draperies, fabric hangings and similar combustible decorative materials suspended from walls or ceilings shall be tested by an *approved agency* and meet the flame propagation performance criteria of Test 1 or 2, as appropriate, of NFPA 701, or exhibit a maximum heat release rate of 100 kW when tested in accordance with NFPA 289, using the 20 kW ignition source. Reports of test results shall be prepared in accordance with the test method used and furnished to the *building official* upon request.

[F] 806.5 Foam Plastic

Foam plastic used as *trim* in any occupancy shall comply with Section 2604.2.

[F] 806.6 Pyroxylin Plastic

Imitation leather or other material consisting of or coated with a pyroxylin or similarly hazardous base shall not be used in Group A occupancies.

[F] 806.7 Interior Trim

Material, other than foam plastic used as interior *trim*, shall have a minimum Class C flame spread and smoke-developed index when tested in accordance with ASTM E84 or UL 723, as described in Section 803.1.1. Combustible *trim*, excluding handrails and guardrails, shall not exceed 10 percent of the specific wall or ceiling area to which it is attached.

[F] 806.8 Interior Floor-Wall Base

Interior floor-wall base that is 6 inches (152 mm) or less in height shall be tested in accordance with Section 804.2 and shall be not less than Class II. Where a Class I floor finish is required, the floor-wall base shall be Class I.

Exception: Interior *trim* materials that comply with Section 806.7.

[F] 806.9 Combustible Lockers

Where lockers constructed of combustible materials are used, the lockers shall be considered to be interior finish and shall comply with Section 803.

Exception: Lockers constructed entirely of wood and noncombustible materials shall be permitted to be used wherever interior finish materials are required to meet a Class C classification in accordance with Section 803.1.1.

Section 807 Insulation

807.1 Insulation

Thermal and acoustical insulation shall comply with Section 720.

Section 808 Acoustical Ceiling Systems

808.1 Acoustical Ceiling Systems

The quality, design, fabrication and erection of metal suspension systems for acoustical tile and lay-in panel ceilings in buildings or structures shall conform to generally accepted engineering practice, the provisions of this chapter and other applicable requirements of

this code.

808.1.1 Materials and Installation

Acoustical materials complying with the *interior finish* requirements of Section 803 shall be installed in accordance with the manufacturer's recommendations and applicable provisions for applying *interior finish*.

808.1.1.1 Suspended Acoustical Ceilings

Suspended acoustical ceiling systems shall be installed in accordance with the provisions of ASTM C635 and ASTM C636.

808.1.1.2 Fire-Resistance-Rated Construction

Acoustical ceiling systems that are part of fire-resistance-rated construction shall be installed in the same manner used in the assembly tested and shall comply with the provisions of Chapter 7.

Section 809 Artificial Decorative Vegetation on Buildings and in Outdoor Occupancies

809.1 General

Fixed artificial decorative vegetation placed in outdoor occupancies or on an occupied roof of a building shall comply with this section.

809.2 Testing

Artificial decorative vegetation shall meet the flame propagation performance criteria of the Test Method 1 or Test Method 2, as appropriate, of NFPA 701. Meeting such criteria shall be documented and certified by the manufacturer in an approved manner. Alternatively, the artificial decorative vegetation shall be tested in accordance with NFPA 289, using the 20 kW ignition source, and shall have a maximum heat release rate of 100 kW.

809.3 Electrical Fixtures and Wiring

The use of unlisted electrical wiring and lighting on artificial decorative vegetation shall be prohibited. The use of electrical wiring and lighting on artificial trees constructed entirely of metal shall be prohibited.

809.4 Ignition Sources and Maintenance

Ignition sources and maintenance of outdoor artificial vegetation shall be in accordance with the *Florida Fire Prevention Code*.

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Chapter 9 Fire Protection Systems

Section 901 General

901.1 Scope

The provisions of this chapter shall specify where *fire protection systems* are required and shall apply to the design, installation and operation of *fire protection systems* and carbon monoxide detection alarms.

901.2 Fire Protection Systems

Fire protection systems shall be installed, repaired, operated and maintained in accordance with this code and the *Florida Fire Prevention Code*.

Any *fire protection system* for which an exception or reduction to the provisions of this code has been granted shall be considered to be a required system.

Exception: Any *fire protection system* or portion thereof not required by this code shall be permitted to be installed for partial or complete protection provided that such system meets the requirements of this code.

901.3 Modifications

Persons shall not remove or modify any *fire protection system* installed or maintained under the provisions of this code or the *Florida Fire Prevention Code* without approval by the *building official*.

901.4 Threads

Threads provided for fire department connections to sprinkler systems, standpipes, yard hydrants or any other fire hose connection shall be compatible with the connections used by the local fire department.

901.5 Acceptance Tests

Fire protection systems shall be tested in accordance with the requirements of this code and the *Florida Fire Prevention Code*. When required, the tests shall be conducted in the presence of the *building official*. Tests required by this code, the *Florida Fire Prevention Code* and the standards listed in this code shall be conducted at the expense of the owner or the owner's authorized agent. It shall be unlawful to occupy portions of a structure until the required *fire protection systems* within that portion of the structure have been tested and *approved*.

901.6 Supervisory Service

Where required, *fire protection systems* shall be monitored by an approved supervising station in accordance with NFPA 72.

901.6.1 Automatic Sprinkler Systems

Automatic sprinkler systems shall be monitored by an *approved* supervising station.

Exceptions:

1. A supervising station is not required for *automatic sprinkler systems* protecting one- and two-family dwellings.
2. Limited area systems in accordance with Section 903.3.8.

901.6.2 Fire Alarm Systems

Fire alarm systems required by the provisions of Section 907.2 of this code and the *Florida Fire Prevention Code* shall be monitored by an *approved* supervising station in accordance with Section 907.6.6.

Exceptions:

1. Single- and multiple-station smoke alarms required by Section 907.2.11.

2. Smoke detectors in Group I-3 occupancies.
3. Supervisory service is not required for *automatic sprinkler systems* in one- and two-family dwellings.

901.6.3 Group H

Supervision and monitoring of emergency alarm, detection and automatic fire-extinguishing systems in Group H occupancies shall be in accordance with the *Florida Fire Prevention Code*.

901.7 Fire Areas

Where buildings, or portions thereof, are divided into *fire areas* so as not to exceed the limits established for requiring a *fire protection system* in accordance with this chapter, such *fire areas* shall be separated by *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both, having a *fire-resistance rating* of not less than that determined in accordance with Section 707.3.10.

[F] 901.8 Pump and Riser Room Size

Where provided, fire pump rooms and *automatic sprinkler system* riser rooms shall be designed with adequate space for all equipment necessary for the installation, as defined by the manufacturer, with sufficient working room around the stationary equipment. Clearances around equipment to elements of permanent construction, including other installed equipment and appliances, shall be sufficient to allow inspection, service, repair or replacement without removing such elements of permanent construction or disabling the function of a required fire-resistance-rated assembly. Fire pump and *automatic sprinkler system* riser rooms shall be provided with a door(s) and unobstructed passageway large enough to allow removal of the largest piece of equipment.

Section 902 Definitions

902.1 Definitions

The following terms are defined in Chapter 2:

[F] ALARM NOTIFICATION APPLIANCE.

[F] ALARM SIGNAL.

[F] ALARM VERIFICATION FEATURE.

[F] ANNUNCIATOR.

[F] AUDIBLE ALARM NOTIFICATION APPLIANCE.

[F] AUTOMATIC.

[F] AUTOMATIC FIRE-EXTINGUISHING SYSTEM.

[F] AUTOMATIC SMOKE DETECTION SYSTEM.

[F] AUTOMATIC SPRINKLER SYSTEM.

[F] AUTOMATIC WATER MIST SYSTEM.

[F] AVERAGE AMBIENT SOUND LEVEL.

[F] CARBON DIOXIDE EXTINGUISHING SYSTEMS.

[F] CEILING LIMIT.

[F] CLEAN AGENT.

[F] COMMERCIAL MOTOR VEHICLE.

[F] CONSTANTLY ATTENDED LOCATION.

[F] DELUGE SYSTEM.

[F] DETECTOR, HEAT.

[F] DRY-CHEMICAL EXTINGUISHING AGENT.

[F] ELECTRICAL CIRCUIT PROTECTIVE SYSTEM.

[F] ELEVATOR GROUP.

[F] EMERGENCY ALARM SYSTEM.

[F] EMERGENCY VOICE/ALARM COMMUNICATIONS.

[F] FIRE ALARM BOX, MANUAL.

[F] FIRE ALARM CONTROL UNIT.

[F] FIRE ALARM SIGNAL.

[F] FIRE ALARM SYSTEM.

FIRE AREA.

[F] FIRE COMMAND CENTER.

[F] FIRE DETECTOR, AUTOMATIC.

[F] FIRE PROTECTION SYSTEM.

[F] FIRE SAFETY FUNCTIONS.

[F] FOAM-EXTINGUISHING SYSTEM.

[F] HALOGENATED EXTINGUISHING SYSTEM.

[F] INITIATING DEVICE.

[F] MANUAL FIRE ALARM BOX.

[F] MULTIPLE-STATION ALARM DEVICE.

[F] MULTIPLE-STATION SMOKE ALARM.

[F] NOTIFICATION ZONE.

[F] NUISANCE ALARM.

PRIVATE GARAGE.

[F] RECORD DRAWINGS.

[F] SINGLE-STATION SMOKE ALARM.

[F] SMOKE ALARM.

[F] SMOKE DETECTOR.

[F] SMOKEPROOF ENCLOSURE.

[F] STANDPIPE SYSTEM, CLASSES OF.

Class I system.

Class II system.

Class III system.

[F] STANDPIPE, TYPES OF.

Automatic dry.

Automatic wet.

Manual dry.

Manual wet.

Semiautomatic dry.

[F] SUPERVISING STATION.

[F] SUPERVISORY SERVICE.

[F] SUPERVISORY SIGNAL.

[F] SUPERVISORY SIGNAL-INITIATING DEVICE.

[F] TIRES, BULK STORAGE OF.

[F] TROUBLE SIGNAL.

[F] VISIBLE ALARM NOTIFICATION APPLIANCE.

[F] WET CHEMICAL EXTINGUISHING SYSTEM.

[F] WIRELESS PROTECTION SYSTEM.

[F] ZONE.

[F] ZONE, NOTIFICATION.

Section 903 Automatic Sprinkler Systems

[F] 903.1 General

Automatic sprinkler systems shall comply with this section.

[F] 903.1.1 Alternative Protection

Alternative *automatic fire-extinguishing systems* complying with Section 904 shall be permitted instead of automatic sprinkler protection where recognized by the applicable standard and *approved* by the fire code official.

[F] 903.2 Where Required

Approved *automatic sprinkler systems* in new buildings and structures shall be provided in the locations described in Sections 903.2.1 through 903.2.12.

Exception: Spaces or areas in telecommunications buildings used exclusively for telecommunications equipment, associated electrical power distribution equipment, batteries and standby engines, provided those spaces or areas are equipped throughout with an *automatic smoke detection system* in accordance with Section 907.2 and are separated from the remainder of the building by not less than 1-hour *fire barriers* constructed in accordance with Section 707 or not less than 2-hour *horizontal assemblies* constructed in accordance with Section 711, or both.

[F] 903.2.1 Group A

An *automatic sprinkler system* shall be provided throughout buildings and portions thereof used as Group A occupancies as provided in this section. For Group A-1, A-2, A-3 and A-4 occupancies, the *automatic sprinkler system* shall be provided throughout the story where the *fire area* containing the Group A-1, A-2, A-3 or A-4 occupancy is located, and throughout all stories from the Group A occupancy to, and including, the *levels of exit discharge* serving the Group A occupancy. For Group A-5 occupancies, the *automatic sprinkler system* shall be provided in the spaces indicated in Section 903.2.1.5.

[F] 903.2.1.1 Group A-1

An *automatic sprinkler system* shall be provided for *fire areas* containing Group A-1 occupancies and intervening floors of the building where one of the following conditions exists:

1. The *fire area* exceeds 12,000 square feet (1115 m^2).
2. The *fire area* has an *occupant load* of 300 or more.
3. The *fire area* is located on a floor other than a *level of exit discharge* serving such occupancies.
4. The *fire area* contains a multitheater complex.

[F] 903.2.1.2 Group A-2

An *automatic sprinkler system* shall be provided for *fire areas* containing Group A-2 occupancies and intervening floors of the building where one of the following conditions exists:

1. The *fire area* exceeds 5,000 square feet (464.5 m^2).
 2. The *fire area* has an *occupant load* of 100 or more.
- Exception:** A restaurant, cafeteria, or similar dining facility, including an associated commercial kitchen, is required to have sprinklers only if it has a fire area occupancy load of 200 patrons or more.
3. The *fire area* is located on a floor other than a *level of exit discharge* serving such occupancies.

[F] 903.2.1.3 Group A-3

An *automatic sprinkler system* shall be provided for *fire areas* containing Group A-3 occupancies and intervening floors of the building where one of the following conditions exists:

1. The *fire area* exceeds 12,000 square feet (1115 m^2).
2. The *fire area* has an *occupant load* of 300 or more.
3. The *fire area* is located on a floor other than a *level of exit discharge* serving such occupancies.

[F] 903.2.1.4 Group A-4

An *automatic sprinkler system* shall be provided for *fire areas* containing Group A-4 occupancies and intervening floors of the building where one of the following conditions exists:

1. The *fire area* exceeds 12,000 square feet (1115 m^2).
2. The *fire area* has an *occupant load* of 300 or more.
3. The *fire area* is located on a floor other than a *level of exit discharge* serving such occupancies.

[F] 903.2.1.5 Group A-5

An *automatic sprinkler system* shall be provided for Group A-5 occupancies in the following areas: concession stands, retail areas, press boxes and other accessory use areas in excess of 1,000 square feet (93 m^2).

[F] 903.2.1.6 Assembly Occupancies on Roofs

Where an occupied roof has an assembly occupancy with an *occupant load* exceeding 100 for Group A-2 and 300 for other Group A occupancies, all floors between the occupied roof and the *level of exit discharge* shall be equipped with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2.

Exception: Open parking garages of Type I or Type II construction.

903.2.1.7 Multiple Fire Areas

An *automatic sprinkler system* shall be provided where multiple fire areas of Group A-1, A-2, A-3 or A-4 occupancies share exit or exit access components and the combined *occupant load* of these fire areas is 300 or more.

[F] 903.2.2 Ambulatory Care Facilities

An *automatic sprinkler system* shall be installed throughout the entire floor containing an *ambulatory care facility* where either of the following conditions exist at any time:

1. Four or more care recipients are incapable of self-preservation, whether rendered incapable by staff or staff has accepted responsibility for care recipients already incapable.
2. One or more care recipients that are incapable of self-preservation are located at other than the level of exit discharge serving such a facility.

In buildings where ambulatory care is provided on levels other than the *level of exit discharge*, an *automatic sprinkler system* shall be installed throughout the entire floor where such care is provided as well as all floors below, and all floors between the level of ambulatory care and the nearest *level of exit discharge*, including the *level of exit discharge*.

[F] 903.2.3 Group E

An *automatic sprinkler system* shall be provided for Group E occupancies as follows:

1. Throughout all Group E *fire areas* greater than 12,000 square feet (1115 m^2) in area.
2. Throughout every portion of educational buildings below the lowest *level of exit discharge* serving that portion of the building.

Exception: An *automatic sprinkler system* is not required in existing educational buildings unless 50 percent of the aggregate area of the building is being remodeled.

[F] 903.2.4 Group F-1

An *automatic sprinkler system* shall be provided throughout all buildings containing a Group F-1 occupancy where one of the following conditions exists:

1. A Group F-1 *fire area* exceeds 12,000 square feet (1115 m^2).
2. A Group F-1 *fire area* is located more than three stories above *grade plane*.
3. The combined area of all Group F-1 *fire areas* on all floors, including any mezzanines, exceeds 24,000 square feet (2230 m^2).
4. A Group F-1 occupancy used for the manufacture of upholstered furniture or mattresses exceeds 2,500 square feet (232 m^2).

[F] 903.2.4.1 Woodworking Operations

An *automatic sprinkler system* shall be provided throughout all Group F-1 occupancy *fire areas* that contain woodworking operations in excess of 2,500 square feet (232 m^2) in area that generate finely divided combustible waste or use finely divided combustible

materials.

[F] 903.2.5 Group H

An *automatic sprinkler system* shall be provided in high-hazard occupancies as required in Sections 903.2.5.1 through 903.2.5.3.

[F] 903.2.5.1 General

An *automatic sprinkler system* shall be installed in Group H occupancies.

[F] 903.2.5.2 Group H-5 Occupancies

An *automatic sprinkler system* shall be installed throughout buildings containing Group H-5 occupancies. The design of the sprinkler system shall be not less than that required by this code for the occupancy hazard classifications in accordance with Table 903.2.5.2.

Where the design area of the sprinkler system consists of a *corridor* protected by one row of sprinklers, the maximum number of sprinklers required to be calculated is 13.

[F] TABLE 903.2.5.2

GROUP H-5 SPRINKLER DESIGN CRITERIA

LOCATION	OCCUPANCY HAZARD CLASSIFICATION
Fabrication areas	Ordinary Hazard Group 2
Service corridors	Ordinary Hazard Group 2
Storage rooms without dispensing	Ordinary Hazard Group 2
Storage rooms with dispensing	Extra Hazard Group 2
Corridors	Ordinary Hazard Group 2

[F] 903.2.5.3 Pyroxylin Plastics

An *automatic sprinkler system* shall be provided in buildings, or portions thereof, where cellulose nitrate film or pyroxylin plastics are manufactured, stored or handled in quantities exceeding 100 pounds (45 kg).

[F] 903.2.6 Group I

An *automatic sprinkler system* shall be provided throughout buildings with a Group I *fire area*.

Exceptions:

1. An *automatic sprinkler system* installed in accordance with Section 903.3.1.2 shall be permitted in Group I-1 Condition 1 facilities.
2. An *automatic sprinkler system* is not required where Group I-4 day care facilities are at the *level of exit discharge* and where every room where care is provided has not fewer than one exterior exit door.
3. In buildings where Group I-4 day care is provided on levels other than the *level of exit discharge*, an *automatic sprinkler system* in accordance with Section 903.3.1.1 shall be installed on the entire floor where care is provided, all floors between the level of care and the *level of exit discharge*, and all floors below the *level of exit discharge* other than areas classified as an open parking garage.

[F] 903.2.7 Group M

An *automatic sprinkler system* shall be provided throughout buildings containing a Group M occupancy where one of the following conditions exists:

1. A Group M *fire area* exceeds 12,000 square feet (1115 m²).

2. A Group M *fire area* is located more than three stories above *grade plane*.
3. The combined area of all Group M *fire areas* on all floors, including any mezzanines, exceeds 24,000 square feet (2230 m²).
4. A Group M occupancy used for the display and sale of upholstered furniture or mattresses exceeds 5,000 square feet (464 m²).

[F] 903.2.7.1 High-Piled Storage

An *automatic sprinkler system* shall be provided in accordance with the *Florida Fire Prevention Code* in all buildings of Group M where storage of merchandise is in high-piled or rack storage arrays.

[F] 903.2.8 Group R

An *automatic sprinkler system* installed in accordance with Section 903.3 shall be provided throughout all buildings with a Group R *fire area*.

[F] 903.2.8.1 Group R-3

An *automatic sprinkler system* installed in accordance with Section 903.3.1.3 shall be permitted in Group R-3 occupancies.

[F] 903.2.8.2 Group R-4 Condition 1

An *automatic sprinkler system* installed in accordance with Section 903.3.1.3 shall be permitted in Group R-4 Condition 1 occupancies.

[F] 903.2.8.3 Group R-4 Condition 2

An *automatic sprinkler system* installed in accordance with Section 903.3.1.2 shall be permitted in Group R-4 Condition 2 occupancies.

[F] 903.2.8.4 Care Facilities

An *automatic sprinkler system* installed in accordance with Section 903.3.1.3 shall be permitted in care facilities with five or fewer individuals in a single-family dwelling.

[F] 903.2.9 Group S-1

An *automatic sprinkler system* shall be provided throughout all buildings containing a Group S-1 occupancy where one of the following conditions exists:

1. A Group S-1 *fire area* exceeds 12,000 square feet (1115 m²).
2. A Group S-1 *fire area* is located more than three stories above *grade plane*.
3. The combined area of all Group S-1 *fire areas* on all floors, including any mezzanines, exceeds 24,000 square feet (2230 m²).
4. A Group S-1 *fire area* used for the storage of commercial motor vehicles where the *fire area* exceeds 5,000 square feet (464 m²).
5. A Group S-1 occupancy used for the storage of upholstered furniture or mattresses exceeds 2,500 square feet (232 m²).

[F] 903.2.9.1 Repair Garages

An *automatic sprinkler system* shall be provided throughout all buildings used as repair garages in accordance with Section 406, as shown:

1. Buildings having two or more *stories above grade plane*, including basements, with a *fire area* containing a repair garage exceeding 10,000 square feet (929 m²).
2. Buildings not more than one *story above grade plane*, with a *fire area* containing a repair garage exceeding 12,000 square feet (1115 m²).

3. Buildings with repair garages servicing vehicles parked in basements.

4. A Group S-1 *fire area* used for the repair of commercial motor vehicles where the *fire area* exceeds 5,000 square feet (464 m^2).

[F] 903.2.9.2 Bulk Storage of Tires

Buildings and structures where the area for the storage of tires exceeds 20,000 cubic feet (566 m^3) shall be equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

[F] 903.2.10 Group S-2 Enclosed Parking Garages

An *automatic sprinkler system* shall be provided throughout buildings classified as enclosed parking garages in accordance with Section 406.6 where either of the following conditions exists:

1. Where the *fire area* of the enclosed parking garage exceeds 12,000 square feet (1115 m^2).

2. Where the enclosed parking garage is located beneath other groups.

Exception: Enclosed parking garages located beneath Group R-3 occupancies.

[F] 903.2.10.1 Commercial Parking Garages

An *automatic sprinkler system* shall be provided throughout buildings used for storage of commercial motor vehicles where the *fire area* exceeds 5,000 square feet (464 m^2).

[F] 903.2.11 Specific Building Areas and Hazards

In all occupancies other than Group U, an *automatic sprinkler system* shall be installed for building design or hazards in the locations set forth in Sections 903.2.11.1 through 903.2.11.6.

[F] 903.2.11.1 Stories Without Openings

An *automatic sprinkler system* shall be installed throughout all *stories*, including basements, of all buildings where the floor area exceeds 1,500 square feet (139.4 m^2) and where there is not provided not fewer than one of the following types of *exterior wall* openings:

1. Openings below grade that lead directly to ground level by an exterior *stairway* complying with Section 1011 or an outside ramp complying with Section 1012. Openings shall be located in each 50 linear feet (15 240 mm), or fraction thereof, of *exterior wall* in the *story* on at least one side. The required openings shall be distributed such that the lineal distance between adjacent openings does not exceed 50 feet (15 240 mm).

2. Openings entirely above the adjoining ground level totaling not less than 20 square feet (1.86 m^2) in each 50 linear feet (15 240 mm), or fraction thereof, of *exterior wall* in the *story* on at least one side. The required openings shall be distributed such that the lineal distance between adjacent openings does not exceed 50 feet (15 240 mm). The height of the bottom of the clear opening shall not exceed 44 inches (1118 mm) measured from the floor.

[F] 903.2.11.1.1 Opening Dimensions and Access

Openings shall have a minimum dimension of not less than 30 inches (762 mm). Such openings shall be accessible to the fire department from the exterior and shall not be obstructed in a manner such that fire fighting or rescue cannot be accomplished from the exterior.

[F] 903.2.11.1.2 Openings on One Side Only

Where openings in a *story* are provided on only one side and the opposite wall of such *story* is more than 75 feet (22 860 mm) from such openings, the *story* shall be equipped throughout with an *approved automatic sprinkler system*, or openings as specified

above shall be provided on not fewer than two sides of the *story*.

[F] 903.2.11.1.3 Basements

Where any portion of a *basement* is located more than 75 feet (22 860 mm) from openings required by Section 903.2.11.1, or where walls, partitions or other obstructions are installed that restrict the application of water from hose streams, the *basement* shall be equipped throughout with an *approved automatic sprinkler system*.

[F] 903.2.11.2 Rubbish and Linen Chutes

An *automatic sprinkler system* shall be installed at the top of rubbish and linen chutes and in their terminal rooms. Chutes shall have additional sprinkler heads installed at alternate floors and at the lowest intake. Where a rubbish chute extends through a building more than one floor below the lowest intake, the extension shall have sprinklers installed that are recessed from the drop area of the chute and protected from freezing in accordance with Section 903.3.1.1. Such sprinklers shall be installed at alternate floors, beginning with the second level below the last intake and ending with the floor above the discharge. Chute sprinklers shall be accessible for servicing.

[F] 903.2.11.3 Buildings Three Stories or More in Height

Any building which is of three stories or more in height shall be equipped with an approved automatic sprinkler system installed in accordance with Section 903.1.

Exceptions:

1. Single- and two-family dwellings.
2. A stand-alone parking garage constructed with noncombustible materials, the design of which is such that all levels of the garage are uniformly open to the atmosphere on all sides with the percentages of openings equal to or greater than those specified in Section 406.3. Such garages shall be separated from any other structure by not less than 20 feet (6096 mm). A stand-alone parking garage is one that is solely for the parking of vehicles and does not have any other occupancy group in the building.
3. Telecommunication spaces located within telecommunication buildings, if the spaces are equipped to meet an equivalent fire prevention standard approved by both the Florida Building Commission and the State Fire Marshal.
4. Telecommunications spaces within telecommunication buildings, if the telecommunications space is equipped with:
 - 4.1. Air sampling smoke detection.
 - 4.2. Remote, proprietary or central station fire alarm monitoring.
 - 4.3. Automatic smoke exhaust system.
 - 4.4. One-hour fire-resistance wall separating the telecommunications space from the adjacent areas on the same floor.
 - 4.5. Two-hour floor/ceiling assembly separating the telecommunications space from adjacent floors.
 - 4.6. All other portions ancillary to the telecommunications equipment area shall be provided with fire sprinkler protection.
5. Sprinkler systems installed solely as a requirement of Section 903.2.11.3 may be a NFPA 13R or NFPA 13D system in accordance with their scopes.

903.2.11.3.1

NFPA 101 as adopted by *Florida Fire Prevention Code*, as regarding the requirements for fire protection sprinklers, is applicable to all multiple-family residential buildings, whether designated as townhouses, condominiums, apartment houses, tenements, garden apartments or by any other name. The attorney general has determined that for the purpose of the fire protection sprinkler requirements in Section 553.895(2), *Florida Statutes*, townhouses that are three or more stories tall and consist of three or more units together are multiple-family dwellings. Therefore, these types of townhouses are not exempt from being considered for the requirements to provide fire protection sprinklers (even if there are any other definitions that define a townhouse as a single-family residence). When determining whether townhouses require fire protection sprinkler systems, the building official must consider in parallel: (a) the attorney general's opinion defining the statutory language for townhouses; (b)

the building code requirements, including all life-safety chapters, that provide additional determining criteria, such as construction types, fire resistance, fire protection systems and egress; and (c) the NFPA 101 as adopted by *Florida Fire Prevention Code*, egress and protection determining criteria. The more restrictive criteria are then applied.

[F] 903.2.11.4 Ducts Conveying Hazardous Exhausts

Where required by the *Florida Building Code, Mechanical*, automatic sprinklers shall be provided in ducts conveying hazardous exhaust or flammable or combustible materials.

Exception: Ducts where the largest cross-sectional diameter of the duct is less than 10 inches (254 mm).

[F] 903.2.11.5 Commercial Cooking Operations

An *automatic sprinkler system* shall be installed in commercial kitchen exhaust hood and duct systems where an *automatic sprinkler system* is used to comply with Section 904.

[F] 903.2.11.6 Other Required Suppression Systems

In addition to the requirements of Section 903.2, the provisions indicated in Table 903.2.11.6 require the installation of a fire suppression system for certain buildings and areas.

[F] TABLE 903.2.11.6

ADDITIONAL REQUIRED SUPPRESSION SYSTEMS

SECTION	SUBJECT
402.5, 402.6.2	Covered and open mall buildings
403.3	High-rise buildings
404.3	Atriums
405.3	Underground structures
407.7	Group I-2
410.7	Stages
411.4	Special amusement buildings
412.3.4	Airport traffic control towers
412.4.6, 412.4.6.1, 412.6.5	Aircraft hangars
415.11.12	Group H-5 HPM exhaust ducts
416.5	Flammable finishes
417.4	Drying rooms
508.5.7	Live/work units
424.3	Children's play structures
507	Unlimited area buildings
509.4	Incidental uses
1029.6.2.3	Smoke-protected assembly seating
FFPC	Sprinkler system requirements as set forth in the <i>Florida Fire Prevention Code</i> .

[F] 903.2.12 During Construction

Automatic sprinkler systems required during construction, *alteration* and demolition operations shall be provided in accordance with the Florida Fire Prevention Code.

[F] 903.3 Installation Requirements

Automatic sprinkler systems shall be designed and installed in accordance with Sections 903.3.1 through 903.3.8.

[F] 903.3.1 Standards

Sprinkler systems shall be designed and installed in accordance with Section 903.3.1.1 unless otherwise permitted by Sections 903.3.1.2 and 903.3.1.3 and other chapters of this code, as applicable.

[F] 903.3.1.1 NFPA 13 Sprinkler Systems

Where the provisions of this code require that a building or portion thereof be equipped throughout with an *automatic sprinkler system* in accordance with this section, sprinklers shall be installed throughout in accordance with NFPA 13 except as provided in Sections 903.3.1.1.1 and 903.3.1.1.2.

[F] 903.3.1.1.1 Exempt Locations

Automatic sprinklers shall not be required in the following rooms or areas where such rooms or areas are protected with an *approved* automatic fire detection system in accordance with Section 907.2 that will respond to visible or invisible particles of combustion. Sprinklers shall not be omitted from a room merely because it is damp, of fire-resistance-rated construction or contains electrical equipment.

1. A room where the application of water, or flame and water, constitutes a serious life or fire hazard.
2. A room or space where sprinklers are considered undesirable because of the nature of the contents, where *approved* by the fire code official.
3. Generator and transformer rooms separated from the remainder of the building by walls and floor/ceiling or roof/ceiling assemblies having a *fire-resistance rating* of not less than 2 hours.
4. Rooms or areas that are of noncombustible construction with wholly noncombustible contents.
5. Fire service access elevator machine rooms and machinery spaces.
6. Machine rooms, machinery spaces, control rooms and control spaces associated with occupant evacuation elevators designed in accordance with Section 3008.

[F] 903.3.1.1.2 Bathrooms

In Group R occupancies, other than Group R-4 occupancies, sprinklers shall not be required in bathrooms that do not exceed 55 square feet (5 m^2) in area and are located within individual *dwelling units* or *sleeping units*, provided that walls and ceilings, including the walls and ceilings behind a shower enclosure or tub, are of noncombustible or limited-combustible materials with a 15-minute thermal barrier rating.

[F] 903.3.1.2 NFPA 13R Sprinkler Systems

Automatic sprinkler systems in Group R occupancies up to and including four stories in height in buildings not exceeding 60 feet (1828 mm) in height above grade plane shall be permitted to be installed throughout in accordance with NFPA 13R.

The number of stories of Group R occupancies constructed in accordance with Sections 510.2 and 510.4 shall be measured from the horizontal assembly creating separate buildings.

[F] 903.3.1.2.1 Balconies and Decks

Sprinkler protection shall be provided for exterior balconies, decks and ground floor patios of *dwelling units* and *sleeping units* where the building is of Type V construction, provided there is a roof or deck above. Sidewall sprinklers that are used to protect such areas shall be permitted to be located such that their deflectors are within 1 inch (25 mm) to 6 inches (152 mm) below the

structural members and a maximum distance of 14 inches (356 mm) below the deck of the exterior balconies and decks that are constructed of open wood joist construction.

[F] 903.3.1.2.2 Corridors and Balconies in the Means of Egress

Sprinkler protection shall be provided in corridors and for balconies in the means of egress where any of the following conditions apply:

1. Corridors with combustible floor or walls.
2. Corridors with an interior change of direction exceeding 45 degrees (0.79 rad).
3. Corridors that are less than 50 percent open to the outside atmosphere at the ends.
4. *Open-ended corridors and associated exterior stairways and ramps as specified in Section 1027.6, Exception 3.*
5. Egress balconies not complying with Sections 1021.2 and 1021.3

903.3.1.2.3 Attics

Attic protection shall be provided as follows:

1. Attics that are used or intended for living purposes or storage shall be protected by an *automatic sprinkler system*.
2. Where fuel-fired equipment is installed in an unsprinklered attic, at least one quick-response intermediate temperature sprinkler shall be installed above the equipment.
3. Where located in a building of Type III, Type IV or Type V construction designed in accordance with Section 510.2 or Section 510.4, attics not required by Item 1 to have sprinkler protection shall comply with one of the following if the roof assembly is located more than 55 feet (16 764 mm) above the lowest level of fire department vehicle access needed to meet the provisions in Section 503:
 - a. Provide *automatic sprinkler system* protection.
 - b. Construct the attic using noncombustible materials.
 - c. Construct the attic using fire-retardanttreated wood complying with Section 2303.2.
 - d. Fill the attic with noncombustible insulation.

The height of the roof assembly shall be determined by measuring the distance from the lowest required fire vehicle access road surface adjacent to the building to the eave of the highest pitched roof, the intersection of the highest roof to the exterior wall, or the top of the highest parapet, whichever yields the greatest distance. For the purpose of this measurement, required fire vehicle access roads shall include only those roads that are necessary for compliance with the *Florida Fire Prevention Code*.

4. Group R-4 Condition 2 occupancy attics not required by Item 1 to have sprinklers shall comply with one of the following:
 - a. Provide *automatic sprinkler system* protection.
 - b. Provide a heat detector system throughout the attic that is arranged to activate the building fire alarm system in accordance with Section 907.2.10.

- c. Construct the attic using noncombustible materials.
- d. Construct the attic using fire-retardant-treated wood complying with Section 2303.2.
- e. Fill the attic with noncombustible insulation.

[F] 903.3.1.3 NFPA 13D Sprinkler Systems

Automatic sprinkler systems installed in one- and two-family dwellings; Group R-3, Group R-4 Condition 1 and townhouses shall be permitted to be installed throughout in accordance with NFPA 13D.

[F] 903.3.2 Quick-Response and Residential Sprinklers

Where automatic sprinkler systems are required by this code, quick-response or residential automatic sprinklers shall be installed in all of the following areas in accordance with Section 903.3.1 and their listings:

1. Throughout all spaces within a smoke compartment containing care recipient sleeping units in Group I-2 in accordance with this code.
2. Throughout all spaces within a smoke compartment containing treatment rooms in ambulatory care facilities.
3. Dwelling units and sleeping units in Group I-1 and R occupancies.
4. Light-hazard occupancies as defined in NFPA 13.

[F] 903.3.3 Obstructed Locations

Automatic sprinklers shall be installed with due regard to obstructions that will delay activation or obstruct the water distribution pattern. Automatic sprinklers shall be installed in or under covered kiosks, displays, booths, concession stands, or equipment that exceeds 4 feet (1219 mm) in width. Not less than a 3-foot (914 mm) clearance shall be maintained between automatic sprinklers and the top of piles of combustible fibers.

Exception: Kitchen equipment under exhaust hoods protected with a fire-extinguishing system in accordance with Section 904.

[F] 903.3.4 Actuation

Automatic sprinkler systems shall be automatically actuated unless specifically provided for in this code.

[F] 903.3.5 Water Supplies

Water supplies for automatic sprinkler systems shall comply with this section and the standards referenced in Section 903.3.1. The potable water supply shall be protected against backflow in accordance with the requirements of this section and the *Florida Building Code, Plumbing*. For connections to public waterworks systems, the water supply test used for design of fire protection systems shall be adjusted to account for seasonal and daily pressure fluctuations based on information from the water supply authority and as approved by the fire code official.

[F] 903.3.5.1 Domestic Services

Where the domestic service provides the water supply for the automatic sprinkler system, the supply shall be in accordance with this section.

[F] 903.3.5.2 Residential Combination Services

A single combination water supply shall be allowed provided that the domestic demand is added to the sprinkler demand as required by NFPA 13R.

[F] 903.3.6 Hose Threads

Fire hose threads and fittings used in connection with *automatic sprinkler systems* shall be as prescribed by the fire code official.

[F] 903.3.7 Fire Department Connections

Fire department connections for *automatic sprinkler systems* shall be installed in accordance with Section 912.

[F] 903.3.8 Limited Area Sprinkler Systems

Limited area sprinkler systems shall be in accordance with the standards listed in Section 903.3.1 except as provided in Sections 903.3.8.1 through 903.3.8.5.

903.3.8.1 Number of Sprinklers

Limited area sprinkler systems shall not exceed six sprinklers in any single *fire area*.

903.3.8.2 Occupancy Hazard Classification

Only areas classified by NFPA 13 as Light Hazard or Ordinary Hazard Group 1 shall be permitted to be protected by limited area sprinkler systems.

903.3.8.3 Piping Arrangement

Where a limited area sprinkler system is installed in a building with an automatic wet standpipe system, sprinklers shall be supplied by the standpipe system. Where a limited area sprinkler system is installed in a building without an automatic wet standpipe system, water shall be permitted to be supplied by the plumbing system provided that the plumbing system is capable of simultaneously supplying domestic and sprinkler demands.

903.3.8.4 Supervision

Control valves shall not be installed between the water supply and sprinklers unless the valves are of an *approved* indicating type that are supervised or secured in the open position.

903.3.8.5 Calculations

Hydraulic calculations in accordance with NFPA 13 shall be provided to demonstrate that the available water flow and pressure are adequate to supply all sprinklers installed in any single *fire area* with discharge densities corresponding to the hazard classification.

[F] 903.4 Sprinkler System Supervision and Alarms

Valves controlling the water supply for *automatic sprinkler systems*, pumps, tanks, water levels and temperatures, critical air pressures and waterflow switches on all sprinkler systems shall be electrically supervised by a *listed* fire alarm control unit.

Exceptions:

1. *Automatic sprinkler systems* protecting one- and two-family dwellings.
2. Limited area sprinkler systems in accordance with Section 903.3.8.
3. *Automatic sprinkler systems* installed in accordance with NFPA 13R where a common supply main is used to supply both domestic water and the *automatic sprinkler system*, and a separate shutoff valve for the *automatic sprinkler system* is not provided.
4. Jockey pump control valves that are sealed or locked in the open position.
5. Control valves to commercial kitchen hoods, paint spray booths or dip tanks that are sealed or locked in the open position.
6. Valves controlling the fuel supply to fire pump engines that are sealed or locked in the open position.
7. Trim valves to pressure switches in dry, preaction and deluge sprinkler systems that are sealed or locked in the open position.

[F] 903.4.1 Monitoring

Alarm, supervisory and trouble signals shall be distinctly different and shall be automatically transmitted to an *approved* supervising station or, where *approved* by the fire code official, shall sound an audible signal at a *constantly attended location*.

Exceptions:

1. Underground key or hub valves in roadway boxes provided by the municipality or public utility are not required to be monitored.
2. Backflow prevention device test valves located in limited area sprinkler system supply piping shall be locked in the open position. In occupancies required to be equipped with a fire alarm system, the backflow preventer valves shall be electrically supervised by a tamper switch installed in accordance with NFPA 72 and separately annunciated.

[F] 903.4.2 Alarms

An approved audible device, located on the exterior of the building in an approved location, shall be connected to each *automatic sprinkler system*. Such sprinkler waterflow alarm devices shall be activated by water flow equivalent to the flow of a single sprinkler of the smallest orifice size installed in the system. Where a fire alarm system is installed, actuation of the *automatic sprinkler system* shall actuate the building fire alarm system.

[F] 903.4.3 Floor Control Valves

Approved supervised indicating control valves shall be provided at the point of connection to the riser on each floor in high-rise buildings.

[F] 903.5 Testing and Maintenance

Sprinkler systems shall be tested and maintained in accordance with the *Florida Fire Prevention Code*.

Section 904 Alternative Automatic Fire-Extinguishing Systems**[F] 904.1 General**

Automatic fire-extinguishing systems, other than *automatic sprinkler systems*, shall be designed, installed, inspected, tested and maintained in accordance with the provisions of this section and the applicable referenced standards.

[F] 904.2 Where Permitted

Automatic fire-extinguishing systems installed as an alternative to the required *automatic sprinkler systems* of Section 903 shall be *approved* by the fire code official.

[F] 904.2.1 Restriction on Using Automatic Sprinkler System Exceptions or Reductions

Automatic fire-extinguishing systems shall not be considered alternatives for the purposes of exceptions or reductions allowed for *automatic sprinkler systems* or by other requirements of this code.

[F] 904.2.2 Commercial Hood and Duct Systems

Each required commercial kitchen exhaust hood and duct system required by the *Florida Fire Prevention Code* or Chapter 5 of the *Florida Building Code, Mechanical* to have a Type I hood shall be protected with an approved automatic fire-extinguishing system installed in accordance with this code.

[F] 904.3 Installation

Automatic fire-extinguishing systems shall be installed in accordance with this section.

[F] 904.3.1 Electrical Wiring

Electrical wiring shall be in accordance with NFPA 70.

[F] 904.3.2 Actuation

Automatic fire-extinguishing systems shall be automatically actuated and provided with a manual means of actuation in accordance with Section 904.11.1. Where more than one hazard could be simultaneously involved in fire due to their proximity, all hazards shall be protected by a single system designed to protect all hazards that could become involved.

Exception: Multiple systems shall be permitted to be installed if they are designed to operate simultaneously.

[F] 904.3.3 System Interlocking

Automatic equipment interlocks with fuel shutoffs, ventilation controls, door closers, window shutters, conveyor openings, smoke and heat vents and other features necessary for proper operation of the fire-extinguishing system shall be provided as required by the design and installation standard utilized for the hazard.

[F] 904.3.4 Alarms and Warning Signs

Where alarms are required to indicate the operation of automatic fire-extinguishing systems, distinctive audible and visible alarms and warning signs shall be provided to warn of pending agent discharge. Where exposure to automatic-extinguishing agents poses a hazard to persons and a delay is required to ensure the evacuation of occupants before agent discharge, a separate warning signal shall be provided to alert occupants once agent discharge has begun. Audible signals shall be in accordance with Section 907.5.2.

[F] 904.3.5 Monitoring

Where a building fire alarm system is installed, automatic fire-extinguishing systems shall be monitored by the building fire alarm system in accordance with NFPA 72.

[F] 904.4 Inspection and Testing

Automatic fire-extinguishing systems shall be inspected and tested in accordance with the provisions of this section prior to acceptance.

[F] 904.4.1 Inspection

Prior to conducting final acceptance tests, all of the following items shall be inspected:

1. Hazard specification for consistency with design hazard.
2. Type, location and spacing of automatic- and manual-initiating devices.
3. Size, placement and position of nozzles or discharge orifices.
4. Location and identification of audible and visible alarm devices.
5. Identification of devices with proper designations.
6. Operating instructions.

[F] 904.4.2 Alarm Testing

Notification appliances, connections to fire alarm systems and connections to *approved* supervising stations shall be tested in accordance with this section and Section 907 to verify proper operation.

[F] 904.4.2.1 Audible and Visible Signals

The audibility and visibility of notification appliances signaling agent discharge or system operation, where required, shall be verified.

[F] 904.4.3 Monitor Testing

Connections to protected premises and supervising station fire alarm systems shall be tested to verify proper identification and retransmission of alarms from automatic fire-extinguishing systems.

[F] 904.5 Wet-Chemical Systems

Wet-chemical extinguishing systems shall be installed, maintained, periodically inspected and tested in accordance with NFPA 17A and their listing. Records of inspections and testing shall be maintained.

[F] 904.6 Dry-Chemical Systems

Dry-chemical extinguishing systems shall be installed, maintained, periodically inspected and tested in accordance with NFPA 17 and their listing. Records of inspections and testing shall be maintained.

[F] 904.7 Foam Systems

Foam-extinguishing systems shall be installed, maintained, periodically inspected and tested in accordance with NFPA 11 and NFPA 16 and their listing. Records of inspections and testing shall be maintained.

[F] 904.8 Carbon Dioxide Systems

Carbon dioxide extinguishing systems shall be installed, maintained, periodically inspected and tested in accordance with NFPA 12 and their listing. Records of inspections and testing shall be maintained.

[F] 904.9 Halon Systems

Halogenated extinguishing systems shall be installed, maintained, periodically inspected and tested in accordance with NFPA 12A and their listing. Records of inspections and testing shall be maintained.

[F] 904.10 Clean-Agent Systems

Clean-agent fire-extinguishing systems shall be installed, maintained, periodically inspected and tested in accordance with NFPA 2001 and their listing. Records of inspections and testing shall be maintained.

[F] 904.11 Automatic Water Mist Systems

Automatic water mist systems shall be permitted in applications that are consistent with the applicable listing or approvals and shall comply with Sections 904.11.1 through 904.11.3.

[F] 904.11.1 Design and Installation Requirements

Automatic water mist systems shall be designed and installed in accordance with Sections 904.11.1.1 through 904.11.1.4.

[F] 904.11.1.1 General

Automatic water mist systems shall be designed and installed in accordance with NFPA 750 and the manufacturer's instructions.

[F] 904.11.1.2 Actuation

Automatic water mist systems shall be automatically actuated.

[F] 904.11.1.3 Water Supply Protection

Connections to a potable water supply shall be protected against backflow in accordance with the *Florida Building Code, Plumbing*.

[F] 904.11.1.4 Secondary Water Supply

Where a secondary water supply is required for an *automatic sprinkler system*, an *automatic water mist system* shall be provided with an *approved* secondary water supply.

[F] 904.11.2 Water Mist System Supervision and Alarms

Supervision and alarms shall be provided as required for *automatic sprinkler systems* in accordance with Section 903.4.

[F] 904.11.2.1 Monitoring

Monitoring shall be provided as required for *automatic sprinkler systems* in accordance with Section 903.4.1.

[F] 904.11.2.2 Alarms

Alarms shall be provided as required for *automatic sprinkler systems* in accordance with Section 903.4.2.

[F] 904.11.2.3 Floor Control Valves

Floor control valves shall be provided as required for *automatic sprinkler systems* in accordance with Section 903.4.3.

[F] 904.11.3 Testing and Maintenance

Automatic water mist systems shall be tested and maintained in accordance with the *Florida Fire Prevention Code*.

[F] 904.12 Commercial Cooking Systems

The automatic fire-extinguishing system for commercial cooking systems shall be of a type recognized for protection of commercial cooking equipment and exhaust systems of the type and arrangement protected. Preengineered automatic dry- and wet-chemical extinguishing systems shall be tested in accordance with UL 300 and *listed* and *labeled* for the intended application. Other types of automatic fire-extinguishing systems shall be *listed* and *labeled* for specific use as protection for commercial cooking operations. The

system shall be installed in accordance with this code, its listing and the manufacturer's installation instructions. Automatic fire-extinguishing systems of the following types shall be installed in accordance with the referenced standard indicated, as follows:

1. Carbon dioxide extinguishing systems, NFPA 12.
2. *Automatic sprinkler systems*, NFPA 13.
3. Foam-water sprinkler system or foam-water spray systems, NFPA 16.
4. Dry-chemical extinguishing systems, NFPA 17.
5. Wet-chemical extinguishing systems, NFPA 17A.

Exception: Factory-built commercial cooking recirculating systems that are tested in accordance with UL 710B and *listed, labeled* and installed in accordance with Section 304.1 of the *Florida Building Code, Mechanical*.

[F] 904.12.1 Manual System Operation

A manual actuation device shall be located at or near a *means of egress* from the cooking area not less than 10 feet (3048 mm) and not more than 20 feet (6096 mm) from the kitchen exhaust system. The manual actuation device shall be installed not more than 48 inches (1200 mm) or less than 42 inches (1067 mm) above the floor and shall clearly identify the hazard protected. The manual actuation shall require a maximum force of 40 pounds (178 N) and a maximum movement of 14 inches (356 mm) to actuate the fire suppression system.

Exception: *Automatic sprinkler systems* shall not be required to be equipped with manual actuation means.

[F] 904.12.2 System Interconnection

The actuation of the fire suppression system shall automatically shut down the fuel or electrical power supply to the cooking equipment. The fuel and electrical supply reset shall be manual.

[F] 904.12.3 Carbon Dioxide Systems

Where carbon dioxide systems are used, there shall be a nozzle at the top of the ventilating duct. Additional nozzles that are symmetrically arranged to give uniform distribution shall be installed within vertical ducts exceeding 20 feet (6096 mm) and horizontal ducts exceeding 50 feet (15 240 mm). *Dampers* shall be installed at either the top or the bottom of the duct and shall be arranged to operate automatically upon activation of the fire-extinguishing system. Where the *damper* is installed at the top of the duct, the top nozzle shall be immediately below the *damper*. Automatic carbon dioxide fire-extinguishing systems shall be sufficiently sized to protect against all hazards venting through a common duct simultaneously.

[F] 904.12.3.1 Ventilation System

Commercial-type cooking equipment protected by an automatic carbon dioxide-extinguishing system shall be arranged to shut off the ventilation system upon activation.

[F] 904.12.4 Special Provisions for Automatic Sprinkler Systems

Automatic sprinkler systems protecting commercial-type cooking equipment shall be supplied from a separate, readily accessible, indicating-type control valve that is identified.

[F] 904.12.4.1 Listed Sprinklers

Sprinklers used for the protection of fryers shall be tested in accordance with UL 199E, *listed* for that application and installed in accordance with their listing.

[F] 904.13 Domestic Cooking Systems in Group I-2 Condition 1

In Group I-2 Condition 1, occupancies where cooking facilities are installed in accordance with Section 407.2.6 of this code, the domestic cooking hood provided over the cooktop or range shall be equipped with an automatic fire-extinguishing system of a type recognized for protection of domestic cooking equipment. Preengineered automatic extinguishing systems shall be tested in accordance with UL 300A

and listed and labeled for the intended application. The system shall be installed in accordance with this code, its listing and the manufacturer's instructions.

[F] 904.13.1 Manual System Operation and Interconnection

Manual actuation and system interconnection for the hood suppression system shall be installed in accordance with Sections 904.12.1 and 904.12.2, respectively.

[F] 904.13.2 Portable Fire Extinguishers for Domestic Cooking Equipment in Group I-2 Condition 1

A portable fire extinguisher complying with Section 906 shall be installed within a 30-foot (9144 mm) distance of travel from domestic cooking appliances.

Section 905 Standpipe Systems

[F] 905.1 General

Standpipe systems shall be provided in new buildings and structures in accordance with Sections 905.2 through 905.10. In buildings used for high-piled combustible storage, fire protection shall be in accordance with the *Florida Fire Prevention Code*.

[F] 905.2 Installation Standard

Standpipe systems shall be installed in accordance with this section and NFPA 14. Fire department connections for standpipe systems shall be in accordance with Section 912.

[F] 905.3 Required Installations

Standpipe systems shall be installed where required by Sections 905.3.1 through 905.3.8. Standpipe systems are allowed to be combined with *automatic sprinkler systems*.

Exception: Standpipe systems are not required in Group R-3 occupancies.

[F] 905.3.1 Height

Class III standpipe systems shall be installed throughout buildings where the floor level of the highest *story* is located more than 30 feet (9144 mm) above the lowest level of fire department vehicle access, or where the floor level of the lowest *story* is located more than 30 feet (9144 mm) below the highest level of fire department vehicle access.

Exceptions:

1. Class I standpipes are allowed in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2.
2. Class I manual standpipes are allowed in *open parking garages* where the highest floor is located not more than 150 feet (45 720 mm) above the lowest level of fire department vehicle access.
3. Class I manual dry standpipes are allowed in *open parking garages* that are subject to freezing temperatures, provided that the hose connections are located as required for Class II standpipes in accordance with Section 905.5.
4. Class I standpipes are allowed in basements equipped throughout with an *automatic sprinkler system*.
5. In determining the lowest level of fire department vehicle access, it shall not be required to consider either of the following:
 - 5.1. Recessed loading docks for four vehicles or less.
 - 5.2. Conditions where topography makes access from the fire department vehicle to the building impractical or impossible.

[F] 905.3.2 Group A

Class I automatic wet standpipes shall be provided in nonsprinklered Group A buildings having an *occupant load* exceeding 1,000 persons.

Exceptions:

1. Open-air-seating spaces without enclosed spaces.
2. Class I automatic dry and semiautomatic dry standpipes or manual wet standpipes are allowed in buildings that are not high-rise buildings.

[F] 905.3.3 Covered and Open Mall Buildings

Covered mall and open mall buildings shall be equipped throughout with a standpipe system where required by Section 905.3.1. Mall buildings not required to be equipped with a standpipe system by Section 905.3.1 shall be equipped with Class I hose connections connected to the *automatic sprinkler system* sized to deliver water at 250 gallons per minute (946.4 L/min) at the most hydraulically remote hose connection while concurrently supplying the automatic sprinkler system demand. The standpipe system shall be designed to not exceed a 50 pounds per square inch (psi) (345 kPa) residual pressure loss with a flow of 250 gallons per minute (946.4 L/min) from the fire department connection to the hydraulically most remote hose connection. Hose connections shall be provided at each of the following locations:

1. Within the mall at the entrance to each *exit passageway or corridor*.
2. At each floor-level landing within *interior exit stairways* opening directly on the mall.
3. At exterior public entrances to the mall of a covered mall building.
4. At public entrances at the perimeter line of an open mall building.
5. At other locations as necessary so that the distance to reach all portions of a tenant space does not exceed 200 feet (60 960 mm) from a hose connection.

[F] 905.3.4 Stages

Stages greater than 1,000 square feet in area (93 m^2) shall be equipped with a Class III wet standpipe system with $1\frac{1}{2}$ -inch and $2\frac{1}{2}$ -inch (38 mm and 64 mm) hose connections on each side of the stage.

Exception: Where the building or area is equipped throughout with an *automatic sprinkler system*, a $1\frac{1}{2}$ -inch (38 mm) hose connection shall be installed in accordance with NFPA 13 or in accordance with NFPA 14 for Class II or III standpipes.

[F] 905.3.4.1 Hose and Cabinet

The $1\frac{1}{2}$ -inch (38 mm) hose connections shall be equipped with sufficient lengths of $1\frac{1}{2}$ -inch (38 mm) hose to provide fire protection for the stage area. Hose connections shall be equipped with an *approved* adjustable fog nozzle and be mounted in a cabinet or on a rack.

[F] 905.3.5 Underground Buildings

Underground buildings shall be equipped throughout with a Class I automatic wet or manual wet standpipe system.

[F] 905.3.6 Heliports and Heliports

Buildings with a rooftop *heliport* or *helipad* shall be equipped with a Class I or III standpipe system extended to the roof level on which the *heliport* or *helipad* is located in accordance with the *Florida Fire Prevention Code*.

[F] 905.3.7 Marinas and Boatyards

Standpipes in marinas and boatyards shall comply with the *Florida Fire Prevention Code*.

[F] 905.3.8 Rooftop Gardens and Landscaped Roofs

Buildings or structures that have rooftop gardens or landscaped roofs and that are equipped with a standpipe system shall have the standpipe system extended to the roof level on which the rooftop garden or landscaped roof is located.

[F] 905.4 Location of Class I Standpipe Hose Connections

Class I standpipe hose connections shall be provided in all of the following locations:

1. In every required *interior exit stairway*, a hose connection shall be provided for each story above and below grade. Hose connections shall be located at the main floor landing, unless otherwise *approved* by the fire code official.

Exception: A single hose connection shall be permitted to be installed in the open corridor or open breezeway between open stairs that are not greater than 75 feet (22 860 mm) apart.

2. On each side of the wall adjacent to the *exit* opening of a *horizontal exit*.

Exception: Where floor areas adjacent to a *horizontal exit* are reachable from an *interior exit stairway* hose connection by a 30-foot (9144 mm) hose stream from a nozzle attached to 100 feet (30 480 mm) of hose, a hose connection shall not be required at the *horizontal exit*.

3. In every *exit passageway*, at the entrance from the *exit passageway* to other areas of a building.

Exception: Where floor areas adjacent to an *exit passageway* are reachable from an *interior exit stairway* hose connection by a 30-foot (9144 mm) hose stream from a nozzle attached to 100 feet (30 480 mm) of hose, a hose connection shall not be required at the entrance from the *exit passageway* to other areas of the building.

4. In covered mall buildings, adjacent to each exterior public entrance to the mall and adjacent to each entrance from an *exit passageway* or *exit corridor* to the mall. In open mall buildings, adjacent to each public entrance to the mall at the perimeter line and adjacent to each entrance from an *exit passageway* or *exit corridor* to the mall.

5. Where the roof has a slope less than four units vertical in 12 units horizontal (33.3-percent slope), a hose connection shall be located to serve the roof or at the highest landing of an *interior exit stairway* with access to the roof provided in accordance with Section 1011.12.

6. Where the most remote portion of a nonsprinklered floor or *story* is more than 150 feet (45 720 mm) from a hose connection or the most remote portion of a sprinklered floor or *story* is more than 200 feet (60 960 mm) from a hose connection, the fire code official is authorized to require that additional hose connections be provided in *approved* locations.

[F] 905.4.1 Protection

Risers and laterals of Class I standpipe systems not located within an *interior exit stairway* shall be protected by a degree of *fire resistance* equal to that required for vertical enclosures in the building in which they are located.

Exception: In buildings equipped throughout with an *approved automatic sprinkler system*, laterals that are not located within an *interior exit stairway* are not required to be enclosed within fire-resistance-rated construction.

[F] 905.4.2 Interconnection

In buildings where more than one standpipe is provided, the standpipes shall be interconnected in accordance with NFPA 14.

[F] 905.5 Location of Class II Standpipe Hose Connections

Class II standpipe hose connections shall be accessible and located so that all portions of the building are within 30 feet (9144 mm) of a nozzle attached to 100 feet (30 480 mm) of hose.

[F] 905.5.1 Groups A-1 and A-2

In Group A-1 and A-2 occupancies having *occupant loads* exceeding 1,000 persons, hose connections shall be located on each side of any stage, on each side of the rear of the auditorium, on each side of the balcony and on each tier of dressing rooms.

[F] 905.5.2 Protection

Fire-resistance-rated protection of risers and laterals of Class II standpipe systems is not required.

[F] 905.5.3 Class II System 1-Inch Hose

A minimum 1-inch (25 mm) hose shall be allowed to be used for hose stations in light-hazard occupancies where investigated and *listed* for this service and where *approved* by the fire code official.

[F] 905.6 Location of Class III Standpipe Hose Connections

Class III standpipe systems shall have hose connections located as required for Class I standpipes in Section 905.4 and shall have Class II hose connections as required in Section 905.5.

[F] 905.6.1 Protection

Risers and laterals of Class III standpipe systems shall be protected as required for Class I systems in accordance with Section 905.4.1.

[F] 905.6.2 Interconnection

In buildings where more than one Class III standpipe is provided, the standpipes shall be interconnected in accordance with NFPA 14.

[F] 905.7 Cabinets

Cabinets containing fire-fighting equipment such as standpipes, fire hoses, fire extinguishers or fire department valves shall not be blocked from use or obscured from view.

[F] 905.7.1 Cabinet Equipment Identification

Cabinets shall be identified in an *approved* manner by a permanently attached sign with letters not less than 2 inches (51 mm) high in a color that contrasts with the background color, indicating the equipment contained therein.

Exceptions:

1. Doors not large enough to accommodate a written sign shall be marked with a permanently attached pictogram of the equipment contained therein.
2. Doors that have either an *approved* visual identification clear glass panel or a complete glass door panel are not required to be marked.

[F] 905.7.2 Locking Cabinet Doors

Cabinets shall be unlocked.

Exceptions:

1. Visual identification panels of glass or other *approved* transparent frangible material that is easily broken and allows access.
2. *Approved* locking arrangements.
3. Group I-3.

[F] 905.8 Dry Standpipes

Dry standpipes shall not be installed.

Exception: Where subject to freezing and in accordance with NFPA 14.

[F] 905.9 Valve Supervision

Valves controlling water supplies shall be supervised in the open position so that a change in the normal position of the valve will generate a supervisory signal at the supervising station required by Section 903.4. Where a fire alarm system is provided, a signal shall be transmitted to the control unit.

Exceptions:

1. Valves to underground key or hub valves in roadway boxes do not require supervision.
2. Valves locked in the normal position and inspected as provided in this code in buildings not equipped with a fire alarm system.

[F] 905.10 During Construction

Standpipe systems required during construction and demolition operations shall be provided in accordance with Section 3311.

Section 906 Portable Fire Extinguishers**[F] 906.1 Where Required**

Portable fire extinguishers shall be installed in all of the following locations:

1. In Group A, B, E, F, H, I, M, R-1, R-2, R-4 and S occupancies.

Exceptions:

1. In Group R-2 occupancies, portable fire extinguishers shall be required only in locations specified in Items 2 through 6 where each dwelling unit is provided with a portable fire extinguisher having a minimum rating of 1-A:10-B:C.
2. In Group E occupancies, portable fire extinguishers shall be required only in locations specified in Items 2 through 6 where each classroom is provided with a portable fire extinguisher having a minimum rating of 2-A:20-B:C.
3. In storage areas of Group S occupancies where forklift, powered industrial truck or powered cart operators are the primary occupants, fixed extinguishers, as specified in NFPA 10, shall not be required where in accordance with all of the following:
 - 3.1. Use of vehicle-mounted extinguishers shall be approved by the fire code official.
 - 3.2. Each vehicle shall be equipped with a 10-pound, 40A:80B:C extinguisher affixed to the vehicle using a mounting bracket approved by the extinguisher manufacturer or the fire code official for vehicular use.
 - 3.3. Not less than two spare extinguishers of equal or greater rating shall be available on site to replace a discharged extinguisher.
 - 3.4. Vehicle operators shall be trained in the proper operation, use and inspection of extinguishers.
 - 3.5. Inspections of vehicle-mounted extinguishers shall be performed daily.
2. Within 30 feet (9144 mm) of commercial cooking equipment.
3. In areas where flammable or combustible liquids are stored, used or dispensed.
4. On each floor of structures under construction, except Group R-3 occupancies, in accordance with the *Florida Fire Prevention Code*.
5. Where required by the *Florida Fire Prevention Code*.
6. Special-hazard areas, including but not limited to laboratories, computer rooms and generator rooms, where required by the fire code official.

Exception: Portable fire extinguishers are not required at normally unmanned Group U occupancy buildings or structures where a portable fire extinguisher suitable to the hazard of the location is provided on the vehicle of visiting personnel.

Table [F] 906.1 Additional Required Portable Fire Extinguishers in the *Florida Fire Prevention Code*. Reserved.**[F] 906.2 General Requirements**

Portable fire extinguishers shall be selected and installed in accordance with this section and NFPA 10.

Exceptions:

1. The distance of travel to reach an extinguisher shall not apply to the spectator seating portions of Group A-5 occupancies.
2. In Group I-3, portable fire extinguishers shall be permitted to be located at staff locations.

[F] 906.3 Size and Distribution

The size and distribution of portable fire extinguishers shall be in accordance with Sections 906.3.1 through 906.3.4.

[F] TABLE 906.3(1)**FIRE EXTINGUISHERS FOR CLASS A FIRE HAZARDS**

	LIGHT (Low) HAZARD OCCUPANCY	ORDINARY (Moderate) HAZARD OCCUPANCY	EXTRA (High) HAZARD OCCUPANCY
Minimum rated single extinguisher	2-A ^c	2-A	4-A ^a
Maximum floor area per unit of A	3,000 square feet	1,500 square feet	1,000 square feet
Maximum floor area for extinguisher ^b	11,250 square feet	11,250 square feet	11,250 square feet
Maximum distance of travel to extinguisher	75 feet	75 feet	75 feet

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m², 1 gallon = 3.785 L.

- a. Two 2½-gallon water-type extinguishers shall be deemed the equivalent of one 4-A rated extinguisher.
- b. Annex E.3.3 of NFPA 10 provides more details concerning application of the maximum floor area criteria.
- c. Two water-type extinguishers each with a 1-A rating shall be deemed the equivalent of one 2-A rated extinguisher for Light (Low) Hazard Occupancies.

[F] TABLE 906.3(2)**FIRE EXTINGUISHERS FOR FLAMMABLE OR COMBUSTIBLE LIQUIDS WITH DEPTHS LESS THAN OR EQUAL TO 0.25 INCH**

TYPE OF HAZARD	BASIC MINIMUM EXTINGUISHER RATING	MAXIMUM DISTANCE OF TRAVEL TO EXTINGUISHERS (feet)

Light (Low)	5-B	30
	10-B	50
Ordinary (Moderate)	10-B	30
	20-B	50
Extra (High)	40-B	30
	80-B	50

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

Note: For requirements on water-soluble flammable liquids and alternative sizing criteria, see Section 5.5 of NFPA 10.

[F] 906.3.1 Class A Fire Hazards

The minimum sizes and distribution of portable fire extinguishers for occupancies that involve primarily Class A fire hazards shall comply with Table 906.3(1).

[F] 906.3.2 Class B Fire Hazards

Portable fire extinguishers for occupancies involving flammable or combustible liquids with depths less than or equal to 0.25-inch (6.4 mm) shall be selected and placed in accordance with Table 906.3(2).

Portable fire extinguishers for occupancies involving flammable or combustible liquids with a depth of greater than 0.25-inch (6.4 mm) shall be selected and placed in accordance with NFPA 10.

[F] 906.3.3 Class C Fire Hazards

Portable fire extinguishers for Class C fire hazards shall be selected and placed on the basis of the anticipated Class A or B hazard.

[F] 906.3.4 Class D Fire Hazards

Portable fire extinguishers for occupancies involving combustible metals shall be selected and placed in accordance with NFPA 10.

[F] 906.4 Cooking Grease Fires

Fire extinguishers provided for the protection of cooking grease fires shall be of an *approved* type compatible with the automatic fire-extinguishing system agent and in accordance with the *Florida Fire Prevention Code*.

[F] 906.5 Conspicuous Location

Portable fire extinguishers shall be located in conspicuous locations where they will be readily accessible and immediately available for use. These locations shall be along normal paths of travel, unless the fire code official determines that the hazard posed indicates the need for placement away from normal paths of travel.

[F] 906.6 Unobstructed and Unobscured

Portable fire extinguishers shall not be obstructed or obscured from view. In rooms or areas in which visual obstruction cannot be completely avoided, means shall be provided to indicate the locations of extinguishers.

[F] 906.7 Hangers and Brackets

Hand-held portable fire extinguishers, not housed in cabinets, shall be installed on the hangers or brackets supplied. Hangers or brackets shall be securely anchored to the mounting surface in accordance with the manufacturer's installation instructions.

[F] 906.8 Cabinets

Cabinets used to house portable fire extinguishers shall not be locked.

Exceptions:

- Where portable fire extinguishers subject to malicious use or damage are provided with a means of ready access.

2. In Group I-3 occupancies and in mental health areas in Group I-2 occupancies, access to portable fire extinguishers shall be permitted to be locked or to be located in staff locations provided the staff has keys.

[F] 906.9 Extinguisher Installation

The installation of portable fire extinguishers shall be in accordance with Sections 906.9.1 through 906.9.3.

[F] 906.9.1 Extinguishers Weighing 40 Pounds or Less

Portable fire extinguishers having a gross weight not exceeding 40 pounds (18 kg) shall be installed so that their tops are not more than 5 feet (1524 mm) above the floor.

[F] 906.9.2 Extinguishers Weighing More Than 40 Pounds

Hand-held portable fire extinguishers having a gross weight exceeding 40 pounds (18 kg) shall be installed so that their tops are not more than 3.5 feet (1067 mm) above the floor.

[F] 906.9.3 Floor Clearance

The clearance between the floor and the bottom of installed hand-held portable fire extinguishers shall be not less than 4 inches (102 mm).

[F] 906.10 Wheeled Units

Wheeled fire extinguishers shall be conspicuously located in a designated location.

Section 907 Fire Alarm and Detection Systems

[F] 907.1 General

This section covers the application, installation, performance and maintenance of fire alarm systems and their components.

[F] 907.1.1 Construction Documents

Construction documents for fire alarm systems shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that it will conform to the provisions of this code, the *Florida Fire Prevention Code* and relevant laws, ordinances, rules and regulations, as determined by the fire code official.

[F] 907.1.2 Fire Alarm Shop Drawings

Shop drawings for fire alarm systems shall be prepared in accordance with NFPA 72 and submitted for review and approval prior to system installation.

[F] 907.1.3 Equipment

Systems and components shall be *listed* and *approved* for the purpose for which they are installed.

907.1.4 Accessibility

Every required fire alarm system shall include a visible alarm indicating appliances in public and common areas. For more specific accessibility requirements related to alarm indicating appliances, refer to applicable sections of the *Florida Building Code, Accessibility*.

[F] 907.2 Where Required—New Buildings and Structures

An *approved* fire alarm system installed in accordance with the provisions of this code and NFPA 72 shall be provided in new buildings and structures in accordance with Sections 907.2.1 through 907.2.23 and provide occupant notification in accordance with Section 907.5, unless other requirements are provided by another section of this code.

Not fewer than one manual fire alarm box shall be provided in an *approved* location to initiate a fire alarm signal for fire alarm systems employing automatic fire detectors or waterflow detection devices. Where other sections of this code allow elimination of fire alarm boxes due to sprinklers, a single fire alarm box shall be installed.

Exceptions:

1. The manual fire alarm box is not required for fire alarm systems dedicated to elevator recall control and supervisory service.

2. The manual fire alarm box is not required for Group R-2 occupancies unless required by the fire code official to provide a means for fire watch personnel to initiate an alarm during a sprinkler system impairment event. Where provided, the manual fire alarm box shall not be located in an area that is accessible to the public.

[F] 907.2.1 Group A

A manual fire alarm system that activates the occupant notification system in accordance with Section 907.5 shall be installed in Group A occupancies where the occupant load due to the assembly occupancy is 300 or more, or where the Group A occupant load is more than 100 persons above or below the lowest level of exit discharge. Group A occupancies not separated from one another in accordance with Section 707.3.10 shall be considered as a single occupancy for the purposes of applying this section. Portions of Group E occupancies occupied for assembly purposes shall be provided with a fire alarm system as required for the Group E occupancy.

Exception: Manual fire alarm boxes are not required where the building is equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 and the occupant notification appliances will activate throughout the notification zones upon sprinkler water flow.

[F] 907.2.1.1 System Initiation in Group A Occupancies With an Occupant Load of 1,000 or More

Activation of the fire alarm in Group A occupancies with an *occupant load* of 1,000 or more shall initiate a signal using an emergency voice/alarm communications system in accordance with Section 907.5.2.2.

Exception: Where *approved*, the prerecorded announcement is allowed to be manually deactivated for a period of time, not to exceed 3 minutes, for the sole purpose of allowing a live voice announcement from an *approved, constantly attended location*.

[F] 907.2.1.2 Emergency Voice/Alarm Communication Captions

Stadiums, arenas and grandstands required to caption audible public announcements shall be in accordance with Section 907.5.2.2.4.

[F] 907.2.2 Group B

A manual fire alarm system, which activates the occupant notification system in accordance with Section 907.5, shall be installed in Group B occupancies where one of the following conditions exists:

1. The combined Group B *occupant load* of all floors is 500 or more.
2. The Group B *occupant load* is more than 100 persons above or below the lowest *level of exit discharge*.
3. The *fire area* contains an ambulatory care facility.

Exception: Manual fire alarm boxes are not required where the building is equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 and the occupant notification appliances will activate throughout the notification zones upon sprinkler water flow.

[F] 907.2.2.1 Ambulatory Care Facilities

Fire areas containing ambulatory care facilities shall be provided with an electronically supervised automatic smoke detection system installed within the ambulatory care facility and in public use areas outside of tenant spaces, including public *corridors* and elevator lobbies.

Exception: Buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, provided the occupant notification appliances will activate throughout the notification zones upon sprinkler waterflow.

[F] 907.2.3 Group E

A manual fire alarm system that initiates the occupant notification signal utilizing an emergency voice/alarm communication system meeting the requirements of Section 907.5.2.2 and installed in accordance with Section 907.6 shall be installed in Group E occupancies. When *automatic sprinkler systems* or smoke detectors are installed, such systems or detectors shall be connected to the building fire alarm system.

Exceptions:

1. A manual fire alarm system is not required in Group E occupancies with an *occupant load* of 50 or less.
2. Emergency voice/alarm communication systems meeting the requirements of Section 907.5.2.2 and installed in accordance with Section 907.6 shall not be required in Group E occupancies with occupant loads of 100 or less, provided that activation of the manual fire alarm system initiates an *approved* occupant notification signal in accordance with Section 907.5.
3. Manual fire alarm boxes shall not be required in Group E occupancies where all of the following apply:
 - 3.1. Interior *corridors* are protected by smoke detectors.
 - 3.2. Auditoriums, cafeterias, gymnasiums and similar areas are protected by *heat detectors* or other *approved* detection devices.
 - 3.3. Shops and laboratories involving dusts or vapors are protected by *heat detectors* or other *approved* detection devices.
 - 3.4. Manual activation is provided from a normally occupied location.
4. Manual fire alarm boxes shall not be required in Group E occupancies where all of the following apply:
 - 4.1. The building is equipped throughout with an *approved automatic sprinkler system* installed in accordance with Section 903.3.1.1.
 - 4.2. The emergency voice/alarm communication system will activate on sprinkler waterflow.
 - 4.3. Manual activation is provided from a normally occupied location.

[F] 907.2.4 Group F

A manual fire alarm system that activates the occupant notification system in accordance with Section 907.5 shall be installed in Group F occupancies where both of the following conditions exist:

1. The Group F occupancy is two or more *stories* in height.
2. The Group F occupancy has a combined *occupant load* of 500 or more above or below the lowest *level of exit discharge*.

Exception: Manual fire alarm boxes are not required where the building is equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 and the occupant notification appliances will activate throughout the notification zones upon sprinkler water flow.

[F] 907.2.5 Group H

A manual fire alarm system that activates the occupant notification system in accordance with Section 907.5 shall be installed in Group H-5 occupancies and in occupancies used for the manufacture of organic coatings. An automatic smoke detection system shall be installed for highly toxic gases, organic peroxides and oxidizers in accordance with the *Florida Fire Prevention Code*.

[F] 907.2.6 Group I

A manual fire alarm system that activates the occupant notification system in accordance with Section 907.5 shall be installed in Group I occupancies. An automatic smoke detection system that activates the occupant notification system in accordance with Section 907.5 shall be provided in accordance with Sections 907.2.6.1, 907.2.6.2 and 907.2.6.3.3.

Exceptions:

1. Manual fire alarm boxes in sleeping units of Group I-1 and I-2 occupancies shall not be required at *exits* if located at all care providers' control stations or other constantly attended staff locations, provided such stations are visible and continuously

accessible and that the distances of travel required in Section 907.4.2.1 are not exceeded.

2. Occupant notification systems are not required to be activated where private mode signaling installed in accordance with NFPA 72 is *approved* by the fire code official and staff evacuation responsibilities are included in the fire safety and evacuation plan required by the *Florida Fire Prevention Code*.

[F] 907.2.6.1 Group I-1

In Group I-1 occupancies, an automatic smoke detection system shall be installed in *corridors*, waiting areas open to *corridors* and *habitable spaces* other than *sleeping units* and kitchens. The system shall be activated in accordance with Section 907.5.

Exceptions:

1. For Group I-1 Condition 1 occupancies, smoke detection in *habitable spaces* is not required where the facility is equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1.
2. Smoke detection is not required for exterior balconies.

[F] 907.2.6.1.1 Smoke Alarms

Single- and multiple-station smoke alarms shall be installed in accordance with Section 907.2.11.

[F] 907.2.6.2 Group I-2

An automatic smoke detection system shall be installed in *corridors* in Group I-2 Condition 1 facilities and spaces permitted to be open to the *corridors* by Section 407.2. The system shall be activated in accordance with Section 907.4. Group I-2 Condition 2 occupancies shall be equipped with an automatic smoke detection system as required in Section 407.

Exceptions:

1. Corridor smoke detection is not required in smoke compartments that contain sleeping units where such units are provided with smoke detectors that comply with UL 268. Such detectors shall provide a visual display on the corridor side of each sleeping unit and shall provide an audible and visual alarm at the care providers' station attending each unit.
2. Corridor smoke detection is not required in smoke compartments that contain sleeping units where sleeping unit doors are equipped with automatic door-closing devices with integral smoke detectors on the unit sides installed in accordance with their listing, provided that the integral detectors perform the required alerting function.

[F] 907.2.6.3 Group I-3 Occupancies

Group I-3 occupancies shall be equipped with a manual fire alarm system and automatic smoke detection system installed for alerting staff.

[F] 907.2.6.3.1 System Initiation

Actuation of an automatic fire-extinguishing system, *automatic sprinkler system*, a manual fire alarm box or a fire detector shall initiate an approved fire alarm signal that automatically notifies staff.

[F] 907.2.6.3.2 Manual Fire Alarm Boxes

Manual fire alarm boxes are not required to be located in accordance with Section 907.4.2 where the fire alarm boxes are provided at staff-attended locations having direct supervision over areas where manual fire alarm boxes have been omitted.

[F] 907.2.6.3.2.1 Manual Fire Alarm Boxes in Detainee Areas

Manual fire alarm boxes are allowed to be locked in areas occupied by detainees, provided that staff members are present within the subject area and have keys readily available to operate the manual fire alarm boxes.

[F] 907.2.6.3.3 Automatic Smoke Detection System

An automatic smoke detection system shall be installed throughout resident housing areas, including *sleeping units* and contiguous day rooms, group activity spaces and other common spaces normally accessible to residents.

Exceptions:

1. Other *approved* smoke detection arrangements providing equivalent protection, including, but not limited to, placing detectors in exhaust ducts from cells or behind protective guards *listed* for the purpose, are allowed when necessary to prevent damage or tampering.
2. *Sleeping units* in Use Conditions 2 and 3 as described in Section 308.
3. Smoke detectors are not required in *sleeping units* with four or fewer occupants in smoke compartments that are equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1.

[F] 907.2.7 Group M

A manual fire alarm system that activates the occupant notification system in accordance with Section 907.5 shall be installed in Group M occupancies where one of the following conditions exists:

1. The combined Group M *occupant load* of all floors is 500 or more persons.
2. The Group M *occupant load* is more than 100 persons above or below the lowest *level of exit discharge*.

Exceptions:

1. A manual fire alarm system is not required in *covered or open mall buildings* complying with Section 402.
2. Manual fire alarm boxes are not required where the building is equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 and the occupant notification appliances will automatically activate throughout the notification zones upon sprinkler water flow.

[F] 907.2.7.1 Occupant Notification

During times that the building is occupied, the initiation of a signal from a manual fire alarm box or from a waterflow switch shall not be required to activate the alarm notification appliances when an alarm signal is activated at a *constantly attended location* from which evacuation instructions shall be initiated over an emergency voice/alarm communication system installed in accordance with Section 907.5.2.2.

[F] 907.2.8 Group R-1

Fire alarm systems and smoke alarms shall be installed in Group R-1 occupancies as required in Sections 907.2.8.1 through 907.2.8.3.

[F] 907.2.8.1 Manual Fire Alarm System

A manual fire alarm system that activates the occupant notification system in accordance with Section 907.5 shall be installed in Group R-1 occupancies.

Exceptions:

1. A manual fire alarm system is not required in buildings not more than two *stories* in height where all individual *sleeping units* and contiguous *attic* and crawl spaces to those units are separated from each other and public or common areas by not less than 1-hour *fire partitions* and each individual *sleeping unit* has an *exit* directly to a *public way, egress court or yard*.
2. Manual fire alarm boxes are not required throughout the building where all of the following conditions are met:

- 2.1. The building is equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 or 903.3.1.2.
- 2.2. The notification appliances will activate upon sprinkler water flow.
- 2.3. Not fewer than one manual fire alarm box is installed at an *approved* location.

[F] 907.2.8.2 Automatic Smoke Detection System

An automatic smoke detection system that activates the occupant notification system in accordance with Section 907.5 shall be installed throughout all interior *corridors* serving *sleeping units*.

Exception: An automatic smoke detection system is not required in buildings that do not have interior *corridors* serving *sleeping units* and where each *sleeping unit* has a *means of egress* door opening directly to an *exit* or to an exterior *exit access* that leads directly to an *exit*.

[F] 907.2.8.3 Smoke Alarms

Single- and multiple-station smoke alarms shall be installed in accordance with Section 907.2.11.

[F] 907.2.9 Group R-2

Fire alarm systems and smoke alarms shall be installed in Group R-2 occupancies as required in Sections 907.2.9.1 through 907.2.9.3.

[F] 907.2.9.1 Manual Fire Alarm System

A manual fire alarm system that activates the occupant notification system in accordance with Section 907.5 shall be installed in Group R-2 occupancies where any of the following conditions apply:

1. Any *dwelling unit* or *sleeping unit* is located three or more *stories* above the lowest *level of exit discharge*.
2. Any *dwelling unit* or *sleeping unit* is located more than one story below the highest *level of exit discharge* of exits serving the *dwelling unit* or *sleeping unit*.
3. The building contains more than 16 *dwelling units* or *sleeping units*.

Exceptions:

1. A fire alarm system is not required in buildings not more than two *stories* in height where all *dwelling units* or *sleeping units* and contiguous *attic* and crawl spaces are separated from each other and public or common areas by not less than 1-hour *fire partitions* and each *dwelling unit* or *sleeping unit* has an *exit* directly to a *public way*, *egress court* or *yard*.
2. Manual fire alarm boxes are not required where the building is equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 or 903.3.1.2 and the occupant notification appliances will automatically activate throughout the notification zones upon a sprinkler water flow.
3. A fire alarm system is not required in buildings that do not have interior *corridors* serving *dwelling units* and are protected by an *approved automatic sprinkler system* installed in accordance with Section 903.3.1.1 or 903.3.1.2, provided that *dwelling units* either have a *means of egress* door opening directly to an exterior *exit access* that leads directly to the *exits* or are served by open-ended *corridors* designed in accordance with Section 1027.6, Exception 3.

[F] 907.2.9.2 Smoke Alarms

Single- and multiple-station smoke alarms shall be installed in accordance with Section 907.2.11.

[F] 907.2.9.3 Group R-2 College and University Buildings

An automatic smoke detection system that activates the occupant notification system in accordance with Section 907.5 shall be installed in Group R-2 occupancies operated by a college or university for student or staff housing in all of the following locations:

1. Common spaces outside of *dwelling units* and *sleeping units*.
2. Laundry rooms, mechanical equipment rooms and storage rooms.
3. All interior corridors serving *sleeping units* or *dwelling units*.

Exception: An automatic smoke detection system is not required in buildings that do not have interior *corridors* serving *sleeping units* or *dwelling units* and where each *sleeping unit* or *dwelling unit* either has a *means of egress* door opening directly to an exterior *exit access* that leads directly to an *exit* or a *means of egress* door opening directly to an *exit*.

Required smoke alarms in *dwelling units* and *sleeping units* in Group R-2 occupancies operated by a college or university for student or staff housing shall be interconnected with the fire alarm system in accordance with NFPA 72.

[F] 907.2.10 Group R-4

Fire alarm systems and smoke alarms shall be installed in Group R-4 occupancies as required in Sections 907.2.10.1 through 907.2.10.3.

[F] 907.2.10.1 Manual Fire Alarm System

A manual fire alarm system that activates the occupant notification system in accordance with Section 907.5 shall be installed in Group R-4 occupancies.

Exceptions:

1. A manual fire alarm system is not required in buildings not more than two *stories* in height where all individual *sleeping units* and contiguous *attic* and crawl spaces to those units are separated from each other and public or common areas by not less than 1-hour *fire partitions* and each individual *sleeping unit* has an *exit* directly to a *public way, egress court or yard*.
2. Manual fire alarm boxes are not required throughout the building where all of the following conditions are met:
 - 2.1. The building is equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 or 903.3.1.2.
 - 2.2. The notification appliances will activate upon sprinkler water flow.
 - 2.3. Not fewer than one manual fire alarm box is installed at an *approved* location.
3. Manual fire alarm boxes in resident or patient sleeping areas shall not be required at *exits* where located at all nurses' control stations or other constantly attended staff locations, provided such stations are visible and continuously accessible and that the distances of travel required in Section 907.4.2.1 are not exceeded.

[F] 907.2.10.2 Automatic Smoke Detection System

An automatic smoke detection system that activates the occupant notification system in accordance with Section 907.5 shall be installed in *corridors*, waiting areas open to *corridors* and *habitable spaces* other than *sleeping units* and kitchens.

Exceptions:

1. Smoke detection in *habitable spaces* is not required where the facility is equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1.

2. An automatic smoke detection system is not required in buildings that do not have interior *corridors* serving *sleeping units* and where each *sleeping unit* has a *means of egress* door opening directly to an *exit* or to an exterior *exit access* that leads directly to an *exit*.

[F] 907.2.10.3 Smoke Alarms

Single- and multiple-station smoke alarms shall be installed in accordance with Section 907.2.11.

[F] 907.2.11 Single- And Multiple-Station Smoke Alarms

Listed single- and multiple-station smoke alarms complying with UL 217 shall be installed in accordance with Sections 907.2.11.1 through 907.2.11.6 and NFPA 72.

[F] 907.2.11.1 Group R-1

Single- or multiple-station smoke alarms shall be installed in all of the following locations in Group R-1:

1. In sleeping areas.
2. In every room in the path of the *means of egress* from the sleeping area to the door leading from the *sleeping unit*.
3. In each *story* within the *sleeping unit*, including basements. For *sleeping units* with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full *story* below the upper level.

[F] 907.2.11.2 Groups R-2, R-3, R-4 and I-1

Single- or multiple-station smoke alarms shall be installed and maintained in Groups R-2, R-3, R-4 and I-1 regardless of *occupant load* at all of the following locations:

1. On the ceiling or wall outside of each separate sleeping area in the immediate vicinity of bedrooms.
2. In each room used for sleeping purposes.
3. In each *story* within a *dwelling unit*, including basements but not including crawl spaces and uninhabitable *attics*. In *dwellings* or *dwelling units* with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full *story* below the upper level.

[F] 907.2.11.3 Installation Near Cooking Appliances

Smoke alarms shall not be installed in the following locations unless this would prevent placement of a smoke alarm in a location required by Section 907.2.11.1 or 907.2.11.2:

1. Ionization smoke alarms shall not be installed less than 20 feet (6096 mm) horizontally from a permanently installed cooking appliance.
2. Ionization smoke alarms with an alarm-silencing switch shall not be installed less than 10 feet (3048 mm) horizontally from a permanently installed cooking appliance.

3. Photoelectric smoke alarms shall not be installed less than 6 feet (1829 mm) horizontally from a permanently installed cooking appliance.

[F] 907.2.11.4 Installation Near Bathrooms

Smoke alarms shall be installed not less than 3 feet (914 mm) horizontally from the door or opening of a bathroom that contains a bathtub or shower unless this would prevent placement of a smoke alarm required by Section 907.2.11.1 or 907.2.11.2.

[F] 907.2.11.5 Interconnection

Where more than one smoke alarm is required to be installed within an individual *dwelling unit* or *sleeping unit* in Group R or I-1 occupancies, the smoke alarms shall be interconnected in such a manner that the activation of one alarm will activate all of the alarms in the individual unit. Physical interconnection of smoke alarms shall not be required where listed wireless alarms are installed and all alarms sound upon activation of one alarm. The alarm shall be clearly audible in all bedrooms over background noise levels with all intervening doors closed.

[F] 907.2.11.6 Power Source

In new construction, required smoke alarms shall receive their primary power from the building wiring where such wiring is served from a commercial source and shall be equipped with a battery backup. Smoke alarms with integral strobes that are not equipped with battery backup shall be connected to an emergency electrical system in accordance with Section 2702. Smoke alarms shall emit a signal when the batteries are low. Wiring shall be permanent and without a disconnecting switch other than as required for overcurrent protection.

Exception: Smoke alarms are not required to be equipped with battery backup where they are connected to an emergency electrical system that complies with Section 2702.

[F] 907.2.11.7 Smoke Detection System

Smoke detectors listed in accordance with UL 268 and provided as part of the building *fire alarm system* shall be an acceptable alternative to single- and multiple-station *smoke alarms* and shall comply with the following:

1. The *fire alarm system* shall comply with all applicable requirements in Section 907.
2. Activation of a smoke detector in a *dwelling unit* or *sleeping unit* shall initiate alarm notification in the *dwelling unit* or *sleeping unit* in accordance with Section 907.5.2.
3. Activation of a smoke detector in a *dwelling unit* or *sleeping unit* shall not activate alarm notification appliances outside of the *dwelling unit* or *sleeping unit*, provided that a supervisory signal is generated and monitored in accordance with Section 907.6.6.

[F] 907.2.12 Special Amusement Buildings

An automatic smoke detection system shall be provided in *special amusement buildings* in accordance with Sections 907.2.12.1 through 907.2.12.3.

[F] 907.2.12.1 Alarm

Activation of any single smoke detector, the *automatic sprinkler system* or any other automatic fire detection device shall immediately activate an audible and visible alarm at the building at a constantly attended location from which emergency action can be initiated, including the capability of manual initiation of requirements in Section 907.2.12.2.

[F] 907.2.12.2 System Response

The activation of two or more smoke detectors, a single smoke detector equipped with an alarm verification feature, the *automatic sprinkler system* or other *approved* fire detection device shall automatically do all of the following:

1. Cause illumination of the *means of egress* with light of not less than 1 footcandle (11 lux) at the walking surface level.
2. Stop any conflicting or confusing sounds and visual distractions.

3. Activate an *approved* directional *exit* marking that will become apparent in an emergency.
4. Activate a prerecorded message, audible throughout the *special amusement building*, instructing patrons to proceed to the nearest *exit*. Alarm signals used in conjunction with the prerecorded message shall produce a sound that is distinctive from other sounds used during normal operation.

[F] 907.2.12.3 Emergency Voice/Alarm Communication System

An emergency voice/alarm communication system, which is also allowed to serve as a public address system, shall be installed in accordance with Section 907.5.2.2 and be audible throughout the entire *special amusement building*.

[F] 907.2.13 High-Rise Buildings

High-rise buildings shall be provided with an automatic smoke detection system in accordance with Section 907.2.13.1, a fire department communication system in accordance with Section 907.2.13.2 and an emergency voice/alarm communication system in accordance with Section 907.5.2.2.

Exceptions:

1. Airport traffic control towers in accordance with Sections 412 and 907.2.22.
2. *Open parking garages* in accordance with Section 406.5.
3. Buildings with an occupancy in Group A-5 in accordance with Section 303.1.
4. Low-hazard special occupancies in accordance with Section 503.1.1.
5. Buildings with an occupancy in Group H-1, H-2 or H-3 in accordance with Section 415.
6. In Group I-1 and I-2 occupancies, the alarm shall sound at a *constantly attended location* and occupant notification shall be broadcast by the emergency voice/alarm communication system.

[F] 907.2.13.1 Automatic Smoke Detection

Automatic smoke detection in high-rise buildings shall be in accordance with Sections 907.2.13.1.1 and 907.2.13.1.2.

[F] 907.2.13.1.1 Area Smoke Detection

Area smoke detectors shall be provided in accordance with this section. Smoke detectors shall be connected to an automatic fire alarm system. The activation of any detector required by this section shall activate the emergency voice/alarm communication system in accordance with Section 907.5.2.2. In addition to smoke detectors required by Sections 907.2.1 through 907.2.10, smoke detectors shall be located as follows:

1. In each mechanical equipment, electrical, transformer, telephone equipment or similar room that is not provided with sprinkler protection.
2. In each elevator machine room, machinery space, control room and control space and in elevator lobbies.

[M] 907.2.13.1.2 Duct Smoke Detection

Duct smoke detectors complying with Section 907.3.1 shall be located as follows:

1. In the main return air and exhaust air plenum of each air-conditioning system having a capacity greater than 2,000 cubic feet per minute (cfm) ($0.94 \text{ m}^3/\text{s}$). Such detectors shall be located in a serviceable area downstream of the last duct inlet.

2. At each connection to a vertical duct or riser serving two or more stories from a return air duct or plenum of an air-conditioning system. In Group R-1 and R-2 occupancies, a smoke detector is allowed to be used in each return air riser carrying not more than 5,000 cfm ($2.4 \text{ m}^3/\text{s}$) and serving not more than 10 air-inlet openings.

[F] 907.2.13.2 Fire Department Communication System

Where a wired communication system is *approved* in lieu of an emergency communication coverage system in accordance with the *Florida Fire Prevention Code*, the wired fire department communication system shall be designed and installed in accordance with NFPA 72 and shall operate between a fire command center complying with Section 911, elevators, elevator lobbies, emergency and standby power rooms, fire pump rooms, *areas of refuge* and inside *interior exit stairways*. The fire department communication device shall be provided at each floor level within the *interior exit stairway*.

[F] 907.2.14 Atriums Connecting More Than Two Stories

A fire alarm system shall be installed in occupancies with an atrium that connects more than two stories, with smoke detection installed in locations required by a rational analysis in Section 909.4 and in accordance with the system operation requirements in Section 909.17. The system shall be activated in accordance with Section 907.5. Such occupancies in Group A, E or M shall be provided with an emergency voice/alarm communication system complying with the requirements of Section 907.5.2.2.

[F] 907.2.15 High-Piled Combustible Storage Areas

An automatic smoke detection system shall be installed throughout high-piled combustible storage areas where required by the *Florida Fire Prevention Code*.

[F] 907.2.16 Aerosol Storage Uses

Aerosol storage rooms and general-purpose warehouses containing aerosols shall be provided with an *approved* manual fire alarm system where required by the *Florida Fire Prevention Code*.

[F] 907.2.17 Lumber, Wood Structural Panel and Veneer Mills

Lumber, wood structural panel and veneer mills shall be provided with a manual fire alarm system.

[F] 907.2.18 Underground Buildings With Smoke Control Systems

Where a smoke control system is installed in an underground building in accordance with this code, automatic smoke detectors shall be provided in accordance with Section 907.2.18.1.

[F] 907.2.18.1 Smoke Detectors

Not fewer than one smoke detector *listed* for the intended purpose shall be installed in all of the following areas:

1. Mechanical equipment, electrical, transformer, telephone equipment, elevator machine or similar rooms.
2. Elevator lobbies.
3. The main return and exhaust air plenum of each air-conditioning system serving more than one story and located in a serviceable area downstream of the last duct inlet.
4. Each connection to a vertical duct or riser serving two or more floors from return air ducts or plenums of heating, ventilating and air-conditioning systems, except that in Group R occupancies, a *listed* smoke detector is allowed to be used in each return air riser carrying not more than 5,000 cfm ($2.4 \text{ m}^3/\text{s}$) and serving not more than 10 air-inlet openings.

[F] 907.2.18.2 Alarm Required

Activation of the smoke control system shall activate an audible alarm at a *constantly attended location*.

[F] 907.2.19 Deep Underground Buildings

Where the lowest level of a structure is more than 60 feet (18 288 mm) below the finished floor of the lowest *level of exit discharge*, the structure shall be equipped throughout with a manual fire alarm system, including an emergency voice/alarm communication system

installed in accordance with Section 907.5.2.2.

[F] 907.2.20 Covered and Open Mall Buildings

Where the total floor area exceeds 50,000 square feet (4645 m^2) within either a covered mall building or within the perimeter line of an open mall building, an emergency voice/alarm communication system shall be provided. Emergency voice/alarm communication systems serving a mall, required or otherwise, shall be accessible to the fire department. The system shall be provided in accordance with Section 907.5.2.2.

[F] 907.2.21 Residential Aircraft Hangars

Not fewer than one single-station smoke alarm shall be installed within a residential aircraft hangar as defined in Chapter 2 and shall be interconnected into the residential smoke alarm or other sounding device to provide an alarm that will be audible in all sleeping areas of the *dwelling*.

[F] 907.2.22 Airport Traffic Control Towers

An automatic smoke detection system that activates the occupant notification system in accordance with Section 907.5 shall be provided in airport control towers in accordance with Sections 907.2.22.1 and 907.2.22.2.

Exception: Audible appliances shall not be installed within the control tower cab.

[F] 907.2.22.1 Airport Traffic Control Towers With Multiple Exits and Automatic Sprinklers

Airport traffic control towers with multiple *exits* and equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 shall be provided with smoke detectors in all of the following locations:

1. Airport traffic control cab.
2. Electrical and mechanical equipment rooms.
3. Airport terminal radar and electronics rooms.
4. Outside each opening into *interior exit stairways*.
5. Along the single *means of egress* permitted from observation levels.
6. Outside each opening into the single *means of egress* permitted from observation levels.

[F] 907.2.22.2 Other Airport Traffic Control Towers

Airport traffic control towers with a single *exit* or where sprinklers are not installed throughout shall be provided with smoke detectors in all of the following locations:

1. Airport traffic control cab.
2. Electrical and mechanical equipment rooms.
3. Airport terminal radar and electronics rooms.
4. Office spaces incidental to the tower operation.
5. Lounges for employees, including sanitary facilities.
6. *Means of egress*.

7. Accessible utility shafts.

[F] 907.2.23 Battery Rooms

An automatic smoke detection system shall be installed in areas containing stationary storage battery systems as required by the *Florida Fire Prevention Code*.

[F] 907.2.24 Capacitor Energy Storage Systems

An automatic smoke detection system shall be installed in areas containing capacitor energy storage systems as required by the *Florida Fire Prevention Code*.

[F] 907.2.25 Group S

A manual fire alarm system that activates the occupant notification system in accordance with Section 907.5 shall be installed in Group S public and self-storage occupancies three stories or greater in height for interior corridors and interior common areas. Visible notification appliances are not required within storage units.

Exception: Manual fire alarm boxes are not required where the building is equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1, and the occupant notification appliances will activate throughout the notification zones upon sprinkler water flow.

[F] 907.3 Fire Safety Functions

Automatic fire detectors utilized for the purpose of performing fire safety functions shall be connected to the building's fire alarm control unit where a fire alarm system is required by Section 907.2. Detectors shall, upon actuation, perform the intended function and activate the alarm notification appliances or activate a visible and audible supervisory signal at a *constantly attended location*. In buildings not equipped with a fire alarm system, the automatic fire detector shall be powered by normal electrical service and, upon actuation, perform the intended function. The detectors shall be located in accordance with NFPA 72.

[F] 907.3.1 Duct Smoke Detectors

Smoke detectors installed in ducts shall be *listed* for the air velocity, temperature and humidity present in the duct. Duct smoke detectors shall be connected to the building's fire alarm control unit when a fire alarm system is required by Section 907.2. Activation of a duct smoke detector shall initiate a visible and audible supervisory signal at a *constantly attended location* and shall perform the intended fire safety function in accordance with this code and the *Florida Building Code, Mechanical*. In facilities that are required to be monitored by a supervising station, duct smoke detectors shall report only as a supervisory signal and not as a fire alarm. They shall not be used as a substitute for required open area detection.

Exceptions:

1. The supervisory signal at a *constantly attended location* is not required where duct smoke detectors activate the building's alarm notification appliances.
2. In occupancies not required to be equipped with a fire alarm system, actuation of a smoke detector shall activate a visible and an audible signal in an *approved* location. Smoke detector trouble conditions shall activate a visible or audible signal in an *approved* location and shall be identified as air duct detector trouble.

[F] 907.3.2 Delayed Egress Locks

Where delayed egress locks are installed on *means of egress* doors in accordance with Section 1010.2.13, an automatic smoke or heat detection system shall be installed as required by that section.

[F] 907.3.3 Elevator Emergency Operation

Automatic fire detectors installed for elevator emergency operation shall be installed in accordance with the provisions of ASME A17.1/CSA B44 and NFPA 72.

[F] 907.3.4 Wiring

The wiring to the auxiliary devices and equipment used to accomplish the fire safety functions shall be monitored for integrity in accordance with NFPA 72.

[F] 907.4 Initiating Devices

Where a fire alarm system is required by another section of this code, occupant notification in accordance with Section 907.5 shall be initiated by one or more of the following. Initiating devices shall be installed in accordance with Sections 907.4.1 through 907.4.3.1.

1. Manual fire alarm boxes.
2. Automatic fire detectors.
3. Automatic sprinkler system waterflow devices.
4. Automatic fire-extinguishing systems.

[F] 907.4.1 Protection of Fire Alarm Control Unit

In areas that are not continuously occupied, a single smoke detector shall be provided at the location of each fire alarm control unit, notification appliance circuit power extenders, and supervising station transmitting equipment.

Exception: Where ambient conditions prohibit installation of a smoke detector, a *heat detector* shall be permitted.

[F] 907.4.2 Manual Fire Alarm Boxes

Where a manual fire alarm system is required by another section of this code, it shall be activated by fire alarm boxes installed in accordance with Sections 907.4.2.1 through 907.4.2.6.

[F] 907.4.2.1 Location

Manual fire alarm boxes shall be located not more than 5 feet (1524 mm) from the entrance to each *exit*. In buildings not protected by an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2, additional manual fire alarm boxes shall be located so that the *exit access* travel distance to the nearest box does not exceed 200 feet (60 960 mm).

[F] 907.4.2.2 Height

The height of the manual fire alarm boxes shall be not less than 42 inches (1067 mm) and not more than 48 inches (1372 mm) measured vertically, from the floor level to the activating handle or lever of the box.

[F] 907.4.2.3 Color

Manual fire alarm boxes shall be red in color.

[F] 907.4.2.4 Signs

Where fire alarm systems are not monitored by an approved supervising station in accordance with Section 907.6.6, an *approved* permanent sign shall be installed adjacent to each manual fire alarm box that reads: WHEN ALARM SOUNDS CALL FIRE DEPARTMENT.

Exception: Where the manufacturer has permanently provided this information on the manual fire alarm box.

[F] 907.4.2.5 Protective Covers

The fire code official is authorized to require the installation of *listed* manual fire alarm box protective covers to prevent malicious false alarms or to provide the manual fire alarm box with protection from physical damage. The protective cover shall be transparent or red in color with a transparent face to permit visibility of the manual fire alarm box. Each cover shall include proper operating instructions. A protective cover that emits a local alarm signal shall not be installed unless *approved*. Protective covers shall not project more than that permitted by Section 1003.3.

[F] 907.4.2.6 Unobstructed and Unobscured

Manual fire alarm boxes shall be accessible, unobstructed, unobscured and visible at all times.

[F] 907.4.3 Automatic Smoke Detection

Where an automatic smoke detection system is required it shall utilize smoke detectors unless ambient conditions prohibit such an installation. In spaces where smoke detectors cannot be utilized due to ambient conditions, *approved* automatic *heat detectors* shall be permitted.

[F] 907.4.3.1 Automatic Sprinkler System

For conditions other than specific fire safety functions noted in Section 907.3, in areas where ambient conditions prohibit the installation of smoke detectors, an *automatic sprinkler system* installed in such areas in accordance with Section 903.3.1.1 or 903.3.1.2 and that is connected to the fire alarm system shall be *approved* as automatic heat detection.

[F] 907.5 Occupant Notification

Occupant notification by fire alarms shall be in accordance with Sections 907.5.1 through 907.5.2.3.3. Occupant notification by smoke alarms in Group R-1 and R-2 occupancies shall comply with Section 907.5.2.1.3.2.

[F] 907.5.1 Alarm Activation and Annunciation

Upon activation, fire alarm systems shall initiate occupant notification and shall annunciate at the fire alarm control unit, or where allowed elsewhere in Section 907, at a constantly attended location.

[F] 907.5.1.1 Presignal Feature

A presignal feature shall only be provided where approved. The presignal shall be annunciated at an approved *constantly attended location* having the capability to activate the occupant notification system in the event of fire or other emergency.

[F] 907.5.2 Alarm Notification Appliances

Alarm notification appliances shall be provided and shall be *listed* for their purpose.

[F] 907.5.2.1 Audible Alarms

Audible alarm notification appliances shall be provided and emit a distinctive sound that is not to be used for any purpose other than that of a fire alarm.

Exceptions:

1. Audible alarm notification appliances are not required in critical care areas of Group I-2 Condition 2 occupancies that are in compliance with Section 907.2.6, Exception 2.
2. A visible alarm notification appliance installed in a nurses' control station or other continuously attended staff location in a Group I-2 Condition 2 suite shall be an acceptable alternative to the installation of audible alarm notification appliances throughout the suite in Group I-2 Condition 2 occupancies that are in compliance with Section 907.2.6, Exception 2.
3. Where provided, audible notification appliances located in each occupant evacuation elevator lobby in accordance with Section 3008.9.1 shall be connected to a separate notification zone for manual paging only.

[F] 907.5.2.1.1 Average Sound Pressure

The audible alarm notification appliances shall provide a sound pressure level of 15 decibels (dBA) above the average ambient sound level or 5 dBA above the maximum sound level having a duration of not less than 60 seconds, whichever is greater, in every occupiable space within the building.

[F] 907.5.2.1.2 Maximum Sound Pressure

The total sound pressure level produced by combining the ambient sound pressure level with all audible notification appliances operating shall not exceed 110 dBA at the minimum hearing distance from the audible appliance. Where the average ambient noise is greater than 105 dBA, visible alarm notification appliances shall be provided in accordance with NFPA 72 and audible alarm notification appliances shall not be required.

[F] 907.5.2.1.3 Audible Signal Frequency in Group R-1 and R-2 Sleeping Rooms

Audible signal frequency in Group R-1 and R-2 occupancies shall be in accordance with Sections 907.5.2.1.3.1 and 907.2.1.3.2.

[F] 907.5.2.1.3.1 Fire Alarm System Signal

In sleeping rooms of Group R-1 and R-2 occupancies, the audible alarm activated by a fire alarm system shall be a 520-Hz low-frequency signal complying NFPA 72.

[F] 907.5.2.1.3.2 Smoke Alarm Signal in Sleeping Rooms

In sleeping rooms of Group R-1 and R-2 occupancies that are required by Section 907.2.8 or 907.2.9 to have a fire alarm system, the audible alarm signal activated by single- or multiple-station smoke alarms in the dwelling unit or sleeping unit shall be a 520-Hz signal complying NFPA 72.

Where a sleeping room smoke alarm is unable to produce a 520-Hz signal, the 520-Hz alarm signal shall be provided by a listed notification appliance or a smoke detector with an integral 520-Hz sounder.

[F] 907.5.2.2 Emergency Voice/Alarm Communication Systems

Emergency voice/alarm communication systems required by this code shall be designed and installed in accordance with NFPA 72. The operation of any automatic fire detector, sprinkler waterflow device or manual fire alarm box shall automatically sound an alert tone followed by voice instructions giving *approved* information and directions for a general or staged evacuation in accordance with the building's fire safety and evacuation plans required by the *Florida Fire Prevention Code*. In high-rise buildings, the system shall operate on at least the alarming floor, the floor above and the floor below. Speakers shall be provided throughout the building by paging zones. At a minimum, paging zones shall be provided as follows:

1. Elevator groups.
2. *Interior exit stairways*.
3. Each floor.
4. *Areas of refuge* as defined in Chapter 2.

Exception: In Group I-1 and I-2 occupancies, the alarm shall sound in a constantly attended area and a general occupant notification shall be broadcast over the overhead page.

[F] 907.5.2.2.1 Manual Override

A manual override for emergency voice communication shall be provided on a selective and all-call basis for all paging zones.

[F] 907.5.2.2.2 Live Voice Messages

The emergency voice/alarm communication system shall have the capability to broadcast live voice messages by paging zones on a selective and all-call basis.

[F] 907.5.2.2.3 Alternate Uses

The emergency voice/alarm communication system shall be allowed to be used for other announcements, provided the manual fire alarm use takes precedence over any other use.

[F] 907.5.2.2.4 Emergency Voice/Alarm Communication Captions

Where stadiums, arenas and grandstands have 15,000 fixed seats or more and provide audible public announcements, the emergency/voice alarm communication system shall provide prerecorded or real-time captions. Prerecorded or live emergency captions shall be from an approved location constantly attended by personnel trained to respond to an emergency.

[F] 907.5.2.2.5 Standby Emergency Power

Emergency voice/alarm communications systems shall be provided with standby power in accordance with Section 2702.

[F] 907.5.2.3 Visible Alarms

Visible alarm notification appliances shall be provided in accordance with Sections 907.5.2.3.1 through 907.5.2.3.3.

Exceptions:

1. Visible alarm notification appliances are not required in *alterations*, except where an existing fire alarm system is upgraded or replaced, or a new fire alarm system is installed.
2. Visible alarm notification appliances shall not be required in *exits* as defined in Chapter 2.
3. Visible alarm notification appliances shall not be required in elevator cars.
4. Visual alarm notification appliances are not required in critical care areas of Group I-2 Condition 2 occupancies that are in compliance with Section 907.2.6, Exception 2.

[F] 907.5.2.3.1 Public Use Areas and Common Use Areas

Visible alarm notification appliances shall be provided in *public use areas* and *common use areas*.

Exception: Where employee work areas have audible alarm coverage, the notification appliance circuits serving the employee work areas shall be initially designed with not less than 20-percent spare capacity to account for the potential of adding visible notification appliances in the future to accommodate hearing-impaired employee(s).

[F] 907.5.2.3.2 Groups I-1 and R-1

Habitable spaces in dwelling units and sleeping units in Group I-1 and R-1 occupancies in accordance with Table 907.5.2.3.2 shall be provided with visible alarm notification. Visible alarms shall be activated by the in-room smoke alarm and the building fire alarm system.

[F] TABLE 907.5.2.3.2

VISIBLE ALARMS

NUMBER OF SLEEP UNITS	SLEEPING ACCOMMODATIONS WITH VISIBLE ALARMS
6 to 25	2
26 to 50	4
51 to 75	7
76 to 100	9
101 to 150	12
151 to 200	14
201 to 300	17
301 to 400	20
401 to 500	22
501 to 1,000	5% of total
1,001 and over	50 plus 3 for each 100 over 1,000

[F] 907.5.2.3.3 Group R-2

In Group R-2 occupancies required by Section 907 to have a fire alarm system, each story that contains dwelling units and sleeping units shall be provided with the capability to support visible alarm notification appliances in accordance with Chapter 11. Such capability shall accommodate wired or wireless equipment. The future capability shall include one of the following:

1. The interconnection of the building fire alarm system with the unit smoke alarms.

2. The replacement of audible appliances with combination audible/visible appliances.
3. The future extension of the existing wiring from the unit smoke alarm locations to required locations for visible appliances.

[F] 907.6 Installation and Monitoring

A fire alarm system shall be installed and monitored in accordance with Sections 907.6.1 through 907.6.6.2 and NFPA 72.

[F] 907.6.1 Wiring

Wiring shall comply with the requirements of NFPA 70 and NFPA 72. Wireless protection systems utilizing radio-frequency transmitting devices shall comply with the special requirements for supervision of low-power wireless systems in NFPA 72.

[F] 907.6.2 Power Supply

The primary and secondary power supply for the fire alarm system shall be provided in accordance with NFPA 72.

Exception: Back-up power for single-station and multiple-station smoke alarms as required in Section 907.2.11.6.

[F] 907.6.3 Initiating Device Identification

The fire alarm system shall identify the specific initiating device address, location, device type, floor level where applicable and status including indication of normal, alarm, trouble and supervisory status, as appropriate.

Exceptions:

1. Fire alarm systems in single-story buildings less than 22,500 square feet (2090 m^2) in area.
2. Fire alarm systems that only include manual fire alarm boxes, waterflow initiating devices and not more than 10 additional alarm-initiating devices.
3. Special initiating devices that do not support individual device identification.
4. Fire alarm systems or devices that are replacing existing equipment.

[F] 907.6.3.1 Annunciation

The initiating device status shall be annunciated at an *approved* on-site location.

[F] 907.6.4 Zones

Each floor shall be zoned separately and a zone shall not exceed 22,500 square feet (2090 m^2). The length of any zone shall not exceed 300 feet (91 440 mm) in any direction.

Exception: *Automatic sprinkler system* zones shall not exceed the area permitted by NFPA 13.

[F] 907.6.4.1 Zoning Indicator Panel

A zoning indicator panel and the associated controls shall be provided in an *approved* location. The visual zone indication shall lock in until the system is reset and shall not be canceled by the operation of an audible-alarm silencing switch.

[F] 907.6.4.2 High-Rise Buildings

In high-rise buildings, a separate zone by floor shall be provided for each of the following types of alarm-initiating devices where provided:

1. Smoke detectors.
2. Sprinkler waterflow devices.

3. Manual fire alarm boxes.
4. Other *approved* types of automatic fire detection devices or suppression systems.

[F] 907.6.5 Access

Access shall be provided to each fire alarm device and notification appliance for periodic inspection, maintenance and testing.

[F] 907.6.6 Monitoring

Fire alarm systems required by this chapter or by the *Florida Fire Prevention Code* shall be monitored by an *approved* supervising station in accordance with NFPA 72.

Exception: Monitoring by a supervising station is not required for:

1. Single- and multiple-station smoke alarms required by Section 907.2.11.
2. Smoke detectors in Group I-3 occupancies.
3. *Automatic sprinkler systems* in one- and two-family dwellings.

[F] 907.6.6.1 Transmission of Alarm Signals

Transmission of alarm signals to a supervising station shall be in accordance with NFPA 72.

[F] 907.6.6.2 Termination of Monitoring Service

Termination of fire alarm monitoring services shall be in accordance with the *Florida Fire Prevention Code*.

[F] 907.7 Acceptance Tests and Completion

Upon completion of the installation, the fire alarm system and all fire alarm components shall be tested in accordance with NFPA 72.

[F] 907.7.1 Single- And Multiple-Station Alarm Devices

When the installation of the alarm devices is complete, each device and interconnecting wiring for multiple-station alarm devices shall be tested in accordance with the smoke alarm provisions of NFPA 72.

[F] 907.7.2 Record of Completion

A record of completion in accordance with NFPA 72 verifying that the system has been installed and tested in accordance with the *approved* plans and specifications shall be provided.

[F] 907.7.3 Instructions

Operating, testing and maintenance instructions and record drawings ("as-builts") and equipment specifications shall be provided at an *approved* location.

[F] 907.8 Inspection, Testing and Maintenance

The maintenance and testing schedules and procedures for fire alarm and fire detection systems shall be in accordance with the *Florida Fire Prevention Code*.

907.9 Accessibility

Alarm systems required to be accessible shall comply with the applicable sections of the *Florida Building Code, Accessibility*.

Section 908 Emergency Alarm Systems**[F] 908.1 Group H Occupancies**

Emergency alarms for the detection and notification of an emergency condition in Group H occupancies shall be provided in accordance

with Section 415.5.

[F] 908.2 Group H-5 Occupancy

Emergency alarms for notification of an emergency condition in an HPM facility shall be provided as required in Section 415.11.4.

[F] 908.3 Fire Alarm System Interface

Where an emergency alarm system is interfaced with a building's fire alarm system, the signal produced at the fire alarm control unit shall be a supervisory signal.

Section 909 Smoke Control Systems

[F] 909.1 Scope and Purpose

This section applies to mechanical or passive smoke control systems where they are required by other provisions of this code. The purpose of this section is to establish minimum requirements for the design, installation and acceptance testing of smoke control systems that are intended to provide a tenable environment for the evacuation or relocation of occupants. These provisions are not intended for the preservation of contents, the timely restoration of operations or for assistance in fire suppression or overhaul activities. Smoke control systems regulated by this section serve a different purpose than the smoke- and heat-venting provisions found in Section 910. Mechanical smoke control systems shall not be considered exhaust systems under Chapter 5 of the *Florida Building Code, Mechanical*.

[F] 909.2 General Design Requirements

Buildings, structures or parts thereof required by this code to have a smoke control system or systems shall have such systems designed in accordance with the applicable requirements of Section 909 and the generally accepted and well-established principles of engineering relevant to the design. The *construction documents* shall include sufficient information and detail to adequately describe the elements of the design necessary for the proper implementation of the smoke control systems. These documents shall be accompanied by sufficient information and analysis to demonstrate compliance with these provisions.

[F] 909.3 Special Inspection and Test Requirements

In addition to the ordinary inspection and test requirements that buildings, structures and parts thereof are required to undergo, smoke control systems subject to the provisions of Section 909 shall undergo *special inspections* and tests sufficient to verify the proper commissioning of the smoke control design in its final installed condition. The design submission accompanying the *construction documents* shall clearly detail procedures and methods to be used and the items subject to such inspections and tests. Such commissioning shall be in accordance with generally accepted engineering practice and, where possible, based on published standards for the particular testing involved.

[F] 909.4 Analysis

A rational analysis supporting the types of smoke control systems to be employed, their methods of operation, the systems supporting them and the methods of construction to be utilized shall accompany the submitted *construction documents* and shall include, but not be limited to, the items indicated in Sections 909.4.1 through 909.4.7.

[F] 909.4.1 Stack Effect

The system shall be designed such that the maximum probable normal or reverse stack effect will not adversely interfere with the system's capabilities. In determining the maximum probable stack effect, altitude, elevation, weather history and interior temperatures shall be used.

[F] 909.4.2 Temperature Effect of Fire

Buoyancy and expansion caused by the design fire in accordance with Section 909.9 shall be analyzed. The system shall be designed such that these effects do not adversely interfere with the system's capabilities.

[F] 909.4.3 Wind Effect

The design shall consider the adverse effects of wind. Such consideration shall be consistent with the wind-loading provisions of Chapter 16.

[F] 909.4.4 HVAC Systems

The design shall consider the effects of the heating, ventilating and air-conditioning (HVAC) systems on both smoke and fire transport. The analysis shall include all permutations of systems status. The design shall consider the effects of the fire on the HVAC systems.

[F] 909.4.5 Climate

The design shall consider the effects of low temperatures on systems, property and occupants. Air inlets and exhausts shall be located so as to prevent snow or ice blockage.

[F] 909.4.6 Duration of Operation

All portions of active or engineered smoke control systems shall be capable of continued operation after detection of the fire event for a period of not less than either 20 minutes or 1.5 times the calculated egress time, whichever is greater.

[F] 909.4.7 Smoke Control System Interaction

The design shall consider the interaction effects of the operation of multiple smoke control systems for all design scenarios.

[F] 909.5 Smoke Barrier Construction

Smoke barriers required for passive smoke control and a smoke control system using the pressurization method shall comply with Section 709. The maximum allowable leakage area shall be the aggregate area calculated using the following leakage area ratios:

1. Walls $A/A_w = 0.00100$
2. Interior *exit stairways* and *ramps* and *exit passageways*: $A/A_w = 0.00035$
3. Enclosed *exit access stairways* and *ramps* and all other shafts: $A/A_w = 0.00150$
4. Floors and roofs: $A/A_f = 0.00050$

where:

A = Total leakage area, square feet (m^2).

A_f = Unit floor or roof area of barrier, square feet (m^2).

A_w = Unit wall area of barrier, square feet (m^2).

The leakage area ratios shown do not include openings due to gaps around doors and operable windows. The total leakage area of the *smoke barrier* shall be determined in accordance with Section 909.5.1 and tested in accordance with Section 909.5.2.

[F] 909.5.1 Total Leakage Area

Total leakage area of the barrier is the product of the *smoke barrier* gross area multiplied by the allowable leakage area ratio, plus the area of other openings such as gaps around doors and operable windows.

[F] 909.5.2 Testing of Leakage Area

Compliance with the maximum total leakage area shall be determined by achieving the minimum air pressure difference across the barrier with the system in the smoke control mode for mechanical smoke control systems utilizing the pressurization method.

Compliance with the maximum total leakage area of passive smoke control systems shall be verified through methods such as door fan testing or other methods, as *approved* by the fire code official.

[F] 909.5.3 Opening Protection

Openings in *smoke barriers* shall be protected by automatic-closing devices actuated by the required controls for the mechanical smoke control system. Door openings shall be protected by *fire door assemblies* complying with Section 716.5.3.

Exceptions:

1. Passive smoke control systems with automatic-closing devices actuated by spot-type smoke detectors *listed* for releasing service installed in accordance with Section 907.3.
2. Fixed openings between smoke zones that are protected utilizing the airflow method.

3. In Group I-1 Condition 2, Group I-2 and ambulatory care facilities, where a pair of opposite-swinging doors are installed across a corridor in accordance with Section 909.5.3.1, the doors shall not be required to be protected in accordance with Section 716. The doors shall be close-fitting within operational tolerances and shall not have a center mullion or undercuts in excess of $\frac{3}{4}$ inch (19.1 mm), louvers or grilles. The doors shall have head and jamb stops and astragals or rabbets at meeting edges and, where permitted by the door manufacturer's listing, positive-latching devices are not required.
4. In Group I-2 and ambulatory care facilities, where such doors are special-purpose horizontal sliding, accordion or folding door assemblies installed in accordance with Section 1010.3.3 and are automatic closing by smoke detection in accordance with Section 716.5.9.4.
5. Group I-3.
6. Openings between smoke zones with clear ceiling heights of 14 feet (4267 mm) or greater and bank-down capacity of greater than 20 minutes as determined by the design fire size.

[F] 909.5.3.1 Group I-1 Condition 2; Group I-2 and Ambulatory Care Facilities

In Group I-1 Condition 2, Group I-2 and *ambulatory care facilities*, where doors are installed across a *corridor*, the doors shall be automatic closing by smoke detection in accordance with Section 716.5.9.4 and shall have a vision panel with fire protection-rated glazing materials in fire protection-rated frames, the area of which shall not exceed that tested.

[F] 909.5.3.2 Ducts and Air Transfer Openings

Ducts and air transfer openings are required to be protected with a minimum Class II, 250°F (121°C) *smoke damper* complying with Section 717.

[F] 909.6 Pressurization Method

The primary mechanical means of controlling smoke shall be by pressure differences across smoke barriers. Maintenance of a tenable environment is not required in the smoke control zone of fire origin.

[F] 909.6.1 Minimum Pressure Difference

The minimum pressure difference across a *smoke barrier* shall be 0.05-inch water gage (0.0124 kPa) in fully sprinklered buildings.

In buildings permitted to be other than fully sprinklered, the smoke control system shall be designed to achieve pressure differences not less than two times the maximum calculated pressure difference produced by the design fire.

[F] 909.6.2 Maximum Pressure Difference

The maximum air pressure difference across a *smoke barrier* shall be determined by required door-opening or closing forces. The actual force required to open *exit* doors when the system is in the smoke control mode shall be in accordance with Section 1010.1.3. Opening and closing forces for other doors shall be determined by standard engineering methods for the resolution of forces and reactions. The calculated force to set a side-hinged, swinging door in motion shall be determined by:

$$F = F_{dc} + K(WA\Delta P)/2(W-d) \quad (\text{Equation 9-1})$$

where:

A = Door area, square feet (m^2).

d = Distance from door handle to latch edge of door, feet (m).

F = Total door opening force, pounds (N).

F_{dc} = Force required to overcome closing device, pounds (N).

K = Coefficient 5.2 (1.0).

W = Door width, feet (m).

ΔP = Design pressure difference, inches of water (Pa).

[F] 909.6.3 Pressurized Stairways and Elevator Hoistways

Where stairways or elevator hoistways are pressurized, such pressurization systems shall comply with Section 909 as smoke control systems, in addition to the requirements of Sections 909.20 of this code and the *Florida Fire Prevention Code*.

[F] 909.7 Airflow Design Method

Where *approved* by the fire code official, smoke migration through openings fixed in a permanently open position, which are located between smoke control zones by the use of the airflow method, shall be permitted. The design airflow shall be in accordance with this section. Airflow shall be directed to limit smoke migration from the fire zone. The geometry of openings shall be considered to prevent flow reversal from turbulent effects. Smoke control systems using the airflow method shall be designed in accordance with NFPA 92.

[F] 909.7.1 Prohibited Conditions

This method shall not be employed where either the quantity of air or the velocity of the airflow will adversely affect other portions of the smoke control system, unduly intensify the fire, disrupt plume dynamics or interfere with exiting. In no case shall airflow toward the fire exceed 200 feet per minute (1.02 m/s). Where the calculated airflow exceeds this limit, the airflow method shall not be used.

[F] 909.8 Exhaust Method

Where *approved* by the fire code official, mechanical smoke control for large enclosed volumes, such as in atriums or malls, shall be permitted to utilize the exhaust method. Smoke control systems using the exhaust method shall be designed in accordance with NFPA 92.

[F] 909.8.1 Smoke Layer

The height of the lowest horizontal surface of the smoke layer interface shall be maintained not less than 6 feet (1829 mm) above a walking surface that forms a portion of a required egress system within the smoke zone.

[F] 909.9 Design Fire

The design fire shall be based on a rational analysis performed by the *registered design professional* and *approved* by the fire code official. The design fire shall be based on the analysis in accordance with Section 909.4 and this section.

[F] 909.9.1 Factors Considered

The engineering analysis shall include the characteristics of the fuel, fuel load, effects included by the fire and whether the fire is likely to be steady or unsteady.

[F] 909.9.2 Design Fire Fuel

Determination of the design fire shall include consideration of the type of fuel, fuel spacing and configuration.

[F] 909.9.3 Heat-Release Assumptions

The analysis shall make use of best available data from *approved* sources and shall not be based on excessively stringent limitations of combustible material.

[F] 909.9.4 Sprinkler Effectiveness Assumptions

A documented engineering analysis shall be provided for conditions that assume fire growth is halted at the time of sprinkler activation.

[F] 909.10 Equipment

Equipment including, but not limited to, fans, ducts, automatic *dampers* and balance *dampers*, shall be suitable for its intended use, suitable for the probable exposure temperatures that the rational analysis indicates and as *approved* by the fire code official.

[F] 909.10.1 Exhaust Fans

Components of exhaust fans shall be rated and certified by the manufacturer for the probable temperature rise to which the components will be exposed. This temperature rise shall be computed by:

$$T_s = (Q_c/mc) + (T_a) \quad (\text{Equation 9-2})$$

where:

c = Specific heat of smoke at smoke layer temperature, Btu/lb°F (kJ/kg • K).

- m = Exhaust rate, pounds per second (kg/s).
 Q_c = Convective heat output of fire, Btu/s (kW).
 T_a = Ambient temperature, °F (K).
 T_s = Smoke temperature, °F (K).

Exception: Reduced T_s as calculated based on the assurance of adequate dilution air.

[F] 909.10.2 Ducts

Duct materials and joints shall be capable of withstanding the probable temperatures and pressures to which they are exposed as determined in accordance with Section 909.10.1. Ducts shall be constructed and supported in accordance with the *Florida Building Code, Mechanical*. Ducts shall be leak tested to 1.5 times the maximum design pressure in accordance with nationally accepted practices. Measured leakage shall not exceed 5 percent of design flow. Results of such testing shall be a part of the documentation procedure. Ducts shall be supported directly from fire-resistance-rated structural elements of the building by substantial, noncombustible supports.

Exception: Flexible connections, for the purpose of vibration isolation, complying with the *Florida Building Code, Mechanical* and that are constructed of *approved* fire-resistance-rated materials.

[F] 909.10.3 Equipment, Inlets and Outlets

Equipment shall be located so as to not expose uninvolved portions of the building to an additional fire hazard. Outside air inlets shall be located so as to minimize the potential for introducing smoke or flame into the building. Exhaust outlets shall be so located as to minimize reintroduction of smoke into the building and to limit exposure of the building or adjacent buildings to an additional fire hazard.

[F] 909.10.4 Automatic Dampers

Automatic dampers, regardless of the purpose for which they are installed within the smoke control system, shall be *listed* and conform to the requirements of *approved*, recognized standards.

[F] 909.10.5 Fans

In addition to other requirements, belt-driven fans shall have 1.5 times the number of belts required for the design duty, with the minimum number of belts being two. Fans shall be selected for stable performance based on normal temperature and, where applicable, elevated temperature. Calculations and manufacturer's fan curves shall be part of the documentation procedures. Fans shall be supported and restrained by noncombustible devices in accordance with the requirements of Chapter 16.

Motors driving fans shall not be operated beyond their nameplate horsepower (kilowatts), as determined from measurement of actual current draw, and shall have a minimum service factor of 1.15.

[F] 909.11 Standby Power

Smoke control systems shall be provided with standby power in accordance with Section 2702.

[F] 909.11.1 Equipment Room

The standby power source and its transfer switches shall be in a room separate from the normal power transformers and switch gears and ventilated directly to and from the exterior. The room shall be enclosed with not less than 1-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

[F] 909.11.2 Power Sources and Power Surges

Elements of the smoke control system relying on volatile memories or the like shall be supplied with uninterruptable power sources of sufficient duration to span 15-minute primary power interruption. Elements of the smoke control system susceptible to power surges shall be suitably protected by conditioners, suppressors or other *approved* means.

[F] 909.12 Detection and Control Systems

Fire detection systems providing control input or output signals to mechanical smoke control systems or elements thereof shall comply with the requirements of Section 907. Such systems shall be equipped with a control unit complying with UL 864 and *listed* as smoke control equipment.

[F] 909.12.1 Verification

Control systems for mechanical smoke control systems shall include provisions for verification. Verification shall include positive confirmation of actuation, testing, manual override and the presence of power downstream of all disconnects. A preprogrammed weekly test sequence shall report abnormal conditions audibly, visually and by printed report. The preprogrammed weekly test shall operate all devices, equipment and components used for smoke control.

Exception: Where verification of individual components tested through the preprogrammed weekly testing sequence will interfere with, and produce unwanted effects to, normal building operation, such individual components are permitted to be bypassed from the preprogrammed weekly testing, where *approved* by the building official and in accordance with both of the following:

1. Where the operation of components is bypassed from the preprogrammed weekly test, presence of power downstream of all disconnects shall be verified weekly by a listed control unit.
2. Testing of all components bypassed from the preprogrammed weekly test shall be in accordance with the *Florida Fire Prevention Code*.

[F] 909.12.2 Wiring

In addition to meeting requirements of NFPA 70, all wiring, regardless of voltage, shall be fully enclosed within continuous raceways.

[F] 909.12.3 Activation

Smoke control systems shall be activated in accordance with this section.

[F] 909.12.3.1 Pressurization, Airflow or Exhaust Method

Mechanical smoke control systems using the pressurization, airflow or exhaust method shall have completely automatic control.

[F] 909.12.3.2 Passive Method

Passive smoke control systems actuated by *approved* spot-type detectors *listed* for releasing service shall be permitted.

[F] 909.12.4 Automatic Control

Where completely automatic control is required or used, the automatic-control sequences shall be initiated from an appropriately zoned *automatic sprinkler system* complying with Section 903.3.1.1, manual controls that are readily accessible to the fire department and any smoke detectors required by engineering analysis.

[F] 909.13 Control Air Tubing

Control air tubing shall be of sufficient size to meet the required response times. Tubing shall be flushed clean and dry prior to final connections and shall be adequately supported and protected from damage. Tubing passing through concrete or masonry shall be sleeved and protected from abrasion and electrolytic action.

[F] 909.13.1 Materials

Control-air tubing shall be hard-drawn copper, Type L, ACR in accordance with ASTM B42, ASTM B43, ASTM B68, ASTM B88, ASTM B251 and ASTM B280. Fittings shall be wrought copper or brass, solder type in accordance with ASME B16.18 or ASME B16.22. Changes in direction shall be made with appropriate tool bends. Brass compression-type fittings shall be used at final connection to devices; other joints shall be brazed using a BCuP-5 brazing alloy with solidus above 1,100°F (593°C) and liquids below 1,500°F (816°C). Brazing flux shall be used on copper-to-brass joints only.

Exception: Nonmetallic tubing used within control panels and at the final connection to devices provided all of the following conditions are met:

1. Tubing shall comply with the requirements of Section 602.2.1.3 of the *Florida Building Code, Mechanical*.
2. Tubing and connected devices shall be completely enclosed within a galvanized or paint-grade steel enclosure having a minimum thickness of 0.0296 inch (0.7534 mm) (No. 22 gage). Entry to the enclosure shall be by copper tubing with a protective grommet of neoprene or Teflon or by suitable brass compression to male barbed adapter.

3. Tubing shall be identified by appropriately documented coding.
4. Tubing shall be neatly tied and supported within the enclosure. Tubing bridging cabinets and doors or moveable devices shall be of sufficient length to avoid tension and excessive stress. Tubing shall be protected against abrasion. Tubing serving devices on doors shall be fastened along hinges.

[F] 909.13.2 Isolation From Other Functions

Control tubing serving other than smoke control functions shall be isolated by automatic isolation valves or shall be an independent system.

[F] 909.13.3 Testing

Control air tubing shall be tested at three times the operating pressure for not less than 30 minutes without any noticeable loss in gauge pressure prior to final connection to devices.

[F] 909.14 Marking and Identification

The detection and control systems shall be clearly marked at all junctions, accesses and terminations.

[F] 909.15 Control Diagrams

Identical control diagrams showing all devices in the system and identifying their location and function shall be maintained current and kept on file with the fire code official, the fire department and in the fire command center in a format and manner *approved* by the fire chief.

[F] 909.16 Fire Fighter's Smoke Control Panel

A fire fighter's smoke control panel for fire department emergency response purposes only shall be provided and shall include manual control or override of automatic control for mechanical smoke control systems. The panel shall be located in a fire command center complying with Section 911 in high-rise buildings or buildings with smoke-protected assembly seating. In all other buildings, the fire fighter's smoke control panel shall be installed in an *approved* location adjacent to the fire alarm control panel. The fire fighter's smoke control panel shall comply with Sections 909.16.1 through 909.16.3.

[F] 909.16.1 Smoke Control Systems

Fans within the building shall be shown on the fire fighter's control panel. A clear indication of the direction of airflow and the relationship of components shall be displayed. Status indicators shall be provided for all smoke control equipment, annunciated by fan and zone, and by pilot-lamp-type indicators as follows:

1. Fans, *dampers* and other operating equipment in their normal status—WHITE.
2. Fans, *dampers* and other operating equipment in their off or closed status—RED.
3. Fans, *dampers* and other operating equipment in their on or open status—GREEN.
4. Fans, *dampers* and other operating equipment in a fault status—YELLOW/AMBER.

[F] 909.16.2 Smoke Control Panel

The fire fighter's control panel shall provide control capability over the complete smoke control system equipment within the building as follows:

1. ON-AUTO-OFF control over each individual piece of operating smoke control equipment that can also be controlled from other sources within the building. This includes *stairway* pressurization fans; smoke exhaust fans; supply, return and exhaust fans; elevator shaft fans and other operating equipment used or intended for smoke control purposes.
2. OPEN-AUTO-CLOSE control over individual *dampers* relating to smoke control and that are also controlled from other sources

within the building.

3. ON-OFF or OPEN-CLOSE control over smoke control and other critical equipment associated with a fire or smoke emergency and that can only be controlled from the fire fighter's control panel.

Exceptions:

1. Complex systems, where *approved*, where the controls and indicators are combined to control and indicate all elements of a single smoke zone as a unit.
2. Complex systems, where *approved*, where the control is accomplished by computer interface using *approved*, plain English commands.

[F] 909.16.3 Control Action and Priorities

The fire-fighter's control panel actions shall be as follows:

1. ON-OFF and OPEN-CLOSE control actions shall have the highest priority of any control point within the building. Once issued from the fire fighter's control panel, automatic or manual control from any other control point within the building shall not contradict the control action. Where automatic means are provided to interrupt normal, nonemergency equipment operation or produce a specific result to safeguard the building or equipment including, but not limited to, duct freezestats, duct smoke detectors, high-temperature cutouts, temperature-actuated linkage and similar devices, such means shall be capable of being overridden by the fire fighter's control panel. The last control action as indicated by each fire fighter's control panel switch position shall prevail. Control actions shall not require the smoke control system to assume more than one configuration at any one time.

Exception: Power disconnects required by NFPA 70.

2. Only the AUTO position of each three-position fire-fighter's control panel switch shall allow automatic or manual control action from other control points within the building. The AUTO position shall be the NORMAL, nonemergency, building control position. Where a fire fighter's control panel is in the AUTO position, the actual status of the device (on, off, open, closed) shall continue to be indicated by the status indicator described in Section 909.16.1. Where directed by an automatic signal to assume an emergency condition, the NORMAL position shall become the emergency condition for that device or group of devices within the zone. Control actions shall not require the smoke control system to assume more than one configuration at any one time.

[F] 909.17 System Response Time

Smoke-control system activation shall be initiated immediately after receipt of an appropriate automatic or manual activation command. Smoke control systems shall activate individual components (such as *dampers* and fans) in the sequence necessary to prevent physical damage to the fans, *dampers*, ducts and other equipment. For purposes of smoke control, the fire fighter's control panel response time shall be the same for automatic or manual smoke control action initiated from any other building control point. The total response time, including that necessary for detection, shutdown of operating equipment and smoke control system startup, shall allow for full operational mode to be achieved before the conditions in the space exceed the design smoke condition. Upon receipt of an alarm condition at the fire alarm control panel, fans, dampers and automatic doors shall have achieved their proper operating state and final status shall be indicated at the smoke control panel within 90 seconds. The system response time for each component and their sequential relationships shall be detailed in the required rational analysis and verification of their installed condition reported in the required final report.

[F] 909.18 Acceptance Testing

Devices, equipment, components and sequences shall be individually tested. These tests, in addition to those required by other provisions of this code, shall consist of determination of function, sequence and, where applicable, capacity of their installed condition.

[F] 909.18.1 Detection Devices

Smoke or fire detectors that are a part of a smoke control system shall be tested in accordance with Chapter 9 in their installed

condition. Where applicable, this testing shall include verification of airflow in both minimum and maximum conditions.

[F] 909.18.2 Ducts

Ducts that are part of a smoke control system shall be traversed using generally accepted practices to determine actual air quantities.

[F] 909.18.3 Dampers

Dampers shall be tested for function in their installed condition.

[F] 909.18.4 Inlets and Outlets

Inlets and outlets shall be read using generally accepted practices to determine air quantities.

[F] 909.18.5 Fans

Fans shall be examined for correct rotation. Measurements of voltage, amperage, revolutions per minute (rpm) and belt tension shall be made.

[F] 909.18.6 Smoke Barriers

Measurements using inclined manometers or other *approved* calibrated measuring devices shall be made of the pressure differences across *smoke barriers*. Such measurements shall be conducted for each possible smoke control condition.

[F] 909.18.7 Controls

Each smoke zone equipped with an automatic-initiation device shall be put into operation by the actuation of one such device. Each additional device within the zone shall be verified to cause the same sequence without requiring the operation of fan motors in order to prevent damage. Control sequences shall be verified throughout the system, including verification of override from the fire-fighter's control panel and simulation of standby power conditions.

[F] 909.18.8 Testing for Smoke Control

Smoke control systems shall be tested by a special inspector.

[F] 909.18.8.1 Scope of Testing

Testing shall be conducted in accordance with the following:

1. During erection of ductwork and prior to concealment for the purposes of leakage testing and recording of device location.
2. Prior to occupancy and after sufficient completion for the purposes of pressure-difference testing, flow measurements, and detection and control verification.

[F] 909.18.8.2 Qualifications

Approved agencies for smoke control testing shall have expertise in fire protection engineering, mechanical engineering and certification as air balancers.

[F] 909.18.8.3 Reports

A complete report of testing shall be prepared by the *approved* agency. The report shall include identification of all devices by manufacturer, nameplate data, design values, measured values and identification tag or *mark*. The report shall be reviewed by the responsible *registered design professional* and, when satisfied that the design intent has been achieved, the responsible *registered design professional* shall sign, seal and date the report.

[F] 909.18.8.3.1 Report Filing

A copy of the final report shall be filed with the fire code official and an identical copy shall be maintained in an *approved* location at the building.

[F] 909.18.9 Identification and Documentation

Charts, drawings and other documents identifying and locating each component of the smoke control system, and describing its proper function and maintenance requirements, shall be maintained on file at the building as an attachment to the report required by Section

909.18.8.3. Devices shall have an *approved* identifying tag or *mark* on them consistent with the other required documentation and shall be dated indicating the last time they were successfully tested and by whom.

[F] 909.19 System Acceptance

Buildings, or portions thereof, required by this code to comply with this section shall not be issued a certificate of occupancy until such time that the fire code official determines that the provisions of this section have been fully complied with and that the fire department has received satisfactory instruction on the operation, both automatic and manual, of the system and a written maintenance program complying with the requirements of the *Florida Fire Prevention Code* has been submitted and approved by the fire code official.

Exception: In buildings of phased construction, a temporary certificate of occupancy, as *approved* by the fire code official, shall be allowed provided that those portions of the building to be occupied meet the requirements of this section and that the remainder does not pose a significant hazard to the safety of the proposed occupants or adjacent buildings.

909.20 Smokeproof Enclosures

Where required by Section 1023.11, a smokeproof enclosure shall be constructed in accordance with this section. A smokeproof enclosure shall consist of an *interior exit stairway* or *ramp* that is enclosed in accordance with the applicable provisions of Section 1023 and an open exterior balcony, ventilated vestibule or pressurized stair and pressurized entrance vestibule meeting the requirements of this section. Where access to the roof is required by the *Florida Fire Prevention Code*, such access shall be from the smokeproof enclosure where a smokeproof enclosure is required.

909.20.1 Access

Access to the *stairway* or *ramp* shall be by way of a vestibule or an open exterior balcony. The minimum dimension of the vestibule shall be not less than the required width of the *corridor* leading to the vestibule but shall not have a width of less than 44 inches (1118 mm) and shall not have a length of less than 72 inches (1829 mm) in the direction of egress travel.

909.20.2 Construction

The smokeproof enclosure shall be separated from the remainder of the building by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. Openings are not permitted other than the required *means of egress* doors. The vestibule shall be separated from the *stairway* or *ramp* by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. The open exterior balcony shall be constructed in accordance with the *fire-resistance rating* requirements for floor assemblies.

909.20.2.1 Door Closers

Doors in a smokeproof enclosure shall be self- or automatic closing by actuation of a smoke detector in accordance with Section 716.5.9.4 and shall be installed at the floor-side entrance to the smokeproof enclosure. The actuation of the smoke detector on any door shall activate the closing devices on all doors in the smokeproof enclosure at all levels. Smoke detectors shall be installed in accordance with Section 907.3.

909.20.3 Natural Ventilation Alternative

The provisions of Sections 909.20.3.1 through 909.20.3.3 shall apply to ventilation of smokeproof enclosures by natural means.

909.20.3.1 Balcony Doors

Where access to the *stairway* or *ramp* is by way of an open exterior balcony, the door assembly into the enclosure shall be a *fire door assembly* in accordance with Section 716.

909.20.3.2 Vestibule Doors

Where access to the *stairway* or *ramp* is by way of a vestibule, the door assembly into the vestibule shall be a *fire door assembly* complying with Section 716. The door assembly from the vestibule to the *stairway* shall have not less than a 20-minute *fire protection rating* complying with Section 716.

909.20.3.3 Vestibule Ventilation

Each vestibule shall have a minimum net area of 16 square feet (1.5 m^2) of opening in a wall facing an outer *court*, *yard* or *public way* that is not less than 20 feet (6096 mm) in width.

909.20.4 Mechanical Ventilation Alternative

The provisions of Sections 909.20.4.1 through 909.20.4.4 shall apply to ventilation of smokeproof enclosures by mechanical means.

909.20.4.1 Vestibule Doors

The door assembly from the building into the vestibule shall be a *fire door assembly* complying with Section 716.5.3. The door assembly from the vestibule to the *stairway or ramp* shall not have less than a 20-minute *fire protection rating* and shall meet the requirements for a smoke door assembly in accordance with Section 716.5.3. The door shall be installed in accordance with NFPA 105.

909.20.4.2 Vestibule Ventilation

The vestibule shall be supplied with not less than one air change per minute and the exhaust shall be not less than 150 percent of supply. Supply air shall enter and exhaust air shall discharge from the vestibule through separate, tightly constructed ducts used only for that purpose. Supply air shall enter the vestibule within 6 inches (152 mm) of the floor level. The top of the exhaust register shall be located at the top of the smoke trap but not more than 6 inches (152 mm) down from the top of the trap, and shall be entirely within the smoke trap area. Doors in the open position shall not obstruct duct openings. Duct openings with controlling *dampers* are permitted where necessary to meet the design requirements, but *dampers* are not otherwise required.

909.20.4.2.1 Engineered Ventilation System

Where a specially engineered system is used, the system shall exhaust a quantity of air equal to not less than 90 air changes per hour from any vestibule in the emergency operation mode and shall be sized to handle three vestibules simultaneously. Smoke detectors shall be located at the floor-side entrance to each vestibule and shall activate the system for the affected vestibule. Smoke detectors shall be installed in accordance with Section 907.3.

909.20.4.3 Smoke Trap

The vestibule ceiling shall be not less than 20 inches (508 mm) higher than the door opening into the vestibule to serve as a smoke and heat trap and to provide an upward-moving air column. The height shall not be decreased unless *approved* and justified by design and test.

909.20.4.4 Stairway or Ramp Shaft Air Movement System

The *stairway or ramp* shaft shall be provided with a dampered relief opening and supplied with sufficient air to maintain a minimum positive pressure of 0.10 inch of water (25 Pa) in the shaft relative to the vestibule with all doors closed.

909.20.5 Stairway and Ramp Pressurization Alternative

Where the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, the vestibule is not required, provided each interior *exit stairway or ramp* is pressurized to not less than 0.10 inch of water (25 Pa) and not more than 0.35 inches of water (87 Pa) in the shaft relative to the building measured with all *interior exit stairway and ramp* doors closed under maximum anticipated conditions of stack effect and wind effect.

909.20.6 Pressurized Stair and Vestibule Alternative

The provisions of Sections 909.20.6.1 through 909.20.6.3 shall apply to smokeproof enclosures using a pressurized stair and pressurized entrance vestibule.

909.20.6.1 Vestibule Doors

The door assembly from the building into the vestibule shall be a fire door assembly complying with Section 716.5.3. The door assembly from the vestibule to the stairway shall not have less than a 20-minute fire protection rating and meet the requirements for a smoke door assembly in accordance with Section 716.5.3. The door shall be installed in accordance with NFPA 105.

909.20.6.2 Pressure Difference

The stair enclosure shall be pressurized to a minimum of 0.05 inch of water gage (12.44 Pa) positive pressure relative to the vestibule with all stairway doors closed under the maximum anticipated stack pressures. The vestibule, with doors closed, shall have a minimum of 0.05 inch of water gage (12.44 Pa) positive pressure relative to the fire floor. The pressure difference across doors shall not exceed 30 pounds (133-N) maximum force to begin opening the door.

909.20.6.3 Dampered Relief Opening

A controlled relief vent capable of discharging a minimum of 2,500 cubic feet per minute (1180 L/s) of air at the design pressure difference shall be located in the upper portion of the pressurized exit enclosure.

909.20.7 Ventilating Equipment

The activation of ventilating equipment required by the alternatives in Sections 909.20.4, 909.20.5 and 909.20.6 shall be by smoke detectors installed at each floor level at an *approved* location at the entrance to the smokeproof enclosure. When the closing device for

the *stairway* and *ramp* shaft and vestibule doors is activated by smoke detection or power failure, the mechanical equipment shall activate and operate at the required performance levels. Smoke detectors shall be installed in accordance with Section 907.3.

909.20.7.1 Ventilation Systems

Smokeproof enclosure ventilation systems shall be independent of other building ventilation systems. The equipment, control wiring, power wiring and ductwork shall comply with one of the following:

1. Equipment, control wiring, power wiring and ductwork shall be located exterior to the building and directly connected to the smokeproof enclosure or connected to the smokeproof enclosure by ductwork enclosed by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.
2. Equipment, control wiring, power wiring and ductwork shall be located within the smokeproof enclosure with intake or exhaust directly from and to the outside or through ductwork enclosed by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.
3. Equipment, control wiring, power wiring and ductwork shall be located within the building if separated from the remainder of the building, including other mechanical equipment, by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

Exception: Control wiring and power wiring located outside of a 2-hour fire barrier construction shall be protected using any one of the following methods:

1. Cables used for survivability of required critical circuits shall be listed in accordance with UL 2196 and shall have a *fire-resistance rating* of not less than 2 hours.
2. Where encased with not less than 2 inches (51 mm) of concrete.
3. Electrical circuit protective systems shall have a *fire-resistance rating* of not less than 2 hours. Electrical circuit protective systems shall be installed in accordance with their listing requirements.

909.20.7.2 Standby Power

Mechanical vestibule and *stairway* and *ramp* shaft ventilation systems and automatic fire detection systems shall be provided with standby power in accordance with Section 2702.

909.20.7.3 Acceptance and Testing

Before the mechanical equipment is *approved*, the system shall be tested in the presence of the *building official* to confirm that the system is operating in compliance with these requirements.

909.21 Elevator Hoistway Pressurization Alternative

Where elevator hoistway pressurization is provided in lieu of required enclosed elevator lobbies, the pressurization system shall comply with Sections 909.21.1 through 909.21.11.

909.21.1 Pressurization Requirements

Elevator hoistways shall be pressurized to maintain a minimum positive pressure of 0.10 inch of water (25 Pa) and a maximum positive pressure of 0.25 inch of water (67 Pa) with respect to adjacent occupied space on all floors. This pressure shall be measured at the midpoint of each hoistway door, with all elevator cars at the floor of recall and all hoistway doors on the floor of recall open and all other hoistway doors closed. The pressure differentials shall be measured between the hoistway and the adjacent elevator landing. The opening and closing of hoistway doors at each level must be demonstrated during this test. The supply air intake shall be from an outside, uncontaminated source located a minimum distance of 20 feet (6096 mm) from any air exhaust system or outlet.

Exceptions:

1. On floors containing only Group R occupancies, the pressure differential is permitted to be measured between the hoistway and a dwelling unit or sleeping unit.
2. Where an elevator opens into a lobby enclosed in accordance with Section 3007.6 or 3008.6, the pressure differential is permitted to be measured between the hoistway and the space immediately outside the door(s) from the floor to the enclosed lobby.
3. The pressure differential is permitted to be measured relative to the outdoor atmosphere on floors other than the following:
 - 3.1. The fire floor.
 - 3.2. The two floors immediately below the fire floor.
 - 3.3. The floor immediately above the fire floor.
4. The minimum positive pressure of 0.10 inch of water (25 Pa) and a maximum positive pressure of 0.25 inch of water (67 Pa) with respect to occupied floors are not required at the floor of recall with the doors open.

909.21.1.1 Use of Ventilation Systems

Ventilation systems, other than hoistway supply air systems, are permitted to be used to exhaust air from adjacent spaces on the fire floor, two floors immediately below and one floor immediately above the fire floor to the building's exterior where necessary to maintain positive pressure relationships as required in Section 909.21.1 during operation of the elevator shaft pressurization system.

909.21.2 Rational Analysis

A rational analysis complying with Section 909.4 shall be submitted with the *construction documents*.

909.21.3 Ducts for System

Any duct system that is part of the pressurization system shall be protected with the same *fire-resistance rating* as required for the elevator shaft enclosure.

909.21.4 Fan System

The fan system provided for the pressurization system shall be as required by Sections 909.21.4.1 through 909.21.4.4.

909.21.4.1 Fire Resistance

Where located within the building, the fan system that provides the pressurization shall be protected with the same *fire-resistance rating* required for the elevator shaft enclosure.

909.21.4.2 Smoke Detection

The fan system shall be equipped with a smoke detector that will automatically shut down the fan system when smoke is detected within the system.

909.21.4.3 Separate Systems

A separate fan system shall be used for each elevator hoistway.

909.21.4.4 Fan Capacity

The supply fan shall be either adjustable with a capacity of not less than 1,000 cfm (0.4719 m³/s) per door, or that specified by a registered design professional to meet the requirements of a designed pressurization system.

909.21.5 Standby Power

The pressurization system shall be provided with standby power in accordance with Section 2702.

909.21.6 Activation of Pressurization System

The elevator pressurization system shall be activated upon activation of either the building fire alarm system or the elevator lobby smoke detectors. Where both a building fire alarm system and elevator lobby smoke detectors are present, each shall be independently

capable of activating the pressurization system.

909.21.7 Testing

Testing for performance shall be required in accordance with Section 909.18.8. System acceptance shall be in accordance with Section 909.19.

909.21.8 Marking and Identification

Detection and control systems shall be marked in accordance with Section 909.14.

909.21.9 Control Diagrams

Control diagrams shall be provided in accordance with Section 909.15.

909.21.10 Control Panel

A control panel complying with Section 909.16 shall be provided.

909.21.11 System Response Time

Hoistway pressurization systems shall comply with the requirements for smoke control system response time in Section 909.17.

Section 910 Smoke and Heat Removal

[F] 910.1 General

Where required by this code, smoke and heat vents or mechanical smoke removal systems shall conform to the requirements of this section.

[F] 910.2 Where Required

Smoke and heat vents or a mechanical smoke removal system shall be installed as required by Sections 910.2.1 and 910.2.2.

Exceptions:

1. Frozen food warehouses used solely for storage of Class I and II commodities where protected by an *approved automatic sprinkler system*.
2. Smoke and heat removal shall not be required in areas of buildings equipped with early suppression fast-response (ESFR) sprinklers.
3. Smoke and heat removal shall not be required in areas of buildings equipped with control mode special application sprinklers with a response time index of $50 \text{ (m} \cdot \text{s)}^{1/2}$ or less that are listed to control a fire in stored commodities with 12 or fewer sprinklers.

910.2.1 Group F-1 or S-1

Smoke and heat vents installed in accordance with Section 910.3 or a mechanical smoke removal system installed in accordance with Section 910.4 shall be installed in buildings and portions thereof used as a Group F-1 or S-1 occupancy having more than 50,000 square feet (4645 m^2) of undivided area. In occupied portions of a building equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 where the upper surface of the story is not a roof assembly, a mechanical smoke removal system in accordance with Section 910.4 shall be installed.

Exception: Group S-1 aircraft repair hangars.

[F] 910.2.2 High-Piled Combustible Storage

Smoke and heat removal required by the *Florida Fire Prevention Code* for buildings and portions thereof containing high-piled combustible storage shall be installed in accordance with Section 910.3 in unsprinklered buildings. In buildings and portions thereof containing high-piled combustible storage equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, a smoke and heat removal system shall be installed in accordance with Section 910.3 or 910.4. In occupied portions of a building equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, where the upper surface of the story is not a roof assembly, a mechanical smoke removal system in accordance with Section 910.4 shall be installed.

[F] 910.3 Smoke and Heat Vents

The design and installation of smoke and heat vents shall be in accordance with Sections 910.3.1 through 910.3.3.

[F] 910.3.1 Listing and Labeling

Smoke and heat vents shall be *listed* and labeled to indicate compliance with UL 793 or FM 4430.

[F] 910.3.2 Smoke and Heat Vent Locations

Smoke and heat vents shall be located 20 feet (6096 mm) or more from adjacent *lot lines* and *fire walls* and 10 feet (3048 mm) or more from *fire barriers*. Vents shall be uniformly located within the roof in the areas of the building where the vents are required to be installed by Section 910.2 with consideration given to roof pitch, sprinkler location and structural members.

910.3.3 Smoke and Heat Vents Area

The required aggregate area of smoke and heat vents shall be calculated as follows:

For buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1:

$$A_{VR} = V/9000 \quad (\text{Equation 9-3})$$

where:

A_{VR} = The required aggregate vent area (ft^2).

V = Volume (ft^3) of the area that requires smoke removal.

For unsprinklered buildings:

$$A_{VR} = A_{FA}/50 \quad (\text{Equation 9-4})$$

where:

A_{VR} = The required aggregate vent area (ft^2).

A_{FA} = The area of the floor in the area that requires smoke removal.

910.3.4 Vent Operation

Smoke and heat vents shall be capable of being operated by approved automatic and manual means.

910.3.5 Fusible Link Temperature Rating

Where vents are installed in areas provided with automatic fire sprinklers and the vents operate by fusible link, the fusible link shall have a temperature rating of 360° F (182° C).

[F] 910.4 Mechanical Smoke Removal Systems

Mechanical smoke removal systems shall be designed and installed in accordance with Sections 910.4.1 through 910.4.7.

910.4.1 Automatic Sprinklers Required

The building shall be equipped throughout with an *approved automatic sprinkler system* in accordance with Section 903.3.1.1.

910.4.2 Exhaust Fan Construction

Exhaust fans that are part of a mechanical smoke removal system shall be rated for operation at 221°F (105°C). Exhaust fan motors shall be located outside of the exhaust fan air stream.

910.4.3 System Design Criteria

The mechanical smoke removal system shall be sized to exhaust the building at a minimum rate of two air changes per hour based upon the volume of the building or portion thereof without contents. The capacity of each exhaust fan shall not exceed 30,000 cubic feet per minute (14.2 m³/s).

910.4.3.1 Makeup Air

Makeup air openings shall be provided within 6 feet (1829 mm) of the floor level. Operation of makeup air openings shall be manual or automatic. The minimum gross area of makeup air inlets shall be 8 square feet per 1,000 cubic feet per minute (0.74 m^2 per $0.4719 \text{ m}^3/\text{s}$) of smoke exhaust.

910.4.4 Activation

The mechanical smoke removal system shall be activated by manual controls only.

910.4.5 Manual Control Location

Manual controls shall be located so as to be accessible to the fire service from an exterior door of the building and protected against interior fire exposure by not less than 1-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

[F] 910.4.6 Control Wiring

Wiring for operation and control of mechanical smoke removal systems shall be connected ahead of the main disconnect in accordance with Section 701.12E of NFPA 70 and be protected against interior fire exposure to temperatures in excess of $1,000^\circ\text{F}$ (538°C) for a period of not less than 15 minutes.

[F] 910.4.7 Controls

Where building air-handling and mechanical smoke removal systems are combined or where independent building air-handling systems are provided, fans shall automatically shut down in accordance with the *Florida Building Code, Mechanical*. The manual controls provided for the smoke removal system shall have the capability to override the automatic shutdown of fans that are part of the smoke removal system.

910.5 Maintenance

Smoke and heat vents and mechanical smoke removal systems shall be maintained in accordance with the *Florida Fire Prevention Code*.

Section 911 Fire Command Center**[F] 911.1 General**

Where required by other sections of this code and in buildings classified as high-rise buildings by this code, a fire command center for fire department operations shall be provided and shall comply with Sections 911.1.1 through 911.1.6.

[F] 911.1.1 Location and Access

The location and accessibility of the fire command center shall be *approved* by the fire chief.

[F] 911.1.2 Separation

The fire command center shall be separated from the remainder of the building by not less than a 1-hour *fire barrier* constructed in accordance with Section 707 or *horizontal assembly* constructed in accordance with Section 711, or both.

[F] 911.1.3 Size

The room shall be not less than 200 square feet (19 m^2) with a minimum dimension of 10 feet (3048 mm).

[F] 911.1.4 Layout Approval

A layout of the fire command center and all features required by this section to be contained therein shall be submitted for approval prior to installation.

[F] 911.1.5 Storage

Storage unrelated to operation of the fire command center shall be prohibited.

[F] 911.1.6 Required Features

The fire command center shall comply with NFPA 72 and shall contain all of the following features:

1. The emergency voice/alarm communication system control unit.
2. The fire department communications system.

3. Fire detection and alarm system annunciation.
4. Annunciation unit visually indicating the location of the elevators and whether they are operational.
5. Status indicators and controls for air distribution systems.
6. The fire fighter's control panel required by Section 909.16 for smoke control systems installed in the building.
7. Controls for unlocking *interior exit stairway* doors simultaneously.
8. Sprinkler valve and waterflow detector display panels.
9. Emergency and standby power status indicators.
10. A telephone for fire department use with controlled access to the public telephone system.
11. Fire pump status indicators.
12. Schematic building plans indicating the typical floor plan and detailing the building core, *means of egress*, fire protection systems, fire fighter air replenishment system, fire-fighting equipment and fire department access and the location of *fire walls*, *fire barriers*, *fire partitions*, *smoke barriers* and smoke partitions.
13. An *approved* Building Information Card that contains, but is not limited to, the following information:
 - 13.1. General building information that includes: property name, address, the number of floors in the building above and below grade, use and occupancy classification (for mixed uses, identify the different types of occupancies on each floor), and the estimated building population during the day, night and weekend.
 - 13.2. Building emergency contact information that includes: a list of the building's emergency contacts including but not limited to building manager and building engineer and their respective work phone number, cell phone number, e-mail address.
 - 13.3. Building construction information that includes: the type of building construction including but not limited to floors, walls, columns, and roof assembly.
 - 13.4. *Exit access* and *exit stairway* information that includes: number of *exit access* and *exit stairways* in the building, each *exit access* and *exit stairway* designation and floors served, location where each *exit access* and *exit stairway* discharges, *interior exit stairways* that are pressurized, *exit* stairways provided with emergency lighting, each *exit stairway* that allows reentry, *exit stairways* providing roof access; elevator information that includes: number of elevator banks, elevator bank designation, elevator car numbers and respective floors that they serve; location of elevator machine rooms, control rooms and control spaces; location of sky lobby, location of freight elevator banks.
 - 13.5. Building services and system information that includes: location of mechanical rooms, location of building management system, location and capacity of all fuel oil tanks, location of emergency generator, location of natural gas service.
 - 13.6. Fire protection system information that includes: location of standpipes, location of fire pump room, location of fire department connections, floors protected by automatic sprinklers, location of different types of *automatic sprinkler systems* installed including, but not limited to, dry, wet and pre-action.
 - 13.7. Hazardous material information that includes: location of hazardous material, quantity of hazardous material.
14. Work table.
15. Generator supervision devices, manual start and transfer features.
16. Public address system, where specifically required by other sections of this code.
17. Elevator fire recall switch in accordance with ASME A17.1/BSA 44.
18. Elevator emergency or standby power selector switch(es), where emergency or standby power is provided.

Section 912 Fire Department Connections

[F] 912.1 Installation

Fire department connections shall be installed in accordance with the NFPA standard applicable to the system design and shall comply with Sections 912.2 through 912.6.

[F] 912.2 Location

With respect to hydrants, driveways, buildings and landscaping, fire department connections shall be so located that fire apparatus and hose connected to supply the system will not obstruct access to the buildings for other fire apparatus. The location of fire department connections shall be *approved* by the fire chief.

[F] 912.2.1 Visible Location

Fire department connections shall be located on the street side of buildings, fully visible and recognizable from the street or nearest point of fire department vehicle access or as otherwise *approved* by the fire chief.

[F] 912.2.2 Existing Buildings

On existing buildings, wherever the fire department connection is not visible to approaching fire apparatus, the fire department connection shall be indicated by an *approved* sign mounted on the street front or on the side of the building. Such sign shall have the letters "FDC" not less than 6 inches (152 mm) high and words in letters not less than 2 inches (51 mm) high or an arrow to indicate the location. Such signs shall be subject to the approval of the fire code official.

[F] 912.3 Fire Hose Threads

Fire hose threads used in connection with standpipe systems shall be *approved* and shall be compatible with fire department hose threads.

[F] 912.4 Access

Immediate access to fire department connections shall be maintained at all times and without obstruction by fences, bushes, trees, walls or any other fixed or moveable object. Access to fire department connections shall be *approved* by the fire chief.

Exception: Fences, where provided with an access gate equipped with a sign complying with the legend requirements of this section and a means of emergency operation. The gate and the means of emergency operation shall be *approved* by the fire chief and maintained operational at all times.

[F] 912.4.1 Locking Fire Department Connection Caps

The fire code official is authorized to require locking caps on fire department connections for water-based *fire protection systems* where the responding fire department carries appropriate key wrenches for removal.

[F] 912.4.2 Clear Space Around Connections

A working space of not less than 36 inches (762 mm) in width, 36 inches (914 mm) in depth and 78 inches (1981 mm) in height shall be provided and maintained in front of and to the sides of wall-mounted fire department connections and around the circumference of free-standing fire department connections, except as otherwise required or *approved* by the fire chief.

[F] 912.4.3 Physical Protection

Where fire department connections are subject to impact by a motor vehicle, vehicle impact protection shall be provided in accordance with the *Florida Fire Prevention Code*.

[F] 912.5 Signs

A metal sign with raised letters not less than 1 inch (25 mm) in size shall be mounted on all fire department connections serving automatic sprinklers, standpipes or fire pump connections. Such signs shall read: AUTOMATIC SPRINKLERS or STANDPIPES or TEST CONNECTION or a combination thereof as applicable. Where the fire department connection does not serve the entire building, a sign shall be provided indicating the portions of the building served.

[P] 912.6 Backflow Protection

The potable water supply to automatic sprinkler and standpipe systems shall be protected against backflow as required by the *Florida Building Code, Plumbing*.

Section 913 Fire Pumps**[F] 913.1 General**

Where provided, fire pumps for fire protection systems shall be installed in accordance with this section and NFPA 20.

Exception: Pumps for automatic sprinkler systems installed in accordance with Section 903.3.1.3 or Section P2904 of the *Florida Building Code, Residential*.

[F] 913.2 Protection Against Interruption of Service

The fire pump, driver and controller shall be protected in accordance with NFPA 20 against possible interruption of service through damage caused by explosion, fire, flood, rodents, insects, windstorm, freezing, vandalism and other adverse conditions.

913.2.1 Protection of Fire Pump Rooms

Fire pumps shall be located in rooms that are separated from all other areas of the building by 2-hour *fire barriers* constructed in accordance with Section 707 or 2-hour *horizontal assemblies* constructed in accordance with Section 711, or both.

Exceptions:

1. In other than high-rise buildings, separation by 1-hour *fire barriers* constructed in accordance with Section 707 or 1-hour *horizontal assemblies* constructed in accordance with Section 711, or both, shall be permitted in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2.
2. Separation is not required for fire pumps physically separated in accordance with NFPA 20.

[F] 913.2.2 Circuits Supplying Fire Pumps

Cables used for survivability of circuits supplying fire pumps shall be protected using one of the following methods:

1. Cables used for survivability of required critical circuits shall be listed in accordance with UL 2196 and shall have a *fire-resistance rating* of not less than 1 hour.
2. Electrical circuit protective systems shall have a *fire-resistance rating* of not less than 1 hour. Electrical circuit protective systems shall be installed in accordance with their listing requirements.
3. Construction having a *fire-resistance rating* of not less than 1 hour.
4. The cable or raceway is encased in a minimum of 2 inches (50 mm) of concrete.

Exception: This section shall not apply to cables, or portions of cables, located within a fire pump room or generator room which is separated from the remainder of the occupancy with fire-resistance-rated construction.

[F] 913.3 Temperature of Pump Room

Suitable means shall be provided for maintaining the temperature of a pump room or pump house, where required, above 40°F (5°C).

[F] 913.3.1 Engine Manufacturer's Recommendation

Temperature of the pump room, pump house or area where engines are installed shall never be less than the minimum recommended by the engine manufacturer. The engine manufacturer's recommendations for oil heaters shall be followed.

[F] 913.4 Valve Supervision

Where provided, the fire pump suction, discharge and bypass valves, and isolation valves on the backflow prevention device or assembly shall be supervised open by one of the following methods:

1. Central-station, proprietary or remote-station signaling service.
2. Local signaling service that will cause the sounding of an audible signal at a *constantly attended location*.
3. Locking valves open.

4. Sealing of valves and *approved* weekly recorded inspection where valves are located within fenced enclosures under the control of the owner.

[F] 913.4.1 Test Outlet Valve Supervision

Fire pump test outlet valves shall be supervised in the closed position.

[F] 913.5 Acceptance Test

Acceptance testing shall be done in accordance with the requirements of NFPA 20.

Section 914 Emergency Responder Safety Features**[F] 914.1 Shaftway Markings**

Vertical shafts shall be identified as required by Sections 914.1.1 and 914.1.2.

[F] 914.1.1 Exterior Access to Shaftways

Outside openings accessible to the fire department and that open directly on a hoistway or shaftway communicating between two or more floors in a building shall be plainly marked with the word "SHAFTWAY" in red letters not less than 6 inches (152 mm) high on a white background. Such warning signs shall be placed so as to be readily discernible from the outside of the building.

[F] 914.1.2 Interior Access to Shaftways

Door or window openings to a hoistway or shaftway from the interior of the building shall be plainly marked with the word "SHAFTWAY" in red letters not less than 6 inches (152 mm) high on a white background. Such warning signs shall be placed so as to be readily discernible.

Exception: Markings shall not be required on shaftway openings that are readily discernible as openings onto a shaftway by the construction or arrangement.

[F] 914.2 Equipment Room Identification

Fire protection equipment shall be identified in an *approved* manner. Rooms containing controls for air-conditioning systems, sprinkler risers and valves or other fire detection, suppression or control elements shall be identified for the use of the fire department. *Approved* signs required to identify fire protection equipment and equipment location shall be constructed of durable materials, permanently installed and readily visible.

Section 915 Carbon Monoxide Protection**915.1 Carbon Monoxide Protection**

Every separate building or an addition to an existing building for which a permit for new construction is issued and having a fossil-fuel-burning heater or appliance, a fireplace, an attached garage, or other feature, fixture, or element that emits carbon monoxide as a byproduct of combustion shall have an operational carbon monoxide alarm installed within 10 feet (3050 mm) of each room used for sleeping purposes in the new building or addition, or at such other locations as required by this code.

Exceptions:

1. An approved operational carbon monoxide detector shall only be required to be installed inside or directly outside of each room or area where a fossilfuel-burning heater, engine or appliance is located within a hospital, inpatient hospice facility or skilled nursing home facility licensed by the Agency for Health Care Administration, or a new state correctional institution. The carbon monoxide detector shall be connected to the fire-alarm system of the hospital, inpatient hospice facility or nursing home facility as a supervisory signal.
2. This section shall not apply to existing buildings that are undergoing alterations or repairs unless the alteration is an addition as defined in Section 915.1.3.

915.1.1 Carbon Monoxide Alarm

The requirements of Section 915.1 shall be satisfied by providing for one of the following alarm installations:

1. A hard-wired carbon monoxide alarm.
2. A battery-powered carbon monoxide alarm.
3. A hard-wired combination carbon monoxide and smoke alarm.
4. A battery-powered combination carbon monoxide and smoke alarm.

915.1.2 Combination Alarms

Combination smoke/carbon monoxide alarms shall be listed and labeled by a nationally recognized testing laboratory.

915.1.3

Addition shall mean an extension or increase in floor area, number of stories or height of a building or structure.

Section 916 Gas Detection Systems

[F] 916.1 Gas Detection Systems

Gas detection systems required by this code shall comply with Sections 916.2 through 916.11.

[F] 916.2 Permits

Permits shall be required as set forth in the *Florida Fire Prevention Code*.

[F] 916.2.1 Construction Documents

Documentation of the gas detection system design and equipment to be used that demonstrates compliance with the requirements of this code shall be provided with the application for permit.

[F] 916.3 Equipment

Gas detection system equipment shall be designed for use with the gases being detected and shall be installed in accordance with manufacturer's instructions.

[F] 916.4 Power Connections

Gas detection systems shall be permanently connected to the building electrical power supply or shall be permitted to be cord connected to an unswitched receptacle using an approved restraining means that secures the plug to the receptacle.

[F] 916.5 Emergency and Standby Power

Standby or emergency power shall be provided or the gas detection system shall initiate a trouble signal at an approved location if the power supply is interrupted.

[F] 916.6 Sensor Locations

Sensors shall be installed in approved locations where leaking gases are expected to accumulate.

[F] 916.7 Gas Sampling

Gas sampling shall be performed continuously. Sample analysis shall be processed immediately after sampling, except as follows:

1. For HPM gases, sample analysis shall be performed at intervals not exceeding 30 minutes.
2. For toxic gases, sample analysis shall be performed at intervals not exceeding 5 minutes in accordance with the *Florida Fire Prevention Code*.

3. Where a less frequent or delayed sampling interval is approved.

[G] 916.8 System Activation

A gas detection alarm shall be initiated where any sensor detects a concentration of gas exceeding the following thresholds:

1. For flammable gases, a gas concentration exceeding 25 percent of the lower flammability limit (LFL).
2. For nonflammable gases, a gas concentration exceeding one-half of the IDLH, unless a different threshold is specified by the section of this code requiring a gas detection system.

Upon activation of a gas detection alarm, alarm signals or other required responses shall be as specified by the section of this code requiring a gas detection system. Audible and visible alarm signals associated with a gas detection alarm shall be distinct from fire alarm and carbon monoxide alarm signals.

[F] 916.9 Signage

Signs shall be provided adjacent to gas detection system alarm signaling devices that advise occupants of the nature of the signals and actions to take in response to the signal.

[F] 916.10 Fire Alarm System Connections

Gas sensors and gas detection systems shall not be connected to fire alarm systems unless approved and connected in accordance with the fire alarm equipment manufacturer's instructions.

[F] 916.11 Inspection, Testing and Sensor Calibration

Gas detection systems and sensors shall be inspected, tested and calibrated in accordance with the *Florida Fire Prevention Code*.

Section 917 Emergency Responder Radio Coverage

[F] 917.1 General

Emergency responder radio coverage shall be provided in all new buildings in accordance with the *Florida Fire Prevention Code*.

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Chapter 10 Means of Egress

Section 1001 Administration

1001.1 General

Buildings or portions thereof shall be provided with a *means of egress* system as required by this chapter. The provisions of this chapter shall control the design, construction and arrangement of *means of egress* components required to provide an *approved means of egress* from structures and portions thereof.

1001.2 Minimum Requirements

It shall be unlawful to alter a building or structure in a manner that will reduce the number of *exits* or the minimum width or required capacity of the *means of egress* to less than required by this code.

[F] 1001.3 Maintenance

Means of egress shall be maintained in accordance with the *Florida Fire Prevention Code*.

[F] 1001.4 Fire Safety and Evacuation Plans

Fire safety and evacuation plans shall be provided for all occupancies and buildings where required by the *Florida Fire Prevention Code*. Such fire safety and evacuation plans shall comply with the applicable provisions of the *Florida Fire Prevention Code*.

Section 1002 Definitions

1002.1 Definitions

The following terms are defined in Chapter 2:

ACCESSIBLE MEANS OF EGRESS.

AISLE.

AISLE ACCESSWAY.

ALTERNATING TREAD DEVICE.

AREA OF REFUGE.

BLEACHERS.

BREAKOUT.

COMMON PATH OF EGRESS TRAVEL.

CORRIDOR.

DOOR, BALANCED.

EGRESS COURT.

EMERGENCY ESCAPE AND RESCUE OPENING.

EXIT.

EXIT ACCESS.

EXIT ACCESS DOORWAY.

EXIT ACCESS RAMP.

EXIT ACCESS STAIRWAY.

EXIT DISCHARGE.

EXIT DISCHARGE, LEVEL OF.

EXIT, HORIZONTAL.

EXIT PASSAGeway.

EXTERIOR EXIT RAMP.

EXTERIOR EXIT STAIRWAY.

FIRE EXIT HARDWARE.

FIXED SEATING.

FLIGHT.

FLOOR AREA, GROSS.

FLOOR AREA, NET.

FOLDING AND TELESCOPIC SEATING.

GRANDSTAND.

GUARD.

HANDRAIL.

INTERIOR EXIT RAMP.

INTERIOR EXIT STAIRWAY.

LOW ENERGY POWER-OPERATED DOOR.

MEANS OF EGRESS.

MEANS OF ESCAPE.

MERCHANDISE PAD.

NOSING.

OCCUPANT LOAD.

OPEN-ENDED CORRIDOR.

PANIC HARDWARE.

PHOTOLUMINESCENT.

POWER-ASSISTED DOOR.

POWER-OPERATED DOOR.

PUBLIC WAY.

RAMP.

SCISSOR STAIRWAY.

SELF-LUMINOUS.

SMOKE-PROTECTED ASSEMBLY SEATING.

STAIR.

STAIRWAY.

STAIRWAY, SPIRAL.**WINDER.****Section 1003 General Means of Egress****1003.1 Applicability**

The general requirements specified in Sections 1003 through 1015 shall apply to all three elements of the *means of egress* system, in addition to those specific requirements for the *exit access*, the *exit* and the *exit discharge* detailed elsewhere in this chapter.

1003.2 Ceiling Height

The *means of egress* shall have a ceiling height of not less than 7 feet 6 inches (2286 mm).

Exceptions:

1. Sloped ceilings in accordance with Section 1208.2.
2. Ceilings of *dwelling units* and *sleeping units* within residential occupancies in accordance with Section 1208.2.
3. Allowable projections in accordance with Section 1003.3.
4. *Stair* headroom in accordance with Section 1011.3.
5. Door height in accordance with Section 1010.1.1.
6. *Ramp* headroom in accordance with Section 1012.5.2.
7. The clear height of floor levels in vehicular and pedestrian traffic areas of public and private parking garages in accordance with Section 406.1.2.
8. Areas above and below *mezzanine* floors in accordance with Section 505.2.

1003.3 Protruding Objects

Protruding objects on *circulation paths* shall comply with the requirements of Sections 1003.3.1 through 1003.3.4.

1003.3.1 Headroom

Protruding objects are permitted to extend below the minimum ceiling height required by Section 1003.2 where a minimum headroom of 80 inches (2032 mm) is provided over any walking surface, including walks, *corridors*, *aisles* and passageways. Not more than 50 percent of the ceiling area of a *means of egress* shall be reduced in height by protruding objects.

Exception: Door closers, overhead door stops, frame stops, power door operators and electromagnetic door locks shall be permitted to project into the opening height not lower than 78 inches (1981 mm).

A barrier shall be provided where the vertical clearance is less than 80 inches (2032 mm) high. The leading edge of such a barrier shall be located 27 inches (686 mm) maximum above the floor.

1003.3.2 Post-Mounted Objects

A free-standing object mounted on a post or pylon shall not overhang that post or pylon more than 4 inches (102 mm) where the lowest point of the leading edge is more than 27 inches (686 mm) and less than 80 inches (2032 mm) above the walking surface. Where a sign or other obstruction is mounted between posts or pylons and the clear distance between the posts or pylons is greater than 12 inches (305 mm), the lowest edge of such sign or obstruction shall be 27 inches (686 mm) maximum or 80 inches (2032 mm) minimum above the finished floor or ground.

Exception: These requirements shall not apply to sloping portions of *handrails* between the top and bottom riser of *stairs* and above the *ramp* run.

1003.3 Horizontal Projections

Objects with leading edges more than 27 inches (685 mm) and not more than 80 inches (2030 mm) above the floor shall not project horizontally more than 4 inches (102 mm) into the *circulation path*.

Exception: *Handrails* are permitted to protrude $4\frac{1}{2}$ inches (114 mm) from the wall.

1003.3.4 Clear Width

Protruding objects shall not reduce the minimum clear width of *accessible routes* (see the *Florida Building Code, Accessibility*).

1003.4 Floor Surface

Walking surfaces of the *means of egress* shall have a slip-resistant surface and be securely attached.

1003.5 Elevation Change

Where changes in elevation of less than 12 inches (305 mm) exist in the *means of egress*, sloped surfaces shall be used. Where the slope is greater than one unit vertical in 20 units horizontal (5-percent slope), *ramps* complying with Section 1012 shall be used. Where the difference in elevation is 6 inches (152 mm) or less, the *ramp* shall be equipped with either *handrails* or floor finish materials that contrast with adjacent floor finish materials.

Exceptions:

1. A single step with a maximum riser height of 7 inches (178 mm) is permitted for buildings with occupancies in Groups F, H, R-2, R-3, S and U at exterior doors not required to be *accessible* by Chapter 11.
2. A *stair* with a single riser or with two risers and a tread is permitted at locations not required to be *accessible* by Chapter 11 where the risers and treads comply with Section 1011.5, the minimum depth of the tread is 13 inches (330 mm) and not less than one *handrail* complying with Section 1014 is provided within 30 inches (762 mm) of the centerline of the normal path of egress travel on the *stair*.
3. A step is permitted in *aisles* serving seating that has a difference in elevation less than 12 inches (305 mm) at locations not required to be *accessible* by Chapter 11, provided that the risers and treads comply with Section 1029.14 and the *aisle* is provided with a *handrail* complying with Section 1029.16.

Throughout a story in a Group I-2 occupancy, any change in elevation in portions of the *means of egress* that serve nonambulatory persons shall be by means of a *ramp* or sloped walkway.

1003.5.1 Accessibility

For accessibility provisions related to changes in levels, see the *Florida Building Code, Accessibility*.

1003.6 Means of Egress Continuity

The path of egress travel along a *means of egress* shall not be interrupted by a building element other than a *means of egress* component as specified in this chapter. Obstructions shall not be placed in the minimum width or required capacity of a *means of egress* component except projections permitted by this chapter. The minimum width or required capacity of a *means of egress* system shall not be diminished along the path of egress travel.

1003.7 Elevators, Escalators and Moving Walks

Elevators, escalators and moving walks shall not be used as a component of a required *means of egress* from any other part of the building.

Exception: Elevators used as an accessible *means of egress* in accordance with Section 1009.

Section 1004 Occupant Load

1004.1 Design Occupant Load

In determining *means of egress* requirements, the number of occupants for whom *means of egress* facilities are provided shall be determined in accordance with this section.

1004.2 Cumulative Occupant Loads

Where the path of egress travel includes intervening rooms, areas or spaces, cumulative *occupant loads* shall be determined in accordance with this section.

1004.2.1 Intervening Spaces or Accessory Areas

Where occupants egress from one or more rooms, areas or spaces through others, the design *occupant load* shall be the combined *occupant load* of interconnected accessory or intervening spaces. Design of egress path capacity shall be based on the cumulative portion of *occupant loads* of all rooms, areas or spaces to that point along the path of egress travel.

1004.2.2 Adjacent Levels for Mezzanines

That portion of the *occupant load* of a *mezzanine* with required egress through a room, area or space on an adjacent level shall be added to the *occupant load* of that room, area or space.

1004.2.3 Adjacent Stories

Other than for the egress components designed for convergence in accordance with Section 1005.6, the *occupant load* from separate stories shall not be added.

1004.3 Multiple Function Occupant Load

Where an area under consideration contains multiple functions having different occupant load factors, the design occupant load for such area shall be based on the floor area of each function calculated independently.

1004.4 Multiple Occupancies

Where a building contains two or more occupancies, the *means of egress* requirements shall apply to each portion of the building based on the occupancy of that space. Where two or more occupancies utilize portions of the same *means of egress* system, those egress components shall meet the more stringent requirements of all occupancies that are served.

1004.5 Areas Without Fixed Seating

The number of occupants shall be computed at the rate of one occupant per unit of area as prescribed in Table 1004.5. For areas without *fixed seating*, the occupant load shall be not less than that number determined by dividing the floor area under consideration by the *occupant load* factor assigned to the function of the space as set forth in Table 1004.5. Where an intended function is not listed in Table 1004.5, the *building official* shall establish a function based on a listed function that most nearly resembles the intended function.

Exception: Where approved by the *building official*, the actual number of occupants for whom each occupied space, floor or building is designed, although less than those determined by calculation, shall be permitted to be used in the determination of the design *occupant load*.

TABLE 1004.5

MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT

FUNCTION OF SPACE	OCCUPANT LOAD FACTOR ^a
Accessory storage areas, mechanical equipment room	300 gross
Agricultural building	300 gross
Aircraft hangars	500 gross
Airport terminal	
Baggage claim	20 gross
Baggage handling	300 gross
Concourse	100 gross
Waiting areas	15 gross

Assembly	
Gaming floors (keno, slots, etc.)	11 gross
Exhibit gallery and museum	30 net
Assembly with fixed seats	See Section 1004.6
Assembly without fixed seats	
Concentrated (chairs only—not fixed)	7 net
Standing space	5 net
Unconcentrated (tables and chairs)	15 net
Bowling centers, allow 5 persons for each lane including 15 feet of runway, and for additional areas	7 net
Business areas	150 gross
Concentrated business use areas	See Section 1004.8
Courtrooms—other than fixed seating areas	40 net
Day care	35 net
Dormitories	50 gross
Educational	
Classroom area	20 net
Shops and other vocational room areas	50 net
Exercise rooms	50 gross
Group H-5 Fabrication and manufacturing areas	200 gross
Industrial areas	100 gross
Institutional areas	
Inpatient treatment areas	240 gross
Outpatient areas	100 gross
Sleeping areas	120 gross
Kitchens, commercial	200 gross
Library	
Reading rooms	50 net
Stack area	100 gross
Locker rooms	50 gross
Mall buildings—covered and open	See Section 402.8.2
Mercantile	60 gross

Storage, stock, shipping areas	300 gross
Parking garages	200 gross
Residential	200 gross
Skating rinks, swimming pools	
Rink and pool	50 gross
Decks	15 gross
Stages and platforms	15 net
Warehouses	500 gross

For SI: 1 square foot = 0.0929 m², 1 foot = 304.8 mm.

- a. Floor area in square feet per occupant.

1004.5.1 Increased Occupant Load

The *occupant load* permitted in any building, or portion thereof, is permitted to be increased from that number established for the occupancies in Table 1004.5, provided that all other requirements of the code are met based on such modified number and the *occupant load* does not exceed one occupant per 7 square feet (0.65 m²) of occupiable floor space. Where required by the *building official*, an *approved aisle*, seating or fixed equipment diagram substantiating any increase in *occupant load* shall be submitted. Where required by the *building official*, such diagram shall be posted.

1004.6 Fixed Seating

For areas having *fixed seats* and *aisles*, the *occupant load* shall be determined by the number of *fixed seats* installed therein. The *occupant load* for areas in which *fixed seating* is not installed, such as waiting spaces, shall be determined in accordance with Section 1004.5 and added to the number of *fixed seats*.

The *occupant load* of *wheelchair spaces* and the associated companion seat shall be based on one occupant for each *wheelchair space* and one occupant for the associated companion seat provided in accordance with the *Florida Building Code, Accessibility*.

For areas having *fixed seating* without dividing arms, the *occupant load* shall be not less than the number of seats based on one person for each 18 inches (457 mm) of seating length.

The *occupant load* of seating booths shall be based on one person for each 24 inches (610 mm) of booth seat length measured at the backrest of the seating booth.

1004.7 Outdoor Areas

Yards, patios, occupied roofs, *courts* and similar outdoor areas accessible to and usable by the building occupants shall be provided with *means of egress* as required by this chapter. The *occupant load* of such outdoor areas shall be assigned by the *building official* in accordance with the anticipated use. Where outdoor areas are to be used by persons in addition to the occupants of the building, and the path of egress travel from the outdoor areas passes through the building, *means of egress* requirements for the building shall be based on the sum of the *occupant loads* of the building plus the outdoor areas.

Exceptions:

1. Outdoor areas used exclusively for service of the building need only have one *means of egress*.
2. Both outdoor areas associated with Group R-3 and individual dwelling units of Group R-2.

1004.8 Concentrated Business Use Areas

The occupant load factor for concentrated business use shall be applied to telephone call centers, trading floors, electronic data processing centers and similar business use areas with a higher density of occupants than would normally be expected in a typical business occupancy environment. Where approved by the building official, the occupant load for concentrated business use areas shall be the actual occupant load, but not less than one occupant per 50 square feet (4.65 m^2) of gross occupiable floor space.

1004.9 Posting of Occupant Load

Every room or space that is an assembly occupancy shall have the *occupant load* of the room or space posted in a conspicuous place, near the main *exit* or *exit access doorway* from the room or space, for the intended configurations. Posted signs shall be of an approved legible permanent design and shall be maintained by the owner or the owner's authorized agent.

Section 1005 Means of Egress Sizing

1005.1 General

All portions of the *means of egress* system shall be sized in accordance with this section.

Exception: *Aisles* and *aisle accessways* in rooms or spaces used for assembly purposes complying with Section 1029.

1005.2 Minimum Width Based on Component

The minimum width, in inches (mm), of any *means of egress* components shall be not less than that specified for such component, elsewhere in this code.

1005.3 Required Capacity Based on Occupant Load

The required capacity, in inches (mm), of the *means of egress* for any room, area, space or story shall be not less than that determined in accordance with Sections 1005.3.1 and 1005.3.2:

1005.3.1 Stairways

The capacity, in inches, of *means of egress stairways* shall be calculated by multiplying the *occupant load* served by such *stairways* by a means of egress capacity factor of 0.3 inch (7.6 mm) per occupant. Where *stairways* serve more than one story, only the occupant load of each story considered individually shall be used in calculating the required capacity of the *stairways* serving that story.

Exceptions:

1. For other than Group H and I-2 occupancies, the capacity, in inches, of *means of egress stairways* shall be calculated by multiplying the *occupant load* served by such *stairways* by a means of egress capacity factor of 0.2 inch (5.1 mm) per occupant in buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2 and an *emergency voice/alarm communication* system in accordance with Section 907.5.2.2.
2. Facilities with *smoke-protected assembly seating* shall be permitted to use the capacity factors in Table 1029.6.2 indicated for stepped aisles for *exit access* or *exit stairways* where the entire path for *means of egress* from the seating to the *exit discharge* is provided with a smoke control system complying with Section 909.
3. Facilities with *open-air assembly seating* shall be permitted to the capacity factors in Section 1029.6.3 indicated for stepped aisles for *exit access* or *exit stairways* where the entire path for *means of egress* from the seating to the *exit discharge* is open to the outdoors.

1005.3.2 Other Egress Components

The capacity, in inches, of *means of egress* components other than *stairways* shall be calculated by multiplying the *occupant load* served by such component by a means of egress capacity factor of 0.2 inch (5.1 mm) per occupant.

Exceptions:

1. For other than Group H and I-2 occupancies, the capacity, in inches, of *means of egress* components other than *stairways* shall be calculated by multiplying the *occupant load* served by such component by a means of egress capacity factor of 0.15 inch (3.8 mm) per occupant in buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2 and an *emergency voice/alarm communication* system in accordance with Section 907.5.2.2.

2. Facilities with *smoke-protected assembly seating* shall be permitted to use the capacity factors in Table 1029.6.2 indicated for level or ramped *aisles* for *means of egress* components other than *stairways* where the entire path for *means of egress* from the seating to the *exit discharge* is provided with a smoke control system complying with Section 909.

3. Facilities with *open-air assembly seating* shall be permitted to the capacity factors in Section 1029.6.3 indicated for level or ramped *aisles* for *means of egress* components other than *stairways* where the entire path for *means of egress* from the seating to the *exit discharge* is open to the outdoors.

1005.4 Continuity

The minimum width or required capacity of the *means of egress* required from any story of a building shall not be reduced along the path of egress travel until arrival at the public way.

1005.5 Distribution of Minimum Width and Required Capacity

Where more than one *exit*, or access to more than one *exit*, is required, the *means of egress* shall be configured such that the loss of any one *exit*, or access to one *exit*, shall not reduce the available capacity or width to less than 50 percent of the required capacity or width.

1005.6 Egress Convergence

Where the *means of egress* from stories above and below converge at an intermediate level, the capacity of the *means of egress* from the point of convergence shall be not less than the largest minimum width or the sum of the required capacities for the *stairways* or *ramps* serving the two adjacent stories, whichever is larger.

1005.7 Encroachment

Encroachments into the required *means of egress* width shall be in accordance with the provisions of this section.

1005.7.1 Doors

Doors, when fully opened, shall not reduce the required width by more than 7 inches (178 mm). Doors in any position shall not reduce the required width by more than one-half.

Exceptions:

1. Surface-mounted latch release hardware shall be exempt from inclusion in the 7-inch maximum (178 mm) encroachment where both of the following conditions exist:
 - 1.1. The hardware is mounted to the side of the door facing away from the adjacent wall where the door is in the open position.
 - 1.2. The hardware is mounted not less than 34 inches (865 mm) nor more than 48 inches (1219 mm) above the finished floor.

2. The restrictions on door swing shall not apply to doors within individual *dwelling units* and *sleeping units* of Group R-2 occupancies and *dwelling units* of Group R-3 occupancies.

1005.7.2 Other Projections

Handrail projections shall be in accordance with the provisions of Section 1014.8. Other nonstructural projections such as trim and similar decorative features shall be permitted to project into the required width not more than 1½ inches (38 mm) on each side.

Exception: Projections are permitted in corridors within Group I-2 Condition 1 in accordance with Section 407.4.3.

1005.7.3 Protruding Objects

Protruding objects shall comply with the applicable requirements of Section 1003.3.

Section 1006 Number of Exits and Exit Access Doorways

1006.1 General

The number of *exits* or *exit access doorways* required within the *means of egress* system shall comply with the provisions of Section 1006.2 for spaces, including *mezzanines*, and Section 1006.3 for *stories*.

1006.2 Egress From Spaces

Rooms, areas or spaces, including *mezzanines*, within a *story* or *basement* shall be provided with the number of *exits* or access to *exits* in accordance with this section.

1006.2.1 Egress Based on Occupant Load and Common Path of Egress Travel Distance

Two *exits* or *exit access doorways* from any space shall be provided where the design *occupant load* or the *common path of egress travel distance* exceeds the values listed in Table 1006.2.1. The cumulative *occupant load* from adjacent rooms, areas or spaces shall be determined in accordance with Section 1004.2.

Exceptions:

1. The number of *exits* from foyers, lobbies, vestibules or similar spaces need not be based on cumulative *occupant loads* for areas discharging through such spaces, but the capacity of the *exits* from such spaces shall be based on applicable cumulative *occupant loads*.
2. *Care suites* in Group I-2 occupancies complying with Section 407.4.
3. Unoccupied mechanical rooms and penthouses are not required to comply with the common path of egress travel distance measurement.

TABLE 1006.2.1
SPACES WITH ONE EXIT OR EXIT ACCESS DOORWAY

OCCUPANCY	MAXIMUM OCCUPANT LOAD OF SPACE	MAXIMUM COMMON PATH OF EGRESS TRAVEL DISTANCE (feet)		
		Without Sprinkler System (feet)		With Sprinkler System (feet)
		Occupant Load	OL ≤ 30	
A ^c , E, M	49	75	75	75 ^a
B	49	100	75	100 ^a
F	49	75	75	100 ^a
H-1, H-2, H-3	3	NP	NP	25 ^b
H-4, H-5	10	NP	NP	75 ^b
I-1, I-2 ^d , I-4	10	NP	NP	75 ^a
I-3	10	NP	NP	100 ^a
R-1	10	NP	NP	75 ^a
R-2	49	NP	NP	125 ^a
R-3 ^e	49	NP	NP	125 ^a
R-4 ^e	20	75	75	125 ^a
S ^f	29	100	75	100 ^a

U	49	100	75	75 ^a
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For SI: 1 foot = 304.8 mm.

NP = Not Permitted.

- a. Buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2. See Section 903 for occupancies where *automatic sprinkler systems* are permitted in accordance with Section 903.3.1.2.
- b. Group H occupancies equipped throughout with an *automatic sprinkler system* in accordance with Section 903.2.5.
- c. For a room or space used for assembly purposes having *fixed seating*, see Section 1029.8.
- d. For the travel distance limitations in Group I-2, see Section 407.4.
- e. The *common path of egress travel* distance shall only apply in a Group R-3 occupancy located in a mixed occupancy building or within a Group R-3 or R-4 *congregate living facility*.
- f. The length of *common path of egress travel* distance in a Group S-2 *open parking garage* shall be not more than 100 feet.

1006.2.1.1 Three or More Exits or Exit Access Doorways

Three *exits* or *exit access doorways* shall be provided from any space with an occupant load of 501 to 1,000. Four *exits* or *exit access doorways* shall be provided from any space with an occupant load greater than 1,000.

1006.2.2 Egress Based on Use

The numbers, configuration and types of components of *exits* or access to *exits* shall be provided in the uses described in Sections 1006.2.2.1 through 1006.2.2.6.

1006.2.2.1 Boiler, Incinerator and Furnace Rooms

Two *exit access doorways* are required in boiler, incinerator and furnace rooms where the area is over 500 square feet (46 m^2) and any fuel-fired equipment exceeds 400,000 British thermal units (Btu) (422 000 KJ) input capacity. Where two *exit access doorways* are required, one is permitted to be a fixed ladder or an *alternating tread device*. *Exit access doorways* shall be separated by a horizontal distance equal to one-half the length of the maximum overall diagonal dimension of the room.

1006.2.2.2 Refrigeration Machinery Rooms

Machinery rooms larger than 1,000 square feet (93 m^2) shall have not less than two *exits* or *exit access doorways*. Where two *exit access doorways* are required, one such doorway is permitted to be served by a fixed ladder or an *alternating tread device*. *Exit access doorways* shall be separated by a horizontal distance equal to one-half the maximum horizontal dimension of the room.

All portions of machinery rooms shall be within 150 feet (45 720 mm) of an *exit* or *exit access doorway*. An increase in *exit access travel distance* is permitted in accordance with Section 1017.1.

Exit or *exit access doorways* shall swing in the direction of egress travel and shall be equipped with panic hardware, regardless of the *occupant load* served. *Exit* or *exit access doorways* shall be tight fitting and self-closing.

1006.2.2.3 Refrigerated Rooms or Spaces

Rooms or spaces having a floor area larger than 1,000 square feet (93 m^2), containing a refrigerant evaporator and maintained at a temperature below 68°F (20°C), shall have access to not less than two *exits* or *exit access doorways*.

Exit access travel distance shall be determined as specified in Section 1017.1, but all portions of a refrigerated room or space shall be within 150 feet (45 720 mm) of an *exit* or *exit access doorway* where such rooms are not protected by an approved *automatic sprinkler system*. Egress is allowed through adjoining refrigerated rooms or spaces.

Exception: Where using refrigerants in quantities limited to the amounts based on the volume set forth in the *Florida Building Code, Mechanical*.

1006.2.2.4 Electrical Rooms

The location and number of exit or exit access doorways shall be provided for electrical rooms in accordance with Section 110.26 of NFPA 70 for electrical equipment rated 1,000 volts or less, and Section 110.33 of NFPA 70 for electrical equipment rated over 1,000 volts. Panic hardware shall be provided where required in accordance with Section 1010.2.9.2.

1006.2.2.5 Group I-4 Means of Egress

Day care facilities, rooms or spaces where care is provided for more than 10 children that are $2\frac{1}{2}$ years of age or less, shall have access to not less than two *exits* or *exit access doorways*.

1006.2.2.6 Vehicular Ramps

Vehicular ramps shall not be considered as an *exit access ramp* unless pedestrian facilities are provided.

1006.3 Egress From Stories or Occupied Roofs

The *means of egress* system serving any *story* or occupied roof shall be provided with the number of separate and distinct exits or access to *exits* based on the aggregate *occupant load* served in accordance with this section. Where stairways serve more than one story, only the occupant load of each story considered individually shall be used in calculating the required number of exits or access to exits serving that story.

1006.3.1 Adjacent Story

The path of egress travel to an exit shall not pass through more than one adjacent story.

Exception: The path of egress travel to an exit shall be permitted to pass through more than one adjacent story in any of the following:

1. In Group R-1, R-2 or R-3 occupancies, exit access stairways and ramps connecting four stories or less serving and contained within an individual dwelling unit or sleeping unit or live/work unit.
2. Exit access stairways serving and contained within a Group R-3 congregate residence or a Group R-4 facility.
3. Exit access stairways and ramps in open parking garages that serve only the parking garage.
4. Exit access stairways and ramps serving open-air assembly seating complying with the exit access travel distance requirements of Section 1029.7.
5. Exit access stairways and ramps between the balcony, gallery or press box and the main assembly floor in occupancies such as theaters, places of religious worship, auditoriums and sports facilities.

1006.3.2 Egress Based on Occupant Load

Each *story* and occupied roof shall have the minimum number of separate and distinct *exits*, or access to *exits*, as specified in Table 1006.3.2. A single *exit* or access to a single *exit* shall be permitted in accordance with Section 1006.3.3. The required number of *exits*, or *exit access stairways* or *ramps* providing access to *exits*, from any *story* or occupied roof shall be maintained until arrival at the *exit discharge* or a *public way*.

TABLE 1006.3.2

MINIMUM NUMBER OF EXITS OR ACCESS TO EXITS PER STORY

OCCUPANT LOAD PER STORY	MINIMUM NUMBER OF EXITS OR ACCESS TO EXITS FROM STORY
1-500	2

501-1,000	3
More than 1,000	4

1006.3.3 Single Exits

A single *exit* or access to a single *exit* shall be permitted from any *story* or occupied roof where one of the following conditions exists:

1. The *occupant load*, number of *dwelling units* and common path of egress travel distance do not exceed the values in Table 1006.3.3(1) or 1006.3.3(2).
2. Rooms, areas and spaces complying with Section 1006.2.1 with *exits* that discharge directly to the exterior at the *level of exit discharge*, are permitted to have one *exit* or access to a single *exit*.
3. Parking garages where vehicles are mechanically parked shall be permitted to have one *exit* or access to a single *exit*.
4. Group R-3 and R-4 occupancies shall be permitted to have one *exit* or access to a single *exit*.
5. Individual single-story or multistory *dwelling units* shall be permitted to have a single exit or access to a single *exit* from the *dwelling unit* provided that both of the following criteria are met:
 - 5.1. The *dwelling unit* complies with Section 1006.2.1 as a space with one *means of egress*.
 - 5.2. Either the *exit* from the *dwelling unit* discharges directly to the exterior at the *level of exit discharge*, or the *exit access* outside the *dwelling unit's entrance door* provides access to not less than two approved independent *exits*.

TABLE 1006.3.3(1)**STORIES WITH ONE EXIT OR ACCESS TO ONE EXIT FOR R-2 OCCUPANCIES**

STORY	OCCUPANCY	MAXIMUM NUMBER OF DWELLING UNITS	MAXIMUM COMMON PATH OF EGRESS TRAVEL DISTANCE
Basement, first, second or third story above grade plane	R-2 ^{a, b}	4 dwelling units	125 feet
Fourth story above grade plane and higher	NP	NA	NA

For SI: 1 foot = 3048 mm.

NP = Not Permitted.

NA = Not Applicable.

- a. Buildings classified as Group R-2 equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2 and provided with *emergency escape and rescue openings* in accordance with Section 1030.
- b. This table is used for R-2 occupancies consisting of *dwelling units*. For R-2 occupancies consisting of *sleeping units*, use Table 1006.3.3(2).

TABLE 1006.3.3(2)**STORIES WITH ONE EXIT OR ACCESS TO ONE EXIT FOR OTHER OCCUPANCIES**

STORY	OCCUPANCY	MAXIMUM OCCUPANT LOAD PER STORY	MAXIMUM COMMON PATH OF EGRESS TRAVEL DISTANCE (feet)
First story above or below grade plane	A, B ^b , E F ^b , M, U	49	75
	H-2, H-3	3	25
	H-4, H-5, I, R-1, R-2 ^{a, c} , R-4	10	75
	S ^{b, d}	29	75
Second story above grade plane	B, F, M, S ^d	29	75
Third story above grade plane and higher	NP	NA	NA

For SI: 1 foot = 304.8 mm.

NP = Not Permitted.

NA = Not Applicable.

- a. Buildings classified as Group R-2 equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2 and provided with *emergency escape and rescue openings* in accordance with Section 1030.
- b. Group B, F and S occupancies in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 shall have a maximum *exit access travel distance* of 100 feet.
- c. This table is used for R-2 occupancies consisting of *sleeping units*. For R-2 occupancies consisting of *dwelling units*, use Table 1006.3.3(1).
- d. The length of *exit access travel distance* in a Group S-2 *open parking garage* shall be not more than 100 feet.

1006.3.3.1 Mixed Occupancies

Where one *exit*, or *exit access stairway* or *ramp* providing access to *exits* at other *stories*, is permitted to serve individual *stories*, mixed occupancies shall be permitted to be served by single *exits* provided each individual occupancy complies with the applicable requirements of Table 1006.3.3(1) or 1006.3.3(2) for that occupancy. Where applicable, cumulative *occupant loads* from adjacent occupancies shall be considered in accordance with the provisions of Section 1004.2. In each *story* of a mixed occupancy building, the maximum number of occupants served by a single *exit* shall be such that the sum of the ratios of the calculated number of occupants of the space divided by the allowable number of occupants indicated in Table 1006.3.3(2) for each occupancy does not exceed one. Where *dwelling units* are located on a *story* with other occupancies, the actual number of *dwelling units* divided by four plus the ratio from the other occupancy does not exceed one.

Section 1007 Exit and Exit Access Doorway Configuration

1007.1 General

Exits, *exit access doorways*, and *exit access stairways* and *ramps* serving spaces, including individual building *stories*, shall be separated in accordance with the provisions of this section.

1007.1.1 Two Exits or Exit Access Doorways

Where two *exits*, *exit access doorways*, *exit access stairways* or *ramps*, or any combination thereof, are required from any portion of the *exit access*, they shall be placed a distance apart equal to not less than one-half of the length of the maximum overall diagonal

dimension of the building or area to be served measured in a straight line between them. Interlocking or *scissor stairways* shall be counted as one *exit stairway*.

Exceptions:

1. Where interior *exit stairways* or *ramps* are interconnected by a 1-hour fire-resistance-rated corridor conforming to the requirements of Section 1020, the required exit separation shall be measured along the shortest direct line of travel within the corridor.
2. Where a building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2, the separation distance shall be not less than one-third of the length of the maximum overall diagonal dimension of the area served.
3. In Group R1 and R2 occupancies, the distance between exits is not applicable to common nonlooped exit access corridors in a building that has corridor doors from the guestroom or guest suite or dwelling unit, which are arranged so that the exits are located in opposite directions from such doors.

1007.1.1.1 Measurement Point

The separation distance required in Section 1007.1.1 shall be measured in accordance with the following:

1. The separation distance to *exit* or *exit access doorways* shall be measured to any point along the width of the doorway.
2. The separation distance to *exit access stairways* shall be measured to the closest riser.

1007.1.2 Three or More Exits or Exit Access Doorways

Where access to three or more *exits* is required, not less than two *exit* or *exit access doorways* shall be arranged in accordance with the provisions of Section 1007.1.1. Additional required *exit* or *exit access doorways* shall be arranged a reasonable distance apart so that if one becomes blocked, the others will be available.

1007.1.3 Remoteness of Exit Access Stairways or Ramps

Where two *exit access stairways* or *ramps* provide the required *means of egress* to *exits* at another story, the required separation distance shall be maintained for all portions of such *exit access stairways* or *ramps*.

1007.1.3.1 Three or More Exit Access Stairways or Ramps

Where more than two *exit access stairways* or *ramps* provide the required *means of egress*, not less than two shall be arranged in accordance with Section 1007.1.3.

Section 1008 Means of Egress Illumination**1008.1 Means of Egress Illumination**

Illumination shall be provided in the *means of egress* in accordance with Section 1008.2. Under emergency power, means of egress illumination shall comply with Section 1008.3.

1008.2 Illumination Required

The *means of egress* serving a room or space shall be illuminated at all times that the room or space is occupied.

Exceptions:

1. Occupancies in Group U.
2. Aisle accessways in Group A.

3. Dwelling units and sleeping units in Groups R-1, R-2 and R-3.

4. Sleeping units of Group I occupancies.

1008.2.1 Illumination Level Under Normal Power

The means of egress illumination level shall be not less than 1 footcandle (11 lux) at the walking surface. Along exit access stairways, exit stairways and at their required landings, the illumination level shall not be less than 10 footcandles at the walking surface when the stairway is in use.

Exception: For auditoriums, theaters, concert or opera halls and similar assembly occupancies, the illumination at the walking surface is permitted to be reduced during performances by one of the following methods provided that the required illumination is automatically restored upon activation of a premises' fire alarm system:

1. Externally illuminated walking surfaces shall be permitted to be illuminated to not less than 0.2 footcandle (2.15 lux).
2. Steps, landings and the sides of ramps shall be permitted to be marked with self-luminous materials in accordance with Sections 1025.2.1, 1025.2.2 and 1025.2.4 by systems listed in accordance with UL 1994.

1008.2.2 Group I-2

In Group I-2 occupancies where two or more exits are required, on the exterior landings required by Section 1010.1.5, means of egress illumination levels for the exit discharge shall be provided such that failure of any single lighting unit shall not reduce the illumination level on that landing to less than 1 footcandle (11 lux).

1008.2.3 Exit Discharge

Illumination shall be provided along the path of travel for the exit discharge from each exit to the public way.

Exception: Illumination shall not be required where the path of exit discharge meets both of the following requirements:

1. The path of exit discharge is illuminated from the exit to a safe dispersal area complying with Section 1028.5.
2. A dispersal area shall be illuminated to a level not less than 1 footcandle (11 lux) at the walking surface.

1008.3 Emergency Power for Illumination

The power supply for means of egress illumination shall normally be provided by the premises' electrical supply.

1008.3.1 General

In the event of power supply failure in rooms and spaces that require two or more exits or access to exits, an emergency electrical system shall automatically illuminate all of the following areas:

1. Aisles.
2. Corridors.
3. Exit access stairways and ramps.

1008.3.2 Buildings

In the event of power supply failure in buildings that require two or more exits or access to exits, an emergency electrical system shall automatically illuminate all of the following areas:

1. *Interior exit access stairways and ramps.*
2. *Interior and exterior exit stairways and ramps.*
3. *Exit passageways.*
4. Vestibules and areas on the level of discharge used for *exit discharge* in accordance with Section 1028.2.
5. Exterior landings as required by Section 1010.1.5 for *exit doorways* that lead directly to the *exit discharge*.

1008.3.3 Rooms and Spaces

In the event of power supply failure, an emergency electrical system shall automatically illuminate all of the following areas:

1. Electrical equipment rooms.
2. Fire command centers.
3. Fire pump rooms.
4. Generator rooms.
5. Public restrooms with an area greater than 300 square feet (27.87 m^2).

1008.3.4 Duration

The emergency power system shall provide power for a duration of not less than 90 minutes and shall consist of storage batteries, unit equipment or an on-site generator. The installation of the emergency power system shall be in accordance with Section 2702.

1008.3.5 Illumination Level Under Emergency Power

Emergency lighting facilities shall be arranged to provide initial illumination that is not less than an average of 1 footcandle (11 lux) and a minimum at any point of 0.1 footcandle (1 lux) measured along the path of egress at floor level. Illumination levels shall be permitted to decline to 0.6 footcandle (6 lux) average and a minimum at any point of 0.06 footcandle (0.6 lux) at the end of the emergency lighting time duration. A maximum-to-minimum illumination uniformity ratio of 40 to 1 shall not be exceeded. In Group I-2 occupancies, failure of any single lighting unit shall not reduce the illumination level to less than 0.2 foot-candle (2.2 lux).

Section 1009 Accessible Means of Egress

1009.1 Accessible Means of Egress Required

Accessible means of egress shall be provided in accordance with the applicable sections of the *Florida Building Code, Accessibility*.

1009.2 Continuity and Components

Reserved.

1009.3 Stairways

Reserved.

1009.4 Elevators

Reserved.

1009.5 Platform Lifts

Reserved.

1009.6 Areas of Refuge

Reserved.

1009.7 Exterior Areas for Assisted Rescue

Reserved.

1009.8 Two-Way Communication

Reserved.

1009.9 Signage

Reserved.

1009.10 Directional Signage

Reserved.

1009.11 Instructions

Reserved.

Section 1010 Doors, Gates and Turnstiles

1010.1 General

Doors in the means of egress shall comply with the requirements of Sections 1010.1.1 through 1010.3.5. Exterior exit doors shall also comply with the requirements of Section 1022.2. Gates in the means of egress shall comply with the requirements of Sections 1010.4 through 1010.4.1. Turnstiles in the means of egress shall comply with the requirements of Sections 1010.5 through 1010.5.4.

Doors, gates and turnstiles provided for egress purposes in numbers greater than required by this code shall comply with the requirements of this section.

Doors in the *means of egress* shall be readily distinguishable from the adjacent construction and finishes such that the doors are easily recognizable as doors. Mirrors or similar reflecting materials shall not be used on *means of egress* doors. *Means of egress* doors shall not be concealed by curtains, drapes, decorations or similar materials.

For accessibility provisions related to doors, refer to the *Florida Building Code, Accessibility*.

1010.1.1 Size of Doors

The required capacity of each door opening shall be sufficient for the *occupant load* thereof and shall provide a minimum clear opening width of 32 inches (813 mm). The clear opening width of doorways with swinging doors shall be measured between the face of the door and the frame stop, with the door open 90 degrees (1.57 rad). Where this section requires a minimum clear opening width of 32 inches (813 mm) and a door opening includes two door leaves without a mullion, one leaf shall provide a minimum clear opening width of 32 inches (813 mm). In Group I-2, doors serving as means of egress doors where used for the movement of beds shall provide a minimum clear opening width of 41 $\frac{1}{2}$ inches (1054 mm). The minimum clear height of door openings shall be not less than 80 inches (2032 mm).

Exceptions:

1. In Group R-2 and R-3 dwelling and sleeping units that are not required to be an Accessible unit, the minimum width shall not apply to door openings that are not part of the required *means of egress*.
2. In Group I-3, door openings to resident *sleeping units* that are not required to be an Accessible unit shall have a minimum clear opening width of 28 inches (711 mm).
3. Door openings to storage closets less than 10 square feet (0.93 m²) in area shall not be limited by the minimum clear opening width.
4. The maximum width of door leaves in revolving doors that comply with Section 1010.3.1 shall not be limited.

5. The maximum width of door leaves in *power-operated doors* that comply with Section 1010.3.2 shall not be limited.
6. Door openings within a *dwelling unit* or *sleeping unit* shall have a minimum clear opening height of 78 inches (1981 mm).
7. In dwelling and sleeping units that are not required to be Accessible units, exterior door openings other than the required *exit* door shall have a minimum clear opening height of 76 inches (1930 mm).
8. In Group I-1, R-2, R-3 and R-4 occupancies, in dwelling and sleeping units that are not required to be Accessible units, the minimum clear opening widths shall not apply to interior egress doors.
9. Door openings required to be *accessible* intended for user passage shall have a minimum clear opening width of 31.75 inches (806 mm).
10. Buildings that are 400 square feet (37 m^2) or less and that are intended for use in conjunction with one- and two-family residences are not subject to the door height and width requirements of this code.
11. Doors to walk-in freezers and coolers less than 1,000 square feet (93 m^2) in area shall have a maximum width of 60 inches (1524 mm) nominal.
12. The minimum clear opening width shall not apply to doors for nonaccessible showers or sauna compartments.
13. The minimum clear opening width shall not apply to the doors for nonaccessible toilet stalls.

1010.1.1.1 Projections Into Clear Opening

There shall not be projections into the required clear opening width lower than 34 inches (864 mm) above the floor or ground. Projections into the clear opening width between 34 inches (864 mm) and 80 inches (2032 mm) above the floor or ground shall not exceed 4 inches (102 mm).

Exception: Door closers, overhead door stops, frame stops, power door operators, and electromagnetic door locks shall be permitted to project into the opening height not lower than 78 inches (1980 mm) minimum above the floor.

1010.1.2 Egress Door Types

Egress doors shall be of the side-hinged swinging door, pivoted door or balanced door types.

Exceptions:

1. Private garages, office areas, factory and storage areas with an *occupant load* of 10 or less.
2. Group I-3 occupancies used as a place of detention.
3. Critical or intensive care patient rooms within suites of health care facilities.
4. Doors within or serving a single *dwelling unit* in Groups R-2 and R-3.
5. In other than Group H occupancies, revolving doors complying with Section 1010.3.1.
6. In other than Group H occupancies, special purpose horizontal sliding, accordion or folding door assemblies complying with Section 1010.3.3.
7. Power-operated doors in accordance with Section 1010.3.2.
8. Doors serving a bathroom within an individual *sleeping unit* in Group R-1.

9. In other than Group H occupancies, manually operated horizontal sliding doors are permitted in a *means of egress* from spaces with an *occupant load* of 10 or less.

1010.1.2.1 Direction of Swing

Side-hinged swinging doors, pivoted doors and balanced doors shall swing in the direction of egress travel where serving a room or area containing an occupant load of 50 or more persons or a Group H occupancy.

1010.1.3 Forces to Unlatch and Open Doors

The forces to unlatch doors shall comply with the following:

1. Where door hardware operates by push or pull, the operational force to unlatch the door shall not exceed 15 pounds (66.7N).
2. Where door hardware operates by rotation, the operational force to unlatch the door shall not exceed 28 inch-pounds (315 N-cm).

The forces to open doors shall comply with the following:

1. For interior swinging egress doors that are manually operated, other than doors required to be fire rated, the force for pushing or pulling open the door shall not exceed 5 pounds (22 N).
2. For other swinging doors, sliding doors or folding doors, and doors required to be fire rated, the door shall require not more than a 30-pound (133 N) force to be set in motion and shall move to a full-open position when subjected to not more than a 15- pound (67 N) force.

1010.1.3.1 Location of Applied Forces

Forces shall be applied to the latch side of the door.

1010.1.3.2 Manual Horizontal Sliding Doors

Where a manual horizontal sliding door is required to latch, the latch or other mechanism shall prevent the door from rebounding into a partially open position when the door is closed.

1010.1.4 Floor Elevation

There shall be a floor or landing on each side of a door. Such floor or landing shall be at the same elevation on each side of the door. Landings shall be level except for exterior landings, which are permitted to have a slope not to exceed 0.25 unit vertical in 12 units horizontal (2-percent slope).

Exceptions:

1. Doors serving individual *dwelling units* in Groups R-2 and R-3 where the following apply:
 - 1.1. A door is permitted to open at the top step of an interior *flight of stairs*, provided the door does not swing over the top step.
 - 1.2. Screen doors and storm doors are permitted to swing over *stairs* or landings.
2. Exterior doors as provided for in Section 1003.5, Exception 1, and Section 1022.2, which are not on an *accessible route*.
3. In Group R-3 occupancies not required to be *Accessible units*, the landing at an exterior doorway shall be not more than $7\frac{3}{4}$ inches (197 mm) below the top of the threshold, provided the door, other than an exterior storm or screen door, does not swing over the landing.
4. Variations in elevation due to differences in finish materials, but not more than $\frac{1}{2}$ inch (12.7 mm).

5. Reserved.

6. Doors serving equipment spaces not required to be *accessible* in accordance with Chapter 11 and serving an occupant load of five or less shall be permitted to have a landing on one side to be not more than 7 inches (178 mm) above or below the landing on the egress side of the door.

1010.1.5 Landings at Doors

Landings shall have a width not less than the width of the *stairway* or the door, whichever is greater. Doors in the fully open position shall not reduce a required dimension by more than 7 inches (178 mm). Where a landing serves an *occupant load* of 50 or more, doors in any position shall not reduce the landing to less than one-half its required width. Landings shall have a length measured in the direction of travel of not less than 44 inches (1118 mm).

Exception: Landing length in the direction of travel in Groups R-3 and U and within individual units of Group R-2 need not exceed 36 inches (914 mm).

1010.1.6 Thresholds

Thresholds at doorways shall not exceed $\frac{3}{4}$ inch (19.1 mm) in height above the finished floor or landing for sliding doors serving *dwelling units* or $\frac{1}{2}$ inch (12.7 mm) above the finished floor or landing for other doors. Raised thresholds and floor level changes greater than $\frac{1}{4}$ inch (6.4 mm) at doorways shall be beveled with a slope not greater than one unit vertical in two units horizontal (50-percent slope).

Exceptions:

1. In occupancy Group R-2 or R-3, threshold heights for sliding and side-hinged exterior doors shall be permitted to be up to $\frac{7}{4}$ inches (197 mm) in height if all of the following apply:

- 1.1. The door is not part of the required *means of egress*.
 - 1.2. The door is not part of an *accessible route* as required by Chapter

2. For exterior doors serving dwelling units, or sleeping units, thresholds at doorways shall be allowed at a height necessary to comply with the water resistance requirements of Section 1709.5.

1010.1.7 Door Arrangement

Space between two doors in a series shall be 48 inches (1219 mm) minimum plus the width of a door swinging into the space. Doors in a series shall swing either in the same direction or away from the space between the doors.

Exceptions:

1. The minimum distance between horizontal sliding power-operated doors in a series shall be 48 inches (1219 mm).
2. Storm and screen doors serving individual *dwelling units* in Groups R-2 and R-3 need not be spaced 48 inches (1219 mm) from the other door.
3. Doors within individual *dwelling units* in Groups R-2 and R-3.

1010.2 Door Operations

Except as specifically permitted by this section, egress doors shall be readily openable from the egress side without the use of a key or special knowledge or effort.

1010.2.1 Unlatching

The unlatching of any door or leaf shall not require more than one operation. Manual bolts are not permitted.

Exceptions:

1. Places of detention or restraint.
2. Doors with *manual bolts, automatic flush bolts, and constant latching bolts* as permitted by Section 1010.2.4, Item 4.
3. Doors from individual *dwelling units and sleeping units* of Group R occupancies as permitted by Section 1010.2.4, Item 5.

1010.2.2 Hardware

Door handles, pulls, latches, locks and other operating devices on doors required to be *accessible* by Chapter 11 shall not require tight grasping, tight pinching or twisting of the wrist to operate.

1010.2.3 Hardware Height

Door handles, pulls, latches, locks and other operating devices shall be installed 34 inches (864 mm) minimum and 48 inches (1219 mm) maximum above the finished floor. Locks used only for security purposes and not used for normal operation are permitted at any height.

Exception: Access doors or gates in barrier walls and fences protecting pools, spas and hot tubs shall be permitted to have operable parts of the release of latch on self-latching devices at 54 inches (1370 mm) maximum above the finished floor or ground, provided the self-latching devices are not also self-locking devices operated by means of a key, electronic opener or integral combination lock.

1010.2.4 Locks and Latches

Locks and latches shall be permitted to prevent operation of doors where any of the following exist:

1. Places of detention or restraint.
2. In Group I-1, Condition 2 and Group I-2 occupancies where the clinical needs of persons receiving care require containment or where persons receiving care pose a security threat, provided that all clinical staff can readily unlock doors at all times, and all such locks are keyed to keys carried by all clinical staff at all times or all clinical staff have the codes or other means necessary to operate the locks at all times.
3. In buildings in occupancy Group A having an *occupant load* of 300 or less, Groups B, F, M and S, and in *places of religious worship*, the main door or doors are permitted to be equipped with key-operated locking devices from the egress side provided:
 - 3.1. The locking device is readily distinguishable as locked.
 - 3.2. A readily visible durable sign is posted on the egress side on or adjacent to the door stating: THIS DOOR TO REMAIN UNLOCKED WHEN THIS SPACE IS OCCUPIED. The sign shall be in letters 1 inch (25 mm) high on a contrasting background.
 - 3.3. The use of the key-operated locking device is revocable by the *building official* for due cause.
4. Manual bolts, automatic flush bolts, and constant latching bolts on the inactive leaf of a pair of doors in accordance with Table 1010.2.4, provided that the inactive leaf does not have a doorknob, panic hardware, or similar operating hardware.
5. Doors from individual *dwelling or sleeping units* of Group R occupancies having an *occupant load* of 10 or less are permitted to be equipped with a night latch, dead bolt or security chain, provided such devices are openable from the inside without the use of a key or tool.
6. *Fire doors* after the minimum elevated temperature has disabled the unlatching mechanism in accordance with *listed fire door* test procedures.
7. Doors serving roofs not intended to be occupied shall be permitted to be locked, preventing entry to the building from the roof, provided that when accessing the roof from the building the locks do not automatically lock, preventing re-entry into the building from the roof.

8. Other than egress courts, where occupants must egress from an exterior space through the building for means of egress, exit access doors shall be permitted to be equipped with an approved locking device where installed and operated in accordance with all of the following:

- 8.1. The maximum occupant load shall be posted where required by Section 1004.9. Such signage shall be permanently affixed inside the building and shall be posted in a conspicuous space near all the exit access doorways.
- 8.2. A weatherproof telephone or two-way communication system installed in accordance with Section 1009 shall be located adjacent to not less than one required exit access door on the exterior side.
- 8.3. The egress door locking device is readily distinguishable as locked and shall be a key-operated locking device.
- 8.4. A clear window or glazed door opening, not less than 5 square feet (0.46 m^2) in area, shall be provided at each exit access door to determine if there are occupants using the outdoor area.
- 8.5. A readily visible, durable sign shall be posted on the interior side on or adjacent to each locked required exit access door serving the exterior area stating, "THIS DOOR TO REMAIN UNLOCKED WHEN THE OUTDOOR AREA IS OCCUPIED." The letters on the sign shall be not less than 1 inch (25.4 mm) high on a contrasting background.
- 8.6. The occupant load of the occupied exterior area shall not exceed 300 occupants in accordance with Section 1004.

9. Locking devices are permitted on doors to balconies, decks or other exterior spaces serving individual dwelling or sleeping units.

10. Locking devices are permitted on doors to balconies, decks or other exterior spaces of 250 square feet (23.23 m^2) or less serving a private office space.

TABLE 1010.2.4

MANUAL BOLTS, AUTOMATIC FLUSH BOLTS AND CONSTANT LATCHING BOLTS ON THE INACTIVE LEAF OF A PAIR OF DOORS

APPLICATION WITH A PAIR OF DOORS WITH AN ACTIVE LEAF AND INACTIVE LEAF	THE PAIR OF DOORS ARE REQUIRED TO COMPLY WITH SECTION 716	PERMITTED USES OF MANUAL BOLTS, AUTOMATIC FLUSH BOLTS, AND CONSTANT LATCHING BOLTS ON THE INACTIVE LEAF OF A PAIR OF DOORS		
		Surface or Flush Mounted Manual Bolts	Automatic Flush Bolts	Constant Latching Bolts
Group B, F or S occupancies with occupant load less than 50	No	P	P	P
	Yes	NP	NP ^b	P
Group B, F or S occupancies where the building is equipped with an automatic sprinkler system in accordance with Section 903.3.1.1 and the inactive leaf is not needed to meet egress capacity requirements	No	P	P	P
	Yes	NP	NP ^b	P
Group I-2 patient care rooms where the inactive leaf is not needed to meet egress capacity requirements	No	NP	NP ^b	P
	Yes	NP	NP ^b	P
Any occupancy where panic hardware is not required, egress doors are used in pairs and both leaves are required to meet egress capacity requirements	No	NP	P	NP
	Yes	NP	NP ^b	NP
Storage or equipment rooms where the inactive leaf is not needed to meet egress capacity requirements	No	P ^a	P	P

	Yes	P ^a	P	P
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P = Permitted; NP = Not Permitted.

- a. Not permitted on corridor doors in Group I-2 healthcare occupancies where corridor doors are required to be positive latching.
- b. Permitted where both doors are self-closing or automatic-closing and are provided with a coordinator that causes the inactive leaf to be closed prior to the active leaf.

1010.2.5

Reserved.

1010.2.6

Reserved.

1010.2.7 Stairway Doors

Interior *stairway means of egress* doors shall be openable from both sides without the use of a key or special knowledge or effort.

Exceptions:

1. *Stairway discharge doors* shall be openable from the egress side and shall only be locked from the opposite side.
2. This section shall not apply to doors arranged in accordance with Section 403.5.3.
3. *Stairway exit doors* are permitted to be locked from the side opposite the egress side, provided they are openable from the egress side and capable of being unlocked simultaneously without unlatching upon a signal from the *fire command center*, if present, or a signal by emergency personnel from a single location inside the main entrance to the building.
4. *Stairway exit doors* shall be openable from the egress side and shall only be locked from the opposite side in Group B, F, M and S occupancies where the only interior access to the tenant space is from a single *exit stairway* where permitted in Section 1006.3.3.
5. *Stairway exit doors* shall be openable from the egress side and shall only be locked from the opposite side in Group R-2 occupancies where the only interior access to the *dwelling unit* is from a single *exit stairway* where permitted in Section 1006.3.3.

1010.2.8 Locking Arrangements in Educational Occupancies

In Group E occupancies, Group B educational occupancies and Group I-4 occupancies, egress doors from classrooms, offices and other occupied rooms with locking arrangements designed to keep intruders from entering the room shall comply with all of the following conditions:

1. The door shall be capable of being unlocked from outside the room with a key or other approved means.
2. The door shall be openable from within the room in accordance with Section 1010.2.
3. Modifications shall not be made to listed panic hardware, fire door hardware or door closer.

4. Modifications to fire door assemblies shall be in accordance with NFPA 80.

Remote locking or unlocking of doors from an approved location shall be permitted in addition to the unlocking operation in Item 1.

1010.2.9 Panic and Fire Exit Hardware

Swinging doors serving a Group H occupancy and swinging doors serving rooms or spaces with an *occupant load* of 50 or more in a Group A or E occupancy shall not be provided with a latch or lock other than *panic hardware* or *fire exit hardware*.

Exceptions:

1. A main *exit* of a Group A occupancy shall be permitted to be locking in accordance with Section 1010.2.4, Item 3.
2. Doors provided with panic hardware or fire exit hardware serving a Group A or E occupancy shall be permitted to be electronically locked in accordance with Section 1010.2.11 or 1010.2.12.
3. Outdoor gates from residential and commercial swimming pools or swimming pool decks, except where the pool deck serves as a portion of the *means of egress* of a building or has an occupant load of 300 or greater.
4. Courtrooms shall be permitted to be locked in accordance with Section 1010.2.13, Exception 2.
5. Exit access doors serving occupied exterior areas shall be permitted to be locked in accordance with Section 1010.2.4, Item 8.

1010.2.9.1 Refrigeration Machinery Room

Refrigeration machinery rooms larger than 1,000 square feet (93 m^2) shall have not less than two exit or exit access doorways that swing in the direction of egress travel and shall be equipped with *panic hardware* or *fire exit hardware*.

1010.2.9.2 Rooms With Electrical Equipment

Exit or exit access doors serving transformer vaults, rooms designated for batteries or energy storage systems, or modular data centers shall be equipped with panic hardware or exit hardware. Rooms containing electrical equipment rated 800 amperes or more and that contain overcurrent devices, switching devices or control devices and where the exit or exit access door is less than 25 feet (7620 mm) from the equipment working space as required by NFPA 70, such doors shall not be provided with a latch or lock other than panic hardware or exit hardware. The doors shall swing in the direction of egress travel.

1010.2.9.3 Installation

Where *panic* or *fire exit hardware* is installed, it shall comply with the following:

1. *Panic hardware* shall be *listed* in accordance with UL 305.
2. *Fire exit hardware* shall be *listed* in accordance with UL 10C and UL 305.
3. The actuating portion of the releasing device shall extend not less than one-half of the door leaf width.
4. The maximum unlatching force shall not exceed 15 pounds (67 N).

1010.2.9.4 Balanced Doors

If *balanced doors* are used and *panic hardware* is required, the *panic hardware* shall be the push-pad type and the pad shall not extend more than one-half the width of the door measured from the latch side.

1010.2.10 Monitored or Recorded Egress

Where electrical systems that monitor or record egress activity are incorporated, the locking system shall comply with Section 1010.2.11, 1010.2.12, 1010.2.13, 1010.2.14 or 1010.2.15 or shall be readily openable from the egress side without the use of a key or special knowledge or effort.

1010.2.11 Door Hardware Release of Electrically Locked Egress Doors

Door hardware release of electric locking systems shall be permitted on doors in the *means of egress* within any occupancy except in Group H where installed and operated in accordance with all of the following:

1. The door hardware that is affixed to the door leaf has an obvious method of operation that is readily operated under all lighting conditions.
2. The door hardware is capable of being operated with one hand and shall comply with Section 1010.2.1.
3. Operation of the door hardware directly interrupts the power to the electric lock and unlocks the door immediately.
4. Loss of power to the electric locking system automatically unlocks the door.
5. Where *panic* or *fire exit hardware* is required by Section 1010.2.9, operation of the *panic* or *fire exit hardware* also releases the electric lock.
6. The locking system units shall be listed in accordance with UL 294.

1010.2.12 Sensor Release of Electrically Locked Egress Doors

Sensor release of electric locking systems shall be permitted on doors located in the *means of egress* with an occupancy in Group A, B, E, I-1, I-2, I-4, M, R-1 or R-2 where installed and operated in accordance with all of the following criteria:

1. The sensor shall be installed on the egress side, arranged to detect an occupant approaching the doors, and shall cause the electric locking system to unlock.
2. The electric locks shall be arranged to unlock by a signal from or loss of power to the sensor.
3. Loss of power to the lock or locking system shall automatically unlock the electric lock.
4. The doors shall be arranged to unlock from a manual unlocking device located 40 inches to 48 inches (1016 mm to 1219 mm) vertically above the floor and within 5 feet (1524 mm) of the secured doors. Ready access shall be provided to the manual unlocking device and the device shall be clearly identified by a sign that reads "PUSH TO EXIT." When operated, the manual unlocking device shall result in direct interruption of power to the electric lock—*independent of other electronics*—and the electric lock shall remain unlocked for not less than 30 seconds.
5. Activation of the building *fire alarm system*, where provided, shall automatically unlock the electric lock, and the electric lock shall remain unlocked until the *fire alarm system* has been reset.
6. Activation of the building *automatic sprinkler system* or *fire detection system*, where provided, shall automatically unlock the electric lock. The electric lock shall remain unlocked until the *fire alarm system* has been reset.
7. The door locking system units shall be listed in accordance with UL 294.

1010.2.13 Delayed Egress

Delayed egress locking systems shall be permitted to be installed on doors serving Group B, F, I, M, R, S and U occupancies in buildings that are equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or an *approved automatic smoke or heat detection system* installed in accordance with Section 907.

Exceptions:

1. Delayed egress locking systems shall be permitted to be installed on doors serving Group E occupancies that have an *occupant load* of 10 or fewer and that are in buildings that are equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or an *approved automatic smoke or heat detection system* installed in accordance with Section 907.

2. In courtrooms in Group A-3 and B occupancies, delayed egress locking systems shall be permitted to be installed on exit or exit access doors, other than the main exit or exit access door, in buildings that are equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.

1010.2.13.1 Delayed Egress Locking System

The delayed egress locking system shall be installed and operated in accordance with all of the following:

1. The delay electronics of the delayed egress locking system shall deactivate upon actuation of the *automatic sprinkler system* or *automatic fire detection system*, allowing immediate, free egress.

2. The delay electronics of the delayed egress locking system shall deactivate upon loss of power controlling the lock or lock mechanism, allowing immediate free egress.

3. The delayed egress locking system shall have the capability of being deactivated at the *fire command center* and other *approved* locations.

4. An attempt to egress shall initiate an irreversible process that shall allow such egress in not more than 15 seconds when a physical effort to exit is applied to the egress side door hardware for not more than 3 seconds. Initiation of the irreversible process shall activate an audible signal in the vicinity of the door. Once the delay electronics have been deactivated, rearming the delay electronics shall be by manual means only.

Exception: Where approved, a delay of not more than 30 seconds is permitted on a delayed egress door.

5. The egress path from any point shall not pass through more than one delayed egress locking system.

Exceptions:

1. In Group I-1, Condition 2, Group I-2 or I-3 occupancies, the egress path from any point in the building shall pass through not more than two delayed egress locking systems, provided that the combined delay does not exceed 30 seconds.

2. In Group I-1, Condition 1, or I-4 occupancies, the egress path from any point in the building shall pass through not more than two delayed egress locking systems, provided that the combined delay does not exceed 30 seconds and the building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.

6. A sign shall be provided on the door and shall be located above and within 12 inches (305 mm) of the door exit hardware:
 - 6.1. For doors that swing in the direction of egress, the sign shall read: PUSH UNTIL ALARM SOUNDS. DOOR CAN BE OPENED IN 15 [30] SECONDS.

 - 6.2. For doors that swing in the opposite direction of egress, the sign shall read: PULL UNTIL ALARM SOUNDS. DOOR CAN BE OPENED IN 15 [30] SECONDS.

 - 6.3. The sign shall comply with the visual character requirements in the *Florida Building Code, Accessibility*.

Exception: Where approved, in Group I occupancies, the installation of a sign is not required where care recipients who because of clinical needs require restraint or containment as part of the function of the treatment area.

7. Emergency lighting shall be provided on the egress side of the door.
8. The delayed egress locking system units shall be listed in accordance with UL 294.

1010.2.14 Controlled Egress Doors in Groups I-1 and I-2

Electric locking systems, including electro-mechanical locking systems and electromagnetic locking systems, shall be permitted to be locked in the means of egress in Group I-1 or I-2 occupancies where the clinical needs of persons receiving care require their containment. Controlled egress doors shall be permitted in such occupancies where the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or an *approved automatic smoke detection system* installed in accordance with Section 907, provided that the doors are installed and operate in accordance with all of the following:

1. The door locks shall unlock on actuation of the *automatic sprinkler system* or *automatic smoke detection system*.
2. The door locks shall unlock on loss of power controlling the lock or lock mechanism.
3. The door locking system shall be installed to have the capability of being unlocked by a switch located at the *fire command center*, a nursing station or other approved location. The switch shall directly break power to the lock.
4. A building occupant shall not be required to pass through more than one door equipped with a controlled egress locking system before entering an exit.
5. The procedures for unlocking the doors shall be described and approved as part of the emergency planning and preparedness required by the *Florida Fire Prevention Code*.
6. All clinical staff shall have the keys, codes or other means necessary to operate the locking systems.
7. Emergency lighting shall be provided at the door.
8. The door locking system units shall be listed in accordance with UL 294.

Exceptions:

1. Items 1 through 4 shall not apply to doors to areas occupied by persons who, because of clinical needs, require restraint or containment as part of the function of a psychiatric or cognitive treatment area.
2. Items 1 through 4 shall not apply to doors to areas where a *listed* egress control system is utilized to reduce the risk of child abduction from nursery and obstetric areas of a Group I-2 hospital.

1010.2.15 Locking Arrangements in Buildings Within Correctional Facilities

In buildings within correctional and detention facilities, doors in *means of egress* serving rooms or spaces occupied by persons whose movements are controlled for security reasons shall be permitted to be locked where equipped with egress control devices that shall unlock manually and by not less than one of the following means:

1. Activation of an *automatic sprinkler system* installed in accordance with Section 903.3.1.1.
2. Activation of an *approved manual fire alarm box*.

3. A signal from a *constantly attended location*.

1010.2.16 Elevator Lobby Exit Access Doors

In other than high-rise buildings and Group I-3, R-3 and R-4 occupancies, electrically locked exit access doors providing egress from elevator lobbies shall be permitted where all the following conditions are met:

1. For all occupants of the floor, the path of exit access travel to not less than two exits is not required to pass through the elevator lobby.
2. The building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, and a fire alarm system in accordance with Section 907. Elevator lobbies shall be provided with an *automatic smoke detection system* in accordance with Section 907.
3. Activation of the building fire alarm system by other than a manual fire alarm box shall automatically unlock the electric locks providing exit access from the elevator lobbies, and the electric locks shall remain unlocked until the system is reset.
4. The electric locks shall unlock on loss of power to the electric lock or electrical locking system.
5. The electric locks shall have the capability of being unlocked by a switch located at the fire command center, security station, or other approved location.
6. A two-way communication system complying with Chapter 7 of the *Florida Building Code, Accessibility* shall be located in the elevator lobby adjacent to the electrically locked exit access door and connected to an approved constantly attended station. This constantly attended station shall have the capability of unlocking the electric locks of the elevator lobby exit access doors.
7. Emergency lighting shall be provided in the elevator lobby on both sides of the electrically locked door.
8. The door locking system units shall be listed in accordance with UL 294.

1010.3 Special Doors

Special doors and security grilles shall comply with the requirements of Sections 1010.1.3.1 through 1010.1.3.4.

1010.3.1 Revolving Doors

Revolving doors shall comply with the following:

1. Revolving doors shall comply with BHMA A156.27 and shall be installed in accordance with the manufacturer's instructions.
2. Each revolving door shall be capable of *breakout* in accordance with BHMA A156.27 and shall provide an aggregate width of not less than 36 inches (914 mm).
3. A revolving door shall not be located within 10 feet (3048 mm) of the foot or top of *stairways* or escalators. A dispersal area shall be provided between the *stairways* or escalators and the revolving doors.
4. The revolutions per minute (rpm) for a revolving door shall not exceed the maximum rpm as specified in BHMA A156.27. Manual revolving doors shall comply with Table 1010.3.1(1). Automatic or power-operated revolving doors shall comply with Table 1010.3.1(2).
5. An emergency stop switch shall be provided near each entry point of power or automatic operated revolving doors within 48 inches (1220 mm) of the door and between 34 inches (864 mm) and 48 inches (1220 mm) above the floor. The activation area of the emergency stop switch button shall be not less than 1 inch (25 mm) in diameter and shall be red.

6. Each revolving door shall have a side-hinged swinging door that complies with Section 1010.1 in the same wall and within 10 feet (3048 mm) of the revolving door.

7. Revolving doors shall not be part of an *accessible route* required by Chapter 11.

TABLE 1010.3.1(1)**MAXIMUM DOOR SPEED MANUAL REVOLVING DOORS**

REVOLVING DOOR MAXIMUM NOMINAL DIAMETER (FT-IN)	MAXIMUM ALLOWABLE REVOLVING DOOR SPEED (RPM)
6-0	12
7-0	11
8-0	10
9-0	9
10-0	8

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

TABLE 1010.3.1(2)**MAXIMUM DOOR SPEED AUTOMATIC OR POWER-OPERATED REVOLVING DOORS**

REVOLVING DOOR MAXIMUM NOMINAL DIAMETER (FT-IN)	MAXIMUM ALLOWABLE REVOLVING DOOR SPEED (RPM)
8-0	7.2
9-0	6.4
10-0	5.7
11-0	5.2
12-0	4.8
12-6	4.6
14-0	4.1
16-0	3.6
17-0	3.4
18-0	3.2
20-0	2.9
24-0	2.4

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

10103.1.1 Egress Component

A revolving door used as a component of a *means of egress* shall comply with Section 1010.3.1 and the following three conditions:

1. Revolving doors shall not be given credit for more than 50 percent of the minimum width or required capacity.
2. Each revolving door shall be credited with a capacity based on not more than a 50-person *occupant load*.
3. Each revolving door shall provide for egress in accordance with BHMA A156.27 with a *breakout* force of not more than 130 pounds (578 N).

1010.3.1.2 Other Than Egress Component

A revolving door used as other than a component of a *means of egress* shall comply with Section 1010.3.1. The *breakout* force of a revolving door not used as a component of a *means of egress* shall not be more than 180 pounds (801 N).

Exception: A *breakout* force in excess of 180 pounds (801 N) is permitted if the *breakout* force is reduced to not more than 130 pounds (578 N) when not less than one of the following conditions is satisfied:

1. There is a power failure or power is removed to the device holding the door wings in position.
2. There is an actuation of the *automatic sprinkler system* where such system is provided.
3. There is an actuation of a smoke detection system that is installed in accordance with Section 907 to provide coverage in areas within the building that are within 75 feet (22 860 mm) of the revolving doors.
4. There is an actuation of a manual control switch, in an approved location and clearly identified, that reduces the *breakout* force to not more than 130 pounds (578 N).

1010.3.2 Power-Operated Doors

Where *means of egress* doors are operated or assisted by power, the design shall be such that in the event of power failure, the door is capable of being opened manually to permit *means of egress* travel or closed where necessary to safeguard *means of egress*. The forces required to open these doors manually shall not exceed those specified in Section 1010.1.3, except that the force to set the door in motion shall not exceed 50 pounds (220 N). The door shall be capable of opening from any position to the full width of the opening in which such door is installed when a force is applied to the door on the side from which egress is made. Power-operated swinging doors, power-operated sliding doors and power-operated folding doors shall comply with BHMA A156.10. Power-assisted swinging doors and low-energy power-operated swinging doors shall comply with BHMA A156.19. Low-energy power-operated sliding doors and low-energy power-operated folding doors shall comply with BHMA A156.38.

Exceptions:

1. Occupancies in Group I-3.
2. Special purpose horizontal sliding, accordion or folding doors complying with Section 1010.3.3.
3. For a biparting door in the emergency breakout mode, a door leaf located within a multiple-leaf opening shall be exempt from the minimum 32-inch (813 mm) single-leaf requirement of Section 1010.1.1, provided a minimum 32-inch (813 mm) clear opening is provided when the two biparting leaves meeting in the center are broken out.

1010.3.3 Special Purpose Horizontal Sliding, Accordion or Folding Doors

In other than Group H occupancies, special purpose horizontal sliding, accordion or folding door assemblies permitted to be a component of a *means of egress* in accordance with Exception 6 to Section 1010.1.2 shall comply with all of the following criteria:

1. The doors shall be power operated and shall be capable of being operated manually in the event of power failure.

2. The doors shall be openable by a simple method without special knowledge or effort from the egress side or sides.
3. The force required to operate the door shall not exceed 30 pounds (133 N) to set the door in motion and 15 pounds (67 N) to close the door or open it to the minimum required width.
4. The door shall be openable with a force not to exceed 15 pounds (67 N) when a force of 250 pounds (1100 N) is applied perpendicular to the door adjacent to the operating device.
5. The door assembly shall comply with the applicable *fire protection rating* and, where rated, shall be self-closing or automatic closing by smoke detection in accordance with Section 716.5.9.4, shall be installed in accordance with NFPA 80 and shall comply with Section 716.
6. The door assembly shall have an integrated standby power supply.
7. The door assembly power supply shall be electrically supervised.
8. The door shall open to the minimum required width within 10 seconds after activation of the operating device.

1010.3.4 Security Grilles

In Groups B, F, M and S, horizontal sliding or vertical security grilles are permitted at the main *exit* and shall be openable from the inside without the use of a key or special knowledge or effort during periods that the space is occupied. The grilles shall remain secured in the full-open position during the period of occupancy by the general public. Where two or more exits or access to exits are required, not more than one-half of the *exits* or *exit access doorways* shall be equipped with horizontal sliding or vertical security grilles.

1010.3.5 Protection Devices for Emergency Escape and Rescue Openings

The temporary installation or closure of storm shutters, panels and other approved hurricane protection devices shall be permitted on emergency escape and rescue openings and egress doors in Group R occupancies during the threat of a storm. Such devices shall not be required to comply with the operational constraints of Section 1030.4 or 1010.2. While such protection is provided, at least one means of escape from the dwelling or dwelling unit shall be provided. The means of escape shall be within the first floor of the dwelling or dwelling unit and shall not be located within a garage without a side-hinged door leading directly to the exterior. Occupants in any part of the dwelling or dwelling unit shall be able to access the means of escape without passing through a lockable door not under their control.

1010.4 Gates

Gates serving the *means of egress* system shall comply with the requirements of this section. Gates used as a component in a *means of egress* shall conform to the applicable requirements for doors.

Exception: Horizontal sliding or swinging gates exceeding the 4-foot (1219 mm) maximum leaf width limitation are permitted in fences and walls surrounding a stadium.

1010.4.1 Stadiums

Panic hardware is not required on gates surrounding stadiums where such gates are under constant immediate supervision while the public is present, and where safe dispersal areas based on 3 square feet (0.28 m²) per occupant are located between the fence and enclosed space. Such required safe dispersal areas shall not be located less than 50 feet (15 240 mm) from the enclosed space. See Section 1028.5 for *means of egress* from safe dispersal areas.

1010.5 Turnstiles and Similar Devices

Turnstiles or similar devices that restrict travel to one direction shall not be placed so as to obstruct any required *means of egress*, except where permitted in accordance with Sections 1010.5.1, 1010.5.2 and 1010.5.3.

1010.5.1 Capacity

Each turnstile or similar device shall be credited with a capacity based on not more than a 50-person *occupant load* where all of the following provisions are met:

1. Each device shall turn free in the direction of egress travel when primary power is lost and on the manual release by an employee in the area.
2. Such devices are not given credit for more than 50 percent of the required egress capacity or width.
3. Each device is not more than 39 inches (991 mm) high.
4. Each device has not less than $16\frac{1}{2}$ inches (419 mm) clear width at and below a height of 39 inches (991 mm) and not less than 22 inches (559 mm) clear width at heights above 39 inches (991 mm).

1010.5.1.1 Clear Width

Reserved

1010.5.2 Security Access Turnstiles

Security access turnstiles that inhibit travel in the direction of egress utilizing a physical barrier shall be permitted to be considered as a component of the *means of egress*, provided that all of the following criteria are met:

1. The building is protected throughout by an approved supervised *automatic sprinkler system* in accordance with Section 903.3.1.1.
2. Each security access turnstile lane configuration has a minimum clear passage width of 22 inches (560 mm).
3. Any security access turnstile lane configuration providing clear passage width of less than 32 inches (810 mm) shall be credited with a maximum egress capacity of 50 persons.
4. Any security access turnstile lane configuration providing a clear passage width of 32 inches (810 mm) or more shall be credited with a maximum egress capacity as calculated in accordance with Section 1005.
5. Each secured physical barrier shall automatically retract or swing to unobstructed open position in the direction of egress, under each of the following conditions:
 - 5.1. Upon loss of power to the turnstile or any part of the access control system that secures the physical barrier.
 - 5.2. Upon actuation of a readily accessible and clearly identified manual release device that results in direct interruption of power to each secured physical barrier, after which such barriers remain in the open position for not less than 30 seconds. The manual release device shall be positioned at one of the following locations:
 - 5.2.1. The manual release device is located on the egress side of each security access turnstile lane.
 - 5.2.2. The manual release device is located at an approved location where it can be actuated by an employee assigned to the area at all times that the building is occupied.
 - 5.3. Upon actuation of the building *fire alarm system*, if provided, the physical barrier remains in the open position until the *fire alarm system* is manually reset.

Exception: Actuation of manual fire alarm boxes.

- 5.4. Upon actuation of the building *automatic sprinkler system* or *fire detection system*, and for which the physical barrier remains in the open position until the *fire alarm system* is manually reset.

1010.5.3 High Turnstile

Turnstiles more than 39 inches (991 mm) high shall meet the requirements for revolving doors or the requirements of Section 1010.5.2 for security access turnstiles.

1010.5.4 Additional Door

Where serving an *occupant load* greater than 300, each turnstile that is not portable shall have a side-hinged swinging door that conforms to Section 1010.1 within 50 feet (15 240 mm).

Exception: A side-hinged swinging door is not required at security access turnstiles that comply with Section 1010.5.2.

Section 1011 Stairways

1011.1 General

Stairways serving occupied portions of a building shall comply with the requirements of Sections 1011.2 through 1011.13. *Alternating tread devices* shall comply with Section 1011.14. Ship's ladders shall comply with Section 1011.15. Ladders shall comply with Section 1011.16.

Exception: Within rooms or spaces used for assembly purposes, stepped aisles shall comply with Section 1029.

1011.2 Width and Capacity

The required capacity of *stairways* shall be determined as specified in Section 1005.1, but the minimum width shall be not less than 44 inches (1118 mm). See Section 1009 for accessible *means of egress stairways*.

Exceptions:

1. *Stairways* serving an *occupant load* of less than 50 shall have a width of not less than 36 inches (914 mm).
2. *Spiral stairways* as provided for in Section 1011.10.
3. Where an incline platform lift or stairway chairlift is installed on *stairways* serving occupancies in Group R-3, or within *dwelling units* in occupancies in Group R-2, a clear passage width not less than 20 inches (508 mm) shall be provided. Where the seat and platform can be folded when not in use, the distance shall be measured from the folded position.

1011.3 Headroom

Stairways shall have a headroom clearance of not less than 80 inches (2032 mm) measured vertically from a line connecting the edge of the *nosings*. Such headroom shall be continuous above the *stairway* to the point where the line intersects the landing below, one tread depth beyond the bottom riser. The minimum clearance shall be maintained the full width of the *stairway* and landing.

Exceptions:

1. *Spiral stairways* complying with Section 1011.10 are permitted a 78-inch (1981 mm) headroom clearance.
2. In Group R-3 occupancies; within *dwelling units* in Group R-2 occupancies; and in Group U occupancies that are accessory to a Group R-3 occupancy or accessory to individual *dwelling units* in Group R-2 occupancies; where the *nosings* of treads at the side of a *flight* extend under the edge of a floor opening through which the *stair* passes, the floor opening shall be allowed to project horizontally into the required headroom not more than $4\frac{3}{4}$ inches (121 mm).

1011.4 Walkline

The walkline across *winder* treads shall be concentric to the direction of travel through the turn and located 12 inches (305 mm) from the side where the *winders* are narrower. The 12-inch (305 mm) dimension shall be measured from the widest point of the clear *stair* width at the walking surface of the *winder*. Where *winders* are adjacent within the *flight*, the point of the widest clear *stair* width of the adjacent *winders* shall be used.

1011.5 Stair Treads and Risers

Stair treads and risers shall comply with Sections 1011.5.1 through 1011.5.5.3.

1011.5.1 Dimension Reference Surfaces

For the purpose of this section, all dimensions are exclusive of carpets, rugs or runners.

1011.5.2 Riser Height and Tread Depth

Stair riser heights shall be 7 inches (178 mm) maximum and 4 inches (102 mm) minimum. The riser height shall be measured vertically between the *nosings* of adjacent treads or between the stairway landing and the adjacent tread. Rectangular tread depths shall be 11 inches (279 mm) minimum measured horizontally between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread's *nosing*. *Winder* treads shall have a minimum tread depth of 11 inches (279 mm) between the vertical planes of the foremost projection of adjacent treads at the intersections with the walkline and a minimum tread depth of 10 inches (254 mm) within the clear width of the *stair*.

Exceptions:

1. *Spiral stairways* in accordance with Section 1011.10.
2. *Stairways* connecting stepped *aisles* to cross *aisles* or concourses shall be permitted to use the riser/tread dimension in Section 1029.14.2.
3. In Group R-3 occupancies; within *dwelling units* in Group R-2 occupancies; and in Group U occupancies that are accessory to a Group R-3 occupancy or accessory to individual *dwelling units* in Group R-2 occupancies; the maximum riser height shall be $7\frac{3}{4}$ inches (197 mm); the minimum tread depth shall be 10 inches (254 mm); the minimum *winder* tread depth at the walkline shall be 10 inches (254 mm); and the minimum *winder* tread depth shall be 6 inches (152 mm). A *nosing* projection not less than $\frac{3}{4}$ inch (19.1 mm) but not more than $1\frac{1}{4}$ inches (32 mm) shall be provided on *stairways* with solid risers where the tread depth is less than 11 inches (279 mm).
4. See Section 403.1 of the *Florida Building Code, Existing Building* for the replacement of existing *stairways*.
5. In Group I-3 facilities, *stairways* providing access to guard towers, observation stations and control rooms, not more than 250 square feet (23 m^2) in area, shall be permitted to have a maximum riser height of 8 inches (203 mm) and a minimum tread depth of 9 inches (229 mm).

1011.5.3 Winder Treads

Winder treads are not permitted in *means of egress stairways* except within a *dwelling unit*.

Exceptions:

1. Curved *stairways* in accordance with Section 1011.9.
2. *Spiral stairways* in accordance with Section 1011.10.

1011.5.4 Dimensional Uniformity

Stair treads and risers shall be of uniform size and shape. The tolerance between the largest and smallest riser height or between the largest and smallest tread depth shall not exceed $\frac{3}{8}$ inch (9.5 mm) in any *flight of stairs*. The greatest *winder* tread depth at the walkline within any *flight of stairs* shall not exceed the smallest by more than $\frac{3}{8}$ inch (9.5 mm).

Exceptions:

1. *Stairways* connecting stepped *aisles* to cross *aisles* or concourses shall be permitted to comply with the dimensional nonuniformity in Section 1029.14.2.

2. Consistently shaped *winders*, complying with Section 1011.5, differing from rectangular treads in the same *flight of stairs*.

3. Nonuniform riser dimension complying with Section 1011.5.4.1.

1011.5.4.1 Nonuniform Height Risers

Where the bottom or top riser adjoins a sloping *public way*, walkway or driveway having an established grade and serving as a landing, the bottom or top riser is permitted to be reduced along the slope to less than 4 inches (102 mm) in height, with the variation in height of the bottom or top riser not to exceed one unit vertical in 12 units horizontal (8-percent slope) of *stair* width. The *nosings* or leading edges of treads at such nonuniform height risers shall have a distinctive marking stripe, different from any other *nosing* marking provided on the *stair flight*. The distinctive marking stripe shall be visible in descent of the *stair* and shall have a slip-resistant surface. Marking stripes shall have a width of not less than 1 inch (25 mm) but not more than 2 inches (51 mm).

1011.5 Nosing and Riser Profile

Nosings shall have a curvature or bevel of not less than $\frac{1}{16}$ inch (1.6 mm) but not more than $\frac{9}{16}$ inch (14.3 mm) from the foremost projection of the tread. Risers shall be solid and vertical or sloped under the tread above from the underside of the *nosing* above at an angle not more than 30 degrees (0.52 rad) from the vertical.

1011.5.5.1 Nosing Projection Size

The leading edge (*nosings*) of treads shall project not more than $1\frac{1}{4}$ inches (32 mm) beyond the tread below.

1011.5.5.2 Nosing Projection Uniformity

Nosing projections of the leading edges shall be of uniform size, including the projections of the *nosing*'s leading edge of the floor at the top of a *flight*.

1011.5.5.3 Solid Risers

Risers shall be solid.

Exceptions:

1. Solid risers are not required for *stairways* that are not required to comply with Section 1009, provided that the opening between treads does not permit the passage of a sphere with a diameter of 4 inches (102 mm).
2. Solid risers are not required for occupancies in Group I-3 or in Group F, H and S occupancies other than areas accessible to the public. There are no restrictions on the size of the opening in the riser.
3. Solid risers are not required for *spiral stairways* constructed in accordance with Section 1011.10.

1011.6 Stairway Landings

There shall be a floor or landing at the top and bottom of each *stairway*. The width of landings shall be not less than the width of *stairways* served. Every landing shall have a minimum width measured perpendicular to the direction of travel equal to the width of the *stairway*. Where the *stairway* has a straight run the depth need not exceed 48 inches (1219 mm). Doors opening onto a landing shall not reduce the landing to less than one-half the required width. When fully open, the door shall not project more than 7 inches (178 mm) into a landing. Where *wheelchair spaces* are required on the *stairway* landing in accordance with the *Florida Building Code, Accessibility*, the *wheelchair space* shall not be located in the required width of the landing and doors shall not swing over the *wheelchair spaces*.

Exception: Where *stairways* connect stepped *aisles* to cross *aisles* or concourses, *stairway* landings are not required at the transition between *stairways* and stepped *aisles* constructed in accordance with Section 1029.

1011.7 Stairway Construction

Stairways shall be built of materials consistent with the types permitted for the type of construction of the building, except that wood *handrails* shall be permitted for all types of construction.

1011.7.1 Stairway Walking Surface

The walking surface of treads and landings of a *stairway* shall not be sloped steeper than one unit vertical in 48 units horizontal (2-percent slope) in any direction. *Stairway* treads and landings shall have a solid surface. Finish floor surfaces shall be securely attached.

Exceptions:

1. Openings in *stair* walking surfaces shall be a size that does not permit the passage of $1\frac{1}{2}$ -inch-diameter (12.7 mm) sphere. Elongated openings shall be placed so that the long dimension is perpendicular to the direction of travel.
2. In Group F, H and S occupancies, other than areas of parking structures accessible to the public, openings in treads and landings shall not be prohibited provided a sphere with a diameter of $1\frac{1}{8}$ inches (29 mm) cannot pass through the opening.
3. See also the *Florida Building Code, Accessibility*.

1011.7.2 Outdoor Conditions

Outdoor *stairways* and outdoor approaches to *stairways* shall be designed so that water will not accumulate on walking surfaces.

1011.7.3 Enclosures Under Interior Stairways

The walls and soffits within enclosed usable spaces under enclosed and unenclosed stairways shall be protected by 1-hour fire-resistance-rated construction or the fire-resistance rating of the stairway enclosure, whichever is greater. Access to the enclosed space shall not be directly from within the stairway enclosure.

Exception: Spaces under *stairways* serving and contained within a single residential dwelling unit in Group R-2 or R-3 shall be permitted to be protected on the enclosed side with $1\frac{1}{2}$ -inch (12.7 mm) gypsum board.

1011.7.4 Enclosures Under Exterior Stairways

There shall not be enclosed usable space under *exterior exit stairways* unless the space is completely enclosed in 1-hour fire-resistance-rated construction. The open space under *exterior stairways* shall not be used for any purpose.

1011.8 Vertical Rise

A flight of stairs shall not have a vertical rise greater than 12 feet (3658 mm) between floor levels or landings.

Exception: Spiral stairways used as a means of egress from technical production areas.

1011.9 Curved Stairways

Curved stairways with winder treads shall have treads and risers in accordance with Section 1011.5 and the smallest radius shall be not less than twice the minimum width or required capacity of the stairway.

Exception: The radius restriction shall not apply to curved stairways in Group R-3 and within individual dwelling units in Group R-2.

1011.10 Spiral Stairways

Spiral stairways are permitted to be used as a component in the *means of egress* only within *dwelling units* or from a space not more than 250 square feet (23 m^2) in area and serving not more than five occupants, or from *technical production areas* in accordance with Section 410.6.

A *spiral stairway* shall have a $6\frac{3}{4}$ -inch (171 mm) minimum clear tread depth at a point 12 inches (305 mm) from the walkline. The risers shall be sufficient to provide a headroom of 78 inches (1981 mm) minimum, but riser height shall not be more than $9\frac{1}{2}$ inches (241 mm). The minimum *stairway* clear width at and below the *handrail* shall be 26 inches (660 mm).

1011.11 Handrails

Flights of stairways shall have *handrails* on each side and shall comply with Section 1014. Where glass is used to provide the *handrail*, the *handrail* shall comply with Section 2407.

Exceptions:

1. Flights of stairways within dwelling units and flights of *spiral stairways* are permitted to have a *handrail* on one side only.

2. Decks, patios and walkways that have a single change in elevation where the landing depth on each side of the change of elevation is greater than what is required for a landing do not require *handrails*.
3. In Group R-3 occupancies, a change in elevation consisting of a single riser at an entrance or egress door does not require *handrails*.
4. Changes in room elevations of three or fewer risers within dwelling units and sleeping units in Group R-2 and R-3 do not require *handrails*.
5. Where a platform lift is in a stationary position and the floor of the platform lift serves as the upper landing of a stairway, *handrails* shall not be required on the stairway, provided that all of the following criteria are met:
 - 5.1. The stairway contains no more than two risers.
 - 5.2. A handhold, positioned horizontally or vertically, is located on one side of the stairway adjacent to the top landing.
 - 5.3. The handhold is located not less than 34 inches (864 mm) and not more than 42 inches (1066 mm) above the bottom landing of the stairway.
 - 5.4. The handhold gripping surface complies with Section 1014.3, and is not less than 4.5 inches (144 mm) in length.

1011.12 Stairway to Roof

In buildings four or more stories above *grade plane*, one *stairway* shall extend to the roof surface unless the roof has a slope steeper than four units vertical in 12 units horizontal (33-percent slope).

Exception: Other than where required by Section 1011.12.1, in buildings without an occupied roof access to the roof from the top story shall be permitted to be by an *alternating tread device*, a ships ladder or a permanent ladder.

1011.12.1 Stairway to Elevator Equipment

Roofs and penthouses containing elevator equipment that must be accessed for maintenance are required to be accessed by a stairway.

1011.12.2 Roof Access

Where a stairway is provided to a roof, access to the roof shall be provided through a penthouse complying with Section 1510.2.

Exception: In buildings without an occupied roof, access to the roof shall be permitted to be a roof hatch or trap door not less than 16 square feet (1.5 m^2) in area and having a minimum dimension of 2 feet (610 mm).

1011.13 Guards

Guards shall be provided along stairways and landings where required by Section 1015 and shall be constructed in accordance with Section 1015. Where the roof hatch opening providing the required access is located within 10 feet (3049 mm) of the roof edge, such roof access or roof edge shall be protected by guards installed in accordance with Section 1015.

1011.14 Alternating Tread Devices

Alternating tread devices are limited to an element of a *means of egress* in buildings of Groups F, H and S from a mezzanine not more than 250 square feet (23 m^2) in area and that serves not more than five occupants; in buildings of Group I-3 from a guard tower, observation station or control room not more than 250 square feet (23 m^2) in area and for access to unoccupied roofs. *Alternating tread devices* used as a means of egress shall not have a rise greater than 20 feet (6096 mm) between floor levels or landings.

1011.14.1 Handrails of Alternating Tread Devices

Handrails shall be provided on both sides of alternating tread devices and shall comply with Section 1014.

1011.14.2 Treads of Alternating Tread Devices

Alternating tread devices shall have a minimum tread depth of 5 inches (127 mm), a minimum projected tread depth of $8\frac{1}{2}$ inches (216 mm), a minimum tread width of 7 inches (178 mm) and a maximum riser height of $9\frac{1}{2}$ inches (241 mm). The tread depth shall be measured horizontally between the vertical planes of the foremost projections of adjacent treads. The riser height shall be measured

vertically between the leading edges of adjacent treads. The riser height and tread depth provided shall result in an angle of ascent from the horizontal of between 50 and 70 degrees (0.87 and 1.22 rad). The initial tread of the device shall begin at the same elevation as the platform, landing or floor surface.

Exception: Alternating tread devices used as an element of a *means of egress* in buildings from a mezzanine area not more than 250 square feet (23 m^2) in area that serves not more than five occupants shall have a minimum tread depth of 3 inches (76 mm) with a minimum projected tread depth of $10\frac{1}{2}$ inches (267 mm). The rise to the next alternating tread surface shall not exceed 8 inches (203 mm).

1011.15 Ship's Ladders

Ship's ladders are permitted to be used in Group I-3 as a component of a *means of egress* to and from control rooms or elevated facility observation stations not more than 250 square feet (23 m^2) with not more than three occupants and for access to unoccupied roofs. The minimum clear width at and below the *handrails* shall be 20 inches (508 mm). Ship's ladders shall be designed for the live loads indicated in Section 1607.16.

1011.15.1 Handrails of Ship's Ladders

Handrails shall be provided on both sides of ship's ladders.

1011.15.2 Treads of Ship's Ladders

Ship's ladders shall have a minimum tread depth of 5 inches (127 mm). The tread shall be projected such that the total of the tread depth plus the *nosing* projection is not less than $8\frac{1}{2}$ inches (216 mm). The maximum riser height shall be $9\frac{1}{2}$ inches (241 mm).

1011.16 Ladders

Permanent ladders shall not serve as a part of the *means of egress* from occupied spaces within a building. Permanent ladders shall be constructed in accordance with Section 306.5 of the *Florida Building Code, Mechanical* and designed for the live loads indicated in Section 1607.16. Permanent ladders shall be permitted to provide access to the following areas:

1. Spaces frequented only by personnel for maintenance, repair or monitoring of equipment.
2. Nonoccupiable spaces accessed only by catwalks, crawl spaces, freight elevators or very narrow passageways.
3. Raised areas used primarily for purposes of security, life safety or fire safety including, but not limited to, observation galleries, prison guard towers, fire towers or lifeguard stands.
4. Elevated levels in Group U not open to the general public.
5. Nonoccupied roofs that are not required to have *stairway* access in accordance with Section 1011.12.1.
6. Where permitted to access equipment and appliances in accordance with Section 306.5 of the *Florida Building Code, Mechanical*.

1011.17 Accessible Stairs

Stairs required to be accessible shall comply with the *Florida Building Code, Accessibility*.

Section 1012 Ramps

1012.1 Scope

The provisions of this section shall apply to ramps used as a component of a *means of egress*.

Exceptions:

1. Ramped *aisles* within assembly rooms or spaces shall comply with the provisions in Section 1029.
2. Curb ramps not subject to *Florida Building Code, Accessibility*, shall comply with ICC A117.1.

3. Vehicle ramps in parking garages for pedestrian *exit access* shall not be required to comply with the provisions of the *Florida Building Code, Accessibility* when they are not an *accessible route* serving *accessible* parking spaces, other required *accessible* elements or part of an *accessible means of egress*.

1012.2 Slope

Ramps used as part of a *means of egress* shall have a running slope not steeper than one unit vertical in 12 units horizontal (8-percent slope). The slope of other pedestrian *ramps* shall not be steeper than one unit vertical in eight units horizontal (12.5-percent slope).

1012.3 Cross Slope

The slope measured perpendicular to the direction of travel of a *ramp* shall not be steeper than one unit vertical in 48 units horizontal (2-percent slope).

Exception: See also the *Florida Building Code, Accessibility*.

1012.4 Vertical Rise

The rise for any *ramp* run shall be 30 inches (762 mm) maximum.

1012.5 Minimum Dimensions

The minimum dimensions of *means of egress ramps* shall comply with Sections 1012.5.1 through 1012.5.3.

1012.5.1 Width and Capacity

The minimum width and required capacity of a *means of egress ramp* shall be not less than that required for *corridors* by Section 1020.3. The clear width of a *ramp* between *handrails*, if provided, or other permissible projections shall be 36 inches (914 mm) minimum.

1012.5.2 Headroom

The minimum headroom in all parts of the *means of egress ramp* shall be not less than 80 inches (2032 mm).

1012.5.3 Restrictions

Means of egress ramps shall not reduce in width in the direction of egress travel. Projections into the required *ramp* and landing width are prohibited. Doors opening onto a landing shall not reduce the clear width to less than 42 inches (1067 mm).

1012.6 Landings

Ramps shall have landings at the bottom and top of each *ramp*, points of turning, entrance, exits at doors and in accordance with the *Florida Building Code, Accessibility*. Landings shall comply with Sections 1012.6.1 through 1012.6.5.

1012.6.1 Slope

Landings shall have a slope not steeper than one unit vertical in 48 units horizontal (2-percent slope) in any direction. Changes in level are not permitted.

Exception: See also the *Florida Building Code, Accessibility*.

1012.6.2 Width

The landing width shall be not less than the width of the widest *ramp* run adjoining the landing.

1012.6.3 Length

The landing length shall be 60 inches (1525 mm) minimum.

Exceptions:

1. In Group R-2 and R-3 individual *dwelling* and *sleeping units* that are not required to be *Accessible units*, landings are permitted to be 36 inches (914 mm) minimum.
2. Where the *ramp* is not a part of an *accessible route*, the length of the landing shall not be required to be more than 48 inches (1220 mm) in the direction of travel.

3. Accessible landings shall comply with the *Florida Building Code, Accessibility*.

1012.6.4 Change in Direction

Where changes in direction of travel occur at landings provided between *ramp* runs, the landing shall be 60 inches by 60 inches (1524 mm by 1524 mm) minimum.

Exception: In Group R-2 and R-3 individual *dwelling* or *sleeping units* that are not required to be *Accessible units*, in accordance with the *Florida Building Code, Accessibility*, landings are permitted to be 36 inches by 36 inches (914 mm by 914 mm) minimum.

1012.6.5 Doorways

Where doorways are located adjacent to a *ramp* landing, maneuvering clearances required by *ICC A117.1* are permitted to overlap the required landing area.

1012.7 Ramp Construction

Ramps shall be built of materials consistent with the types permitted for the type of construction of the building, except that wood *handrails* shall be permitted for all types of construction.

1012.7.1 Ramp Surface

The surface of *ramps* shall be of slip-resistant materials that are securely attached.

1012.7.2 Outdoor Conditions

Outdoor *ramps* and outdoor approaches to *ramps* shall be designed so that water will not accumulate on walking surfaces.

1012.8 Handrails

Ramps with a rise greater than 6 inches (152 mm) shall have *handrails* on both sides. *Handrails* shall comply with Section 1014.

1012.9 Guards

Guards shall be provided where required by Section 1015 and shall be constructed in accordance with Section 1015.

1012.10 Edge Protection

Edge protection complying with Section 1012.10.1 or 1012.10.2 shall be provided on each side of *ramp* runs and at each side of *ramp* landings.

Exceptions:

1. Edge protection is not required on *ramps* that are not required to have *handrails*, provided they have flared sides that comply with the provisions of the *Florida Building Code, Accessibility*.
2. Edge protection is not required on the sides of *ramp* landings serving an adjoining *ramp* run or *stairway*.
3. Edge protection is not required on the sides of *ramp* landings having a vertical dropoff of not more than $\frac{1}{2}$ inch (12.7 mm) within 10 inches (254 mm) horizontally of the required landing area.

1012.10.1 Curb, Rail, Wall or Barrier

A curb, rail, wall or barrier shall be provided to serve as edge protection. A curb shall be not less than 4 inches (102 mm) in height. Barriers shall be constructed so that the barrier prevents the passage of a 4-inch-diameter (102 mm) sphere, where any portion of the sphere is within 4 inches (102 mm) of the floor or ground surface.

1012.10.2 Extended Floor or Ground Surface

The floor or ground surface of the *ramp* run or landing shall extend 12 inches (305 mm) minimum beyond the inside face of a *handrail* complying with Section 1014.

Section 1013 Exit Signs

1013.1 Where Required

Exits and *exit access* doors shall be marked by an *approved* exit sign readily visible from any direction of egress travel. The path of egress travel to *exits* and within *exits* shall be marked by readily visible exit signs to clearly indicate the direction of egress travel in cases where the *exit* or the path of egress travel is not immediately visible to the occupants. Intervening *means of egress* doors within *exits* shall be marked by exit signs. Exit sign placement shall be such that no point in an *exit access corridor* or *exit passageway* is more than 100 feet (30 480 mm) or the *listed* viewing distance for the sign, whichever is less, from the nearest visible exit sign.

Exceptions:

1. Exit signs are not required in rooms or areas that require only one *exit* or *exit access*.
2. Main exterior *exit* doors or gates that are obviously and clearly identifiable as *exits* need not have exit signs where *approved* by the *building official*.
3. Exit signs are not required in occupancies in Group U and individual *sleeping units* or *dwelling units* in Group R-1, R-2 or R-3.
4. Exit signs are not required in dayrooms, sleeping rooms or dormitories in occupancies in Group I-3.
5. In occupancies in Groups A-4 and A-5, exit signs are not required on the seating side of vomitories or openings into seating areas where exit signs are provided in the concourse that are readily apparent from the vomitories. Egress lighting is provided to identify each vomitory or opening within the seating area in an emergency.

1013.2 Floor-Level Exit Signs in Group R-1

Where exit signs are required in Group R-1 occupancies by Section 1013.1, additional low-level exit signs shall be provided in all areas serving guest rooms in Group R-1 occupancies and shall comply with Section 1013.5.

The bottom of the sign shall be not less than 10 inches (254 mm) nor more than 18 inches (455 mm) above the floor level. The sign shall be flush mounted to the door or wall. Where mounted on the wall, the edge of the sign shall be within 4 inches (102 mm) of the door frame on the latch side.

1013.3 Illumination

Exit signs shall be internally or externally illuminated.

Exception: Tactile signs required by Section 1013.4 need not be provided with illumination.

1013.4 Raised Character and Braille Exit Signs

A sign stating EXIT in visual characters, raised characters and braille and complying with the *Florida Building Code, Accessibility* shall be provided adjacent to each door to an *area of refuge* providing direct access to a stairway, an exterior area for assisted rescue, an *exit stairway* or *ramp*, an *exit passageway*, a horizontal exit and the *exit discharge*.

1013.5 Internally Illuminated Exit Signs

Electrically powered, *self-luminous* and *photoluminescent* exit signs shall be *listed* and *labeled* in accordance with UL 924 and shall be installed in accordance with the manufacturer's instructions and Chapter 27. Exit signs shall be illuminated at all times.

1013.6 Externally Illuminated Exit Signs

Externally illuminated exit signs shall comply with Sections 1013.6.1 through 1013.6.3.

1013.6.1 Graphics

Every exit sign and directional exit sign shall have plainly legible letters not less than 6 inches (152 mm) high with the principal strokes of the letters not less than $\frac{3}{4}$ inch (19.1 mm) wide. The word "EXIT" shall have letters having a width not less than 2 inches (51 mm) wide, except the letter "I," and the minimum spacing between letters shall be not less than $\frac{3}{8}$ inch (9.5 mm). Signs larger than the minimum established in this section shall have letter widths, strokes and spacing in proportion to their height.

The word "EXIT" shall be in high contrast with the background and shall be clearly discernible when the means of exit sign illumination is or is not energized. If a chevron directional indicator is provided as part of the exit sign, the construction shall be such

that the direction of the chevron directional indicator cannot be readily changed.

1013.6.2 Exit Sign Illumination

The face of an exit sign illuminated from an external source shall have an intensity of not less than 5 footcandles (54 lux).

1013.6.3 Power Source

Exit signs shall be illuminated at all times. To ensure continued illumination for a duration of not less than 90 minutes in case of primary power loss, the sign illumination means shall be connected to an emergency power system provided from storage batteries, unit equipment or an on-site generator. The installation of the emergency power system shall be in accordance with Chapter 27. Group I-2, Condition 2 exit sign illumination shall not be provided by unit equipment batteries only.

Exception: Approved exit sign illumination means that provide continuous illumination independent of external power sources for a duration of not less than 90 minutes, in case of primary power loss, are not required to be connected to an emergency electrical system.

Section 1014 Handrails

1014.1 Where Required

Handrails serving flights of *stairways*, *ramps*, stepped *aisles* and ramped *aisles* shall be adequate in strength and attachment in accordance with Section 1607.9. *Handrails* required for flights of *stairways* by Section 1011.11 shall comply with Sections 1014.2 through 1014.9.

Handrails required for *ramps* by Section 1012.8 shall comply with Sections 1014.2 through 1014.8. *Handrails* for stepped *aisles* and ramped *aisles* required by Section 1029.16 shall comply with Sections 1014.2 through 1014.8.

1014.2 Height

Handrail height, measured above *stair* tread *nosings*, or finish surface of *ramp* slope, shall be uniform, not less than 34 inches (864 mm) and not more than 38 inches (965 mm). *Handrail* height of *alternating tread* devices and ship's ladders, measured above *tread nosings*, shall be uniform, not less than 30 inches (762 mm) and not more than 34 inches (864 mm).

Exceptions:

1. Where handrail fittings or bendings are used to provide continuous transition between *flights*, the fittings or bendings shall be permitted to exceed the maximum height.
2. In Group R-3 occupancies; within *dwelling units* in Group R-2 occupancies; and in Group U occupancies that are associated with a Group R-3 occupancy or associated with individual *dwelling units* in Group R-2 occupancies; where handrail fittings or bendings are used to provide continuous transition between *flights*, transition at *winder* treads, transition from *handrail* to *guard*, or where used at the start of a *flight*, the *handrail* height at the fittings or bendings shall be permitted to exceed the maximum height.
3. *Handrails* on top of a *guard* where permitted along stepped aisles and ramped aisles in accordance with Section 1029.16.

1014.3 Handrail Graspability

Required *handrails* shall comply with Section 1014.3.1 or shall provide equivalent graspability.

Exceptions:

1. In Group R-3 occupancies; within *dwelling units* in Group R-2 occupancies; and in Group U occupancies that are accessory to a Group R-3 occupancy or accessory to individual *dwelling units* in Group R-2 occupancies; *handrails* shall be Type I in accordance with Section 1014.3.1, Type II in accordance with Section 1014.3.2 or shall provide equivalent graspability.
2. Accessible handrails shall meet the requirements of the *Florida Building Code, Accessibility*.

1014.3.1 Type I

Handrails with a circular cross section shall have an outside diameter of not less than $1\frac{1}{4}$ inches (32 mm) and not greater than 2 inches (51 mm). Where the *handrail* is not circular, it shall have a perimeter dimension of not less than 4 inches (102 mm) and not greater than $6\frac{1}{4}$ inches (160 mm) with a maximum cross-sectional dimension of $2\frac{1}{4}$ inches (57 mm) and minimum cross-sectional dimension of 1 inch (25 mm). Edges shall have a minimum radius of 0.01 inch (0.25 mm).

1014.3.2 Type II

Handrails with a perimeter greater than $6\frac{1}{4}$ inches (160 mm) shall provide a graspable finger recess area on both sides of the profile. The finger recess shall begin within a distance of $\frac{3}{4}$ inch (19 mm) measured vertically from the tallest portion of the profile and achieve a depth of not less than $\frac{5}{16}$ inch (8 mm) within $\frac{7}{8}$ inch (22 mm) below the widest portion of the profile. This required depth shall continue for not less than $\frac{3}{8}$ inch (10 mm) to a level that is not less than $1\frac{3}{4}$ inches (45 mm) below the tallest portion of the profile. The width of the *handrail* above the recess shall be not less than $1\frac{1}{4}$ inches (32 mm) to not greater than $2\frac{3}{4}$ inches (70 mm). Edges shall have a minimum radius of 0.01 inch (0.25 mm).

1014.4 Continuity

Handrail gripping surfaces shall be continuous, without interruption by newel posts or other obstructions.

Exceptions:

1. *Handrails* within *dwelling units* are permitted to be interrupted by a newel post at a turn or landing.
2. Within a *dwelling unit*, the use of a volute, turnout, starting easing or starting newel is allowed over the lowest tread.
3. Handrail brackets or balusters attached to the bottom surface of the *handrail* that do not project horizontally beyond the sides of the *handrail* within $1\frac{1}{2}$ inches (38 mm) of the bottom of the *handrail* shall not be considered obstructions. For each $\frac{1}{2}$ inch (12.7 mm) of additional handrail perimeter dimension above 4 inches (102 mm), the vertical clearance dimension of $1\frac{1}{2}$ inches (38 mm) shall be permitted to be reduced by $\frac{1}{8}$ inch (3.2 mm).
4. Where *handrails* are provided along walking surfaces with slopes not steeper than 1:20, the bottoms of the handrail gripping surfaces shall be permitted to be obstructed along their entire length where they are integral to crash rails or bumper guards.
5. *Handrails* serving stepped *aisles* or ramped *aisles* are permitted to be discontinuous in accordance with Section 1029.16.1.

1014.5 Fittings

Handrails shall not rotate within their fittings.

1014.6 Handrail Extensions

Handrails shall return to a wall, *guard* or the walking surface or shall be continuous to the handrail of an adjacent *flight of stairs* or *ramp* run. Where *handrails* are not continuous between *flights*, the *handrails* shall extend horizontally not less than 12 inches (305 mm) beyond the top riser and continue to slope for the depth of one tread beyond the bottom riser. At *ramps* where *handrails* are not continuous between runs, the *handrails* shall extend horizontally above the landing 12 inches (305 mm) minimum beyond the top and bottom of *ramp* runs. The extensions of *handrails* shall be in the same direction of the *flights of stairs* at *stairways* and the *ramp* runs at *ramps*.

Exceptions:

1. *Handrails* within a *dwelling unit* that is not required to be *accessible* need extend only from the top riser to the bottom riser.
2. *Handrails* serving aisles in rooms or spaces used for assembly purposes are permitted to comply with the handrail extensions in accordance with Section 1029.16.
3. *Handrails* for *alternating tread devices* and ship's ladders are permitted to terminate at a location vertically above the top and bottom risers. *Handrails* for *alternating tread devices* are not required to be continuous between *flights* or to extend beyond the top or bottom risers.

4. Accessible handrail extensions shall be in accordance with the *Florida Building Code, Accessibility*.

1014.7 Clearance

Clear space between a handrail and a wall or other surface shall be not less than $1\frac{1}{2}$ inches (38 mm). A handrail and a wall or other surface adjacent to the *handrail* shall be free of any sharp or abrasive elements.

1014.8 Projections

On *ramps* and on ramped *aisles* that are part of an *accessible route*, the clear width between *handrails* shall be 36 inches (914 mm) minimum. Projections into the required width of *aisles*, *stairways* and *ramps* at each side shall not exceed $4\frac{1}{2}$ inches (114 mm) at or below the handrail height. Projections into the required width shall not be limited above the minimum headroom height required in Section 1011.3. Projections due to intermediate *handrails* shall not constitute a reduction in the egress width. Where a pair of intermediate *handrails* are provided within the *stairway* width without a walking surface between the pair of intermediate *handrails* and the distance between the pair of intermediate *handrails* is greater than 6 inches (152 mm), the available egress width shall be reduced by the distance between the closest edges of each such intermediate pair of *handrails* that is greater than 6 inches (152 mm).

1014.9 Intermediate Handrails

Stairways shall have intermediate *handrails* located in such a manner that all portions of the *stairway* minimum width or required capacity are within 30 inches (762 mm) of a handrail. On monumental *stairs*, *handrails* shall be located along the most direct path of egress travel.

Section 1015 Guards

1015.1 General

Guards shall comply with the provisions of Sections 1015.2 through 1015.7. Operable windows with sills located more than 72 inches (1829 mm) above finished grade or other surface below shall comply with Section 1015.8.

1015.2 Where Required

Guards shall be located along open-sided walking surfaces, including *mezzanines*, *equipment platforms*, *aisles*, *stairs*, *ramps* and landings that are located more than 30 inches (762 mm) measured vertically to the floor or grade below at any point within 36 inches (914 mm) horizontally to the edge of the open side. *Guards* shall be adequate in strength and attachment in accordance with Section 1607.9.

Exception: *Guards* are not required for the following locations:

1. On the loading side of loading docks or piers.
2. On the audience side of *stages* and raised *platforms*, including *stairs* leading up to the *stage* and raised *platforms*.
3. On raised *stage* and *platform* floor areas, such as runways, *ramps* and side *stages* used for entertainment or presentations.
4. At vertical openings in the performance area of *stages* and *platforms*.
5. At elevated walking surfaces appurtenant to *stages* and *platforms* for access to and utilization of special lighting or equipment.
6. Along vehicle service pits not accessible to the public.
7. In assembly seating areas at cross aisles in accordance with Section 1029.17.2.
8. On the loading side of station platforms on fixed guideway transit or passenger rail systems.

1015.2.1 Glazing

Where glass is used to provide a *guard* or as a portion of the *guard* system, the *guard* shall comply with Section 2407. Where the glazing provided does not meet the strength and attachment requirements of Section 1607.9, complying *guards* shall be located along glazed

sides of open-sided walking surfaces.

1015.3 Height

Required *guards* shall be not less than 42 inches (1067 mm) high, measured vertically as follows:

1. From the adjacent walking surfaces.
2. On *stairways* and stepped *aisles*, from the line connecting the leading edges of the tread *nosings*.
3. On *ramps* and ramped *aisles*, from the *ramp* surface at the *guard*.

Exceptions:

1. For occupancies in Group R-3 not more than three stories above grade in height and within individual *dwelling units* in occupancies in Group R-2 not more than three stories above grade in height with separate *means of egress*, required *guards* shall be not less than 36 inches (914 mm) in height measured vertically above the adjacent walking surfaces.
2. For occupancies in Group R-3, and within individual *dwelling units* in occupancies in Group R-2, *guards* on the open sides of *stairs* shall have a height not less than 34 inches (864 mm) measured vertically from a line connecting the leading edges of the treads.
3. For occupancies in Group R-3, and within individual *dwelling units* in occupancies in Group R-2, where the top of the *guard* also serves as a *handrail* on the open sides of *stairs*, the top of the *guard* shall be not less than 34 inches (864 mm) and not more than 38 inches (965 mm) measured vertically from a line connecting the leading edges of the treads.
4. The *guard* height in assembly seating areas shall comply with Section 1029.17 as applicable.
5. Along *alternating tread devices* and ship's ladders, *guards* where the top rail also serves as a *handrail* shall have height not less than 30 inches (762 mm) and not more than 34 inches (864 mm), measured vertically from the leading edge of the device tread *nosing*.
6. In Group F occupancies, where exit access stairways serve three stories or fewer and such stairs are not open to the public, where the top of the *guard* also serves as a handrail, the top of the *guard* shall be not less than 34 inches (864 mm) and not more than 38 inches (965 mm) measured from a line connecting the leading edges of the treads.

1015.4 Opening Limitations

Required *guards* shall not have openings that allow passage of a sphere 4 inches (102 mm) in diameter from the walking surface to the required *guard* height.

Exceptions:

1. From a height of 36 inches (914 mm) to 42 inches (1067 mm), *guards* shall not have openings that allow passage of a sphere $4\frac{3}{8}$ inches (111 mm) in diameter.
2. The triangular openings at the open sides of a *stair*, formed by the riser, tread and bottom rail shall not allow passage of a sphere 6 inches (152 mm) in diameter.
3. At elevated walking surfaces for access to and use of electrical, mechanical or plumbing systems or equipment, *guards* shall not have openings that allow passage of a sphere 21 inches (533 mm) in diameter.
4. In areas that are not open to the public within occupancies in Group I-3, F, H or S, and for *alternating tread devices* and ship's ladders, *guards* shall not have openings that allow passage of a sphere 21 inches (533 mm) in diameter.

5. In assembly seating areas, *guards* required at the end of aisles in accordance with Section 1029.17.4 shall not have openings that allow passage of a sphere 4 inches (102 mm) in diameter up to a height of 26 inches (660 mm). From a height of 26 inches (660 mm) to 42 inches (1067 mm) above the adjacent walking surfaces, *guards* shall not have openings that allow passage of a sphere 8 inches (203 mm) in diameter.
6. Within individual *dwelling units* and *sleeping units* in Group R-2 and R-3 occupancies, *guards* on the open sides of *stairs* shall not have openings that allow passage of a sphere $4\frac{3}{8}$ (111 mm) inches in diameter.

1015.5 Screen Porches

Porches and decks that are enclosed with insect screening shall be provided with *guards* where the walking surface is located more than 30 inches (762 mm) above the floor or grade below.

1015.6 Mechanical Equipment, Systems and Devices

Guards shall be provided where various components that require service are located within 10 feet (3048 mm) of a roof edge or open side of a walking surface and such edge or open side is located more than 30 inches (762 mm) above the floor, roof or grade below. The *guard* shall extend not less than 30 inches (762 mm) beyond each end of such components. The *guard* shall be constructed so as to prevent the passage of a sphere 21 inches (533 mm) in diameter.

Exception: *Guards* are not required where permanent fall arrest/restraint anchorage connector devices that comply with ANSI/ASSE Z359.1 are affixed for use during the entire roof covering lifetime. The devices shall be reevaluated for possible replacement when the entire roof covering is replaced. The devices shall be placed not more than 10 feet (3048 mm) on center along hip and ridge lines and placed not less than 10 feet (3048 mm) from the roof edge or open side of the walking surface.

1015.7 Roof Access

Guards shall be provided where the roof hatch opening is located within 10 feet (3048 mm) of a roof edge or open side of a walking surface and such edge or open side is located more than 30 inches (762 mm) above the floor, roof or grade below. The *guard* shall be constructed so as to prevent the passage of a sphere 21 inches (533 mm) in diameter.

Exception: *Guards* are not required where permanent fall arrest/restraint anchorage connector devices that comply with ANSI/ASSE Z359.1 are affixed for use during the entire roof covering lifetime. The devices shall be reevaluated for possible replacement when the entire roof covering is replaced. The devices shall be placed not more than 10 feet (3048 mm) on center along hip and ridge lines and placed not less than 10 feet (3048 mm) from the roof edge or open side of the walking surface.

1015.8 Window Openings

Windows in Group R-2 and R-3 buildings including *dwelling units*, where the top of the sill of an operable window opening is located less than 36 inches (914 mm) above the finished floor and more than 72 inches (1829 mm) above the finished grade or other surface below on the exterior of the building, shall comply with one of the following:

1. Operable windows where the top of the sill of the opening is located more than 75 feet (22 860 mm) above the finished grade or other surface below and that are provided with window fall prevention devices that comply with ASTM F2006.
2. Operable windows where the openings will not allow a 4-inch-diameter (102 mm) sphere to pass through the opening when the window is in its largest opened position.
3. Operable windows where the openings are provided with window fall prevention devices that comply with ASTM F2090.
4. Operable windows that are provided with window opening control devices that comply with Section 1015.8.1.

1015.8.1 Window Opening Control Devices

Window opening control devices shall comply with ASTM F2090. The window opening control device, after operation to release the control device allowing the window to fully open, shall not reduce the minimum net clear opening area of the window unit to less than the area required by Section 1030.2.

Section 1016 Exit Access**1016.1 General**

The *exit access* shall comply with the applicable provisions of Sections 1003 through 1015. *Exit access* arrangement shall comply with Sections 1016 through 1021.

1016.2 Egress Through Intervening Spaces

Egress through intervening spaces shall comply with this section.

1. *Exit access* through an enclosed elevator lobby is permitted. Where access to two or more exits or exit access doorways is required in Section 1006.2.1, access to not less than one of the required *exits* shall be provided without travel through the enclosed elevator lobbies required by Section 3006, not to apply if the lobby is only provided to meet the requirements of Section 3007.6, Exception 1. Where the path of exit access travel passes through an enclosed elevator lobby, the level of protection required for the enclosed elevator lobby is not required to be extended to the *exit* unless direct access to an *exit* is required by other sections of this code.
2. Egress from a room or space shall not pass through adjoining or intervening rooms or areas, except where such adjoining rooms or areas and the area served are accessory to one or the other, are not a Group H occupancy and provide a discernible path of egress travel to an *exit*.

Exception: *Means of egress* are not prohibited through adjoining or intervening rooms or spaces in a Group H, S or F occupancy where the adjoining or intervening rooms or spaces are the same or a lesser hazard occupancy group.

3. An *exit access* shall not pass through a room that can be locked to prevent egress.

Exception: An electrically locked *exit access* door providing egress from an elevator lobby shall be permitted in accordance with Section 1010.2.16.

4. *Means of egress* from *dwelling units* or sleeping areas shall not lead through other sleeping areas, toilet rooms or bathrooms.

5. Egress shall not pass through kitchens, storage rooms, closets or spaces used for similar purposes.

Exceptions:

1. *Means of egress* are not prohibited through a kitchen area serving adjoining rooms constituting part of the same *dwelling unit* or *sleeping unit*.
2. *Means of egress* are not prohibited through stockrooms in Group M occupancies where all of the following are met:
 - 2.1. The stock is of the same hazard classification as that found in the main retail area.
 - 2.2. Not more than 50 percent of the *exit access* is through the stockroom.
 - 2.3. The stockroom is not subject to locking from the egress side.
 - 2.4. There is a demarcated, minimum 44-inch-wide (1118 mm) *aisle* defined by full- or partial-height fixed walls or similar construction that will maintain the required width and lead directly from the retail area to the *exit* without obstructions.

1016.2.1 Multiple Tenants

Where more than one tenant occupies any one floor of a building or structure, each tenant space, *dwelling unit* and *sleeping unit* shall be provided with access to the required *exits* without passing through adjacent tenant spaces, *dwelling units* and *sleeping units*.

Exception: The *means of egress* from a smaller tenant space shall not be prohibited from passing through a larger adjoining tenant space where such rooms or spaces of the smaller tenant occupy less than 10 percent of the area of the larger tenant space through which they pass; are the same or similar occupancy group; a discernible path of egress travel to an *exit* is provided; and the *means of egress* into the adjoining space is not subject to locking from the egress side. A required *means of egress* serving the larger tenant space shall not pass through the smaller tenant space or spaces.

Section 1017 Exit Access Travel Distance

1017.1 General

Travel distance within the *exit access* portion of the *means of egress* system shall be in accordance with this section.

1017.2 Limitations

Exit access travel distance shall not exceed the values given in Table 1017.2.

TABLE 1017.2

EXIT ACCESS TRAVEL DISTANCE^a

OCCUPANCY	WITHOUT SPRINKLER SYSTEM (feet)	WITH SPRINKLER SYSTEM (feet)
A, E, F-1, M, R, S-1	200	250 ^b
I-1	Not Permitted	250 ^b
B	200	300 ^c
F-2, S-2, U	300	400 ^c
H-1	Not Permitted	75 ^d
H-2	Not Permitted	100 ^d
H-3	Not Permitted	150 ^d
H-4	Not Permitted	175 ^d
H-5	Not Permitted	200 ^c
I-2, I-3, I-4	Not Permitted ^e	200 ^c

For SI: 1 foot = 304.8 mm.

a. See the following sections for modifications to *exit access* travel distance requirements:

Section 402.8: For the distance limitation in malls.

Section 404.9: For the distance limitation through an atrium space.

Section 407.4: For the distance limitation in Group I-2.

Sections 408.6.1 and 408.8.1: For the distance limitations in Group I-3.

Section 411.4: For the distance limitation in special amusement buildings.

Section 412.7: For the distance limitations in aircraft manufacturing facilities.

Section 1006.2.2.2: For the distance limitation in refrigeration machinery rooms.

Section 1006.2.2.3: For the distance limitation in refrigerated rooms and spaces.

Section 1006.3.3: For buildings with one exit.

Section 1017.2.2: For increased distance limitation in Groups F-1 and S-1.

Section 1029.7: For increased limitation in assembly seating.

Section 3103.4: For temporary structures.

Section 3104.9: For pedestrian walkways.

- b. Buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2. See Section 903 for occupancies where *automatic sprinkler systems* are permitted in accordance with Section 903.3.1.2.
- c. Buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.
- d. Group H occupancies equipped throughout with an *automatic sprinkler system* in accordance with Section 903.2.5.1.
- e. Group I-4 day care facilities for which an automatic sprinkler system is not required in accordance with Section 903.2.6, Exception 2.

1017.2.1 Exterior Egress Balcony Increase

Exit access travel distances specified in Table 1017.2 shall be increased up to an additional 100 feet (30 480 mm) provided the last portion of the *exit access* leading to the *exit* occurs on an exterior egress balcony constructed in accordance with Section 1021. The length of such balcony shall be not less than the amount of the increase taken.

1017.2.2 Group F-1 and S-1 Increase

The maximum *exit access* travel distance shall be 400 feet (122 m) in Group F-1 or S-1 occupancies where all of the following conditions are met:

1. The portion of the building classified as Group F-1 or S-1 is limited to one story in height.
2. The minimum height from the finished floor to the bottom of the ceiling or roof slab or deck is 24 feet (7315 mm).
3. The building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

1017.3 Measurement

Exit access travel distance shall be measured from the most remote point of each room, area or space along the natural and unobstructed path of horizontal and vertical egress travel to the entrance to an *exit*. Where more than one exit is required, *exit access* travel distance shall be measured to the nearest exit.

Exceptions:

1. In *open parking garages*, *exit access* travel distance is permitted to be measured to the closest riser of an *exit access stairway* or the closest slope of an *exit access ramp*.

2. In smoke protected seating and open air assembly seating, exit access travel distance shall be measured in accordance with Section 1029.7.

1017.3.1 Exit Access Stairways and Ramps

Travel distance on *exit access stairways* or *ramps* shall be included in the *exit access* travel distance measurement. The measurement along *stairways* shall be made on a plane parallel and tangent to the *stair tread nosings* in the center of the *stair* and landings. The measurement along *ramps* shall be made on the walking surface in the center of the *ramp* and landings.

Section 1018 Aisles

1018.1 General

Aisles and *aisle accessways* serving as a portion of the *exit access* in the *means of egress* system shall comply with the requirements of this section. *Aisles* or *aisle accessways* shall be provided from all occupied portions of the *exit access* that contain seats, tables, furnishings, displays and similar fixtures or equipment. The minimum width or required capacity of *aisles* shall be unobstructed.

Exception: Encroachments complying with Section 1005.7.

1018.2 Aisles in Assembly Spaces

Aisles and *aisle accessways* serving a room or space used for assembly purposes shall comply with Section 1029.

1018.3 Aisles in Groups B and M

In Group B and M occupancies, the minimum clear aisle width shall be determined by Section 1005.1 for the *occupant load* served, but shall be not less than that required for corridors by Section 1020.3.

Exception: Nonpublic *aisles* serving less than 50 people and not required to be *accessible* by Chapter 11 need not exceed 28 inches (711 mm) in width.

1018.4 Aisle Accessways in Group M

An *aisle accessway* shall be provided on not less than one side of each element within the *merchandise pad*. The minimum clear width for an *aisle accessway* not required to be *accessible* shall be 30 inches (762 mm). The required clear width of the *aisle accessway* shall be measured perpendicular to the elements and merchandise within the *merchandise pad*. The 30-inch (762 mm) minimum clear width shall be maintained to provide a path to an adjacent *aisle* or *aisle accessway*. The *common path of egress travel* shall not exceed 30 feet (9144 mm) from any point in the *merchandise pad*.

Exception: For areas serving not more than 50 occupants, the *common path of egress travel* shall not exceed 75 feet (22 860 mm).

1018.5 Aisles in Other Than Assembly Spaces and Groups B and M

In other than rooms or spaces used for assembly purposes and Group B and M occupancies, the minimum clear *aisle* capacity shall be determined by Section 1005.1 for the occupant load served, but the width shall be not less than that required for corridors by Section 1020.3.

Exception: Nonpublic *aisles* serving less than 50 people and not required to be *accessible* by Chapter 11 need not exceed 28 inches (711 mm) in width.

Section 1019 Exit Access Stairways and Ramps

1019.1 General

Exit access stairways and *ramps* serving as an *exit access* component in a *means of egress* system shall comply with the requirements of this section. The number of stories connected by *exit access stairways* and *ramps* shall include *basements*, but not *mezzanines*.

1019.2 All Occupancies

Exit access stairways and *ramps* that serve floor levels within a single story are not required to be enclosed.

1019.3 Occupancies Other Than Groups I-2 and I-3

In other than Group I-2 and I-3 occupancies, floor openings containing *exit access stairways* or *ramps* shall be enclosed with a shaft enclosure constructed in accordance with Section 713.

Exceptions:

1. *Exit access stairways and ramps* that serve or atmospherically communicate between only two stories. Such interconnected stories shall not be open to other stories.
2. In Group R-1, R-2 or R-3 occupancies, *exit access stairways and ramps* connecting four stories or less serving and contained within an individual *dwelling unit* or *sleeping unit* or *live/work unit*.
3. *Exit access stairways* serving and contained within a Group R-3 congregate residence or a Group R-4 facility are not required to be enclosed.
4. *Exit access stairways and ramps* in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, where the area of the vertical opening between stories does not exceed twice the horizontal projected area of the *stairway* or *ramp* and the opening is protected by a draft curtain and closely spaced sprinklers in accordance with NFPA 13. In other than Group B and M occupancies, this provision is limited to openings that do not connect more than four stories.
5. *Exit access stairways and ramps* within an *atrium* complying with the provisions of Section 404.
6. *Exit access stairways and ramps* in *open parking garages* that serve only the parking garage.
7. *Exit access stairways and ramps* serving smoke-protected or open-air assembly seating complying with the *exit access travel distance* requirements of Section 1029.7.
8. *Exit access stairways and ramps* between the balcony, gallery or press box and the main assembly floor in occupancies such as theaters, places of religious worship, auditoriums and sports facilities.

1019.4 Group I-2 and I-3 Occupancies

In Group I-2 and I-3 occupancies, floor openings between stories containing *exit access stairways* or *ramps* are required to be enclosed with a shaft enclosure constructed in accordance with Section 713.

Exception: In Group I-3 occupancies, *exit access stairways* or *ramps* constructed in accordance with Section 408 are not required to be enclosed.

Section 1020 Corridors**1020.1 General**

Corridors serving as an exit access component in a means of egress system shall comply with the requirements of this section.

1020.2 Construction

Corridors shall be fire-resistance rated in accordance with Table 1020.2. The *corridor* walls required to be fire-resistance rated shall comply with Section 708 for *fire partitions*.

Exceptions:

1. A *fire-resistance rating* is not required for *corridors* in an occupancy in Group E where each room that is used for instruction has not less than one door opening directly to the exterior and rooms for assembly purposes have not less than one-half of the required *means of egress* doors opening directly to the exterior. Exterior doors specified in this exception are required to be at ground level.
2. A *fire-resistance rating* is not required for *corridors* contained within a *dwelling unit* or *sleeping unit* in an occupancy in Groups I-1 and R.
3. A *fire-resistance rating* is not required for *corridors* in *open parking garages*.

4. A *fire-resistance rating* is not required for *corridors* in an occupancy in Group B that is a space requiring only a single *means of egress* complying with Section 1006.2.
5. *Corridors* adjacent to the *exterior walls* of buildings shall be permitted to have unprotected openings on unrated *exterior walls* where unrated walls are permitted by Table 705.5 and unprotected openings are permitted by Table 705.8.

TABLE 1020.2
CORRIDOR FIRE-RESISTANCE RATING

OCCUPANCY	OCCUPANT LOAD SERVED BY CORRIDOR	REQUIRED FIRE-RESISTANCE RATING (hours)	
		Without sprinkler system	With sprinkler system ^c
H-1, H-2, H-3	All	Not Permitted	1
H-4, H-5	Greater than 30	Not Permitted	1
A, B, E, F, M, S, U	Greater than 30	1	0
R	Greater than 10	Not Permitted	0.5
I-2 ^a , I-4	All	Not Permitted	0
I-1, I-3	All	Not Permitted	1 ^b

- a. For requirements for occupancies in Group I-2, see Sections 407.2 and 407.3.
- b. For a reduction in the *fire-resistance rating* for occupancies in Group I-3, see Section 408.8.
- c. Buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2 where allowed.

1020.3 Width and Capacity

The required capacity of *corridors* shall be determined as specified in Section 1005.1, but the minimum width shall be not less than that specified in Table 1020.3.

Exception: In Group I-2 occupancies, *corridors* are not required to have a clear width of 96 inches (2438 mm) in areas where there will not be stretcher or bed movement for access to care or as part of the defend-in-place strategy.

TABLE 1020.3
MINIMUM CORRIDOR WIDTH

OCCUPANCY	MINIMUM WIDTH (inches)
Any facilities not listed below	44
Access to and utilization of mechanical, plumbing or electrical systems or equipment	24
With an occupant load of less than 50	36
Within a <i>dwelling unit</i>	36

In Group E with a <i>corridor</i> having an occupant load of 100 or more	72
In <i>corridors</i> and areas serving stretcher traffic in occupancies where patients receive outpatient medical care that causes the patient to be incapable of self-preservation	72
Group I-2 in areas where required for bed movement	96

For SI: 1 inch = 25.4 mm.

1020.4 Obstruction

The minimum width or required capacity of *corridors* shall be unobstructed.

Exception: Encroachments complying with Section 1005.7.

1020.5 Dead Ends

Where more than one *exit* or *exit access doorway* is required, the *exit access* shall be arranged such that there are no dead ends in *corridors* more than 20 feet (6096 mm) in length.

Exceptions:

1. In occupancies in Group I-3 of Condition 2, 3 or 4, the dead end in a *corridor* shall not exceed 50 feet (15 240 mm).
2. In occupancies in Groups B, E, F, I-1, M, R-1, R-2, S and U, where the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, the length of the dead-end *corridors* shall not exceed 50 feet (15 240 mm).
3. A dead-end *corridor* shall not be limited in length where the length of the dead-end *corridor* is less than 2.5 times the least width of the dead-end *corridor*.
4. In Group I-2, Condition 2 occupancies, the length of dead end corridors that do not serve patient rooms or patient treatment spaces shall not exceed 30 feet (9144 mm).

1020.6 Air Movement in Corridors

Corridors shall not serve as supply, return, exhaust, relief or ventilation air ducts.

Exceptions:

1. Use of a *corridor* as a source of makeup air for exhaust systems in rooms that open directly onto such *corridors*, including toilet rooms, bathrooms, dressing rooms, smoking lounges and janitor closets, shall be permitted, provided that each such *corridor* is directly supplied with outdoor air at a rate greater than the rate of makeup air taken from the *corridor*.
2. Where located within a *dwelling unit*, the use of *corridors* for conveying return air shall not be prohibited.
3. Where located within tenant spaces of 1,000 square feet (93 m^2) or less in area, utilization of *corridors* for conveying return air is permitted.
4. Transfer air movement required to maintain pressurization difference within health care facilities in accordance with ASHRAE 170.

1020.6.1 Corridor Ceiling

Use of the space between the *corridor* ceiling and the floor or roof structure above as a return air plenum is permitted for one or more of the following conditions:

1. The *corridor* is not required to be of *fire-resistance-rated* construction.
2. The *corridor* is separated from the plenum by *fire-resistance-rated* construction.
3. The air-handling system serving the *corridor* is shut down upon activation of the air-handling unit *smoke detectors* required by the *Florida Building Code, Mechanical*.
4. The air-handling system serving the *corridor* is shut down upon detection of sprinkler water flow where the building is equipped throughout with an *automatic sprinkler system*.
5. The space between the *corridor* ceiling and the floor or roof structure above the *corridor* is used as a component of an approved engineered smoke control system.

1020.7 Corridor Continuity

Fire-resistance-rated corridors shall be continuous from the point of entry to an *exit*, and shall not be interrupted by intervening rooms. Where the path of egress travel within a *fire-resistance-rated corridor* to the exit includes travel along unenclosed *exit access stairways* or *ramps*, the *fire-resistance rating* shall be continuous for the length of the *stairway* or *ramp* and for the length of the connecting *corridor* on the adjacent floor leading to the *exit*.

Exceptions:

1. Foyers, lobbies or reception rooms constructed as required for *corridors* shall not be construed as intervening rooms.
2. Enclosed elevator lobbies as permitted by Item 1 of Section 1016.2 shall not be construed as intervening rooms.

Section 1021 Egress Balconies

1021.1 General

Balconies used for egress purposes shall conform to the same requirements as *corridors* for minimum width, required capacity, headroom, dead ends and projections.

1021.2 Wall Separation

Exterior egress balconies shall be separated from the interior of the building by walls and opening protectives as required for *corridors*.

Exception: Separation is not required where the exterior egress balcony is served by not less than two *stairways* and a dead-end travel condition does not require travel past an unprotected opening to reach a *stairway*.

1021.3 Openness

The long side of an egress balcony shall be at least 50 percent open, and the open area above the *guards* shall be so distributed as to minimize the accumulation of smoke or toxic gases.

1021.4 Location

Exterior egress balconies shall have a minimum *fire separation distance* of 10 feet (3048 mm) measured at right angles from the exterior edge of the egress balcony to the following:

1. Adjacent *lot lines*.
2. Other portions of the building.

3. Other buildings on the same lot unless the adjacent building *exterior walls* and openings are protected in accordance with Section 705 based on *fire separation distance*.

For the purposes of this section, other portions of the building shall be treated as separate buildings.

Section 1022 Exits

1022.1 General

Exits shall comply with Sections 1022 through 1027 and the applicable requirements of Sections 1003 through 1015. An *exit* shall not be used for any purpose that interferes with its function as a *means of egress*. Once a given level of *exit* protection is achieved, such level of protection shall not be reduced until arrival at the *exit discharge*. *Exits* shall be continuous from the point of entry into the *exit* to the *exit discharge*.

1022.2 Exterior Exit Doors

Buildings or structures used for human occupancy shall have not less than one exterior door that meets the requirements of Section 1010.1.1.

1022.2.1 Detailed Requirements

Exterior *exit* doors shall comply with the applicable requirements of Section 1010.1.

1022.2.2 Arrangement

Exterior *exit* doors shall lead directly to the *exit discharge* or the *public way*.

Section 1023 Interior Exit Stairways and Ramps

1023.1 General

Interior exit stairways and ramps serving as an *exit* component in a *means of egress* system shall comply with the requirements of this section. *Interior exit stairways and ramps* shall be enclosed and lead directly to the exterior of the building or shall be extended to the exterior of the building with an *exit passageway* conforming to the requirements of Section 1024, except as permitted in Section 1028.2. An *interior exit stairway or ramp* shall not be used for any purpose other than as a *means of egress* and a circulation path.

1023.2 Construction

Enclosures for *interior exit stairways and ramps* shall be constructed as *fire barriers* in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. *Interior exit stairway and ramp* enclosures shall have a *fire-resistance rating* of not less than 2 hours where connecting four stories or more and not less than 1 hour where connecting less than four stories. The number of stories connected by the *interior exit stairways or ramps* shall include any *basements*, but not any *mezzanines*. Enclosures for *interior exit stairways and ramps* shall have a *fire-resistance rating* not less than the floor assembly penetrated, but need not exceed 2 hours.

Exceptions:

1. *Interior exit stairways and ramps* in Group I-3 occupancies in accordance with the provisions of Section 408.3.8.
2. *Interior exit stairways* within an *atrium* enclosed in accordance with Section 404.6.

1023.3 Termination

Interior exit stairways and ramps shall terminate at an *exit discharge* or a *public way*.

Exception: A combination of *interior exit stairways*, *interior exit ramps* and *exit passageways*, constructed in accordance with Sections 1023.2, 1023.3.1 and 1024, respectively, and forming a continuous protected enclosure, shall be permitted to extend an *interior exit stairway or ramp* to the *exit discharge* or a *public way*.

1023.3.1 Extension

Where *interior exit stairways* and *ramps* are extended to an *exit discharge* or a *public way* by an *exit passageway*, the *interior exit stairway* and *ramp* shall be separated from the *exit passageway* by a *fire barrier* constructed in accordance with Section 707 or a *horizontal assembly* constructed in accordance with Section 711, or both. The *fire-resistance rating* shall be not less than that required for the *interior exit stairway* and *ramp*. A *fire door* assembly complying with Section 716.5 shall be installed in the *fire barrier* to provide a *means of egress* from the *interior exit stairway* and *ramp* to the *exit passageway*. Openings in the *fire barrier* other than the *fire door* assembly are prohibited. Penetrations of the *fire barrier* are prohibited.

Exceptions:

1. Penetrations of the *fire barrier* in accordance with Section 1023.5 shall be permitted.
2. Separation between an *interior exit stairway* or *ramp* and the *exit passageway* extension shall not be required where there are no openings into the *exit passageway* extension.
3. Separation between an interior exit stairway or ramp and the exit passageway extension shall not be required when the interior exit stair and the exit passageway extension are pressurized in accordance with Section 909.20.5.

1023.4 Openings

Interior exit stairway and *ramp* opening protectives shall be in accordance with the requirements of Section 716.

Openings in *interior exit stairways* and *ramps* other than unprotected exterior openings shall be limited to those required for *exit access* to the enclosure from normally occupied spaces and for egress from the enclosure.

Elevators shall not open into *interior exit stairways* and *ramps*.

1023.5 Penetrations

Penetrations into or through *interior exit stairways* and *ramps* are prohibited except for equipment and ductwork necessary for independent ventilation or pressurization, sprinkler piping, standpipes, electrical raceway for fire department communication and security systems and electrical raceway serving the *interior exit stairway* and *ramp* and terminating at a steel box not exceeding 16 square inches (0.010 m²). Such penetrations shall be protected in accordance with Section 714. There shall not be penetrations or communication openings, whether protected or not, between adjacent *interior exit stairways* and *ramps*.

Exception: Membrane penetrations shall be permitted on the outside of the *interior exit stairway* and *ramp*. Such penetrations shall be protected in accordance with Section 714.4.2.

1023.6 Ventilation

Equipment and ductwork for *interior exit stairway* and *ramp* ventilation as permitted by Section 1023.5 shall comply with one of the following items:

1. Such equipment and ductwork shall be located exterior to the building and shall be directly connected to the *interior exit stairway* and *ramp* by ductwork enclosed in construction as required for shafts.
2. Where such equipment and ductwork is located within the *interior exit stairway* and *ramp*, the intake air shall be taken directly from the outdoors and the exhaust air shall be discharged directly to the outdoors, or such air shall be conveyed through ducts enclosed in construction as required for shafts.
3. Where located within the building, such equipment and ductwork shall be separated from the remainder of the building, including other mechanical equipment, with construction as required for shafts.

In each case, openings into the *fire-resistance-rated* construction shall be limited to those needed for maintenance and operation and shall be protected by opening protectives in accordance with Section 716 for shaft enclosures.

The *interior exit stairway* and *ramp* ventilation systems shall be independent of other building ventilation systems.

1023.7 Interior Exit Stairway and Ramp Exterior Walls

Exterior walls of the *interior exit stairway or ramp* shall comply with the requirements of Section 705 for *exterior walls*. Where nonrated walls or unprotected openings enclose the exterior of the *stairway or ramps* and the walls or openings are exposed by other parts of the building at an angle of less than 180 degrees (3.14 rad), the building *exterior walls* within 10 feet (3048 mm) horizontally of a nonrated wall or unprotected opening shall have a *fire-resistance rating* of not less than 1 hour. Openings within such *exterior walls* shall be protected by opening protectives having a *fire protection rating* of not less than $\frac{3}{4}$ hour. This construction shall extend vertically from the ground to a point 10 feet (3048 mm) above the topmost landing of the *stairway or ramp*, or to the roof line, whichever is lower.

1023.8 Discharge Identification

An *interior exit stairway and ramp* shall not continue below its *level of exit discharge* unless an *approved barrier* is provided at the *level of exit discharge* to prevent persons from unintentionally continuing into levels below. Directional exit signs shall be provided as specified in Section 1013.

1023.9 Stairway Identification Signs

A sign shall be provided at each floor landing in an *interior exit stairway and ramp* connecting more than three stories designating the floor level, the terminus of the top and bottom of the *interior exit stairway and ramp* and the identification of the *stairway or ramp*. The signage shall also state the story of, and the direction to, the *exit discharge* and the availability of roof access from the *interior exit stairway and ramp* for the fire department. The sign shall be located 5 feet (1524 mm) above the floor landing in a position that is readily visible when the doors are in the open and closed positions. In addition to the *stairway* identification sign, a floor-level sign in visual characters, raised characters and braille complying with the *Florida Building Code, Accessibility* shall be located at each floor-level landing adjacent to the door leading from the *interior exit stairway and ramp* into the *corridor* to identify the floor level.

1023.9.1 Signage Requirements

Stairway identification signs shall comply with all of the following requirements:

1. The signs shall be a minimum size of 18 inches (457 mm) by 12 inches (305 mm).
2. The letters designating the identification of the *interior exit stairway and ramp* shall be not less than $1\frac{1}{2}$ inches (38 mm) in height.
3. The number designating the floor level shall be not less than 5 inches (127 mm) in height and located in the center of the sign.
4. Other lettering and numbers shall be not less than 1 inch (25 mm) in height.
5. Characters and their background shall have a non-glare finish. Characters shall contrast with their background, with either light characters on a dark background or dark characters on a light background.
6. Where signs required by Section 1023.9 are installed in the *interior exit stairways and ramps* of buildings subject to Section 1025, the signs shall be made of the same materials as required by Section 1025.4.

1023.10 Elevator Lobby Identification Signs

At landings in *interior exit stairways* where two or more doors lead to the floor level, any door with direct access to an enclosed elevator lobby shall be identified by signage located on the door or directly adjacent to the door stating "Elevator Lobby." Signage shall be in accordance with Section 1023.9.1, Items 4, 5 and 6.

1023.11 Smokeproof Enclosures

Where required by Section 403.5.4, 405.7.2 or 412.3.2.1, *interior exit stairways and ramps* shall be *smokeproof enclosures* in accordance with Section 909.20.

1023.11.1 Termination and Extension

A *smokeproof enclosure* shall terminate at an *exit discharge* or a *public way*. The *smokeproof enclosure* shall be permitted to be extended by an *exit passageway* in accordance with Section 1023.3. The *exit passageway* shall be without openings other than the *fire door assembly* required by Section 1023.3.1 and those necessary for egress from the *exit passageway*. The *exit passageway* shall be separated from the remainder of the building by 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

Exceptions:

1. Openings in the *exit passageway* serving a *smokeproof enclosure* are permitted where the *exit passageway* is protected and pressurized in the same manner as the *smokeproof enclosure*, and openings are protected as required for access from other floors.
2. The *fire barrier* separating the *smokeproof enclosure* from the *exit passageway* is not required, provided the *exit passageway* is protected and pressurized in the same manner as the *smoke-proof enclosure*.
3. A *smokeproof enclosure* shall be permitted to egress through areas on the *level of exit discharge* or vestibules as permitted by Section 1028.

1023.11.2 Enclosure Access

Access to the *stairway* or *ramp* within a *smokeproof enclosure* shall be by way of a vestibule or an open exterior balcony.

Exception: Access is not required by way of a vestibule or exterior balcony for *stairways* and *ramps* using the pressurization alternative complying with Section 909.20.5.

1023.12 Standpipes

Standpipes and standpipe hose connections shall be provided in accordance with Sections 905.3 and 905.4.

Section 1024 Exit Passageways**1024.1 General**

Exit passageways serving as an exit component in a *means of egress* system shall comply with the requirements of this section. An *exit passageway* shall not be used for any purpose other than as a *means of egress* and a *circulation path*.

1024.2 Width

The required capacity of *exit passageways* shall be determined as specified in Section 1005.1 but the minimum width shall be not less than 44 inches (1118 mm), except that *exit passageways* serving an occupant load of less than 50 shall be not less than 36 inches (914 mm) in width. The minimum width or required capacity of *exit passageways* shall be unobstructed.

Exception: Encroachments complying with Section 1005.7.

1024.3 Construction

Exit passageway enclosures shall have walls, floors and ceilings of not less than a 1-hour *fire-resistance rating*, and not less than that required for any connecting *interior exit stairway* or *ramp*. *Exit passageways* shall be constructed as *fire barriers* in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

1024.4 Termination

Exit passageways on the *level of exit discharge* shall terminate at an *exit discharge*. *Exit passageways* on other levels shall terminate at an *exit*.

1024.5 Openings

Exit passageway opening protectives shall be in accordance with the requirements of Section 716.

Except as permitted in Section 402.8.7, openings in *exit passageways* other than unprotected exterior openings shall be limited to those necessary for *exit access* to the *exit passageway* from normally occupied spaces and for egress from the *exit passageway*.

Where an *interior exit stairway* or *ramp* is extended to an *exit discharge* or a *public way* by an *exit passageway*, the *exit passageway* shall comply with Section 1023.3.1.

Elevators shall not open into an *exit passageway*.

1024.6 Penetrations

Penetrations into or through an *exit passageway* are prohibited except for equipment and ductwork necessary for independent pressurization, *fire protection systems*, two-way communication systems, electrical raceway for fire department communication and

electrical raceway serving the *exit passageway* and terminating at a steel box not exceeding 16 square inches (0.010 m²). Such penetrations shall be protected in accordance with Section 714. There shall not be penetrations or communicating openings, whether protected or not, between adjacent *exit passageways*.

Exception: Membrane penetrations shall be permitted on the outside of the *exit passageway*. Such penetrations shall be protected in accordance with Section 714.

1024.7 Ventilation

Equipment and ductwork for *exit passageway* ventilation as permitted by Section 1024.6 shall comply with one of the following:

1. The equipment and ductwork shall be located exterior to the building and shall be directly connected to the *exit passageway* by ductwork enclosed in construction as required for shafts.
2. Where the equipment and ductwork is located within the *exit passageway*, the intake air shall be taken directly from the outdoors and the exhaust air shall be discharged directly to the outdoors, or the air shall be conveyed through ducts enclosed in construction as required for shafts.
3. Where located within the building, the equipment and ductwork shall be separated from the remainder of the building, including other mechanical equipment, with construction as required for shafts.

In each case, openings into the fire-resistance-rated construction shall be limited to those needed for maintenance and operation and shall be protected by opening protectives in accordance with Section 716 for shaft enclosures.

Exit passageway ventilation systems shall be independent of other building ventilation systems.

1024.8 Standpipes

Standpipes and standpipe hose connections shall be provided in accordance with Sections 905.3 and 905.4.

1024.9 Exit Passageway Exterior Walls

Exterior walls of the exit passageway shall comply with Section 705. Where nonrated walls or unprotected openings enclose the exterior of the exit passageway and the walls or openings are exposed by other parts of the building at an angle of less than 180 degrees (3.14 rad), the building exterior walls within 10 feet (3048 mm) horizontally of a nonrated wall or unprotected opening shall have a fire-resistance rating of not less than 1 hour. Openings within such exterior walls shall be protected by opening protectives having a fire protection rating of not less than $\frac{3}{4}$ hour. This construction shall extend vertically from the ground to a point 10 feet (3048 mm) above the floor of the exit passageway, or to the roof line, whichever is lower.

Section 1025 Luminous Egress Path Markings

1025.1 General

Approved luminous egress path markings delineating the exit path shall be provided in *high-rise buildings* of Group A, B, E, I, M, and R-1 occupancies in accordance with Sections 1025.1 through 1025.5.

Exception: Luminous egress path markings shall not be required on the *level of exit discharge* in lobbies that serve as part of the exit path in accordance with Section 1028.2, Exception 1.

1025.2 Markings Within Exit Components

Egress path markings shall be provided in *interior exit stairways*, *interior exit ramps* and *exit passageways*, in accordance with Sections 1025.2.1 through 1025.2.6.

1025.2.1 Steps

A solid and continuous stripe shall be applied to the horizontal leading edge of each step and shall extend for the full length of the step. Outlining stripes shall have a minimum horizontal width of 1 inch (25 mm) and a maximum width of 2 inches (51 mm). The leading edge of the stripe shall be placed not more than $\frac{1}{2}$ inch (12.7 mm) from the leading edge of the step and the stripe shall not overlap the leading edge of the step by not more than $\frac{1}{2}$ inch (12.7 mm) down the vertical face of the step.

Exception: The minimum width of 1 inch (25 mm) shall not apply to outlining stripes listed in accordance with UL 1994.

1025.2.2 Landings

The leading edge of landings shall be marked with a stripe consistent with the dimensional requirements for steps.

1025.2.3 Handrails

Handrails and handrail extensions shall be marked with a solid and continuous stripe having a minimum width of 1 inch (25 mm). The stripe shall be placed on the top surface of the *handrail* for the entire length of the *handrail*, including extensions and newel post caps. Where *handrails* or handrail extensions bend or turn corners, the stripe shall not have a gap of more than 4 inches (102 mm).

Exception: The minimum width of 1 inch (25 mm) shall not apply to outlining stripes listed in accordance with UL 1994.

1025.2.4 Perimeter Demarcation Lines

Stair landings and other floor areas within *interior exit stairways*, *interior exit ramps* and *exit passageways*, with the exception of the sides of steps, shall be provided with solid and continuous demarcation lines on the floor or on the walls or a combination of both. The stripes shall be 1 to 2 inches (25 mm to 51 mm) wide with interruptions not exceeding 4 inches (102 mm).

Exception: The minimum width of 1 inch (25 mm) shall not apply to outlining stripes listed in accordance with UL 1994.

1025.2.4.1 Floor-Mounted Demarcation Lines

Perimeter demarcation lines shall be placed within 4 inches (102 mm) of the wall and shall extend to within 2 inches (51 mm) of the markings on the leading edge of landings. The demarcation lines shall continue across the floor in front of all doors.

Exception: Demarcation lines shall not extend in front of *exit discharge* doors that lead out of an *exit* and through which occupants must travel to complete the exit path.

1025.2.4.2 Wall-Mounted Demarcation Lines

Perimeter demarcation lines shall be placed on the wall with the bottom edge of the stripe not more than 4 inches (102 mm) above the finished floor. At the top or bottom of the *stairs*, demarcation lines shall drop vertically to the floor within 2 inches (51 mm) of the step or landing edge. Demarcation lines on walls shall transition vertically to the floor and then extend across the floor where a line on the floor is the only practical method of outlining the path. Where the wall line is broken by a door, demarcation lines on walls shall continue across the face of the door or transition to the floor and extend across the floor in front of such door.

Exception: Demarcation lines shall not extend in front of *exit discharge* doors that lead out of an *exit* and through which occupants must travel to complete the exit path.

1025.2.4.3 Transition

Where a wall-mounted demarcation line transitions to a floor-mounted demarcation line, or vice versa, the wall-mounted demarcation line shall drop vertically to the floor to meet a complimentary extension of the floor-mounted demarcation line, thus forming a continuous marking.

1025.2.5 Obstacles

Obstacles at or below 6 feet 6 inches (1981 mm) in height and projecting more than 4 inches (102 mm) into the egress path shall be outlined with markings not less than 1 inch (25 mm) in width comprised of a pattern of alternating equal bands, of luminous material and black, with the alternating bands not more than 2 inches (51 mm) thick and angled at 45 degrees (0.79 rad). Obstacles shall include, but are not limited to, standpipes, hose cabinets, wall projections and restricted height areas. However, such markings shall not conceal any required information or indicators including but not limited to instructions to occupants for the use of standpipes.

Exception: The minimum width of 1 inch (25 mm) shall not apply to markings listed in accordance with UL 1994.

1025.2.6 Doors Within the Exit Path

Doors through which occupants must pass in order to complete the exit path shall be provided with markings complying with Sections 1025.2.6.1 through 1025.2.6.3.

1025.2.6.1 Emergency Exit Symbol

The doors shall be identified by a low-location luminous emergency exit symbol complying with NFPA 170. The exit symbol shall be not less than 4 inches (102 mm) in height and shall be mounted on the door, centered horizontally, with the top of the symbol not

higher than 18 inches (457 mm) above the finished floor.

1025.2.6.2 Door Hardware Markings

Door hardware shall be marked with not less than 16 square inches ($10\ 323\ mm^2$) of luminous material. This marking shall be located behind, immediately adjacent to, or on the door handle or escutcheon. Where a panic bar is installed, such material shall not be less than 1 inch (25 mm) wide for the entire length of the actuating bar or touchpad.

1025.2.6.3 Door Frame Markings

The top and sides of the door frame shall be marked with a solid and continuous 1-inch- to 2-inch-wide (25 mm to 51 mm) stripe. Where the door molding does not provide sufficient flat surface on which to locate the stripe, the stripe shall be permitted to be located on the wall surrounding the frame.

1025.3 Uniformity

Placement and dimensions of markings shall be consistent and uniform throughout the same enclosure.

1025.4 Self-Luminous and Photoluminescent

Luminous egress path markings shall be permitted to be made of any material, including paint, provided that an electrical charge is not required to maintain the required luminance. Such materials shall include, but not be limited to, *self-luminous* materials and *photoluminescent* materials. Materials shall comply with either of the following standards:

1. UL 1994.
2. ASTM E2072, except that the charging source shall be 1 footcandle (11 lux) of fluorescent illumination for 60 minutes, and the minimum luminance shall be 30 milicandela per square meter at 10 minutes and 5 milicandela per square meter after 90 minutes.

1025.5 Illumination

Where *photoluminescent* exit path markings are installed, they shall be provided with not less than 1 footcandle (11 lux) of illumination for not less than 60 minutes prior to periods when the building is occupied and continuously during occupancy.

Section 1026 Horizontal Exits

1026.1 General

Horizontal exits serving as an *exit* in a *means of egress* system shall comply with the requirements of this section. A *horizontal exit* shall not serve as the only *exit* from a portion of a building, and where two or more *exits* are required, not more than one-half of the total number of *exits* or total *exit* minimum width or required capacity shall be *horizontal exits*.

Exceptions:

1. *Horizontal exits* are permitted to comprise two-thirds of the required *exits* from any building or floor area for occupancies in Group I-2.
2. *Horizontal exits* are permitted to comprise 100 percent of the *exits* required for occupancies in Group I-3. Not less than 6 square feet ($0.6\ m^2$) of accessible space per occupant shall be provided on each side of the *horizontal exit* for the total number of people in adjoining compartments.

1026.2 Separation

The separation between buildings or refuge areas connected by a *horizontal exit* shall be provided by a *fire wall* complying with Section 706; or by a *fire barrier* complying with Section 707 or a *horizontal assembly* complying with Section 711, or both. The minimum *fire-resistance rating* of the separation shall be 2 hours. Opening protectives in *horizontal exits* shall also comply with Section 716. Duct and air transfer openings in a *fire wall* or *fire barrier* that serves as a *horizontal exit* shall also comply with Section 717. The *horizontal exit* separation shall extend vertically through all levels of the building unless floor assemblies have a *fire-resistance rating* of not less than 2 hours with no unprotected openings.

Exception: A fire-resistance rating is not required at horizontal exits between a building area and an above-grade pedestrian walkway constructed in accordance with Section 3104, provided that the distance between connected buildings is more than 20 feet (6096 mm).

Horizontal exits constructed as fire barriers shall be continuous from exterior wall to exterior wall so as to divide completely the floor served by the horizontal exit.

1026.3 Opening Protectives

Fire doors in horizontal exits shall be self-closing or automatic-closing when activated by a smoke detector in accordance with Section 716.5.9.4. Doors, where located in a cross-corridor condition, shall be automatic-closing by activation of a smoke detector installed in accordance with Section 716.5.9.4.

1026.4 Refuge Area

The refuge area of a horizontal exit shall be a space occupied by the same tenant or a public area and each such refuge area shall be adequate to accommodate the original occupant load of the refuge area plus the occupant load anticipated from the adjoining compartment. The anticipated occupant load from the adjoining compartment shall be based on the capacity of the horizontal exit doors entering the refuge area or the total occupant load of the adjoining compartment, whichever is less.

1026.4.1 Capacity

The capacity of the refuge area shall be computed based on a net floor area allowance of 3 square feet (0.2787 m^2) for each occupant to be accommodated therein. Where the horizontal exit also forms a smoke compartment, the capacity of the refuge area for Group I-1, I-2 and I-3 occupancies and Group B ambulatory care facilities shall comply with Section 407.5.1, 408.6.2, 420.4.1 and 422.3.2 as applicable.

1026.4.2 Number of Exits

The refuge area into which a horizontal exit leads shall be provided with exits adequate to meet the occupant requirements of this chapter, but not including the added occupant load imposed by persons entering the refuge area through horizontal exits from other areas. Not less than one refuge area exit shall lead directly to the exterior or to an interior exit stairway or ramp.

Exception: The adjoining compartment shall not be required to have a stairway or door leading directly outside, provided the refuge area into which a horizontal exit leads has stairways or doors leading directly outside and are so arranged that egress shall not require the occupants to return through the compartment from which egress originates.

1026.5 Standpipes

Standpipes and standpipe hose connections shall be provided in accordance with Sections 905.3 and 905.4.

Section 1027 Exterior Exit Stairways and Ramps

1027.1 General

Exterior exit stairways and ramps serving as an exit component in a means of egress system shall comply with the requirements of this section.

1027.2 Use in a Means of Egress

Exterior exit stairways shall not be used as an element of a required means of egress for Group I-2 occupancies. For occupancies in other than Group I-2, exterior exit stairways and ramps shall be permitted as an element of a required means of egress for buildings not exceeding six stories above grade plane or that are not high-rise buildings.

1027.3 Open Side

Exterior exit stairways and ramps serving as an element of a required means of egress shall be open on not less than one side, except for required structural columns, beams, handrails and guards. An open side shall have not less than 35 square feet (3.3 m^2) of aggregate open area adjacent to each floor level and the level of each intermediate landing. The required open area shall be located not less than 42 inches (1067 mm) above the adjacent floor or landing level.

1027.4 Side Yards

The open areas adjoining exterior exit stairways or ramps shall be either yards, courts or public ways; the remaining sides are permitted to be enclosed by the exterior walls of the building.

1027.5 Location

Exterior exit stairways and ramps shall have a minimum fire separation distance of 10 feet (3048 mm) measured at right angles from the exterior edge of the *stairway or ramps*, including landings, to:

1. Adjacent *lot lines*.
2. Other portions of the building.
3. Other buildings on the same lot unless the adjacent building *exterior walls* and openings are protected in accordance with Section 705 based on *fire separation distance*.

For the purposes of this section, other portions of the building shall be treated as separate buildings.

Exception: Exterior exit stairways and ramps serving individual dwelling units of Group R-3 shall have a minimum fire separation distance of 5 feet (1524 mm).

1027.6 Exterior Exit Stairway and Ramp Protection

Exterior exit stairways and ramps shall be separated from the interior of the building as required in Section 1023.2. Openings shall be limited to those necessary for egress from normally occupied spaces. Where a vertical plane projecting from the edge of an *exterior exit stairway or ramp* and landings is exposed by other parts of the building at an angle of less than 180 degrees (3.14 rad), the exterior wall shall be rated in accordance with Section 1023.7.

Exceptions:

1. Separation from the interior of the building is not required for occupancies, other than those in Group R-1 or R-2, in buildings that are not more than two stories above *grade plane* where a *level of exit discharge* serving such occupancies is the first story above *grade plane*.
2. Separation from the interior of the building is not required where the *exterior exit stairway or ramp* is served by an *exterior exit ramp* or balcony that connects two remote *exterior exit stairways* or other *approved exits* with a perimeter that is not less than 50 percent open. To be considered open, the opening shall be not less than 50 percent of the height of the enclosing wall, with the top of the openings not less than 7 feet (2134 mm) above the top of the balcony.
3. Separation from the open-ended *corridor* of the building is not required for *exterior exit stairways or ramps*, provided that Items 3.1 through 3.5 are met:
 - 3.1. The building, including open-ended *corridors*, and *stairways and ramps*, shall be equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2.
 - 3.2. The open-ended *corridors* comply with Section 1020.
 - 3.3. The open-ended *corridors* are connected on each end to an *exterior exit stairway or ramp* complying with Section 1027.
 - 3.4. The exterior *walls* and openings adjacent to the *exterior exit stairway or ramp* comply with Section 1023.7.
 - 3.5. At any location in an open-ended *corridor* where a change of direction exceeding 45 degrees (0.79 rad) occurs, a clear opening of not less than 35 square feet (3.3 m^2) or an *exterior stairway or ramp* shall be provided. Where clear openings are provided, they shall be located so as to minimize the accumulation of smoke or toxic gases.
4. In Group R-3 occupancies not more than four stories in height, *exterior exit stairways and ramps* serving individual *dwelling units* are not required to be separated from the interior of the building where the *exterior exit stairway or ramp* discharges directly to grade.

Section 1028 Exit Discharge

1028.1 General

The exit discharge shall comply with Sections 1028 and 1029 and the applicable requirements of Sections 1003 through 1015.

1028.2 Exit Discharge

Exits shall discharge directly to the exterior of the building. The *exit discharge* shall be at grade or shall provide a direct path of egress travel to grade. The *exit discharge* shall not reenter a building. The combined use of Exceptions 1 and 2 shall not exceed 50 percent of the number and minimum width or required capacity of the required exits.

Exceptions:

1. Not more than 50 percent of the number and minimum width or required capacity of *interior exit stairways* and *ramps* is permitted to egress through areas on the level of discharge provided all of the following conditions are met:

1.1. Discharge of *interior exit stairways* and *ramps* shall be provided with a free and unobstructed path of travel to an exterior *exit door* and such *exit* is readily visible and identifiable from the point of termination of the enclosure.

1.2. The entire area of the *level of exit discharge* is separated from areas below by construction conforming to the *fire-resistance rating* for the enclosure.

1.3. The egress path from the *interior exit stairway* and *ramp* on the *level of exit discharge* is protected throughout by an *approved automatic sprinkler system*. Portions of the *level of exit discharge* with access to the egress path shall be either equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 or 903.3.1.2, or separated from the egress path in accordance with the requirements for the enclosure of *interior exit stairways* or *ramps*.

1.4. Where a required *interior exit stairway* or *ramp* and an *exit access stairway* or *ramp* serve the same floor level and terminate at the same *level of exit discharge*, the termination of the *exit access stairway* or *ramp* and the *exit discharge* door of the *interior exit stairway* or *ramp* shall be separated by a distance of not less than 30 feet (9144 mm) or not less than one-fourth the length of the maximum overall diagonal dimension of the building, whichever is less. The distance shall be measured in a straight line between the *exit discharge* door from the *interior exit stairway* or *ramp* and the last tread of the *exit access stairway* or termination of slope of the *exit access ramp*.

2. Not more than 50 percent of the number and minimum width or required capacity of the *interior exit stairways* and *ramps* is permitted to egress through a vestibule provided all of the following conditions are met:

2.1. The entire area of the vestibule is separated from areas below by construction conforming to the *fire-resistance rating* of the *interior exit stairway* or *ramp enclosure*.

2.2. The depth from the exterior of the building is not greater than 10 feet (3048 mm) and the length is not greater than 30 feet (9144 mm).

2.3. The area is separated from the remainder of the *level of exit discharge* by a *fire partition* constructed in accordance with Section 708.

Exception: The maximum transmitted temperature rise is not required.

2.4. The area is used only for *means of egress* and *exits* directly to the outside.

3. *Horizontal exits* complying with Section 1026 shall not be required to discharge directly to the exterior of the building.

1028.3 Exit Discharge Width or Capacity

The minimum width or required capacity of the *exit discharge* shall be not less than the minimum width or required capacity of the *exits* being served.

1028.4 Exit Discharge Components

Exit discharge components shall be sufficiently open to the exterior so as to minimize the accumulation of smoke and toxic gases.

1028.5 Access to a Public Way

The *exit discharge* shall provide a direct and unobstructed access to a *public way*.

Exception: Where access to a *public way* cannot be provided, a safe dispersal area shall be provided where all of the following are met:

1. The area shall be of a size to accommodate not less than 5 square feet (0.46 m^2) for each person.
2. The area shall be located on the same lot not less than 50 feet (15 240 mm) away from the building requiring egress.
3. The area shall be permanently maintained and identified as a safe dispersal area.
4. The area shall be provided with a safe and unobstructed path of travel from the building.

Section 1029 Assembly**1029.1 General**

A room or space used for assembly purposes that contains seats, tables, displays, equipment or other material shall comply with this section.

1029.1.1 Bleachers

Bleachers, grandstands and folding and telescopic seating, that are not building elements, shall comply with ICC 300.

1029.1.1.1 Spaces Under Grandstands and Bleachers

Where spaces under *grandstands* or *bleachers* are used for purposes other than ticket booths less than 100 square feet (9.29 m^2) and toilet rooms, such spaces shall be separated by *fire barriers* complying with Section 707 and *horizontal assemblies* complying with Section 711 with not less than 1-hour *fire-resistance-rated* construction.

1029.2 Assembly Main Exit

A building, room or space used for assembly purposes that has an *occupant load* of greater than 300 and is provided with a main *exit*, that main *exit* shall be of sufficient capacity to accommodate not less than one-half of the *occupant load*, but such capacity shall be not less than the total required capacity of all *means of egress* leading to the *exit*. Where the building is classified as a Group A occupancy, the main *exit* shall front on not less than one street or an unoccupied space of not less than 10 feet (3048 mm) in width that adjoins a street or *public way*. In a building, room or space used for assembly purposes where there is not a well-defined main *exit* or where multiple main *exits* are provided, *exits* shall be permitted to be distributed around the perimeter of the building provided that the total capacity of egress is not less than 100 percent of the required capacity.

1029.3 Assembly Other Exits

In addition to having access to a main *exit*, each level in a building used for assembly purposes having an *occupant load* greater than 300 and provided with a main *exit*, shall be provided with additional *means of egress* that shall provide an egress capacity for not less than one-half of the total *occupant load* served by that level and shall comply with Section 1007.1. In a building used for assembly purposes where there is not a well-defined main *exit* or where multiple main *exits* are provided, *exits* for each level shall be permitted to be distributed around the perimeter of the building, provided that the total width of egress is not less than 100 percent of the required width.

1029.4 Foyers and Lobbies

In Group A-1 occupancies, where persons are admitted to the building at times when seats are not available, such persons shall be allowed to wait in a lobby or similar space, provided such lobby or similar space shall not encroach upon the minimum width or required capacity of the *means of egress*. Such foyer, if not directly connected to a public street by all the main entrances or *exits*, shall have a straight and unobstructed *corridor* or path of travel to every such main entrance or *exit*.

1029.5 Interior Balcony and Gallery Means of Egress

For balconies, galleries or press boxes having a seating capacity of 50 or more located in a building, room or space used for assembly purposes, not less than two *means of egress* shall be provided, with one from each side of every balcony, gallery or press box.

1029.6 Capacity of Aisle for Assembly

The required capacity of *aisles* shall be not less than that determined in accordance with Section 1029.6.1 where *smoke-protected assembly seating* is not provided, Section 1029.6.2 where *smoke-protected assembly seating* is provided and Section 1029.6.3 where open-air assembly seating is provided.

1029.6.1 Without Smoke Protection

The required capacity in inches (mm) of the *aisles* for assembly seating without smoke protection shall be not less than the *occupant load* served by the egress element in accordance with all of the following, as applicable:

1. Not less than 0.3 inch (7.6 mm) of *aisle* capacity for each occupant served shall be provided on stepped *aisles* having riser heights 7 inches (178 mm) or less and tread depths 11 inches (279 mm) or greater, measured horizontally between tread *nosings*.
2. Not less than 0.005 inch (0.127 mm) of additional *aisle* capacity for each occupant shall be provided for each 0.10 inch (2.5 mm) of riser height above 7 inches (178 mm).
3. Where egress requires stepped *aisle* descent, not less than 0.075 inch (1.9 mm) of additional *aisle* capacity for each occupant shall be provided on those portions of *aisle* capacity having no *handrail* within a horizontal distance of 30 inches (762 mm).
4. Ramped *aisles*, where slopes are steeper than one unit vertical in 12 units horizontal (8-percent slope), shall have not less than 0.22 inch (5.6 mm) of clear *aisle* capacity for each occupant served. Level or ramped *aisles*, where slopes are not steeper than one unit vertical in 12 units horizontal (8-percent slope), shall have not less than 0.20 inch (5.1 mm) of clear *aisle* capacity for each occupant served.

1029.6.2 Smoke-Protected Assembly Seating

The required capacity in inches (mm) of the aisle for *smoke-protected assembly seating* shall be not less than the occupant load served by the egress element multiplied by the appropriate factor in Table 1029.6.2. The total number of seats specified shall be those within the space exposed to the same smoke-protected environment. Interpolation is permitted between the specific values shown. A life safety evaluation, complying with NFPA 101, shall be done for a facility utilizing the reduced width requirements of Table 1029.6.2 for *smoke-protected assembly seating*.

TABLE 1029.6.2

CAPACITY FOR AISLES FOR SMOKE-PROTECTED ASSEMBLY

TOTAL NUMBER OF SEATS IN THE SMOKE-PROTECTED ASSEMBLY SEATING	INCHES OF CAPACITY PER SEAT SERVED			
	Stepped aisles with handrails within 30 inches	Stepped aisles without handrails within 30 inches	Level aisles or ramped aisles not steeper than 1 in 10 in slope	Ramped aisles steeper than 1 in 10 in slope
Equal to or less than 5,000	0.2	0.25	0.15	0.165
10,000	0.13	0.163	0.1	0.11
15,000	0.096	0.12	0.07	0.077
20,000	0.076	0.095	0.056	0.062
Equal to or greater than 25,000	0.06	0.075	0.044	0.048

For SI: 1 inch = 25.4 mm.

1029.6.2.1 Smoke Control

Aisles and aisle accessways serving a smoke-protected assembly seating area shall be provided with a smoke control system complying with Section 909 or natural ventilation designed to maintain the smoke level not less than 6 feet (1829 mm) above the floor of the means of egress.

1029.6.2.2 Roof Height

A smoke-protected assembly seating area with a roof shall have the lowest portion of the roof deck not less than 15 feet (4572 mm) above the highest aisle or aisle accessway.

Exception: A roof canopy in an outdoor stadium shall be permitted to be less than 15 feet (4572 mm) above the highest aisle or aisle accessway provided that there are no objects less than 80 inches (2032 mm) above the highest aisle or aisle accessway.

1029.6.2.3 Automatic Sprinklers

Enclosed areas with walls and ceilings in buildings or structures containing *smoke-protected assembly seating* shall be protected with an *approved automatic sprinkler system* in accordance with Section 903.3.1.1.

Exceptions:

1. The floor area used for contests, performances or entertainment provided the roof construction is more than 50 feet (15 240 mm) above the floor level and the use is restricted to low fire hazard uses.
2. Press boxes and storage facilities less than 1,000 square feet (93 m^2) in area.

1029.6.3 Open-Air Assembly Seating

In open-air assembly seating, the required capacity in inches (mm) of *aisles* shall be not less than the total *occupant load* served by the egress element multiplied by 0.08 (2.0 mm) where egress is by stepped *aisle* and multiplied by 0.06 (1.52 mm) where egress is by level *aisles* and ramped *aisles*.

Exception: The required capacity in inches (mm) of *aisles* shall be permitted to comply with Section 1029.6.2 for the number of seats in the open-air *smoke-protected assembly seating* where Section 1029.6.2 permits less capacity.

1029.6.3.1 Automatic Sprinklers

Enclosed areas with walls and ceilings in buildings or structures containing open-air assembly seating shall be protected with an *approved automatic sprinkler system* in accordance with Section 903.3.1.1.

Exceptions:

1. The floor area used for contests, performances or entertainment, provided that the roof construction is more than 50 feet (15 240 mm) above the floor level and the use is restricted to low fire hazard uses.
2. Press boxes and storage facilities less than 1,000 square feet (93 m^2) in area.
3. Open-air assembly seating facilities where seating and the means of egress in the seating area are essentially open to the outside.

1029.7 Travel Distance

The exit access travel distance shall comply with Section 1017. Where *aisles* are provided for seating, the distance shall be measured along the *aisles* and *aisle accessways* without travel over or on the seats.

Exceptions:

1. In facilities with *smoke-protected assembly seating*, the total *exit access* travel distance shall be not greater than 400 feet (122 m). That portion of the total permitted *exit access* travel distance from each seat to the nearest entrance to a vomitory or concourse shall not exceed 200 feet (60 960 mm). The portion of the total permitted *exit access* travel distance from the entrance to the vomitory or concourse to one of the following shall not exceed 200 feet (60 960 mm):

- 1.1. The closest riser of an *exit access* stairway.
- 1.2. The closest slope of an *exit access* ramp.
- 1.3. An exit.

2. In facilities with *open-air assembly seating* of Type III, IV or V construction, the *exit access* travel distance to one of the following shall not exceed 400 feet (122 m):
 - 2.1. The closest riser of an *exit access* stairway.
 - 2.2. The closest slope of an *exit access* ramp.
 - 2.3. An exit.

3. In facilities with *open-air assembly seating* of Type I or II construction, the exit access travel distance shall not be limited.

1029.8 Common Path of Egress Travel

The *common path of egress travel* shall not exceed 30 feet (9144 mm) from any seat to a point where an occupant has a choice of two paths of egress travel to two *exits*.

Exceptions:

1. For areas serving less than 50 occupants, the *common path of egress travel* shall not exceed 75 feet (22 860 mm).
2. For smoke-protected or *open-air assembly seating*, the *common path of egress travel* shall not exceed 50 feet (15 240 mm).

1029.8.1 Path Through Adjacent Row

Where one of the two paths of travel is across the *aisle* through a row of seats to another *aisle*, there shall be not more than 24 seats between the two *aisles*, and the minimum clear width between rows for the row between the two *aisles* shall be 12 inches (305 mm) plus 0.6 inch (15.2 mm) for each additional seat above seven in the row between *aisles*.

Exception: For smoke-protected or *open-air assembly seating* there shall be not more than 40 seats between the two *aisles* and the minimum clear width shall be 12 inches (305 mm) plus 0.3 inch (7.6 mm) for each additional seat.

1029.9 Assembly Aisles Are Required

Every occupied portion of any building, room or space used for assembly purposes that contains seats, tables, displays, similar fixtures or equipment shall be provided with *aisles* leading to *exits* or *exit access doorways* in accordance with this section.

1029.9.1 Minimum Aisle Width

The minimum clear width for *aisles* shall comply with one of the following:

1. Forty-eight inches (1219 mm) for stepped *aisles* having seating on both sides.

Exception: Thirty-six inches (914 mm) where the stepped *aisles* serve less than 50 seats.

2. Thirty-six inches (914 mm) for stepped *aisles* having seating on only one side.

Exception: Twenty-three inches (584 mm) between a stepped *aisle handrail* and seating where a stepped *aisle* does not serve more than five rows on one side.

3. Twenty-three inches (584 mm) between a stepped *aisle handrail* or *guard* and seating where the stepped *aisle* is subdivided by a mid-aisle *handrail*.

4. Forty-two inches (1067 mm) for level or ramped *aisles* having seating on both sides.

Exceptions:

1. Thirty-six inches (914 mm) where the *aisle* serves fewer than 50 seats.

2. Thirty inches (762 mm) where the *aisle* serves fewer than 15 seats and does not serve as part of an accessible route.

5. Thirty-six inches (914 mm) for level or ramped *aisles* having seating on only one side.

Exception: Thirty inches (762 mm) where the *aisle* serves fewer than 15 seats and does not serve as part of an accessible route.

1029.9.2 Aisle Catchment Area

The *aisle* shall provide sufficient capacity for the number of persons accommodated by the catchment area served by the *aisle*. The catchment area served by an *aisle* is that portion of the total space served by that section of the *aisle*. In establishing catchment areas, the assumption shall be made that there is a balanced use of all *means of egress*, with the number of persons in proportion to egress capacity.

1029.9.3 Converging Aisles

Where *aisles* converge to form a single path of egress travel, the required capacity of that path shall be not less than the combined required capacity of the converging aisles.

1029.9.4 Uniform Width and Capacity

Those portions of *aisles*, where egress is possible in either of two directions, shall be uniform in minimum width or required capacity.

1029.9.5 Dead End Aisles

Each end of an *aisle* shall be continuous to a cross *aisle*, foyer, doorway, vomitory, concourse or *stairway* in accordance with Section 1029.9.7 having access to an *exit*.

Exceptions:

1. Dead-end *aisles* shall be not greater than 20 feet (6096 mm) in length.

2. Dead-end *aisles* longer than 16 rows are permitted where seats beyond the 16th row dead-end *aisle* are not more than 24 seats from another *aisle*, measured along a row of seats having a minimum clear width of 12 inches (305 mm) plus 0.6 inch (15.2 mm) for each additional seat above seven in the row where seats have backrests or beyond 10 where seats are without backrests in the row.

3. For smoke-protected or *open-air assembly seating*, the dead end *aisle* length of vertical *aisles* shall not exceed a distance of 21 rows.

4. For smoke-protected or *open-air assembly seating*, a longer dead-end *aisle* is permitted where seats beyond the 21-row dead-end *aisle* are not more than 40 seats from another *aisle*, measured along a row of seats having an *aisle* accessway with a minimum clear width of 12 inches (305 mm) plus 0.3 inch (7.6 mm) for each additional seat above seven in the row where seats have backrests or beyond 10 where seats are without backrests in the row.

1029.9.6 Aisle Measurement

The clear width for *aisles* shall be measured to walls, edges of seating and tread edges except for permitted projections.

Exception: The clear width of *aisles* adjacent to seating at tables shall be permitted to be measured in accordance with Section 1029.13.1.

1029.9.6.1 Assembly Aisle Obstructions

There shall not be obstructions in the minimum width or required capacity of *aisles*.

Exception: Handrails are permitted to project into the required width of stepped *aisles* and ramped *aisles* in accordance with Section 1014.8.

1029.9.7 Stairways Connecting to Stepped Aisles

A *stairway* that connects a stepped *aisle* to a cross *aisle* or concourse shall be permitted to comply with the assembly *aisle* walking surface requirements of Section 1029.14. Transitions between *stairways* and stepped *aisles* shall comply with Section 1029.10.

1029.9.8 Stairways Connecting to Vomitories

A *stairway* that connects a vomitory to a cross aisle or concourse shall be permitted to comply with the assembly *aisle* walking surface requirements of Section 1029.14. Transitions between *stairways* and stepped *aisles* shall comply with Section 1029.10.

1029.10 Transitions

Transitions between *stairways* and stepped *aisles* shall comply with either Section 1029.10.1 or 1029.10.2.

1029.10.1 Transitions to Stairways That Maintain Stepped Aisle Riser and Tread Dimensions

Stepped *aisles*, transitions and *stairways* that maintain the stepped aisle riser and tread dimensions shall comply with Section 1029.14 as one exit access component.

1029.10.2 Transitions to Stairways That Do Not Maintain Stepped Aisle Riser and Tread Dimensions

Transitions between *stairways* and stepped *aisles* having different riser and tread dimensions shall comply with Sections 1029.10.2.1 through 1029.10.3.

1029.10.2.1 Stairways and Stepped Aisles in a Straight Run

Where stairways and stepped aisles are in a straight run, the transition shall have one of the following:

1. A minimum depth of 22 inches (559 mm) where the treads on the descending side of the transition have greater depth.
2. A minimum depth of 30 inches (762 mm) where the treads on the descending side of the transition have lesser depth.

1029.10.2.2 Stairways That Change Direction From Stepped Aisles

Transitions where the *stairway* changes direction from the stepped *aisle* shall have a minimum depth of 11 inches (280 mm) or the stepped *aisle* tread depth, whichever is greater, between the stepped *aisle* and *stairway*.

1029.10.3 Transition Marking

A distinctive marking stripe shall be provided at each *nosing* or leading edge adjacent to the transition. Such stripe shall be a minimum of 1 inch (25 mm), and a maximum of 2 inches (51 mm), wide. The edge marking stripe shall be distinctively different from the stepped *aisle* contrasting marking stripe.

1029.11 Stepped Aisles at Vomitories

Stepped aisles that change direction at vomitories shall comply with Section 1029.11.1. Transitions between a stepped aisle above a vomitory and stepped aisle to the side of vomitory shall comply with Section 1029.11.2.

1029.11.1 Stepped Aisles That Change Direction at Vomitories

Stepped aisle treads where the stepped aisle changes direction at a vomitory shall have a minimum depth of 11 inches (280 mm) or the stepped aisle tread depth, whichever is greater. The height of a stepped aisle tread above a transition at a vomitory shall comply with Section 1029.14.2.2.

1029.11.2 Stepped Aisle Transitions at the Top of Vomitories

Transitions between the stepped aisle above a vomitory and stepped aisles to the side of a vomitory shall have a minimum depth of 11 inches (280 mm) or the stepped aisle depth, whichever is greater.

1029.12 Construction

Aisles, stepped *aisles* and ramped *aisles* shall be built of materials consistent with the types permitted for the type of construction of the building.

Exception: Wood *handrails* shall be permitted for all types of construction.

1029.12.1 Walking Surface

The surface of *aisles*, stepped *aisles* and ramped *aisles* shall be of slip-resistant materials that are securely attached. The surface for stepped *aisles* shall comply with Section 1011.7.1.

1029.12.2 Outdoor Conditions

Outdoor *aisles*, stepped *aisles* and ramped *aisles* and outdoor approaches to *aisles*, stepped *aisles* and ramped *aisles* shall be designed so that water will not accumulate on the walking surface.

1029.13 Aisle Accessways

Aisle accessways for seating at tables shall comply with Section 1029.13.1. *Aisle accessways* for seating in rows shall comply with Section 1029.13.2.

1029.13.1 Seating at Tables

Where seating is located at a table or counter and is adjacent to an *aisle* or *aisle accessway*, the measurement of required clear width of the *aisle* or *aisle accessway* shall be made to a line 19 inches (483 mm) away from and parallel to the edge of the table or counter. The 19-inch (483 mm) distance shall be measured perpendicular to the side of the table or counter. In the case of other side boundaries for *aisles* or *aisle accessways*, the clear width shall be measured to walls, edges of seating and tread edges.

Exception: Where tables or counters are served by *fixed seats*, the width of the *aisle* or *aisle accessway* shall be measured from the back of the seat.

1029.13.1.1 Aisle Accessway Capacity and Width for Seating at Tables

Aisle accessways serving arrangements of seating at tables or counters shall comply with the capacity requirements of Section 1005.1 but shall not have less than 12 inches (305 mm) of width plus $\frac{1}{2}$ inch (12.7 mm) of width for each additional 1 foot (305 mm), or fraction thereof, beyond 12 feet (3658 mm) of *aisle accessway* length measured from the center of the seat farthest from an *aisle*.

Exception: Portions of an *aisle accessway* having a length not exceeding 6 feet (1829 mm) and used by a total of not more than four persons.

1029.13.1.2 Seating at Table Aisle Accessway Length

The length of travel along the *aisle accessway* shall not exceed 30 feet (9144 mm) from any seat to the point where a person has a choice of two or more paths of egress travel to separate exits.

1029.13.2 Clear Width of Aisle Accessways Serving Seating in Rows

Where seating rows have 14 or fewer seats, the minimum clear *aisle accessway* width shall be not less than 12 inches (305 mm) measured as the clear horizontal distance from the back of the row ahead and the nearest projection of the row behind. Where chairs have automatic or self-rising seats, the measurement shall be made with seats in the raised position. Where any chair in the row does not have an automatic or self-rising seat, the measurements shall be made with the seat in the down position. For seats with folding tablet arms, row spacing shall be determined with the tablet arm in the used position.

Exception: For seats with folding tablet arms, row spacing is permitted to be determined with the tablet arm in the stored position where the tablet arm when raised manually to vertical position in one motion automatically returns to the stored position by force of gravity.

1029.13.2.1 Dual Access

For rows of seating served by *aisles* or doorways at both ends, there shall be not more than 100 seats per row. The minimum clear width of 12 inches (305 mm) between rows shall be increased by 0.3 inch (7.6 mm) for every additional seat beyond 14 seats where

seats have backrests or beyond 21 where seats are without backrests. The minimum clear width is not required to exceed 22 inches (559 mm).

Exception: For smoke-protected or *open-air assembly seating*, the row length limits for a 12-inch-wide (305 mm) *aisle accessway*, beyond which the *aisle accessway* minimum clear width shall be increased, are in Table 1029.13.2.1.

TABLE 1029.13.2.1

SMOKE-PROTECTED OR OPEN-AIR ASSEMBLY AISLE ACCESSWAYS

TOTAL NUMBER OF SEATS IN THE SMOKE-PROTECTED OR OPEN-AIR ASSEMBLY SEATING	MAXIMUM NUMBER OF SEATS PER ROW PERMITTED TO HAVE A MINIMUM 12-INCH CLEAR WIDTH AISLE ACCESSWAY			
	Aisle or doorway at both ends of row		Aisle or doorway at one end of row only	
	Seats with backrests	Seats without backrests	Seats with backrests	Seats without backrests
Fewer than 4,000	14	21	7	10
4,000 to 6,999	15	22	7	10
7,000 to 9,999	16	23	8	11
10,000 to 12,999	17	24	8	11
13,000 to 15,999	18	25	9	12
16,000 to 18,999	19	26	9	12
19,000 to 21,999	20	27	10	13
22,000 and greater	21	28	11	14

For SI: 1 inch = 25.4 mm.

1029.13.2.2 Single Access

For rows of seating served by an *aisle* or doorway at only one end of the row, the minimum clear width of 12 inches (305 mm) between rows shall be increased by 0.6 inch (15.2 mm) for every additional seat beyond seven seats where seats have backrests or beyond 10 where seats are without backrests. The minimum clear width is not required to exceed 22 inches (559 mm).

Exception: For smoke-protected or *open-air assembly seating*, the row length limits for a 12-inch-wide (305 mm) *aisle accessway*, beyond which the *aisle accessway* minimum clear width shall be increased, are in Table 1029.13.2.1.

1029.14 Assembly Aisle Walking Surfaces

Ramped *aisles* shall comply with Sections 1029.14.1 through 1029.14.1.3. Stepped *aisles* shall comply with Sections 1029.14.2 through 1029.14.2.4.

1029.14.1 Ramped Aisles

Aisles that are sloped more than one unit vertical in 20 units horizontal (5-percent slope) shall be considered a ramped *aisle*. Ramped *aisles* that serve as part of an *accessible route* in accordance with Sections 1009 and 1108.2 shall have a maximum slope of one unit vertical in 12 units horizontal (8-percent slope). The slope of other ramped *aisles* shall not exceed one unit vertical in 8 units horizontal (12.5-percent slope).

1029.14.1.1 Cross Slope

The slope measured perpendicular to the direction of travel of a ramped *aisle* shall not be steeper than one unit vertical in 48 units horizontal (2-percent slope).

1029.14.1.2 Landings

Ramped *aisles* shall have landings in accordance with Sections 1012.6 through 1012.6.5. Landings for ramped *aisles* shall be

permitted to overlap required *aisles* or cross *aisles*.

1029.14.1.3 Edge Protection

Ramped *aisles* shall have edge protection in accordance with Sections 1012.10 and 1012.10.1.

Exception: In assembly spaces with *fixed seating*, edge protection is not required on the sides of ramped *aisles* where the ramped *aisles* provide access to the adjacent seating and *aisle accessways*.

1029.14.2 Stepped Aisles

Aisles with a slope exceeding one unit vertical in eight units horizontal (12.5-percent slope) shall consist of a series of risers and treads that extends across the full width of *aisles* and complies with Sections 1029.14.2.1 through 1029.14.2.4.

1029.14.2.1 Treads

Tread depths shall be not less than 11 inches (279 mm) and shall have dimensional uniformity.

Exception: The tolerance between adjacent treads shall not exceed $\frac{3}{16}$ inch (4.8 mm).

1029.14.2.2 Risers

Where the gradient of stepped *aisles* is to be the same as the gradient of adjoining seating areas, the riser height shall be not less than 4 inches (102 mm) nor more than 8 inches (203 mm) and shall be uniform within each *flight*.

Exceptions:

1. Riser height nonuniformity shall be limited to the extent necessitated by changes in the gradient of the adjoining seating area to maintain adequate sightlines. Where nonuniformities exceed $\frac{3}{16}$ inch (4.8 mm) between adjacent risers, the exact location of such nonuniformities shall be indicated with a distinctive marking stripe on each tread at the *nosing* or leading edge adjacent to the nonuniform risers. Such stripe shall be not less than 1 inch (25 mm), and not more than 2 inches (51 mm), wide. The edge marking stripe shall be distinctively different from the contrasting marking stripe.
2. Riser heights not exceeding 9 inches (229 mm) shall be permitted where they are necessitated by the slope of the adjacent seating areas to maintain sightlines.

1029.14.2.2.1 Construction Tolerances

The tolerance between adjacent risers on a stepped *aisle* that were designed to be equal height shall not exceed $\frac{3}{16}$ inch (4.8 mm). Where the stepped *aisle* is designed in accordance with Exception 1 of Section 1029.14.2.2, the stepped *aisle* shall be constructed so that each riser of unequal height, determined in the direction of descent, is not more than $\frac{3}{8}$ inch (9.5 mm) in height different from adjacent risers where stepped *aisle* treads are less than 22 inches (560 mm) in depth and $\frac{3}{4}$ inch (19.1 mm) in height different from adjacent risers where stepped *aisle* treads are 22 inches (560 mm) or greater in depth.

1029.14.2.3 Tread Contrasting Marking Stripe

A contrasting marking stripe shall be provided on each tread at the *nosing* or leading edge such that the location of each tread is readily apparent when viewed in descent. Such stripe shall be not less than 1 inch (25 mm), and not more than 2 inches (51 mm), wide.

Exception: The contrasting marking stripe is permitted to be omitted where tread surfaces are such that the location of each tread is readily apparent when viewed in descent.

1029.14.2.4 Nosing and Profile

Nosing and riser profile shall comply with Sections 1011.5.5 through 1011.5.5.3.

1029.15 Seat Stability

In a building, room or space used for assembly purposes, the seats shall be securely fastened to the floor.

Exceptions:

1. In a building, room or space used for assembly purposes or portions thereof without ramped or tiered floors for seating and with 200 or fewer seats, the seats shall not be required to be fastened to the floor.
2. In a building, room or space used for assembly purposes or portions thereof with seating at tables and without ramped or tiered floors for seating, the seats shall not be required to be fastened to the floor.
3. In a building, room or space used for assembly purposes or portions thereof without ramped or tiered floors for seating and with greater than 200 seats, the seats shall be fastened together in groups of not less than three or the seats shall be securely fastened to the floor.
4. In a building, room or space used for assembly purposes where flexibility of the seating arrangement is an integral part of the design and function of the space and seating is on tiered levels, not more than 200 seats shall not be required to be fastened to the floor. Plans showing seating, tiers and *aisles* shall be submitted for approval.
5. Groups of seats within a building, room or space used for assembly purposes separated from other seating by railings, *guards*, partial height walls or similar barriers with level floors and having not more than 14 seats per group shall not be required to be fastened to the floor.
6. Seats intended for musicians or other performers and separated by railings, *guards*, partial height walls or similar barriers shall not be required to be fastened to the floor.

1029.16 Handrails

Ramped *aisles* having a slope exceeding one unit vertical in 15 units horizontal (6.7-percent slope) and stepped *aisles* shall be provided with *handrails* in compliance with Section 1014 located either at one or both sides of the *aisle* or within the *aisle* width. Where the stepped aisles have seating on one side and the aisle width is 74 inches (1880 mm) or greater, two handrails are required. Where two handrails are required, one of the handrails shall be within 30 inches (762 mm) horizontally of side of the tiered floor adjacent to the stepped the aisle.

Exceptions:

1. *Handrails* are not required for ramped *aisles* with seating on both sides.
2. *Handrails* are not required where, at the side of the *aisle*, there is a *guard* with a top surface that complies with the graspability requirements of *handrails* in accordance with Section 1014.3.
3. *Handrail* extensions are not required at the top and bottom of stepped *aisles* and ramped *aisles* to permit crossovers within the *aisles*.

1029.16.1 Discontinuous Mid-Aisle Handrails

Where there is seating on both sides of the *aisle*, the mid-aisle *handrails* shall be discontinuous. Where a stepped aisle is required to have two handrails, the mid-aisle handrails shall be discontinuous. The gaps or breaks at intervals shall not exceed five rows to facilitate access to seating and to permit crossing from one side of the *aisle* to the other. These gaps or breaks shall have a clear width of not less than 22 inches (559 mm) and not greater than 36 inches (914 mm), measured horizontally, and the mid-aisle *handrail* shall have rounded terminations or bends.

1029.16.2 Handrail Termination

Handrails located on the side of stepped *aisles* shall return to a wall, *guard* or the walking surface or shall be continuous to the *handrail* of an adjacent stepped *aisle flight*.

1029.16.3 Mid-Aisle Termination

Mid-aisle *handrails* shall not extend beyond the lowest riser and shall terminate within 18 inches (381 mm), measured horizontally, from the lowest riser. *Handrail* extensions are not required.

Exception: Mid-aisle *handrails* shall be permitted to extend beyond the lowest riser where the *handrail* extensions do not obstruct the width of the cross *aisle*.

1029.16.4 Rails

Where mid-aisle *handrails* are provided in stepped *aisles*, there shall be an additional rail located approximately 12 inches (305 mm) below the *handrail*. The rail shall be adequate in strength and attachment in accordance with Section 1607.9.1.2.

1029.17 Assembly Guards

Guards adjacent to seating in a building, room or space used for assembly purposes shall be provided where required by Section 1015 and shall be constructed in accordance with Section 1015 except where provided in accordance with Sections 1029.17.1 through 1029.17.4. At *bleachers, grandstands and folding and telescopic seating*, *guards* must be provided where required by ICC 300 and Section 1029.17.1.

1029.17.1 Perimeter Guards

Perimeter *guards* shall be provided where the footboards or walking surface of seating facilities are more than 30 inches (762 mm) above the floor or grade below. Where the seatboards are adjacent to the perimeter, *guard* height shall be 42 inches (1067 mm) high minimum, measured from the seatboard. Where the seats are self-rising, *guard* height shall be 42 inches (1067 mm) high minimum, measured from the floor surface. Where there is an *aisle* between the seating and the perimeter, the *guard* height shall be measured in accordance with Section 1015.3.

Exceptions:

1. *Guards* that impact sightlines shall be permitted to comply with Section 1029.17.3.
2. *Bleachers, grandstands and folding and telescopic seating* shall not be required to have perimeter *guards* where the seating is located adjacent to a wall and the space between the wall and the seating is less than 4 inches (102 mm).

1029.17.2 Cross Aisles

Cross *aisles* located more than 30 inches (762 mm) above the floor or grade below shall have *guards* in accordance with Section 1015.

Where an elevation change of 30 inches (762 mm) or less occurs between a cross *aisle* and the adjacent floor or grade below, *guards* not less than 26 inches (660 mm) above the *aisle* floor shall be provided.

Exception: Where the backs of seats on the front of the cross *aisle* project 24 inches (610 mm) or more above the adjacent floor of the *aisle*, a *guard* need not be provided.

1029.17.3 Sightline-Constrained Guard Heights

Unless subject to the requirements of Section 1029.17.4, a fascia or railing system in accordance with the *guard* requirements of Section 1015 and having a minimum height of 26 inches (660 mm) shall be provided where the floor or foot-board elevation is more than 30 inches (762 mm) above the floor or grade below and the fascia or railing would otherwise interfere with the sightlines of immediately adjacent seating.

1029.17.4 Guards at the End of Aisles

A fascia or railing system complying with the *guard* requirements of Section 1015 shall be provided for the full width of the *aisle* where the foot of the *aisle* is more than 30 inches (762 mm) above the floor or grade below. The fascia or railing shall be a minimum of 36 inches (914 mm) high and shall provide a minimum 42 inches (1067 mm) measured diagonally between the top of the rail and the *nosing* of the nearest tread.

Section 1030 Emergency Escape and Rescue

1030.1 General

In addition to the *means of egress* required by this chapter, provisions shall be made for *emergency escape and rescue openings* in Group R-2 occupancies in accordance with Tables 1006.3.3(1) and 1006.3.3(2) and Group R-3 occupancies. *Basements* and sleeping rooms below the fourth story above *grade plane* shall have at least one exterior *emergency escape and rescue opening* in accordance with this section. Where *basements* contain one or more sleeping rooms, *emergency escape and rescue openings* shall be required in each sleeping room, but shall not be required in adjoining areas of the *basement*. Such openings shall open directly into a *public way* or to a *yard* or *court* that opens to a *public way*.

Exceptions:

1. Basements with a ceiling height of less than 80 inches (2032 mm) shall not be required to have *emergency escape and rescue openings*.
2. *Emergency escape and rescue openings* are not required from basements or sleeping rooms that have an *exit door* or *exit access door* that opens directly into a *public way* or to a *yard, court* or exterior exit balcony that opens to a *public way*.
3. Basements without *habitable spaces* and having not more than 200 square feet (18.6 m^2) in floor area shall not be required to have *emergency escape and rescue openings*.

1030.2 Minimum Size

Emergency escape and rescue openings shall have a minimum net clear opening of 5.7 square feet (0.53 m^2).

Exception: The minimum net clear opening for grade-floor *emergency escape and rescue openings* shall be 5 square feet (0.46 m^2).

1030.2.1 Minimum Dimensions

The minimum net clear opening height dimension shall be 24 inches (610 mm). The minimum net clear opening width dimension shall be 20 inches (508 mm). The net clear opening dimensions shall be the result of normal operation of the opening.

1030.3 Maximum Height From Floor

Emergency escape and rescue openings shall have the bottom of the clear opening not greater than 44 inches (1118 mm) measured from the floor.

1030.3.1 Emergency Escape and Rescue Doors

Where a door is provided as the required emergency escape and rescue opening, it shall be a swinging door or a sliding door.

1030.4 Operational Constraints

Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys or tools. Window-opening control devices and fall prevention devices complying with ASTM F2090 shall be permitted for use on windows serving as a required emergency escape and rescue opening. Bars, grilles, grates or similar devices are permitted to be placed over *emergency escape and rescue openings* provided the minimum net clear opening size complies with Section 1030.2 and such devices shall be releasable or removable from the inside without the use of a key, tool or force greater than that which is required for normal operation of the *emergency escape and rescue opening*. Where such bars, grilles, grates or similar devices are installed in existing buildings, *smoke alarms* shall be installed in accordance with Section 907.2.11 regardless of the valuation of the *alteration*.

1030.5 Window Wells

An *emergency escape and rescue opening* with a finished sill height below the adjacent ground level shall be provided with a window well in accordance with Sections 1030.5.1 and 1030.5.2.

1030.5.1 Minimum Size

The minimum horizontal area of the window well shall be 9 square feet (0.84 m^2), with a minimum dimension of 36 inches (914 mm). The area of the window well shall allow the *emergency escape and rescue opening* to be fully opened.

1030.5.2 Ladders or Steps

Window wells with a vertical depth of more than 44 inches (1118 mm) shall be equipped with an *approved* permanently affixed ladder or steps. Ladders or rungs shall have an inside width of at least 12 inches (305 mm), shall project at least 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center (o.c.) vertically for the full height of the window well. The ladder or steps shall not encroach into the required dimensions of the window well by more than 6 inches (152 mm). The ladder or steps shall not be obstructed by the *emergency escape and rescue opening*. Ladders or steps required by this section are exempt from the *stairway* requirements of Section 1011.

1030.5.2.1 Steps

Steps shall have an inside width of not less than 12 inches (305 mm), shall have treads greater than 5 inches (127 mm) in depth and

a riser height not greater than 18 inches (457 mm) for the full height of the area well.

Section 1031 Egress Courts

1031.1 General

Egress courts serving as an exit discharge component in the *means of egress* system shall comply with the requirements in this section.

1031.2 Width or Capacity

The required capacity of *egress courts* shall be determined as specified in Section 1005.1, but the minimum width shall be not less than 44 inches (1118 mm), except as specified herein. *Egress courts* serving Group R-3 and U occupancies shall be not less than 36 inches (914 mm) in width. The required capacity and width of egress courts shall be unobstructed to a height of 7 feet (2134 mm). The width of the *egress court* shall not be less than the required capacity.

Exception: Encroachments complying with Section 1005.7.

1031.3 Construction and Openings

Where an *egress court* serving a building or portion thereof is less than 10 feet (3048 mm) in width, the *egress court* walls shall have not less than 1-hour *fire-resistance-rated* construction for a distance of 10 feet (3048 mm) above the floor of the *egress court*. Openings within such walls shall be protected by opening protectives having a *fire protection rating* of not less than $\frac{3}{4}$ hour.

Exceptions:

1. *Egress courts* serving an *occupant load* of less than 10.
2. *Egress courts* serving Group R-3.

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Chapter 11 Accessibility

Section 1101 General

1101.1 Scope

This chapter governs the design and construction of buildings for accessibility.

1101.1.1 Criteria

Buildings shall be designed and constructed in accordance with the *Florida Building Code, Accessibility*.

1101.2 Design

Reserved.

Section 1102 Definitions

RESERVED

Section 1103 Scoping Requirements

RESERVED

Section 1104 Accessible Route

RESERVED

Section 1105 Accessible Entrances

RESERVED

Section 1106 Parking and Passenger Loading Facilities

RESERVED

Section 1107 Dwelling Units and Sleeping Units

RESERVED

Section 1108 Special Occupancies

RESERVED

Section 1109 Other Features and Facilities

RESERVED

Section 1110 Recreational Facilities

RESERVED

Section 1111 Signage

RESERVED

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Chapter 12 Interior Environment

Section 1201 General

1201.1 Scope

The provisions of this chapter shall govern ventilation, temperature control, lighting, yards and courts, sound transmission, room dimensions, surrounding materials and rodentproofing associated with the interior spaces of buildings.

Section 1202 Definitions

1202.1 General

The following terms are defined in Chapter 2:

SUNROOM.

THERMAL ISOLATION.

Section 1203 Ventilation

1203.1 General

Buildings shall be provided with natural ventilation in accordance with Section 1203.4, or mechanical ventilation in accordance with the *Florida Building Code, Mechanical*.

Where the air infiltration rate in a *dwelling unit* is less than 3 air changes per hour when tested with a blower door at a pressure 0.2 inch w.c. (50 Pa) in accordance with Section R402.4.1.2 of the *Florida Building Code, Energy Conservation—Residential Provisions*, the *dwelling unit* shall be ventilated by mechanical means in accordance with Section 403 of the *Florida Building Code, Mechanical*. *Ambulatory care facilities* and Group I-2 occupancies shall be ventilated by mechanical means in accordance with Section 407 of the *Florida Building Code, Mechanical*.

1203.2 Ventilation Required

Enclosed *attics* and enclosed rafter spaces formed where ceilings are applied directly to the underside of roof framing members shall have cross ventilation for each separate space by ventilation openings protected against the entrance of rain and snow. Blocking, bridging, and insulation shall be arranged so as not to interfere with the movement of air. An airspace of not less than 1 inch (25 mm) shall be provided between the insulation and the roof sheathing. The net free ventilating area shall be not less than $\frac{1}{150}$ of the area of the space ventilated. Ventilators shall be installed in accordance with manufacturer's installation instructions.

Exception: The net free cross-ventilation area shall be permitted to be reduced to $\frac{1}{300}$ provided at least 40 percent and not more than 50 percent of the required venting area is provided by ventilators located in the upper portion of the *attic* or rafter space. Upper ventilators shall be located not more than 3 feet (914 mm) below the ridge or highest point of the space, measured vertically, with the balance of the *ventilation* provided by eave or cornice vents. Where the location of wall or roof framing members conflicts with the installation of upper ventilators, installation more than 3 feet (914 mm) below the ridge or highest point of the space shall be permitted.

1203.2.1 Openings Into Attic

Exterior openings into the *attic* space of any building intended for human occupancy shall be protected to prevent the entry of birds, squirrels, rodents, snakes and other similar creatures. Openings for ventilation having a least dimension of not less than $\frac{1}{16}$ inch (1.6 mm) and not more than $\frac{1}{4}$ inch (6.4 mm) shall be permitted. Openings for ventilation having a least dimension larger than $\frac{1}{4}$ inch (6.4 mm) shall be provided with corrosion-resistant wire cloth screening, hardware cloth, perforated vinyl or similar material with openings having a least dimension of not less than $\frac{1}{16}$ inch (1.6 mm) and not more than $\frac{1}{4}$ inch (6.4 mm). Where combustion air is obtained from an *attic* area, it shall be in accordance with Chapter 7 of the *Florida Building Code, Mechanical*.

1203.3 Unvented Attic and Unvented Enclosed Rafter Assemblies

Unvented *attics* and unvented enclosed roof framing assemblies created by ceilings applied directly to the underside of the roof framing members/rafters and the structural roof sheathing at the top of the roof framing members shall be permitted where all the following conditions are met:

1. The unvented *attic* space is completely within the *building thermal envelope*.

2. No interior Class I vapor retarders are installed on the ceiling side (*attic* floor) of the unvented *attic* assembly or on the ceiling side of the unvented enclosed roof framing assembly.

3. Where wood shingles or shakes are used, a minimum $\frac{1}{4}$ -inch (6.4 mm) vented airspace separates the shingles or shakes and the roofing underlayment above the structural sheathing.

4. In Climate Zones 5, 6, 7 and 8, any air-impermeable insulation shall be a Class II vapor retarder or shall have a Class II vapor retarder coating or covering in direct contact with the underside of the insulation.

5. Insulation shall comply with either Item 5.1 or 5.2, and additionally Item 5.3.

5.1. Item 5.1.1, 5.1.2, 5.1.3 or 5.1.4 shall be met, depending on the air permeability of the insulation directly under the structural roof sheathing.

5.1.1. Where only air-impermeable insulation is provided, it shall be applied in direct contact with the underside of the structural roof sheathing.

5.1.2. Where air-permeable insulation is provided inside the building thermal envelope, it shall be installed in accordance with Item 5.1. In addition to the air-permeable insulation installed directly below the structural sheathing, rigid board or sheet insulation shall be installed directly above the structural roof sheathing in accordance with the R values in Table 1203.3 for condensation control.

5.1.3. Where both air-impermeable and *air-permeable insulation* are provided, the air-impermeable insulation shall be applied in direct contact with the underside of the structural roof sheathing in accordance with Item 5.1.1 and shall be in accordance with the R values in Table 1203.3 for condensation control. The *air-permeable insulation* shall be installed directly under the *air-impermeable insulation*.

5.1.4. Alternatively, sufficient rigid board or sheet insulation shall be installed directly above the structural roof sheathing to maintain the monthly average temperature of the underside of the structural roof sheathing above 45°F (7°C). For calculation purposes, an interior air temperature of 68°F (20°C) is assumed and the exterior air temperature is assumed to be the monthly average outside air temperature of the three coldest months.

5.2. In Climate Zones 1, 2 and 3 air-permeable insulation installed in unvented attics shall meet the following requirements:

5.2.1. A vapor diffusion port shall be installed not more than 12 inches (305 mm) from the highest point of the roof, measured vertically from the highest point of the roof to the lower edge of the port.

5.2.2. The port area shall be greater than or equal to $\frac{1}{600}$ of the ceiling area. Where there are multiple ports in the attic, the sum of the port areas shall be greater than or equal to the area requirement.

5.2.3. The vapor permeable membrane in the vapor diffusion port shall have a vapor permeance rating of greater than or equal to 20 perms when tested in accordance with Procedure A of ASTM E96.

5.2.4. The vapor diffusion port shall serve as an air barrier between the attic and the exterior of the building.

5.2.5. The vapor diffusion port shall protect the attic against the entrance of rain and snow.

5.2.6. Framing members and blocking shall not block the free flow of water vapor to the port. Not less than a 2-inch (50 mm) space shall be provided between any blocking and the roof sheathing. Air-permeable insulation shall be permitted within that space.

5.2.7. The roof slope shall be greater than or equal to 3 units vertical in 12 units horizontal (3:12).

5.2.8. Where only air-permeable insulation is used, it shall be installed directly below the structural roof sheathing, on top the attic floor, or on top of the ceiling.

5.2.9. Where only air-permeable insulation is used and is installed directly below the structural roof sheathing, air shall be supplied at a flow rate greater than or equal to 50 cubic feet per minute (23.6 L/s) per 1,000 square feet (93 m^2) of ceiling.

5.3. The air shall be supplied from ductwork providing supply air to the occupiable space when the conditioning system is operating. Alternatively, the air shall be supplied by a supply fan when the conditioning system is operating. Where preformed insulation board is used as the air-impermeable insulation layer, it shall be sealed at the perimeter of each individual sheet interior surface to form a continuous layer.

Exceptions:

1. Section 1203.3 does not apply to special use structures or enclosures such as swimming pool enclosures, data processing centers, hospitals or art galleries.
2. Section 1203.3 does not apply to enclosures in Climate Zones 5 through 8 that are humidified beyond 35 percent during the three coldest months.

TABLE 1203.3
INSULATION FOR CONDENSATION CONTROL

CLIMATE ZONE	MINIMUM R-VALUE OF AIR-IMPERMEABLE INSULATION ^a
2B and 3B tile roof only	0 (none required)
1, 2A, 2B, 3A, 3B, 3C	R-5
4C	R-10
4A, 4B	R-15
5	R-20
6	R-25
7	R-30
8	R-35

- a. Contributes to, but does not supersede, thermal resistance requirements for attic and roof assemblies in Section C402.2.1 of the *Florida Building Code, Energy Conservation*.

1203.4 Under-Floor Ventilation

The space between the bottom of the floor joists and the earth under any building except spaces occupied by basements or cellars shall be provided with ventilation openings through foundation walls or *exterior walls*. Such openings shall be placed so as to provide cross ventilation of the under-floor space.

1203.4.1 Openings for Under-Floor Ventilation

The net area of ventilation openings shall be not less than 1 square foot for each 150 square feet (0.67 m^2 for each 100 m^2) of crawl-space area. Ventilation openings shall be covered for their height and width with any of the following materials, provided that the least dimension of the covering shall be not greater than $\frac{1}{4}$ inch (6.4 mm):

1. Perforated sheet metal plates not less than 0.070 inch (1.8 mm) thick.
2. Expanded sheet metal plates not less than 0.047 inch (1.2 mm) thick.

3. Cast-iron grilles or gratings.
4. Extruded load-bearing vents.
5. Hardware cloth of 0.035-inch (0.89 mm) wire or heavier.
6. Corrosion-resistant wire mesh, with the least dimension not greater than $\frac{1}{8}$ inch (3.2 mm).

1203.4.2 Exceptions

The following are exceptions to Sections 1203.4 and 1203.4.1:

1. Where warranted by climatic conditions, ventilation openings to the outdoors are not required if ventilation openings to the interior are provided.
2. The total area of ventilation openings is permitted to be reduced to $\frac{1}{1,500}$ of the under-floor area where the ground surface is covered with a Class I vapor retarder material and the required openings are placed so as to provide cross ventilation of the space. The installation of operable louvers shall not be prohibited.
3. Ventilation openings are not required where continuously operated mechanical ventilation is provided at a rate of 1.0 cubic foot per minute (cfm) for each 50 square feet (1.02 L/s for each 10 m²) of crawlspace floor area and the ground surface is covered with a Class I vapor retarder.
4. Ventilation openings are not required where the ground surface is covered with a Class I vapor retarder, the perimeter walls are insulated and the space is conditioned in accordance with the *Florida Building Code, Energy Conservation*.
5. For buildings in flood hazard areas as established in Section 1612.3, the openings for under-floor ventilation shall be deemed as meeting the flood opening requirements of ASCE 24 provided that the ventilation openings are designed and installed in accordance with ASCE 24.

1203.5 Natural Ventilation

Natural *ventilation* of an occupied space shall be through windows, doors, louvers or other openings to the outdoors. The operating mechanism for such openings shall be provided with ready access so that the openings are readily controllable by the building occupants.

1203.5.1 Ventilation Area Required

The openable area of the openings to the outdoors shall be not less than 4 percent of the floor area being ventilated.

1203.5.1.1 Adjoining Spaces

Where rooms and spaces without openings to the outdoors are ventilated through an adjoining room, the opening to the adjoining room shall be unobstructed and shall have an area of not less than 8 percent of the floor area of the interior room or space, but not less than 25 square feet (2.3 m²). The openable area of the openings to the outdoors shall be based on the total floor area being ventilated.

Exception: Exterior openings required for *ventilation* shall be permitted to open into a sunroom with *thermal isolation* or a patio cover provided that the openable area between the sunroom addition or patio cover and the interior room shall have an area of not less than 8 percent of the floor area of the interior room or space, but not less than 20 square feet (1.86 m²). The openable area of the openings to the outdoors shall be based on the total floor area being ventilated.

1203.5.1.2 Openings Below Grade

Where openings below grade provide required natural *ventilation*, the outside horizontal clear space measured perpendicular to the opening shall be one and one-half times the depth of the opening. The depth of the opening shall be measured from the average adjoining ground level to the bottom of the opening.

1203.5.2 Contaminants Exhausted

Contaminant sources in naturally ventilated spaces shall be removed in accordance with the *Florida Building Code, Mechanical* and the *Florida Fire Prevention Code*.

1203.5.2.1 Bathrooms

Rooms containing bathtubs, showers, spas and similar bathing fixtures shall be mechanically ventilated in accordance with the *Florida Building Code, Mechanical*.

1203.5.3 Openings on Yards or Courts

Where natural *ventilation* is to be provided by openings onto *yards* or *courts*, such *yards* or *courts* shall comply with Section 1206.

1203.6 Other Ventilation and Exhaust Systems

Ventilation and exhaust systems for occupancies and operations involving flammable or combustible hazards or other contaminant sources as covered in the *Florida Building Code, Mechanical* or the *Florida Fire Prevention Code* shall be provided as required by both codes.

Section 1204 Temperature Control**1204.1 Equipment and Systems**

Interior spaces intended for human occupancy shall be provided with active or passive space heating systems capable of maintaining an indoor temperature of not less than 68°F (20°C) at a point 3 feet (914 mm) above the floor on the design heating day.

Exceptions: Space heating systems are not required for:

1. Interior spaces where the primary purpose of the space is not associated with human comfort.
2. Group F, H, S or U occupancies.

Section 1205 Lighting**1205.1 General**

Every space intended for human occupancy shall be provided with natural light by means of exterior glazed openings in accordance with Section 1205.2 or shall be provided with artificial light in accordance with Section 1205.3. Exterior glazed openings shall open directly onto a *public way* or onto a *yard* or *court* in accordance with Section 1206.

1205.2 Natural Light

The minimum net glazed area shall be not less than 8 percent of the floor area of the room served.

1205.2.1 Adjoining Spaces

For the purpose of natural lighting, any room is permitted to be considered as a portion of an adjoining room where one-half of the area of the common wall is open and unobstructed and provides an opening of not less than one-tenth of the floor area of the interior room or 25 square feet (2.32 m²), whichever is greater.

Exception: Openings required for natural light shall be permitted to open into a sunroom with *thermal isolation* or a patio cover where the common wall provides a glazed area of not less than one-tenth of the floor area of the interior room or 20 square feet (1.86 m²), whichever is greater.

1205.2.2 Exterior Openings

Exterior openings required by Section 1205.2 for natural light shall open directly onto a *public way*, *yard* or *court*, as set forth in Section 1206.

Exceptions:

1. Required exterior openings are permitted to open into a roofed porch where the porch meets all of the following criteria:
 - 1.1. Abuts a *public way*, *yard* or *court*.

- 1.2. Has a ceiling height of not less than 7 feet (2134 mm).
 - 1.3. Has a longer side at least 65 percent open and unobstructed.
2. Skylights are not required to open directly onto a *public way, yard or court*.

1205.3 Artificial Light

Artificial light shall be provided that is adequate to provide an average illumination of 10 footcandles (107 lux) over the area of the room at a height of 30 inches (762 mm) above the floor level.

1205.4 Stairway Illumination

Stairways within dwelling units and exterior stairways serving a dwelling unit shall have an illumination level on tread runs of not less than 1 footcandle (11 lux). *Stairways* in other occupancies shall be governed by Chapter 10.

1205.4.1 Controls

The control for activation of the required *stairway* lighting shall be in accordance with NFPA 70.

1205.5 Emergency Egress Lighting

The *means of egress* shall be illuminated in accordance with Section 1008.1.

Section 1206 Yards or Courts

1206.1 General

This section shall apply to *yards* and *courts* adjacent to exterior openings that provide natural light or ventilation. Such *yards* and *courts* shall be on the same *lot* as the building.

1206.2 Yards

Yards shall be not less than 3 feet (914 mm) in width for buildings two *stories* or less above *grade plane*. For buildings more than two *stories above grade plane*, the minimum width of the *yard* shall be increased at the rate of 1 foot (305 mm) for each additional *story*. For buildings exceeding 14 *stories above grade plane*, the required width of the *yard* shall be computed on the basis of 14 *stories above grade plane*.

1206.3 Courts

Courts shall be not less than 3 feet (914 mm) in width. *Courts* having windows opening on opposite sides shall be not less than 6 feet (1829 mm) in width. *Courts* shall be not less than 10 feet (3048 mm) in length unless bounded on one end by a *public way* or *yard*. For buildings more than two *stories above grade plane*, the *court* shall be increased 1 foot (305 mm) in width and 2 feet (610 mm) in length for each additional *story*. For buildings exceeding 14 *stories above grade plane*, the required dimensions shall be computed on the basis of 14 *stories above grade plane*.

1206.3.1 Court Access

Access shall be provided to the bottom of *courts* for cleaning purposes.

1206.3.2 Air Intake

Courts more than two *stories* in height shall be provided with a horizontal air intake at the bottom not less than 10 square feet (0.93 m²) in area and leading to the exterior of the building unless abutting a *yard* or *public way*.

1206.3.3 Court Drainage

The bottom of every *court* shall be properly graded and drained to a public sewer or other *approved* disposal system complying with the *Florida Building Code, Plumbing*.

Section 1207 Sound Transmission

1207.1 Scope

This section shall apply to common interior walls, partitions and floor/ceiling assemblies between adjacent *dwelling units* and *sleeping units*

or between *dwelling units* and *sleeping units* and adjacent public areas such as halls, *corridors*, *stairways* or *service areas*.

1207.2 Airborne Sound

Walls, partitions and floor/ceiling assemblies separating *dwelling units* and *sleeping units* from each other or from public or service areas shall have a sound transmission class of not less than 50 where tested in accordance with ASTM E90, or have a Normalized Noise Isolation Class (NNIC) rating of not less than 45 if field tested in accordance with ASTM E336 for airborne noise. Alternatively, the sound transmission class of walls, partitions and floor/ceiling assemblies shall be established by engineering analysis based on a comparison of walls, partitions and floor/ceiling assemblies having sound transmission class ratings as determined by the test procedures set forth in ASTM E90. Penetrations or openings in construction assemblies for piping; electrical devices; recessed cabinets; bathtubs; soffits; or heating, ventilating or exhaust ducts shall be sealed, lined, insulated or otherwise treated to maintain the required ratings. This requirement shall not apply to entrance doors; however, such doors shall be tight fitting to the frame and sill.

1207.2.1 Masonry

The sound transmission class of concrete masonry and clay masonry assemblies shall be calculated in accordance with TMS 0302 or determined through testing in accordance with ASTM E90.

1207.3 Structure-Borne Sound

Floor/ceiling assemblies between *dwelling units* and *sleeping units* or between a *dwelling unit* or *sleeping unit* and a public or service area within the structure shall have an impact insulation class rating of not less than 50 where tested in accordance with ASTM E492, or have an Apparent Impact Insulation Class (AIIC) of not less than 45 if field tested in accordance with ASTM E1007. Alternatively, the impact insulation class of floor/ceiling assemblies shall be established by engineering analysis based on a comparison of floor/ceiling assemblies having impact insulation class ratings as determined by the test procedures set forth in ASTM E492.

Section 1208 Interior Space Dimensions

1208.1 Minimum Room Widths

Habitable spaces, other than a kitchen, shall be not less than 7 feet (2134 mm) in any plan dimension. Kitchens shall have a clear passageway of not less than 3 feet (914 mm) between counter fronts and appliances or counter fronts and walls.

1208.2 Minimum Ceiling Heights

Occupiable spaces, *habitable spaces* and *corridors* shall have a ceiling height of not less than 7 feet 6 inches (2286 mm) above the finished floor. Bathrooms, toilet rooms, kitchens, storage rooms and laundry rooms shall have a ceiling height of not less than 7 feet (2134 mm) above the finished floor.

Exceptions:

1. In one- and two-family *dwellings*, beams or girders spaced not less than 4 feet (1219 mm) on center shall be permitted to project not more than 6 inches (152 mm) below the required ceiling height.
2. If any room in a building has a sloped ceiling, the prescribed ceiling height for the room is required in one-half the area thereof. Any portion of the room measuring less than 5 feet (1524 mm) from the finished floor to the ceiling shall not be included in any computation of the minimum area thereof.
3. The height of *mezzanines* and spaces below *mezzanines* shall be in accordance with Section 505.1.
4. Corridors contained within a *dwelling unit* or *sleeping unit* in a Group R occupancy shall have a ceiling height of not less than 7 feet (2134 mm) above the finished floor.

1208.2.1 Furred Ceiling

Any room with a furred ceiling shall be required to have the minimum ceiling height in two-thirds of the area thereof, but in no case shall the height of the furred ceiling be less than 7 feet (2134 mm).

1208.3 Room Area

Every *dwelling unit* shall have no fewer than one room that shall have not less than 120 square feet (11.2 m²) of *net floor area*. Other habitable rooms shall have a *net floor area* of not less than 70 square feet (6.5 m²).

Exception: Kitchens are not required to be of a minimum floor area.

1208.4 Efficiency Dwelling Units

Efficiency dwelling units shall conform to the requirements of the code except as modified herein:

1. The unit shall have a living room of not less than 190 square feet (17.7 m^2) of floor area.
2. The unit shall be provided with a separate closet.
3. The unit shall be provided with a kitchen sink, cooking appliance and refrigeration facilities, each having a clear working space of not less than 30 inches (762 mm) in front. Light and *ventilation* conforming to this code shall be provided.
4. The unit shall be provided with a separate bathroom containing a water closet, lavatory and bathtub or shower.

Section 1209 Access to Unoccupied Spaces

1209.1 Crawl Spaces

Crawl spaces shall be provided with not fewer than one access opening that shall be not less than 18 inches by 24 inches (457 mm by 610 mm).

1209.2 Attic Spaces

An opening not less than 20 inches by 30 inches (559 mm by 762 mm) shall be provided to any *attic* area having a clear height of over 30 inches (762 mm). Clear headroom of not less than 30 inches (762 mm) shall be provided in the *attic* space at or above the access opening.

1209.3 Mechanical Appliances

Access to mechanical appliances installed in under-floor areas, in *attic* spaces and on roofs or elevated structures shall be in accordance with the *Florida Building Code, Mechanical*.

Section 1210 Toilet and Bathroom Requirements

[P] 1210.1 Required Fixtures

The number and type of plumbing fixtures provided in any occupancy shall comply with Chapter 29.

1210.2 Finish Materials

Walls, floors and partitions in toilet and bathrooms shall comply with Sections 1210.2.1 through 1210.2.4.

1210.2.1 Floors and Wall Bases

In other than *dwelling units*, toilet, bathing and shower room floor finish materials shall have a smooth, hard, nonabsorbent surface. The intersections of such floors with walls shall have a smooth, hard, nonabsorbent vertical base that extends upward onto the walls not less than 4 inches (102 mm).

1210.2.2 Walls and Partitions

Walls and partitions within 2 feet (610 mm) of service sinks, urinals and water closets shall have a smooth, hard, nonabsorbent surface, to a height of not less than 4 feet (1219 mm) above the floor, and except for structural elements, the materials used in such walls shall be of a type that is not adversely affected by moisture.

Exception: This section does not apply to the following buildings and spaces:

1. Dwelling units and sleeping units.
2. Toilet rooms that are not accessible to the public and that have not more than one water closet.

Accessories such as grab bars, towel bars, paper dispensers and soap dishes, provided on or within walls, shall be installed and sealed to protect structural elements from moisture.

1210.2.3 Showers

Shower compartments and walls above bathtubs with installed shower heads shall be finished with a smooth, nonabsorbent surface to a height not less than 72 inches (1829 mm) above the drain inlet.

1210.2.4 Waterproof Joints

Built-in tubs with showers shall have waterproof joints between the tub and adjacent wall.

[P] 1210.3 Privacy

Public restrooms shall be visually screened from outside entry or exit doorways to ensure user privacy within the restroom. This provision shall also apply where mirrors would compromise personal privacy. Privacy at water closets and urinals shall be provided in accordance with Sections 1210.3.1 and 1210.3.2.

Exception: Visual screening shall not be required for single-occupant toilet rooms with a lockable door.

[P] 1210.3.1 Water Closet Compartment

Each water closet utilized by the public or employees shall occupy a separate compartment with walls or partitions and a door enclosing the fixtures to ensure privacy.

Exceptions:

1. Water closet compartments shall not be required in a single-occupant toilet room with a lockable door.
2. Toilet rooms located in child day care facilities and containing two or more water closets shall be permitted to have one water closet without an enclosing compartment.
3. This provision is not applicable to toilet areas located within Group I-3 occupancy housing areas.

[P] 1210.3.2 Urinal Partitions

Each urinal utilized by the public or employees shall occupy a separate area with walls or partitions to provide privacy. The walls or partitions shall begin at a height not more than 12 inches (305 mm) from and extend not less than 60 inches (1524 mm) above the finished floor surface. The walls or partitions shall extend from the wall surface at each side of the urinal not less than 18 inches (457 mm) or to a point not less than 6 inches (152 mm) beyond the outermost front lip of the urinal measured from the finished backwall surface, whichever is greater.

Exceptions:

1. Urinal partitions shall not be required in a single-occupant or family or assisted-use toilet room with a lockable door.
2. Toilet rooms located in child day care facilities and containing two or more urinals shall be permitted to have one urinal without partitions.

Section 1211 Enhanced Classroom Acoustics

1211.1 General

Enhanced classroom acoustics, where required in this section, shall comply with Section 808 of ICC A117.1.

1211.2 Where Required

In Group E occupancies, enhanced classroom acoustics shall be provided in all classrooms with a volume of 20,000 cubic feet (566 m^3) or less.

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Chapter 13 Energy Efficiency

Section 1301 General

[E] 1301.1 Scope

This chapter governs the design and construction of buildings for energy efficiency.

[E] 1301.1.1 Criteria

Buildings shall be designed and constructed in accordance with the *Florida Building Code, Energy Conservation*.

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Chapter 14 Exterior Walls

Section 1401 General

1401.1 Scope

The provisions of this chapter shall establish the minimum requirements for exterior walls; *exterior wall* coverings; *exterior wall* openings; exterior windows and doors; exterior soffits and fascias; architectural *trim*; balconies and similar projections; and bay and oriel windows.

Section 1402 Definitions

1402.1 Definitions

The following terms are defined in Chapter 2:

ADHERED MASONRY VENEER.

ANCHORED MASONRY VENEER.

BACKING.

EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS).

EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS) WITH DRAINAGE.

EXTERIOR WALL.

EXTERIOR WALL COVERING.

EXTERIOR WALL ENVELOPE.

FENESTRATION.

FIBER-CEMENT SIDING.

HIGH-PRESSURE DECORATIVE EXTERIOR-GRADE COMPACT LAMINATE (HPL).

HIGH-PRESSURE DECORATIVE EXTERIOR-GRADE COMPACT LAMINATE (HPL) SYSTEM.

METAL COMPOSITE MATERIAL (MCM).

METAL COMPOSITE MATERIAL (MCM) SYSTEM.

POLYPROPYLENE SIDING.

PORCELAIN TILE.

VENEER.

VINYL SIDING.

WATER-RESISTIVE BARRIER.

Section 1403 Performance Requirements

1403.1 General

The provisions of this section shall apply to exterior walls, wall coverings and components thereof.

1403.2 Weather Protection

Exterior walls shall provide the building with a weather-resistant *exterior wall envelope*. The *exterior wall envelope* shall include flashing, as described in Section 1405.4. The *exterior wall envelope* shall be designed and constructed in such a manner as to prevent the accumulation of water within the wall assembly by providing a *water-resistive barrier* behind the exterior veneer, as described in Section 1404.2, and a means

for draining water that enters the assembly to the exterior. Protection against condensation in the *exterior wall* assembly shall be provided in accordance with Section 1405.3.

Exceptions:

1. A weather-resistant *exterior wall envelope* shall not be required over concrete or masonry walls designed in accordance with Chapters 19 and 21, respectively.
2. Compliance with the requirements for a means of drainage, and the requirements of Sections 1404.2 and 1405.4, shall not be required for an *exterior wall envelope* that has been demonstrated through testing to resist wind-driven rain, including joints, penetrations and intersections with dissimilar materials, in accordance with ASTM E331 under the following conditions:
 - 2.1. *Exterior wall envelope* test assemblies shall include at least one opening, one control joint, one wall/eave interface and one wall sill. Tested openings and penetrations shall be representative of the intended end-use configuration.
 - 2.2. *Exterior wall envelope* test assemblies shall be at least 4 feet by 8 feet (1219 mm by 2438 mm) in size.
 - 2.3. *Exterior wall envelope* assemblies shall be tested at a minimum differential pressure of 6.24 pounds per square foot (psf) (0.297 kN/m²).
 - 2.4. *Exterior wall envelope* assemblies shall be subjected to a minimum test exposure duration of 2 hours.

The exterior wall envelope design shall be considered to resist wind-driven rain where the results of testing indicate that water did not penetrate control joints in the *exterior wall envelope*, joints at the perimeter of openings or intersections of terminations with dissimilar materials.

3. Exterior insulation and finish systems (EIFS) complying with Section 1408.4.1.

[BS] 1403.3 Wind Resistance

Exterior walls, exterior wall coverings, exterior soffits and fascias, components and claddings and the associated openings, shall be designed and constructed to resist safely the superimposed loads required by Chapter 16.

1403.4 Fire Resistance

Exterior walls shall be fire-resistance rated as required by other sections of this code with opening protection as required by Chapter 7.

1403.5 Water-Resistive Barriers

Exterior walls on buildings of Type I, II, III or IV construction that are greater than 40 feet (12 192 mm) in height above grade plane and contain a combustible *water-resistive barrier* shall be tested in accordance with and comply with the acceptance criteria of NFPA 285. Combustibility shall be determined in accordance with Section 703.2.2. For the purposes of this section, fenestration products, flashing of fenestration products and *water-resistive-barrier* flashing and accessories at other locations, including through wall flashings, shall not be considered part of the *water-resistive barrier*.

Exceptions:

1. Walls in which the *water-resistive barrier* is the only combustible component and the *exterior wall* has a wall covering of brick, concrete, stone, terra cotta, stucco or steel with minimum thicknesses in accordance with Table 1405.2.
2. Walls in which the *water-resistive barrier* is the only combustible component and the *water-resistive barrier* complies with the following:
 - 2.1. A peak heat release rate of less than 150 kW/m², a total heat release of less than 20 MJ/m² and an effective heat of combustion of less than 18 MJ/kg when tested on specimens at the thickness intended for use, in accordance with ASTM E1354, in the horizontal orientation and at an incident radiant heat flux of 50 kW/m².

2.2. A flame spread index of 25 or less and a smoke-developed index of 450 or less as determined in accordance with ASTM E84 or UL 723, with test specimen preparation and mounting in accordance with ASTM E2404.

[BS] 1403.6 Flood Resistance

For buildings in flood hazard areas as established in Section 1612.3, *exterior walls* extending below the elevation required by Section 1612 shall be constructed with flood-damage-resistant materials.

[BS] 1403.7 Flood Resistance for Coastal High-Hazard Areas and Coastal A Zones

For buildings in coastal high-hazard areas and coastal A zones as established in Section 1612.3, electrical, mechanical and plumbing system components shall not be mounted on or penetrate through exterior walls that are designed to break away under flood loads.

1403.8

In order to provide for inspection for termite infestation, clearance between exterior wall coverings and final earth grade on the exterior of a building shall not be less than 6 inches (152 mm).

Exceptions:

1. Paint or decorative cementitious finish less than $\frac{5}{8}$ inch (17.1 mm) thick adhered directly to the masonry foundation sidewall.
2. Access or vehicle ramps which rise to the interior finish floor elevation for the width of such ramps only.
3. A 4-inch (102 mm) inspection space above patio and garage slabs and entry areas.
4. If the patio has been soil treated for termites, the finish elevation may match the building interior finish floor elevations on masonry construction only.
5. Masonry veneers constructed in accordance with Section 2114.2.

Section 1404 Materials

1404.1 General

Materials used for the construction of *exterior walls* shall comply with the provisions of this section. Materials not prescribed herein shall be permitted, provided that any such alternative has been *approved*.

1404.2 Water-Resistive Barrier

Not fewer than one layer of water-resistive barrier material shall be attached to the studs or sheathing, with flashing as described in Section 1405.4, in such a manner as to provide a continuous *water-resistive barrier* behind the *exterior wall* veneer. Water-resistive barriers shall comply with one of the following:

1. No. 15 felt complying with ASTM D226, Type I.
2. ASTM E2556, Type I or II.
3. ASTM E331 in accordance with Section 1402.2.
4. Other approved materials installed in accordance with the manufacturer's installation instructions.

[BS] 1404.3 Wood

Exterior walls of wood construction shall be designed and constructed in accordance with Chapter 23.

[BS] 1404.3.1 Basic Hardboard

Basic hardboard shall conform to the requirements of ANSI A135.4.

[BS] 1404.3.2 Hardboard Siding

Hardboard siding shall conform to the requirements of ANSI A135.6 and, where used structurally, shall be so identified by the *label* of an approved agency.

[BS] 1404.4 Masonry

Exterior walls of masonry construction shall be designed and constructed in accordance with this section and Chapter 21. Masonry units, mortar and metal accessories used in anchored and adhered veneer shall meet the physical requirements of Chapter 21. The backing of anchored and adhered veneer shall be of concrete, masonry, steel framing or wood framing. Continuous insulation meeting the applicable requirements of this code shall be permitted between the backing and the masonry veneer.

[BS] 1404.5 Metal

Exterior walls constructed of cold-formed steel, structural steel or aluminum shall be designed in accordance with Chapters 22 and 20, respectively.

[BS] 1404.5.1 Aluminum Siding

Aluminum siding shall conform to the requirements of AAMA 1402. AAMA 1402 shall be modified to read as follows:

3.0 SIDING SPECIFICATIONS.

3.2.1.1 Static Pressure Test.

3.2.1.1.1 All siding products shall be capable of resisting the design pressures specified for walls for components and cladding loads in accordance with Section 1609.1.1. To verify that the soffit will perform under these conditions, it shall be tested in the maximum unsupported length for which the manufacturer seeks conformance when tested in accordance with Test Method #1, "Standard for Testing of Aluminum Siding/Fastener and Windload Resistance."

The static test pressure shall be as required to demonstrate compliance with the provisions of Section 1609.1.

3.2.1.1.2 For applications where the effective design pressure as specified in Section 1609.1.1 is greater than 1040 Pa (21.7 psf) [e.g., wind zone areas greater than 36 m/s (80 mph) or elevations above 33 feet (10 m) the product shall be tested in accordance with Test Method #1 under a static test pressure determined by the formula:

$$PT = \times 1.5 \times DP_p$$

Where:

PT = Static Test Pressure [Pa (psf)]

DP_p = Design Pressure [Pa (psf)]

1.5 = Safety Factor

Appendix A1.0 Windload Criteria is deleted in its entirety.

[BS] 1404.5.2 Cold-Rolled Copper

Copper shall conform to the requirements of ASTM B370.

[BS] 1404.5.3 Lead-Coated Copper

Lead-coated copper shall conform to the requirements of ASTM B101.

[BS] 1404.6 Concrete

Exterior walls of concrete construction shall be designed and constructed in accordance with Chapter 19.

[BS] 1404.7 Glass-Unit Masonry

Exterior walls of glass-unit masonry shall be designed and constructed in accordance with Chapter 21.

1404.8 Plastics

Plastic panel, apron or spandrel walls as defined in this code shall not be limited in thickness, provided that such plastics and their assemblies conform to the requirements of Chapter 26 and are constructed of *approved* weather-resistant materials of adequate strength to resist the wind loads for cladding specified in Chapter 16.

1404.9 Vinyl Siding

Vinyl siding shall be certified and labeled as conforming to the requirements of ASTM D3679 by an *approved* quality control agency.

1404.10 Fiber-Cement Siding

Fiber-cement siding shall conform to the requirements of ASTM C1186, Type A (or ISO 8336, Category A), and shall be so identified on labeling listing an *approved* quality control agency.

1404.11 Exterior Insulation and Finish Systems

Exterior insulation and finish systems (EIFS) and exterior insulation and finish systems (EIFS) with drainage shall comply with Section 1408.

1404.12 Polypropylene Siding

Polypropylene siding shall be certified and labeled as conforming to the requirements of ASTM D7254 by an approved quality control agency. In addition, polypropylene siding shall conform to the fire separation distance requirements of Section 1404.12.1 or 1404.12.2. Polypropylene siding shall be installed in accordance with the requirements of Section 1405.18 and in accordance with the manufacturer's instructions. Polypropylene siding shall be secured to the building so as to provide weather protection for the exterior walls of the building.

1404.12.1 Flame Spread Index

The certification of the flame spread index shall be accompanied by a test report stating that all portions of the test specimen ahead of the flame front remained in position during the test in accordance with ASTM E84 or UL 723.

1404.12.2 Fire Separation Distance

The fire separation distance between a building with polypropylene siding and the adjacent building shall be not less than 10 feet (3048 mm).

1404.13 Foam Plastic Insulation

Foam plastic insulation used in *exterior wall covering* assemblies shall comply with Chapter 26.

1404.14

Manufactured soffit materials and systems shall be labeled in accordance with the provisions of Section 1709.10 of this code.

1404.15 Attachments Through Insulation

Exterior wall coverings attached to the building structure through foam plastic insulating sheathing shall comply with the attachment requirements of Section 2603.11, 2603.12 or 2603.13.

Section 1405 Installation of Wall Coverings

1405.1 General

Exterior wall coverings shall be designed and constructed in accordance with the applicable provisions of this section and TAS 202 and 203 in the HVHZ.

1405.1.1 Soffits and Fascias

Soffits and fascias installed at roof overhangs shall comply with Section 1410.

1405.2 Weather Protection

Exterior walls shall provide weather protection for the building. The materials of the minimum nominal thickness specified in Table 1405.2 shall be acceptable as *approved* weather coverings. Where the ultimate design wind speed, V_{ult} , is greater than 115 mph, claddings listed in Table 1405.2 must be of adequate strength to resist the wind loads for cladding specified in Chapter 16.

TABLE 1405.2

MINIMUM THICKNESS OF WEATHER COVERINGS

COVERING TYPE	MINIMUM THICKNESS (inches)
Adhered masonry veneer	0.25
Aluminum siding	0.019
Anchored masonry veneer	2.625
Asbestos-cement boards	0.125
Asbestos shingles	0.156
Cold-rolled copper ^d	0.0216 nominal
Copper shingles ^d	0.0162 nominal
Exterior plywood (with sheathing)	0.313
Exterior plywood (without sheathing)	See Section 2304.6 (HVHZ, see Section 2322)
Fiber cement lap siding	0.25 ^c
Fiber cement panel siding	0.25 ^c
Fiberboard siding	0.5
Glass-fiber reinforced concrete panels	0.375
Hardboard siding ^c	0.25
High-yield copper ^d	0.0162 nominal
Lead-coated copper ^d	0.0216 nominal
Lead-coated high-yield copper	0.0162 nominal
Marble slabs	1
Particleboard (with sheathing)	See Section 2304.6 (HVHZ, see Section 2315.1.11)
Particleboard (without sheathing)	See Section 2304.6 (HVHZ, see Section 2315.1.11)
Porcelain tile	0.125 nominal
Steel (approved corrosion resistant)	0.0149
Stone (cast artificial, anchored)	1.5
Stone (natural)	2
Structural glass	0.344
Stucco or exterior cement plaster	
Three-coat work over:	
Metal plaster base	0.875 ^b
Unit masonry	0.625 ^b
Cast-in-place or precast concrete	0.625 ^b

Two-coat work over:	
Unit masonry	0.5 ^b
Cast-in-place or precast concrete	0.375 ^b
Terra cotta (anchored)	1
Terra cotta (adhered)	0.25
Vinyl siding	0.035
Wood shingles	0.375
Wood siding (without sheathing) ^a	0.5

For SI: 1 inch = 25.4 mm, 1 ounce = 28.35 g, 1 square foot = 0.093 m².

- a. Wood siding of thicknesses less than 0.5 inch shall be placed over sheathing that conforms to Section 2304.6. (HVHZ, see Section 2322)
- b. Exclusive of texture.
- c. As measured at the bottom of decorative grooves.
- d. 16 ounces per square foot for cold-rolled copper and lead-coated copper, 12 ounces per square foot for copper shingles, high-yield copper and lead-coated high-yield copper.

1405.3 Vapor Retarders

Vapor retarder materials shall be classified in accordance with Table 1405.3(1). A vapor retarder shall be provided on the interior side of frame walls in accordance with Tables 1405.3(2) and 1405.3(3), or an approved design using accepted engineering practice for hygrothermal analysis. The appropriate climate zone shall be selected in accordance with Chapter 3 [CE] of the *Florida Building Code, Energy Conservation—Commercial Provisions*.

TABLE 1405.3(1)
VAPOR RETARDER MATERIALS AND CLASSES

VAPOR RETARDER CLASS	ACCEPTABLE MATERIALS
I	Sheet polyethylene, nonperforated aluminum foil, or other approved materials with a perm rating of less than or equal to 0.1
II	Kraft-faced fiberglass batts, vapor retarder paint, or other approved materials applied in accordance with the manufacturer's instructions for a perm rating greater than 0.1 and less than or equal to 1.0
III	Latex paint, enamel paint, or other approved materials applied in accordance with the manufacturer's instructions for a perm rating of greater than 1.0 and less than or equal to 10

TABLE 1405.3(2)
VAPOR RETARDER OPTIONS

CLIMATE ZONE	VAPOR RETARDER CLASS		
	I	II	IIIa

1, 2	Not permitted	Not Permitted	Permitted
3, 4 (except Marine 4)	Not permitted	Permitted	Permitted
Marine 4, 5, 6, 7, 8	Permitted	Permitted	See Table 1405.3(3)

- a. Only Class III vapor retarders shall be used on the interior side of frame walls where foam plastic insulating sheathing with a perm rating of less than 1 is applied in accordance with Table 1405.3(3) on the exterior side of the frame wall.

TABLE 1405.3(3)

CLASS III VAPOR RETARDERS

ZONE	CLASS III VAPOR RETARDERS PERMITTED FOR: ^a
Marine 4	Vented cladding over wood structural panels Vented cladding over fiberboard Vented cladding over gypsum Insulated sheathing with R -value $\geq R2.5$ over 2×4 wall Insulated sheathing with R -value $\geq R3.75$ over 2×6 wall
5	Vented cladding over wood structural panels Vented cladding over fiberboard Vented cladding over gypsum Insulated sheathing with R -value $\geq R5$ over 2×4 wall Insulated sheathing with R -value $\geq R7.5$ over 2×6 wall
6	Vented cladding over fiberboard Vented cladding over gypsum Insulated sheathing with R -value $\geq R7.5$ over 2×4 wall Insulated sheathing with R -value $\geq R11.25$ over 2×6 wall
7	Continuous insulation with R -value $\geq R10$ over 2×4 wall Continuous insulation with R -value $\geq R15$ over 2×6 wall
8	Continuous insulation with R -value $\geq R12.5$ over 2×4 wall Continuous insulation with R -value $\geq R20$ over 2×6 wall

- a. The requirements in this table apply only to insulation used to control moisture in order to permit the use of Class III vapor retarders. The insulation materials used to satisfy this option also contribute to but do not supersede the thermal envelope requirements of the *Florida Building Code, Energy Conservation*.
- b. Vented cladding shall include vinyl lap siding, polypropylene, or horizontal aluminum siding, brick veneer with clear airspace as specified in this code, and other approved vented claddings.

1405.3.1 Class I and II Vapor Retarders

Where a Class II vapor retarder is used in combination with foam plastic insulating sheathing installed as continuous insulation on the exterior side of frame walls, the continuous insulation shall comply with Table 1405.3.1 and the Class II vapor retarder shall have a vapor permeance greater than 1 perm when measured by ASTM E96 water method (Procedure B). Use of a Class I interior vapor retarder in frame walls with a Class I vapor retarder on the exterior side shall require an approved design.

Exceptions:

1. Basement walls.

2. Below-grade portion of any wall.
3. Construction where accumulation, condensation or freezing of moisture will not damage the materials.
4. Class I and II vapor retarders with vapor permeance greater than 1 perm when measured by ASTM E96 water method (Procedure B) shall be allowed on the interior side of any frame wall in all climate zones.

TABLE 1405.3.1**CONTINUOUS INSULATION WITH CLASS II VAPOR RETARDER**

CLIMATE ZONE	PERMITTED CONDITIONS ^a
3	Continuous insulation with R-value ≥ 2
4, 5, and 6	Continuous insulation with R-value ≥ 3 over 2×4 wall Continuous insulation with R-value ≥ 5 over 2×6 wall
7	Continuous insulation with R-value ≥ 5 over 2×4 wall Continuous insulation with R-value ≥ 7.5 over 2×6 wall
8	Continuous insulation with R-value ≥ 7.5 over 2×4 wall Continuous insulation with R-value ≥ 10 over 2×6 wall

- a. In addition to the vapor retarder, spray foam with a maximum permeance of 1.5 perms at the installed thickness applied to the interior cavity side of wood structural panels, fiberboard, insulating sheathing or gypsum is deemed to comply with the continuous insulation requirement only for the moisture control purposes of this table where the spray foam R-value plus any continuous insulation R-value provided equals or exceeds the specified continuous insulation R-value.

1405.3.2 Class III Vapor Retarders

Only Class III vapor retarders shall be used on the interior side of frame walls where foam plastic insulating sheathing with a perm rating of less than 1 is applied in accordance with Table 1404.3(3) on the exterior side of the frame wall.

1405.3.2.1 Spray Foam Plastic Insulation for Moisture Control With Class III Vapor Retarders

For purposes of compliance with Table 1405.3(3), spray foam with a maximum permeance of 1.5 perms at the installed thickness applied to the interior cavity side of wood structural panels, fiberboard, insulating sheathing or gypsum shall be deemed to meet the continuous insulation R-value requirement where the spray foam R-value meets or exceeds the specified continuous insulation R-value.

1405.3.2.1.1 Hybrid Insulation for Moisture Control With Class III Vapor Retarders

For the purposes of compliance with Table 1405.3(3), the combined R-values of spray foam plastic insulation and continuous insulation shall be permitted to be counted toward the continuous R-value requirement.

1405.3.3 Minimum Airspaces and Vented Openings for Vented Cladding

For the purposes of this section, vented cladding shall include the following minimum airspaces:

1. Vinyl lap or horizontal aluminum siding applied over a weather-resistive barrier as specified in this chapter.
2. Brick veneer with an airspace as specified in this code.
3. Other approved vented claddings.

1405.4 Flashing

Flashing shall be installed in such a manner so as to prevent moisture from entering the wall or to redirect that moisture to the exterior. Flashing shall be installed at the perimeters of exterior door and window assemblies, penetrations and terminations of *exterior wall* assemblies, *exterior wall* intersections with roofs, chimneys, porches, decks, balconies and similar projections and at built-in gutters and similar locations where moisture could enter the wall. Flashing with projecting flanges shall be installed on both sides and the ends of copings, under sills and continuously above projecting *trim*. When self-adhered membranes are used as flashing in wall assemblies, those self-adhered flashings shall comply with AAMA-711. When fluid applied membranes are used as flashing for exterior wall openings, those fluid applied membrane flashings shall comply with AAMA 714. Approved corrosion-resistant flashing shall be applied at the following locations:

1. Exterior window and door openings. Flashing at exterior window and door openings shall extend to the surface of the exterior wall finish or to the water-resistive barrier for subsequent drainage. Flashing at exterior window and door openings shall be installed in accordance with one or more of the following:
 - 1.1. The fenestration manufacturer's installation and flashing instructions, or for applications not addressed in the fenestration manufacturer's instructions, in accordance with the flashing or water-resistive barrier manufacturer's instructions. Where flashing instructions or details are not provided, pan flashing shall be installed at the sill of exterior window and door openings. Pan flashing shall be sealed or sloped in such a manner as to direct water to the surface of the exterior wall finish or to the water-resistive barrier for subsequent drainage. Openings using pan flashing shall also incorporate flashing or protection at the head and sides.
 - 1.2. In accordance with the flashing design or method of a registered design professional.
 - 1.3. In accordance with other approved methods.
 - 1.4. In accordance with FMA/AAMA 100, FMA/AAMA 200, FMA/WDMA 250, FMA/AAMA/WDMA 300, FMA/AAMA/WDMA 400, or FMA/AAMA/WDMA 2710.

2. At the intersection of chimneys or other masonry construction with frame or stucco walls, with projecting lips on both sides under stucco copings.

3. Under and at the ends of masonry, wood or metal copings and sills.

4. Continuously above all projecting wood trim.

5. Where exterior porches, decks or stairs attach to a wall or floor assembly of wood-frame construction.

6. At wall and roof intersections.

7. At built-in gutters.

1405.4.1 Exterior Wall Pockets

In exterior walls of buildings or structures, wall pockets or crevices in which moisture can accumulate shall be avoided or protected with caps or drips, or other *approved* means shall be provided to prevent water damage.

1405.4.2 Masonry

Flashing and weep holes in anchored veneer shall be located in the first course of masonry above finished ground level above the foundation wall or slab, and other points of support, including structural floors, shelf angles and lintels where anchored veneers are designed in accordance with Section 1405.6.

1405.5 Wood Veneers

Wood veneers on exterior walls of buildings of Type I, II, III and IV construction shall be not less than 1 inch (25 mm) nominal thickness, 0.438-inch (11.1 mm) exterior hardboard siding or 0.375-inch (9.5 mm) exterior-type wood structural panels or particleboard and shall conform to the following:

1. The veneer shall not exceed 40 feet (12 190 mm) in height above grade. Where fire-retardant-treated wood is used, the height shall not exceed 60 feet (18 290 mm) in height above grade.

2. The veneer is attached to or furred from a noncombustible backing that is fire-resistance rated as required by other provisions of this code.

3. Where open or spaced wood veneers (without concealed spaces) are used, they shall not project more than 24 inches (610 mm) from the building wall.

[BS] 1405.6 Anchored Masonry Veneer

Anchored masonry veneer shall comply with the provisions of Sections 1405.6, 1405.7, 1405.8 and 1405.9 and Sections 12.1 and 12.2 of TMS 402.

[BS] 1405.6.1 Tolerances

Anchored masonry veneers in accordance with Chapter 14 are not required to meet the tolerances in Article 3.3 F1 of TMS 602.

[BS] 1405.7 Stone Veneer

Anchored stone veneer units not exceeding 10 inches (254 mm) in thickness shall be anchored directly to masonry, concrete or to stud construction by one of the following methods:

1. With concrete or masonry backing, anchor ties shall be not less than 0.1055-inch (2.68 mm) corrosion-resistant wire, or *approved equal*, formed beyond the base of the backing. The legs of the loops shall be not less than 6 inches (152 mm) in length bent at right angles and laid in the mortar joint, and spaced so that the eyes or loops are 12 inches (305 mm) maximum on center in both directions. There shall be provided not less than a 0.1055-inch (2.68 mm) corrosion-resistant wire tie, or *approved equal*, threaded through the exposed loops for every 2 square feet (0.2 m^2) of stone veneer. This tie shall be a loop having legs not less than 15 inches (381 mm) in length bent so that the tie will lie in the stone veneer mortar joint. The last 2 inches (51 mm) of each wire leg shall have a right-angle bend. One-inch (25 mm) minimum thickness of cement grout shall be placed between the backing and the stone veneer.

2. With wood stud backing, a 2-inch by 2-inch (51 by 51 mm) 0.0625-inch (1.59 mm) zinc-coated or nonmetallic coated wire mesh with two layers of water-resistive barrier in accordance with Section 1404.2 shall be applied directly to wood studs spaced not more than 16 inches (406 mm) on center. On studs, the mesh shall be attached with 2-inch-long (51 mm) corrosion-resistant steel wire furring nails at 4 inches (102 mm) on center providing a minimum 1.125-inch (29 mm) penetration into each stud and with 8d annular threaded nails at 8 inches (203 mm) on center into top and bottom plates or with equivalent wire ties. There shall be not less than a 0.1055-inch (2.68 mm) zinc-coated or nonmetallic coated wire, or *approved equal*, attached to the stud with not smaller than an 8d (0.120 in. diameter) annular threaded nail for every 2 square feet (0.2 m^2) of stone veneer. This tie shall be a loop having legs not less than 15 inches (381 mm) in length, so bent that the tie will lie in the stone veneer mortar joint. The last 2 inches (51 mm) of each wire leg shall have a right-angle bend. One-inch (25 mm) minimum thickness of cement grout shall be placed between the backing and the stone veneer.

3. With cold-formed steel stud backing, a 2-inch by 2-inch (51 by 51 mm) 0.0625-inch (1.59 mm) zinc-coated or nonmetallic coated wire mesh with two layers of water-resistive barrier in accordance with Section 1404.2 shall be applied directly to steel studs spaced a not more than 16 inches (406 mm) on center. The mesh shall be attached with corrosion-resistant #8 self-drilling, tapping screws at 4 inches (102 mm) on center, and at 8 inches (203 mm) on center into top and bottom tracks or with equivalent wire ties. Screws shall extend through the steel connection not fewer than three exposed threads. There shall be not less than a 0.1055-inch (2.68 mm) corrosion-resistant wire, or *approved equal*, attached to the stud with not smaller than a #8 self-drilling, tapping screw extending through the steel framing not fewer than three exposed threads for every 2 square feet (0.2 m^2) of stone veneer. This tie shall be a loop having legs not less than 15 inches (381 mm) in length, so bent that the tie will lie in the stone veneer mortar joint. The last 2 inches (51 mm) of each wire leg shall have a right-angle bend. One-inch (25 mm) minimum thickness of cement grout shall be placed between the backing and the stone veneer. The cold-formed steel framing members shall have a minimum bare steel thickness of 0.0428 inches (1.087 mm).

[BS] 1405.8 Slab-Type Veneer

Anchored slab-type veneer units not exceeding 2 inches (51 mm) in thickness shall be anchored directly to masonry, concrete or light-frame construction. For veneer units of marble, travertine, granite or other stone units of slab form, ties of corrosion-resistant dowels in drilled holes shall be located in the middle third of the edge of the units, spaced not more than 24 inches (610 mm) apart around the periphery of each unit with not less than four ties per veneer unit. Units shall not exceed 20 square feet (1.9 m^2) in area. If the dowels are not tight fitting, the holes shall be drilled not more than 0.063 inch (1.6 mm) larger in diameter than the dowel, with the hole countersunk to a diameter and depth equal to twice the diameter of the dowel in order to provide a tight-fitting key of cement mortar at the dowel locations where the mortar in the joint has set. Veneer ties shall be corrosion-resistant metal capable of resisting, in tension or compression, a force equal to two

times the weight of the attached veneer. If made of sheet metal, veneer ties shall be not smaller in area than 0.0336 by 1 inch (0.853 by 25 mm) or, if made of wire, not smaller in diameter than 0.1483-inch (3.76 mm) wire.

[BS] 1405.9 Terra Cotta

Anchored terra cotta or ceramic units not less than $1\frac{5}{8}$ inches (41 mm) thick shall be anchored directly to masonry, concrete or stud construction. Tied terra cotta or ceramic veneer units shall be not less than $1\frac{5}{8}$ inches (41 mm) thick with projecting dovetail webs on the back surface spaced approximately 8 inches (203 mm) on center. The facing shall be tied to the backing wall with corrosion-resistant metal anchors of not less than No. 8 gage wire installed at the top of each piece in horizontal bed joints not less than 12 inches (305 mm) nor more than 18 inches (457 mm) on center; these anchors shall be secured to $\frac{1}{4}$ -inch (6.4 mm) corrosion-resistant pencil rods that pass through the vertical aligned loop anchors in the backing wall. The veneer ties shall have sufficient strength to support the full weight of the veneer in tension. The facing shall be set with not less than a 2-inch (51 mm) space from the backing wall and the space shall be filled solidly with Portland cement grout and pea gravel. Immediately prior to setting, the backing wall and the facing shall be drenched with clean water and shall be distinctly damp when the grout is poured.

[BS] 1405.10 Adhered Masonry Veneer

Adhered masonry veneer shall comply with the applicable requirements in this section and Sections 12.1 and 12.3 of TMS 402.

[BS] 1405.10.1 Exterior Adhered Masonry Veneer

Exterior adhered masonry veneer shall be installed in accordance with Section 1405.10 and the manufacturer's instructions.

[BS] 1405.10.1.1 Water-Resistive Barriers

Water-resistive barriers shall be installed as required in Section 2510.6.

[BS] 1405.10.1.2 Flashing

Flashing shall comply with the applicable requirements of Section 1405.4 and the following.

[BS] 1405.10.1.2.1 Flashing at Foundation

A corrosion-resistant screed or flashing of a minimum 0.019-inch (0.48 mm) or 26 gage galvanized or plastic with a minimum vertical attachment flange of $3\frac{1}{2}$ inches (89 mm) shall be installed to extend not less than 1 inch (25 mm) below the foundation plate line on exterior stud walls in accordance with Section 1405.4. The water-resistive barrier shall lap over the exterior of the attachment flange of the screed or flashing.

[BS] 1405.10.1.3 Clearances

On exterior stud walls, adhered masonry veneer shall be installed not less than 4 inches (102 mm) above the earth, or not less than 2 inches (51 mm) above paved areas, or not less than $\frac{1}{2}$ inch (12.7 mm) above exterior walking surfaces that are supported by the same foundation that supports the exterior wall.

[BS] 1405.10.1.4 Adhered Masonry Veneer Installed With Lath and Mortar

Exterior adhered masonry veneer installed with lath and mortar shall comply with the following.

[BS] 1405.10.1.4.1 Lathing

Lathing shall comply with the requirements of Section 2510.

[BS] 1405.10.1.4.2 Scratch Coat

A nominal $\frac{1}{2}$ -inch-thick (12.7 mm) layer of mortar complying with the material requirements of Sections 2103 and 2512.2 shall be applied, encapsulating the lathing. The surface of this mortar shall be scored horizontally, resulting in a scratch coat.

[BS] 1405.10.1.4.3 Adhering Veneer

The masonry veneer units shall be adhered to the mortar scratch coat with a nominal $\frac{1}{2}$ -inch-thick (12.7 mm) setting bed of mortar complying with Sections 2103 and 2512.2 applied to create a full setting bed for the back of the masonry veneer units. The masonry veneer units shall be worked into the setting bed resulting in a nominal $\frac{3}{8}$ -inch (9.5 mm) setting bed after the masonry veneer units are applied.

[BS] 1405.10.1.5 Adhered Masonry Veneer Applied Directly to Masonry and Concrete

Adhered masonry veneer applied directly to masonry or concrete shall comply with the applicable requirements of Section 1405.10 and with the requirements of Section 1405.10.1.4 or 2510.7.

[BS] 1405.10.1.6 Cold Weather Construction

Cold weather construction of adhered masonry veneer shall comply with the requirements of Sections 2104 and 2512.4.

[BS] 1405.10.1.7 Hot Weather Construction

Hot weather construction of adhered masonry veneer shall comply with the requirements of Section 2104.

[BS] 1405.10.2 Exterior Adhered Masonry Veneers—Porcelain Tile

Adhered units weighing more than 3.5 pounds per square foot (0.17 kN/m^2) shall not exceed 48 inches (1219 mm) in any face dimension nor more than 9 square feet (0.8 m^2) in total face area and shall not weigh more than 6 pounds per square foot (0.29 kN/m^2). Adhered units weighing less than or equal to 3.5 pounds per square foot (0.17 kN/m^2) shall not exceed 72 inches (1829 mm) in any face dimension nor more than 17.5 square feet (1.6 m^2) in total face area. Porcelain tile shall be adhered to an approved backing system.

[BS] 1405.10.3 Interior Adhered Masonry Veneers

Interior adhered masonry veneers shall have a maximum weight of 20 psf (0.958 kg/m^2) and shall be installed in accordance with Section 1405.10. Where the interior adhered masonry veneer is supported by wood construction, the supporting members shall be designed to limit deflection to $1/600$ of the span of the supporting members.

[BS] 1405.11 Metal Veneers

Veneers of metal shall be fabricated from *approved* corrosion-resistant materials or shall be protected front and back with porcelain enamel, or otherwise be treated to render the metal resistant to corrosion. Such veneers shall be not less than 0.0149-inch (0.378 mm) nominal thickness sheet steel mounted on wood or metal furring strips or approved sheathing on light-frame construction.

[BS] 1405.11.1 Attachment

Exterior metal veneer shall be securely attached to the supporting masonry or framing members with corrosion-resistant fastenings, metal ties or by other *approved* devices or methods. The spacing of the fastenings or ties shall not exceed 24 inches (610 mm) either vertically or horizontally, but where units exceed 4 square feet (0.4 m^2) in area there shall be not less than four attachments per unit. The metal attachments shall have a cross-sectional area not less than provided by W 1.7 wire. Such attachments and their supports shall be designed and constructed to resist the wind loads as specified in Section 1609 for components and cladding.

1405.11.2 Weather Protection

Metal supports for exterior metal veneer shall be protected by painting, galvanizing or by other equivalent coating or treatment. Wood studs, furring strips or other wood supports for exterior metal veneer shall be *approved* pressure-treated wood or protected as required in Section 1403.2. Joints and edges exposed to the weather shall be caulked with *approved* durable waterproofing material or by other *approved* means to prevent penetration of moisture.

1405.11.3 Backup

Masonry backup shall not be required for metal veneer unless required by the fire-resistance requirements of this code.

1405.11.4 Grounding

Grounding of metal veneers on buildings shall comply with the requirements of Chapter 27 of this code.

[BS] 1405.12 Glass Veneer

The area of a single section of thin exterior structural glass veneer shall not exceed 10 square feet (0.93 m^2) where that section is not more than 15 feet (4572 mm) above the level of the sidewalk or grade level directly below, and shall not exceed 6 square feet (0.56 m^2) where it is more than 15 feet (4572 mm) above that level.

[BS] 1405.12.1 Length and Height

The length or height of any section of thin exterior structural glass veneer shall not exceed 48 inches (1219 mm).

[BS] 1405.12.2 Thickness

The thickness of thin exterior structural glass veneer shall be not less than 0.344 inch (8.7 mm).

[BS] 1405.12.3 Application

Thin exterior structural glass veneer shall be set only after backing is thoroughly dry and after application of an *approved* bond coat uniformly over the entire surface of the backing so as to effectively seal the surface. Glass shall be set in place with an *approved* mastic cement in sufficient quantity so that at least 50 percent of the area of each glass unit is directly bonded to the backing by mastic not less

than $\frac{1}{4}$ inch (6.4 mm) thick and not more than $\frac{5}{8}$ inch (15.9 mm) thick. The bond coat and mastic shall be evaluated for compatibility and shall bond firmly together.

[BS] 1405.12.4 Installation at Sidewalk Level

Where glass extends to a sidewalk surface, each section shall rest in an *approved* metal molding, and be set at least $\frac{1}{4}$ inch (6.4 mm) above the highest point of the sidewalk. The space between the molding and the sidewalk shall be thoroughly caulked and made water tight.

[BS] 1405.12.4.1 Installation Above Sidewalk Level

Where thin exterior structural glass veneer is installed above the level of the top of a bulkhead facing, or at a level more than 36 inches (914 mm) above the sidewalk level, the mastic cement binding shall be supplemented with *approved* nonferrous metal shelf angles located in the horizontal joints in every course. Such shelf angles shall be not less than 0.0478-inch (1.2 mm) thick and not less than 2 inches (51 mm) long and shall be spaced at *approved* intervals, with not less than two angles for each glass unit. Shelf angles shall be secured to the wall or backing with expansion bolts, toggle bolts or by other *approved* methods.

[BS] 1405.12.5 Joints

Unless otherwise specifically *approved* by the *building official*, abutting edges of thin exterior structural glass veneer shall be ground square. Mitered joints shall not be used except where specifically *approved* for wide angles. Joints shall be uniformly buttered with an *approved* jointing compound and horizontal joints shall be held to not less than 0.063 inch (1.6 mm) by an *approved* nonrigid substance or device. Where thin exterior structural glass veneer abuts nonresilient material at sides or top, expansion joints not less than $\frac{1}{4}$ inch (6.4 mm) wide shall be provided.

[BS] 1405.12.6 Mechanical Fastenings

Thin exterior structural glass veneer installed above the level of the heads of show windows and veneer installed more than 12 feet (3658 mm) above sidewalk level shall, in addition to the mastic cement and shelf angles, be held in place by the use of fastenings at each vertical or horizontal edge, or at the four corners of each glass unit. Fastenings shall be secured to the wall or backing with expansion bolts, toggle bolts or by other methods. Fastenings shall be so designed as to hold the glass veneer in a vertical plane independent of the mastic cement. Shelf angles providing both support and fastenings shall be permitted.

[BS] 1405.12.7 Flashing

Exposed edges of thin exterior structural glass veneer shall be flashed with overlapping corrosion-resistant metal flashing and caulked with a waterproof compound in a manner to effectively prevent the entrance of moisture between the glass veneer and the backing.

1405.13 Exterior Windows and Doors

Windows and doors installed in exterior walls shall conform to the testing and performance requirements of Section 1709.5.

1405.13.1 Installation

Windows and doors shall be installed in accordance with *approved* manufacturer's instructions. Fastener size and spacing shall be provided in such instructions and shall be calculated based on maximum loads and spacing used in the tests.

[BS] 1405.14 Vinyl Siding

Vinyl siding conforming to the requirements of this section and complying with ASTM D3679 shall be permitted on *exterior walls* where the design wind pressure determined in accordance with Section 1609 does not exceed 30 pounds per square foot (1.44 kN/m^2). Where the design wind pressure exceeds 30 pounds per square foot (1.44 kN/m^2), tests or calculations indicating compliance with Chapter 16 shall be submitted. Vinyl siding shall be secured to the building so as to provide weather protection for the exterior walls of the building.

[BS] 1405.14.1 Application

The siding shall be applied over sheathing or materials listed in Section 2304.6. Siding shall be applied over a *water-resistive barrier* in accordance with requirements in Section 1404. Siding and accessories shall be installed in accordance with the approved manufacturer's instructions.

1405.14.1.1 Fasteners and Fastener Penetration for Wood Construction

Unless otherwise specified in the approved manufacturer's instructions, nails used to fasten the siding and accessories shall be corrosion resistant and have a minimum 0.313-inch (7.9 mm) head diameter and $\frac{1}{8}$ -inch (3.18 mm) shank diameter. The penetration into nailable substrate shall be not less than at least $1\frac{1}{4}$ inches (32 mm).

1405.14.1.2 Fasteners and Fastener Penetration for Cold-Formed Steel Light-Frame Construction

For cold-formed steel light-frame construction, corrosion resistant fasteners shall be used. Screw fasteners shall penetrate through the steel with a minimum of three exposed threads. Other fasteners shall be installed in accordance with the approved construction documents and manufacturer's instructions.

1405.14.1.3 Fastener Spacing

Unless specified otherwise by the approved manufacturer's instructions, fasteners shall be installed in the middle third of the slots of the nail hem and maximum spacing between fasteners shall be 16 inches (406 mm) for horizontal siding and 12 inches (305 mm) for vertical siding.

1405.14.2 Accessories

Accessories must be installed in accordance with the approved manufacturer's instructions.

1405.14.2.1 Starter Strip

Horizontal siding shall be installed with a starter strip at the initial course at any location.

1405.14.2.2 Utility Trim

Under windows, and at top of walls, utility trim shall be used with snap locks.

[BS] 1405.15 Cement Plaster

Cement plaster applied to exterior walls shall conform to the requirements specified in Chapter 25.

[BS] 1405.16 Fiber-Cement Siding

Fiber-cement siding complying with Section 1404.10 shall be permitted on exterior walls of Type I, II, III, IV and V construction for wind pressure resistance or wind speed exposures as indicated by the manufacturer's listing and *label* and *approved* installation instructions. Where specified, the siding shall be installed over sheathing or materials *listed* in Section 2304.6 and shall be installed to conform to the *water-resistive barrier* requirements in Section 1403. Siding and accessories shall be installed in accordance with *approved* manufacturer's instructions. Unless otherwise specified in the *approved* manufacturer's instructions, nails used to fasten the siding to wood studs shall be corrosion-resistant round head smooth shank and shall be long enough to penetrate the studs at least 1 inch (25 mm). For cold-formed steel light-frame construction, corrosion-resistant fasteners shall be used. Screw fasteners shall penetrate the cold-formed steel framing at least three exposed full threads. Other fasteners shall be installed in accordance with the approved construction documents and manufacturer's instructions.

[BS] 1405.16.1 Panel Siding

Fiber-cement panels shall comply with the requirements of ASTM C1186, Type A, minimum Grade II (or ISO 8336, Category A, minimum Class 2). Panels shall be installed with the long dimension either parallel or perpendicular to framing. Vertical and horizontal joints shall occur over framing members and shall be protected with caulking, with battens or flashing, or be vertical or horizontal shiplap or otherwise designed to comply with Section 1403.2. Panel siding shall be installed with fasteners in accordance with the *approved* manufacturer's instructions.

[BS] 1405.16.2 Lap Siding

Fiber-cement lap siding having a maximum width of 12 inches (305 mm) shall comply with the requirements of ASTM C1186, Type A, minimum Grade II (or ISO 8336, Category A, minimum Class 2). Lap siding shall be lapped a minimum of 1 $\frac{1}{4}$ inches (32 mm) and lap siding not having tongue-and-groove end joints shall have the ends protected with caulking, covered with an H-section joint cover, located over a strip of flashing or shall be otherwise designed to comply with Section 1403.2. Lap siding courses shall be installed with the fastener heads exposed or concealed in accordance with the *approved* manufacturer's instructions.

[BS] 1405.17 Fastening

Weather boarding and wall coverings shall be securely fastened with aluminum, copper, zinc, zinc-coated or other *approved* corrosion-resistant fasteners in accordance with the nailing schedule in Table 2304.10.1, the HVHZ shall comply with Table 2324.1 or the *approved* manufacturer's instructions. Shingles and other weather coverings shall be attached with appropriate standard-shingle nails to furring strips securely nailed to studs, or with *approved* mechanically bonding nails, except where sheathing is of wood not less than 1-inch (25 mm) nominal thickness or of wood structural panels as specified in Section 2301.2 (the HVHZ shall comply with Section 2322).

[BS] 1405.18 Polypropylene Siding

Polypropylene siding conforming to the requirements of this section and complying with Section 1404.12 shall be limited to exterior walls of Type VB construction located in areas where the wind speed specified in Chapter 16 does not exceed 100 miles per hour (45 m/s) and the building height is less than or equal to 40 feet (12 192 mm) in Exposure C. Where construction is located in areas where the basic wind speed exceeds 100 miles per hour (45 m/s), or building heights are in excess of 40 feet (12 192 mm), tests or calculations indicating compliance with

Chapter 16 shall be submitted. Polypropylene siding shall be installed in accordance with the manufacturer's instructions. Polypropylene siding shall be secured to the building so as to provide weather protection for the exterior walls of the building.

[BS] 1405.18.1 Installation

Unless otherwise specified in the approved manufacturer's instructions, polypropylene siding and accessories shall be installed over and attached to wood structural panel sheathing with a minimum thickness of $\frac{7}{16}$ inch (11.1 mm), or another nailable substrate.

[BS] 1405.18.1.1 Accessories

Accessories shall be installed in accordance with the approved manufacturer's instructions.

[BS] 1405.18.1.1.1 Starter Strip

Horizontal siding shall be installed with a starter strip at the initial course at any location.

[BS] 1405.18.1.1.2 Under Windows and Top of Walls

Where nail hem is removed such as under windows and at top of walls, nail slot punch or predrilled holes shall be constructed.

[BS] 1405.18.2 Fastener Requirements

Unless otherwise specified in the approved manufacturer's instructions, nails shall be corrosion resistant, with a minimum 0.120-inch (3 mm) shank and minimum 0.313-inch (8 mm) head diameter. Nails shall be a minimum of $1\frac{1}{4}$ inches (32 mm) long or as necessary to penetrate sheathing or nailable substrate not less than $\frac{3}{4}$ inch (19.1 mm). Where the nail fully penetrates the sheathing or nailable substrate, the end of the fastener shall extend not less than $\frac{1}{4}$ inch (6.4 mm) beyond the opposite face of the sheathing or nailable substrate. The spacing of fasteners shall conform to the approved manufacturer's instructions.

Section 1406 Combustible Materials on the Exterior Side of Exterior Walls

1406.1 General

Section 1406 shall apply to *exterior wall coverings*; balconies and similar projections; and bay and oriel windows constructed of combustible materials.

1406.2 Combustible Exterior Wall Coverings

Combustible *exterior wall coverings* shall comply with this section.

Exception: Plastics complying with Chapter 26.

1406.2.1 Type I, II, III and IV Construction

On buildings of Type I, II, III and IV construction, exterior wall coverings shall be permitted to be constructed of combustible materials, complying with the following limitations:

1. Combustible exterior wall coverings shall not exceed 10 percent of an exterior wall surface area where the fire separation distance is 5 feet (1524 mm) or less.
2. Combustible exterior wall coverings shall be limited to 40 feet (12 192 mm) in height above grade plane.
3. Combustible exterior wall coverings constructed of fire-retardant-treated wood complying with Section 2303.2 for exterior installation shall not be limited in wall surface area where the fire separation distance is 5 feet (1524 mm) or less and shall be permitted up to 60 feet (18 288 mm) in height above grade plane regardless of the fire separation distance.
4. Wood veneers shall comply with Section 1405.5.

1406.2.1.1 Ignition Resistance

Where permitted by Section 1406.2.1, combustible exterior wall coverings shall be tested in accordance with NFPA 268.

Exceptions:

1. Wood or wood-based products.

2. Other combustible materials covered with an exterior weather covering, other than vinyl sidings, included in and complying with the thickness requirements of Table 1405.2.

3. Aluminum having a minimum thickness of 0.019 inch (0.48 mm).

1406.2.1.1.1 Fire Separation 5 Feet or Less

Where installed on exterior walls having a fire separation distance of 5 feet (1524 mm) or less, combustible exterior wall coverings shall not exhibit sustained flaming as defined in NFPA 268.

1406.2.1.1.2 Fire Separation Greater Than 5 Feet

For fire separation distances greater than 5 feet (1524 mm), any exterior wall covering shall be permitted that has been exposed to a reduced level of incident radiant heat flux in accordance with the NFPA 268 test method without exhibiting sustained flaming. The minimum fire separation distance required for the exterior wall covering shall be determined from Table 1406.2.1.1.2 based on the maximum tolerable level of incident radiant heat flux that does not cause sustained flaming of the exterior wall covering.

TABLE 1406.2.1.1.2

MINIMUM FIRE SEPARATION FOR COMBUSTIBLE EXTERIOR WALL COVERINGS

FIRE SEPARATION DISTANCE (feet)	TOLERABLE LEVEL INCIDENT RADIANT HEAT ENERGY (kW/m ²)		FIRE SEPARATION DISTANCE (feet)	TOLERABLE LEVEL INCIDENT RADIANT HEAT ENERGY (kW/m ²)
5	12.5		16	5.9
6	11.8		17	5.5
7	11.0		18	5.2
8	10.3		19	4.9
9	9.6		20	4.6
10	8.9		21	4.4
11	8.3		22	4.1
12	7.7		23	3.9
13	7.2		24	3.7
14	6.7		25	3.5
15	6.3			

For SI: 1 foot = 304.8 mm, 1 Btu/H² × °F = 0.0057 kW/m² × K.

1406.2.2 Location

Combustible exterior wall coverings located along the top of exterior walls shall be completely backed up by the exterior wall and shall not extend over or above the top of the exterior wall.

1406.2.3 Fireblocking

Where the combustible exterior wall covering is furred out from the exterior wall and forms a solid surface, the distance between the back of the exterior wall covering and the exterior wall shall not exceed 1⁵/₈ inches (41 mm). The concealed space thereby created shall be fireblocked in accordance with Section 718.

Exception: The distance between the back of the exterior wall covering and the exterior wall shall be permitted to exceed $1\frac{5}{8}$ inches (41 mm) where the concealed space is not required to be fireblocked by Section 718.

1406.3 Balconies and Similar Projections

Balconies and similar projections of combustible construction other than fire-retardant-treated wood shall be fire-resistance rated where required by Table 601 for floor construction or shall be of heavy timber construction in accordance with Section 2304.11. The aggregate length of the projections shall not exceed 50 percent of the building's perimeter on each floor.

Exceptions:

1. On buildings of Type I and II construction, three stories or less above *grade plane*, *fire-retardant-treated wood* shall be permitted for balconies, porches, decks and exterior stairways not used as required exits.
2. Untreated wood, and plastic composites that comply with ASTM D7032 and Section 2612, are permitted for pickets and rails or similar guardrail devices that are limited to 42 inches (1067 mm) in height.
3. Balconies and similar projections on buildings of Type III, IV and V construction shall be permitted to be of Type V construction, and shall not be required to have a *fire-resistance rating* where sprinkler protection is extended to these areas.
4. Where sprinkler protection is extended to the balcony areas, the aggregate length of the balcony on each floor shall not be limited.

1406.4 Bay and Oriel Windows

Bay and oriel windows shall conform to the type of construction required for the building to which they are attached.

Exception: *Fire-retardant-treated wood* shall be permitted on buildings three stories or less above grade plane of Type I, II, III or IV construction.

Section 1407 Metal Composite Materials (MCM)

1407.1 General

The provisions of this section shall govern the materials, construction and quality of metal composite materials (MCM) for use as *exterior wall coverings* in addition to other applicable requirements of Chapters 14 and 16.

1407.2 Exterior Wall Finish

MCM used as *exterior wall* finish or as elements of balconies and similar projections and bay and oriel windows to provide cladding or weather resistance shall comply with Sections 1407.4 through 1407.14.

1407.3 Architectural Trim and Embellishments

MCM used as architectural *trim* or embellishments shall comply with Sections 1407.7 through 1407.14.

1407.4 Structural Design

MCM systems shall be designed and constructed to resist wind loads as required by Chapter 16 for components and cladding.

1407.5 Approval

Results of *approved* tests or an engineering analysis shall be submitted to the *building official* to verify compliance with the requirements of Chapter 16 for wind loads.

1407.6 Weather Resistance

MCM systems shall comply with Section 1403 and shall be designed and constructed to resist wind and rain in accordance with this section and the manufacturer's installation instructions.

1407.7 Durability

MCM systems shall be constructed of *approved* materials that maintain the performance characteristics required in Section 1407 for the duration of use.

1407.8 Fire-Resistance Rating

Where MCM systems are used on exterior walls required to have a *fire-resistance rating* in accordance with Section 705, evidence shall be submitted to the *building official* that the required *fire-resistance rating* is maintained.

Exception: MCM systems that are part of an exterior wall envelope not containing foam plastic insulation and are installed on the outer surface of a fire-resistance-rated *exterior wall* in a manner such that the attachments do not penetrate through the entire *exterior wall* assembly, shall not be required to comply with this section.

1407.9 Surface-Burning Characteristics

Unless otherwise specified, MCM shall have a *flame spread index* of 75 or less and a smoke-developed index of 450 or less when tested in the maximum thickness intended for use in accordance with ASTM E84 or UL 723.

1407.10 Type I, II, III and IV Construction

Where installed on buildings of Type I, II, III and IV construction, MCMs and MCM systems shall comply with Sections 1407.10.1 through 1407.10.3 for installations up to 40 feet (12 192 mm) above grade plane. Where installed on buildings of Type I, II, III and IV construction, MCMs and MCM systems shall comply with Sections 1407.10.1 through 1407.10.4 for installations greater than 40 feet (12 192 mm) above grade plane.

1407.10.1 Surface-Burning Characteristics

MCM shall have a *flame spread index* of not more than 25 and a smoke-developed index of not more than 450 when tested as an assembly in the maximum thickness intended for use in accordance with ASTM E84 or UL 723.

1407.10.2 Thermal Barriers

MCM shall be separated from the interior of a building by an approved thermal barrier consisting of $\frac{1}{2}$ -inch (12.7 mm) gypsum wallboard or a material that is tested in accordance with and meets the acceptance criteria of both the Temperature Transmission Fire Test and the Integrity Fire Test of NFPA 275.

1407.10.3 Thermal Barrier Not Required

The thermal barrier specified for MCM in Section 1407.10.2 is not required where:

1. The MCM system is specifically approved based on tests conducted in accordance with NFPA 286 and with the acceptance criteria of Section 803.1.2.1, UL 1040 or UL 1715. Such testing shall be performed with the MCM in the maximum thickness intended for use. The MCM system shall include seams, joints and other typical details used in the installation and shall be tested in the manner intended for use.
2. The MCM is used as elements of balconies and similar projections, architectural *trim* or embellishments.

1407.10.4 Full-Scale Tests

The MCM system shall be tested in accordance with, and comply with, the acceptance criteria of NFPA 285. Such testing shall be performed on the MCM system with the MCM in the maximum thickness intended for use.

1407.11

Reserved.

1407.12 Type V Construction

MCM shall be permitted to be installed on buildings of Type V construction.

1407.13 Foam Plastic Insulation

Where MCM systems are included in an exterior wall envelope containing foam plastic insulation, the exterior wall envelope shall also comply with the requirements of Section 2603.

1407.14 Labeling

MCM shall be labeled in accordance with Section 1703.5.

Section 1408 Exterior Insulation and Finish Systems (EIFS)

1408.1 General

The provisions of this section shall govern the materials, construction and quality of exterior insulation and finish systems (EIFS) for use as *exterior wall coverings* in addition to other applicable requirements of Chapters 7, 14, 16, 17 and 26.

1408.2 Performance Characteristics

EIFS shall be constructed such that it meets the performance characteristics required in ASTM E2568.

[BS] 1408.3 Structural Design

The underlying structural framing and substrate shall be designed and constructed to resist loads as required by Chapter 16.

1408.4 Weather Resistance

EIFS shall comply with Section 1403 and shall be designed and constructed to resist wind and rain in accordance with this section and the manufacturer's application instructions.

1408.4.1 EIFS With Drainage

EIFS with drainage shall have an average minimum drainage efficiency of 90 percent when tested in accordance the requirements of ASTM E2273 and is required on framed walls of Type V construction, Group R1, R2, R3 and R4 occupancies.

1408.4.1.1 Water-Resistive Barrier

For EIFS with drainage, the *water-resistive barrier* shall comply with Section 1404.2 or ASTM E2570.

1408.5 Installation

Installation of the EIFS and EIFS with drainage shall be in accordance with the EIFS manufacturer's instructions.

1408.6 Special Inspections

Reserved.

Section 1409 High-Pressure Decorative Exterior-Grade Compact Laminates (HPL)**1409.1 General**

The provisions of this section shall govern the materials, construction and quality of High-Pressure Decorative Exterior-Grade Compact Laminates (HPL) for use as exterior wall coverings in addition to other applicable requirements of Chapters 14 and 16.

1409.2 Exterior Wall Finish

HPL used as exterior wall covering or as elements of balconies and similar projections and bay and oriel windows to provide cladding or weather resistance shall comply with Sections 1409.4 and 1409.14.

1409.3 Architectural Trim and Embellishments

HPL used as architectural trim or embellishments shall comply with Sections 1409.7 through 1409.14.

[BS] 1409.4 Structural Design

HPL systems shall be designed and constructed to resist wind loads as required by Chapter 16 for components and cladding.

1409.5 Approval

Results of approved tests or an engineering analysis shall be submitted to the building official to verify compliance with the requirements of Chapter 16 for wind loads.

1409.6 Weather Resistance

HPL systems shall comply with Section 1403 and shall be designed and constructed to resist wind and rain in accordance with this section and the manufacturer's instructions.

1409.7 Durability

HPL systems shall be constructed of approved materials that maintain the performance characteristics required in Section 1409 for the duration of use.

1409.8 Fire-Resistance Rating

Where HPL systems are used on exterior walls required to have a *fire-resistance rating* in accordance with Section 705, evidence shall be submitted to the building official that the required *fire-resistance rating* is maintained.

Exception: HPL systems not containing foam plastic insulation, which are installed on the outer surface of a fire-resistance-rated exterior wall in a manner such that the attachments do not penetrate through the entire exterior wall assembly, shall not be required to comply with this section.

1409.9 Surface-Burning Characteristics

Unless otherwise specified, HPL shall have a flame spread index of 75 or less and a smoke-developed index of 450 or less when tested in the minimum and maximum thicknesses intended for use in accordance with ASTM E84 or UL 723.

1409.10 Type I, II, III and IV Construction

Where installed on buildings of Type I, II, III and IV construction, HPL systems shall comply with Sections 1409.10.1 through 1409.10.4, or Section 1409.11.

1409.10.1 Surface-Burning Characteristics

HPL shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 450 when tested in the minimum and maximum thicknesses intended for use in accordance with ASTM E84 or UL 723.

1409.10.2 Thermal Barriers

HPL shall be separated from the interior of a building by an approved thermal barrier consisting of $\frac{1}{2}$ -inch (12.7 mm) gypsum wallboard or a material that is tested in accordance with and meets the acceptance criteria of both the Temperature Transmission Fire Test and the Integrity Fire Test of NFPA 275.

1409.10.3 Thermal Barrier Not Required

The thermal barrier specified for HPL in Section 1409.10.2 is not required where:

1. The HPL system is specifically approved based on tests conducted in accordance with NFPA 286, and with the acceptance criteria of Section 803.1.2.1, or with UL 1040 or UL 1715. Such testing shall be performed with the HPL in the minimum and maximum thicknesses intended for use. The HPL system shall include seams, joints and other typical details used in the installation and shall be tested in the manner intended for use.
2. The HPL is used as elements of balconies and similar projections, architectural *trim* or embellishments.

1409.10.4 Full-Scale Tests

The HPL system shall be tested in accordance with, and comply with, the acceptance criteria of NFPA 285. Such testing shall be performed on the HPL system with the HPL in the minimum and maximum thicknesses intended for use.

1409.11 Alternate Conditions

HPL and HPL systems shall not be required to comply with Sections 1409.10.1 through 1409.10.4 provided such systems comply with Section 1409.11.1.

1409.11.1 Installations Up to 40 Feet in Height

HPL shall be permitted to be installed up to 40 feet (12 190 mm) in height above grade plane where installed in accordance with Section 1409.11.1.1 or 1409.11.1.2.

1409.11.1.1 Fire Separation Distance of 5 Feet or Less

Where the fire separation distance is 5 feet (1524 mm) or less, the area of HPL shall not exceed 10 percent of the exterior wall surface.

1409.11.1.2 Fire Separation Distance Greater Than 5 Feet

Where the fire separation distance is greater than 5 feet (1524 mm), there shall be no limit on the area of exterior wall surface coverage using HPL.

1409.12 Type V Construction

HPL shall be permitted to be installed on buildings of Type V construction.

1409.13 Foam Plastic Insulation

HPL systems containing foam plastic insulation shall also comply with the requirements of Section 2603.

1409.14 Labeling

HPL shall be labeled in accordance with Section 1703.5.

Section 1410 Soffits and Fascias at Roof Overhangs

1410.1 General

Soffits and fascias at roof overhangs shall be designed and constructed in accordance with the applicable provisions of this section.

1410.2 General Wind Requirements

Soffits and fascias shall be capable of resisting the component and cladding loads for walls determined in accordance with Chapter 16 using an effective wind area of 10 square feet (0.93 m^2).

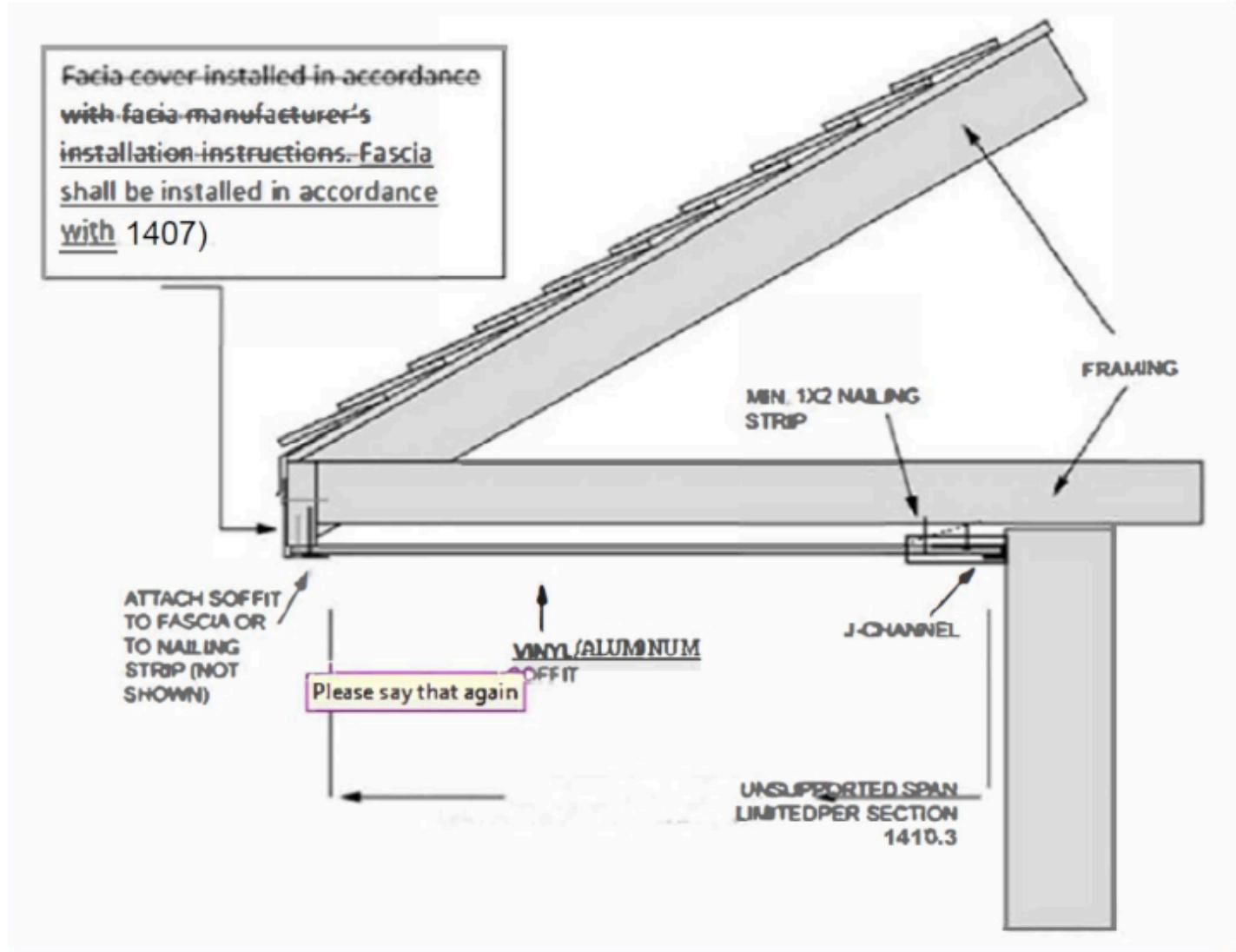


FIGURE 1410.2(1)

TYPICAL SINGLE-SPAN VINYL OR ALUMINUM SOFFIT PANEL SUPPORT

1410.3 Vinyl and Aluminum Soffit Panels

Vinyl and aluminum soffit panels shall comply with Section 1410.2 and shall be installed using fasteners specified by the manufacturer and shall be fastened at both ends to a supporting component such as a nailing strip, fascia or subfascia component in accordance with Figure

1410.3(1). Where the unsupported span of soffit panels is greater than 12 inches (406 mm), intermediate nailing strips shall be provided in accordance with Figure 1410.3(2) unless a larger span is permitted in accordance with the manufacturer's product approval specification and limitations of use. Vinyl and aluminum soffit panels shall be installed in accordance with the manufacturer's product approval specification and limitations of use. Fasteners shall be corrosion resistant. Fascias shall comply with Section 1410.7 and the manufacturer's product approval specification and limitations of use. In the HVHZ, vinyl and aluminum soffit panels shall also comply with TAS 202 and TAS 203.

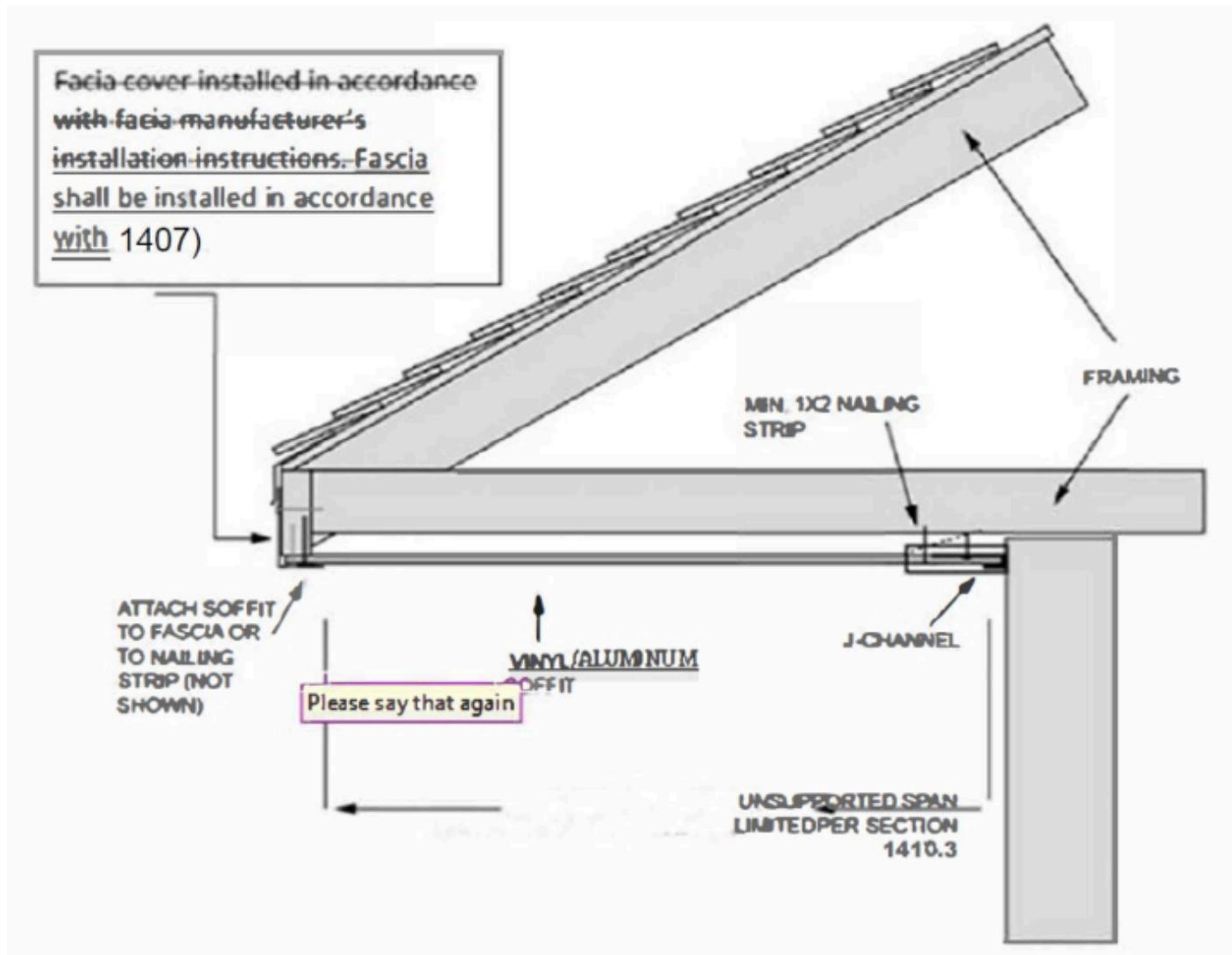


FIGURE 1410.3(1)

TYPICAL DOUBLE-SPAN VINYL OR ALUMINUM SOFFIT PANEL SUPPORT

1410.4 Fiber-Cement Soffit Panels

Fiber-cement soffit panels shall comply with Section 1410.2 and shall be a minimum of $\frac{1}{4}$ inch (6.4 mm) in thickness and comply with the requirements of ASTM C1186, Type A, minimum Grade II, or ISO 8336, Category A, minimum Class 2. Panel joints shall occur over framing or over wood structural panel sheathing. Soffit panels shall be installed with spans and fasteners in accordance with the manufacturer's product approval specification and limitations of use. Fasteners shall be corrosion resistant. In the HVHZ, fiber-cement soffit panels shall also comply with TAS 202 and TAS 203.

1410.5 Hardboard Soffit Panels

Hardboard soffit panels shall comply with Section 1410.2 and shall be not less than $\frac{7}{16}$ inch (11.11 mm) in thickness and fastened to framing or nailing strips to meet the required design wind pressures. Where the design wind pressure is 30 psf (1.44 kPa) and less, hardboard soffit panels are permitted to be attached to wood framing with $2\frac{1}{2}$ -inch by 0.113-inch (64 mm by 2.9 mm) siding nails spaced not more than 6 inches (152 mm) on center at panel edges and 12 inches (305 mm) on center at intermediate supports. Where the design wind pressure is greater than 30 psf (1.44 kPa), hardboard soffit panels shall be installed in accordance with the manufacturer's product approval specification

and limitations of use. Fasteners shall be corrosion resistant. In the HVHZ, hardboard soffit panels shall also comply with TAS 202 and TAS 203.

1410.6 Wood Structural Panel Soffit

Wood structural panel soffits shall comply with Section 1410.2 and shall have a minimum panel performance category of $\frac{3}{8}$. Fasteners shall be corrosion resistant. Alternatively, wood structural panel soffits are permitted to attached to wood framing in accordance with Table 1410.6.

TABLE 1410.6

PRESCRIPTIVE ALTERNATE FOR WOOD STRUCTURAL PANEL SOFFIT^{b, c, d, e}

MAXIMUM DESIGN PRESSURE (- or + psf)	MINIMUM PANEL SPAN RATING	MINIMUM PANEL PERFORMANCE CATEGORY	NAIL TYPE AND SIZE (inches)	FASTENER ^a SPACING ALONG EDGES AND INTERMEDIATE SUPPORTS (inches)	
				GALVANIZED STEEL	STAINLESS STEEL
30	24/0	3/8	6d box ($2 \times 0.099 \times 0.266$ head diameter)	6 ^f	4
40	24/0	3/8	6d box ($2 \times 0.099 \times 0.266$ head diameter)	6	4
50	24/0	3/8	6d box ($2 \times 0.099 \times 0.266$ head diameter)	4	4
			8d common ($2\frac{1}{2} \times 0.131 \times 0.281$ head diameter)	6	6
60	24/0	3/8	6d box ($2 \times 0.099 \times 0.266$ head diameter)	4	3
			8d common ($2\frac{1}{2} \times 0.131 \times 0.281$ head diameter)	6	4
70	24/16	7/16	8d common ($2\frac{1}{2} \times 0.131 \times 0.281$ head diameter)	4	4
			10d box ($3 \times 0.128 \times 0.312$ head diameter)	6	4
80	24/16	7/16	8d common ($2\frac{1}{2} \times 0.131 \times 0.281$ head diameter)	4	4
			10d box ($3 \times 0.128 \times 0.312$ head diameter)	6	4
90	32/16	15/32	8d common ($2\frac{1}{2} \times 0.131 \times 0.281$ head diameter)	4	3
			10d box ($3 \times 0.128 \times 0.312$ head diameter)	6	4

For SI: 1 inch = 25.4 mm, 1 foot = 304.5 mm, 1 pound per square foot = 0.0479 kW/m².

- a. Fasteners shall comply with Section 1410.6.
- b. Maximum spacing of soffit framing members shall not exceed 24 inches.
- c. Wood structural panels shall be of an exterior exposure grade.
- d. Wood structural panels shall be installed with strength axis perpendicular to supports with a minimum of two continuous spans.

- e. Wood structural panels shall be attached to soffit framing members with specific gravity of at least 0.42. Framing members shall be minimum 2 × 3 nominal with the larger dimension in the cross section aligning with the length of fasteners to provide sufficient embedment depths.
- f. Spacing at intermediate supports is permitted to be 12 inches on center.

1410.7 Aluminum Fascia

Aluminum fascia shall have a minimum thickness of 0.019 inches and be installed per the manufacturer's instructions and this code. Fasteners shall be aluminum or stainless steel. Aluminum fascia shall be attached in accordance with Section 1410.7.1, 1410.7.2 or 1410.7.3. The drip edge shall comply with 1507.2.9.3, and the thickness of the drip edge shall be in accordance with Table 1503.2.

1410.7.1 Fascia Installation Where the Design Wind Pressure Is 30 psf or Less

Where the design wind pressure is 30 psf (1.44 kPa) or less, aluminum fascia shall be attached as follows:

1. Finish nails shall be provided in the return leg ($1\frac{1}{4}$ " × 0.057" × 0.177" head diameter) spaced a maximum of 24 inches (610 mm) on center.
2. The fascia shall be inserted under the drip edge with not less than half the height of the drip edge or 1 inch (25 mm), whichever is greater, of the fascia material covered by the drip edge. One finish nail shall be centered in the face of the fascia from each end of the fascia material section located no more than 1 inch below the drip edge.

1410.7.2

Where the design wind pressure is greater than 30 pounds per square foot (1.44 kPa), aluminum fascia shall be attached with one a finish nail [$1\frac{1}{4}$ inches by 0.57 inch by 0.177 inch head diameter (32 mm × 14.5 mm × 4.5 mm)] in the return leg spaced a maximum of 16 inches (406 mm) on center. The fascia shall be inserted under the drip edge with not less than half the height of the drip edge or 1.0 inch (25 mm), whichever is greater, of the fascia material covered by the drip edge. And one of the following additional attachments:

1. One finish nail shall be centered in the face of the fascia from each end of the fascia material section located no more than 1 inch (25mm) below the drip edge.
2. Top edge of the fascia is secured using utility trim installed beneath the drip edge with snap locks punched into the fascia spaced not more than 6 inches (152 mm) on center, or
3. An approved adhesive applied to the inside of the fascia cover or onto the exterior face of the subfascia framing member.

1410.7.2.1 Fascia Installation Where the Design Wind Pressure Is 30 psf or Less

Where the design wind pressure is 30 pounds per square foot (1.44 kPa) or less, aluminum fascia shall be attached as follows:

1. Finish nails shall be provided in the return leg ($1\frac{1}{4}$ " × 0.057" × 0.177" head diameter) spaced a maximum of 24 inches (610 mm) on center, and
2. The fascia shall be inserted under the drip edge with not less than half the height of the drip edge or 1.0 inch (25 mm), whichever is greater, of the fascia material covered by the drip edge. One finish nail shall be centered in the face of the fascia from each end of the fascia material section located no more than 1 inch below the drip edge.

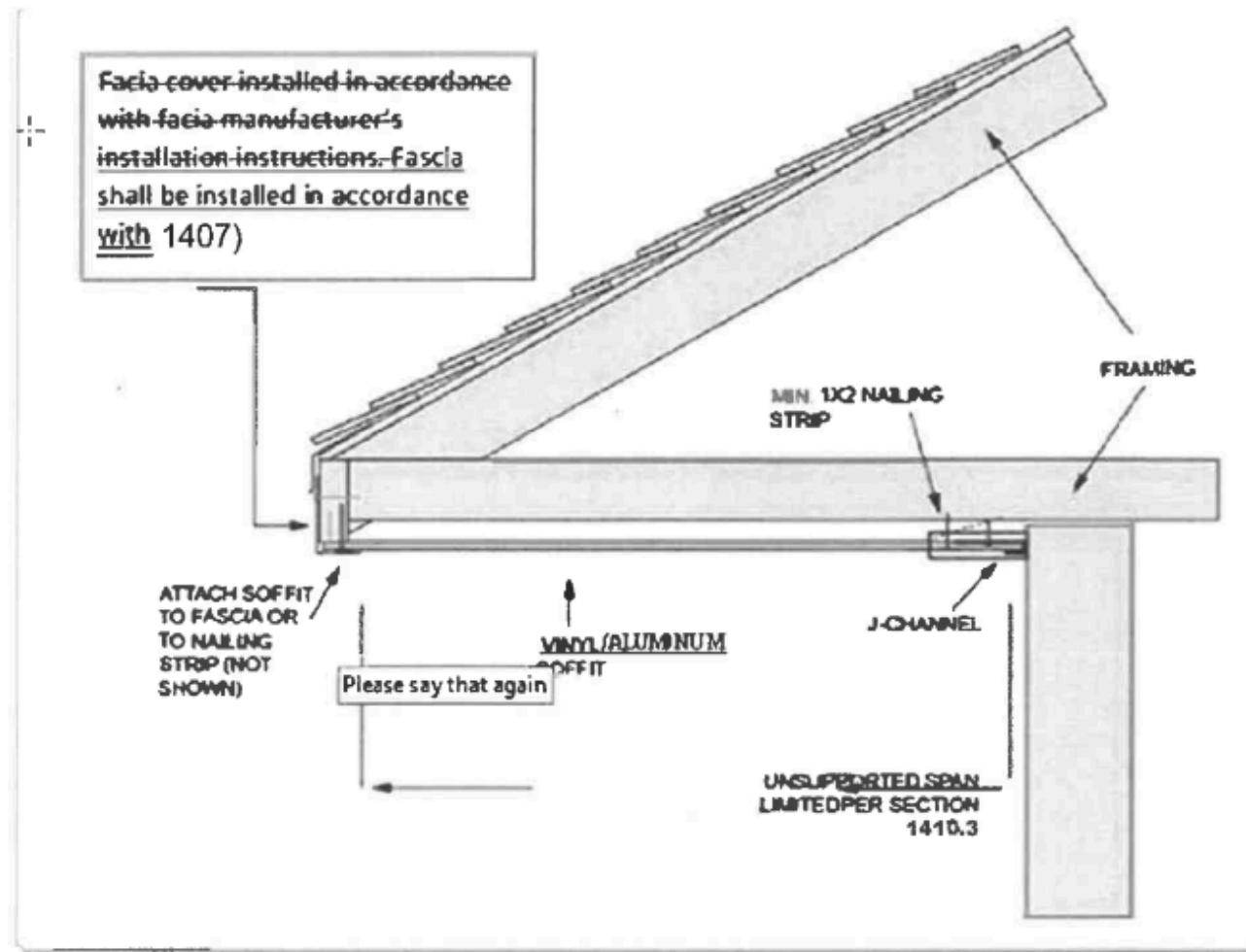


FIGURE 1410.2(1) TYPICAL SINGLE-SPAN VINYL OR ALUMINUM SOFFIT PANEL SUPPORT

1410.7.2.2

Where the height of the fascia from the top of the roof sheathing to the bottom of the sub-fascia plus any thickness of soffit material below the sub-fascia is greater than 6.5 inches (165 mm), the top edge of the fascia shall be secured using utility trim installed beneath the drip edge with snap locks punched into the fascia spaced no more than 6 inches (152 mm) on center.

1410.7.3 Fascia Installation Where the Design Wind Pressure Exceeds 60 psf

Where the design wind pressure is greater than 60 psf (2.88 kPa), aluminum fascia shall be attached in accordance with Section 1410.7.3.1 or 1410.7.3.2.

1410.7.3.1

Where the height of the fascia from the top of the roof sheathing to the bottom of the sub-fascia plus any thickness of soffit material below the sub-fascia is less than or equal to 4.5 inches (114 mm) or less aluminum fascia shall be attached as follows:

1. Finish nails shall be provided in the return leg ($1\frac{1}{4}'' \times 0.057'' \times 0.177''$ head diameter) spaced a maximum of 16 inches (406 mm) on center.
2. The fascia shall be inserted under the drip edge with not less than half the height of the drip edge or 1 inch (25 mm), whichever is greater, of the fascia material covered by the drip edge. One finish nail shall be centered in the face of the fascia from each end of the fascia material section located no more than 1 inch below the drip edge.

1410.7.3.2

Where the height of the fascia from the top of the roof sheathing to the bottom of the sub-fascia plus any thickness of soffit material below the sub-fascia is greater than 4.5 inches (114 mm), the top edge of the fascia shall be secured using utility trim installed beneath

the drip edge with snap locks punched into the fascia spaced no more than 6 inches (152 mm) on center.

1410.7.4 Corners on Hip Roofs

Fascia shall be bent around corners and extend at least 12 inches (305 mm) beyond the corner. The next fascia material section shall overlap the extension a minimum of 3 inches (76 mm) and be fastened through the return leg at the overlap.

1410.7.5 Corners on Gable Roofs

Fascia shall be wrapped (tabbed) around and extend at least 1 inch (25 mm) beyond the corner. The gable fascia material section shall overlap the tab and be fastened through the fascia cover and the tab at the end with two face nails ($1\frac{1}{4}$ " x 0.057" x 0.177" head diameter) for a 2 × 4-inch sub-fascia and three face nails for 2 × 6-inch and greater sub fascia.

Section 1411 Plastic Composite Decking

1411.1 Plastic Composite Decking

Exterior deck boards, stair treads, handrails and guard systems constructed of plastic composites, including plastic lumber, shall comply with Section 2612.

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Chapter 15 Roof Assemblies and Rooftop Structures

Section 1501 General

1501.1 Scope

The provisions of this chapter shall govern the design, materials, construction and quality of roof assemblies, and rooftop structures.

Exception: Buildings and structures located within the high-velocity hurricane zone shall comply with the provisions of Section 1503.7, Section 1507.18.1 and Sections 1512 through 1525.

Section 1502 Definitions

1502.1 Definitions

The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

AGGREGATE. In roofing, crushed stone, crushed slag or water-worn gravel used for surfacing for roof coverings.

BALLAST. In roofing, ballast comes in the form of large stones or paver systems or light-weight interlocking paver systems and is used to provide uplift resistance for roofing systems that are not adhered or mechanically attached to the roof deck.

BUILDING INTEGRATED PHOTOVOLTAIC ROOFING. A roofing product consisting of electricity generating photovoltaic component integrated into a roof covering.

BUILT-UP ROOF COVERING. Two or more layers of felt cemented together and surfaced with a cap sheet, mineral aggregate, smooth coating or similar surfacing material.

FLASHING. The roofing component used to seal roofing systems, where the system is interrupted or terminated.

INTERLAYMENT. A layer of felt or nonbituminous saturated felt not less than 18 inches (457 mm) wide, shingled between each course of a wood-shake roof covering.

MECHANICAL EQUIPMENT SCREEN. A partially enclosed *rooftop structure* used to aesthetically conceal heating, ventilating and air conditioning (HVAC) electrical or mechanical equipment from view.

METAL ROOF PANEL. An interlocking metal sheet having a minimum installed weather exposure of 3 square feet (0.279 m²) per sheet.

METAL ROOF SHINGLE. An interlocking metal sheet having an installed weather exposure less than 3 square feet (0.279 m²) per sheet.

MODIFIED BITUMEN ROOF COVERING. One or more layers of polymer-modified asphalt sheets. The sheet materials shall be fully adhered or mechanically attached to the substrate or held in place with an *approved* ballast layer.

PENTHOUSE. An enclosed, unoccupied structure above the roof of a building, other than a tank, tower, spire, dome cupola or bulkhead.

PHOTOVOLTAIC MODULE. A complete, environmentally protected unit consisting of solar cells, optics and other components, exclusive of tracker, designed to generate DC power when exposed to sunlight.

PHOTOVOLTAIC PANEL. A collection of modules mechanically fastened together, wired and designed to provide a field-installable unit.

PHOTOVOLTAIC PANEL SYSTEM. A system that incorporates discrete photovoltaic panels, that converts solar radiation into electricity, including rack support systems.

POSITIVE ROOF DRAINAGE. The drainage condition in which consideration has been made for all loading deflections of the roof deck, and additional slope has been provided to ensure drainage of the roof within 48 hours of precipitation.

RADIANT BARRIER. A material having a low-emittance surface of 0.1 or less installed in building assemblies.

REROOFING. The process of recovering or replacing an existing roof covering. See "Roof recover" and "Roof replacement."

ROOF ASSEMBLY. A system designed to provide weather protection and resistance to design loads. The system consists of a roof covering and roof deck or a single component serving as both the roof covering and the roof deck. A roof assembly includes the roof covering, roof

deck, and may include a *vapor retarder*, thermal barrier, insulation or similar substrate.

ROOF COVERING. The covering applied to the roof deck for weather resistance, fire classification or appearance.

ROOF DECK. The flat or sloped surface not including its supporting members or vertical supports.

ROOF RECOVER. The process of installing an additional roof covering over a prepared existing roof covering without removing the existing roof covering.

ROOF REPAIR. Reconstruction or renewal of any part of an existing roof for the purposes of its maintenance.

ROOF REPLACEMENT. The process of removing the existing roof covering, repairing any damaged substrate and installing a new roof covering.

ROOF SECTION. A separation or division of a roof area by existing joints, parapet walls, flashing (excluding valleys), difference of elevation (excluding hips and ridges), roof type or legal description; not including the roof area required for a proper tie-off with an existing system.

ROOF SYSTEM. A roof system consists of a roof covering and other interacting roofing components and may include a vapor retarder, thermal barrier, insulation or other similar substrate. The system does not include the roof deck unless it is part of a single component serving as the roof covering and the roof deck.

ROOF VENTILATION. The natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, attics, cathedral ceilings or other enclosed spaces over which a roof assembly is installed.

ROOFTOP STRUCTURE. An enclosed structure on or above the roof of any part of a building.

SCUPPER. An opening in a wall or parapet that allows water to drain from a roof.

SINGLE-PLY MEMBRANE. A roofing membrane that is field applied using one layer of membrane material (either homogeneous or composite) rather than multiple layers.

UNDERLAYMENT. One or more layers of felt, sheathing paper, nonbituminous saturated felt or other *approved* material over which a steep-slope roof covering is applied.

VEGETATIVE ROOF. An assembly of interacting components designed to waterproof and normally insulate a building's top surface that includes, by design, vegetation and related landscape elements.

Section 1503 Weather Protection

1503.1 General

Roof decks shall be covered with *approved* roof coverings secured to the building or structure in accordance with the provisions of this chapter. Roof coverings shall be designed in accordance with this code, and installed in accordance with this code and the manufacturer's approved instructions such that the roof covering shall serve to protect the building or structure.

1503.2 Flashing

Flashing shall be used to seal roofing systems, where the system is interrupted or terminated and shall be installed in such a manner so as to prevent moisture entering the wall and roof through joints in copings, through moisture-permeable materials and at intersections with parapet walls and other penetrations through the roof plane.

TABLE 1503.2

METAL FLASHING MATERIAL

MATERIAL	MINIMUM THICKNESS (INCHES)	GAGE	WEIGHT (LBS PER SQ FT)
Copper			1 (16 oz)
Aluminum	0.024		
Stainless Steel		28	

Galvanized Steel	0.0179	26 (zinc coated G90)	
Aluminum Zinc Coated Steel	0.0179	26 (AZ50 Alum Zinc)	
Zinc Alloy	0.027		
Lead			2.5 (40 oz)
Painted Terne			1.25 (20 oz)

1503.2.1 Locations

Flashing shall be installed at wall and roof intersections, at gutters, wherever there is a change in roof slope or direction and around roof openings. Where flashing is of metal, the metal shall be corrosion resistant with a thickness of not less than provided in Table 1503.2 or in compliance with RAS 111.

Exception: This requirement does not apply to hip and ridge junctions.

1503.3 Coping

Parapet walls shall be properly sealed with weatherproof materials. When coping is used, it shall be of noncombustible materials of a width no less than the thickness of the parapet wall.

[P] 1503.4 Roof Drainage

Unless roofs are sloped to drain over roof edges, design and installation of roof drainage systems shall comply with Section 1503 and the *Florida Building Code, Plumbing*, Chapter 11.

[P] 1503.4.1 Secondary (Emergency Overflow) Drains or Scuppers

Where roof drains are required, secondary (emergency overflow) roof drains or scuppers shall be provided where the roof perimeter construction extends above the roof in such a manner that water will be entrapped if the primary drains allow buildup for any reason. The installation and sizing of secondary emergency overflow drains, leaders and conductors shall comply with Sections 1106 and 1107, as applicable, of the *Florida Building Code, Plumbing*, Chapter 11.

1503.4.2 Scuppers

Where required for roof drainage, a scupper shall be placed level with the roof surface in a wall or parapet. The scupper shall be located as determined by the slope and the contributing area of the roof. The exterior facing or lining of a scupper, if metal, shall be the same as flashing material required by Sections 1503 through 1510 for the particular type of covering specified for the building. For other type materials, follow manufacturer's specifications.

1503.4.2.1 Overflow Scuppers

When other means of drainage of overflow water is not provided, overflow scuppers shall be placed in walls or parapets not less than 2 inches (51 mm) nor more than 4 inches (102 mm) above the finished roof covering and shall be located as close as practical to required vertical leaders or downspouts or wall and parapet scuppers. An overflow scupper shall be sized in accordance with the *Florida Building Code, Plumbing*.

1503.4.3 Gutters

Gutters and leaders placed on the outside of buildings, other than Group R-3, private garages and buildings of Type V construction, shall be of noncombustible material or a minimum of Schedule 40 plastic pipe.

1503.5 Roof Ventilation

Attic ventilation shall be provided in accordance with Section 1203.2 and the vent product manufacturer's installation instructions.

1503.6 Crickets and Saddles

A cricket or saddle shall be installed on the ridge side of any chimney or penetration greater than 30 inches (762 mm) wide as measured perpendicular to the slope. Cricket or saddle coverings shall be sheet metal or of the same material as the roof covering.

Exception: Unit skylights installed in accordance with Section 2405.5 and flashed in accordance with the manufacturer's instructions shall be permitted to be installed without a cricket or saddle.

1503.7 Protection Against Decay and Termites

Condensate lines and roof downspouts shall discharge at least 1 foot (305 mm) away from the structure sidewall, whether by underground piping, tail extensions, or splash blocks. Gutters with downspouts are required on all buildings with eaves of less than 6 inches (152 mm) horizontal projection except for gable end rakes or on a roof above another roof.

Section 1504 Performance Requirements

1504.1 Wind Resistance of Roofs

Roof decks and roof coverings shall be designed for wind loads in accordance with Chapter 16 and Sections 1504.2, 1504.3 and 1504.4.

1504.1.1 Wind Resistance of Asphalt Shingles

Asphalt shingles shall be designed for wind speeds in accordance with Section 1507.2.7.

1504.2 Wind Resistance of Clay and Concrete Tile

Wind loads on clay and concrete tile roof coverings shall be in accordance with Section 1609.6.

1504.2.1 Testing

Testing of concrete and clay tile roof coverings shall be in accordance with Sections 1504.2.1.1, 1504.2.1.2, and 1504.2.1.3. Testing of underlayment or underlayment assembly for clay and concrete tile roof coverings shall be in accordance with Section 1504.2.1.4.

1504.2.1.1 Overturning Resistance

Concrete and clay roof tiles shall be tested to determine their resistance to overturning due to wind in accordance with SBCCI SSTD 11 and Chapter 15.

1504.2.1.2 Wind Tunnel Testing

Where concrete and clay roof tiles do not satisfy the limitations in Chapter 16 for rigid tile, a wind tunnel test shall be used to determine the wind characteristics of the concrete or clay tile roof covering in accordance with Chapter 15 and either SBCCI SSTD 11 or ASTM C1569.

1504.2.1.3 Air Permeability Testing

The lift coefficient for concrete and clay tile shall be 0.2 or shall be determined in accordance with SBCCI SSTD 11 or ASTM C1570.

1504.2.1.4 Underlayment Testing

Adhered or mechanically attached tile underlayment or underlayment assemblies shall be tested in accordance with FM 4474 or UL 1897.

1504.3 Wind Resistance of Nonballasted Roofs

Roof coverings installed on roofs in accordance with Section 1507 that are mechanically attached or adhered to the roof deck shall be designed to resist the design wind load pressures for components and cladding in accordance with Section 1609.

1504.3.1 Other Roof Systems

Built-up, modified bitumen, fully adhered or mechanically attached single-ply roof systems, metal panel roof systems applied to a solid or closely fitted deck and other types of membrane roof coverings shall be tested in accordance with FM 4474, UL 580 or UL 1897.

1504.3.2 Metal Panel Roof Systems

Metal panel roof system through fastened or standing seam shall be tested in accordance with UL 580 or ASTM E1592 or TAS 125.

Exceptions: Metal roofs constructed of cold-formed steel, where the roof deck acts as the roof covering and provides both weather protection and support for structural loads, shall be permitted to be designed and tested in accordance with the applicable referenced structural design standard in Section 2210.1.

1504.3.3 Metal Roof Shingles

Metal roof shingles applied to a solid or closely fitted deck shall be tested in accordance with FM 4474, UL 580, UL 1897, ASTM D3161 or TAS 107. Metal roof shingles tested in accordance with ASTM D3161 shall meet the classification requirements of Table 1504.3.3 for the appropriate maximum basic wind speed and the metal shingle packaging shall bear a label to indicate compliance with ASTM D3161 and the required classification in Table 1504.3.3.

TABLE 1504.3.3**CLASSIFICATION OF METAL ROOF SHINGLES TESTED IN ACCORDANCE WITH ASTM D3161**

MAXIMUM BASIC WIND SPEED FROM FIGURE 1609.3(1), FIGURE 1609.3(2), FIGURE 1609.3(3), FIGURE 1609.3(4) or ASCE 7	V_{asd}	ASTM D3161
110	85	D or F
116	90	D or F
129	100	D or F
142	110	F
155	120	F
168	130	F
181	140	F
194	150	F

1504.4 Ballasted Low-Slope Single-Ply Roof Systems

Ballasted low-slope (roof slope < 2:12) single-ply roof system coverings installed in accordance with Sections 1507.12 and 1507.13 shall be designed in accordance with ANSI/SPRI RP-4.

1504.5 Edge Systems for Low-Slope Roofs

Metal edge systems, except gutters and counterflashing, installed on buildup, modified bitumen and single-ply roof systems having a slope less than 2:12, shall be designed and installed for wind loads in accordance with Chapter 16 and tested for resistance in accordance with Test Methods RE-1, RE-2 and RE-3 of ANSI/SPRI ES-1, or RAS 111 except V_{ult} wind speed shall be determined from Figure 1609.3(1), 1609.3(2), 1609.3(3) or 1609.3(4) as applicable.

1504.5.1 Gutter Securement for Low-Slope Roofs

Gutters that are used to secure the perimeter edge of the roof membrane on low-slope (less than 2:12 slope) built-up, modified bitumen and single-ply roofs, shall be designed, constructed and installed to resist wind loads in accordance with Section 1609 and shall be tested in accordance with Test Methods G-1 and G-2 of SPRI GT-1.

1504.6 Physical Properties

Roof coverings installed on low-slope roofs (roof slope < 2:12) in accordance with Section 1507 shall demonstrate physical integrity over the working life of the roof based upon 2,000 hours of exposure to accelerated weathering tests conducted in accordance with ASTM G152, ASTM G153, ASTM G154 or ASTM G155. Those roof coverings that are subject to cyclical flexural response due to wind loads shall not demonstrate any significant loss of tensile strength for unreinforced membranes or breaking strength for reinforced membranes when tested as herein required.

1504.7 Impact Resistance

Roof coverings installed on low-slope roofs (roof slope < 2:12) in accordance with Section 1507 shall resist impact damage based on the results of tests conducted in accordance with ASTM D3746, ASTM D4272 or the "Resistance to Foot Traffic Test" of FM 4470. All structural metal roofing systems having a thickness equal to or greater than 22 gage and all nonstructural metal roof systems having a thickness equal to or greater than 26 gage shall be exempt from the tests listed above.

1504.8 Aggregate

Aggregate shall be permitted as roof surfacing when installed on slopes of 3:12 or less, not less than 400 pound (182 kg) of roofing gravel or 300 pounds (145 kg) of slag per square shall be applied. A minimum of 50 percent of the total aggregate shall be embedded in the flood coat of bitumen or installed in accordance with its product approval. Aggregate shall be dry and free from dirt and shall be in compliance with the sizing requirements set forth in ASTM D1863. A building official may request a test to confirm compliance with these requirements.

Table 1504.8 Maximum Allowable Mean Roof Height Permitted for Buildings with Aggregate on the Roof in Areas Outside a Hurricane-Prone Region. Reserved.

1504.9 Margin of Safety

A margin of safety of 2:1 shall be applied to all wind-uplift resistance-test results except when a margin of safety is specified in the test standard.

Exception: Asphalt shingles testing resulting in a miles per hour rating as required in Section 1507.2.7.

Section 1505 Fire Classification

[BF] 1505.1 General

Fire classification of roof assemblies shall be in accordance with Section 1505. The minimum fire classification of roof assemblies installed on buildings shall comply with Table 1505.1 based on type of construction of the building. Class A, B and C roof assemblies and roof coverings required to be listed by this section shall be tested in accordance with ASTM E108 or UL 790. In addition, *fire-retardant-treated wood* roof coverings shall be tested in accordance with ASTM D2898.

Exception: Skylights and sloped glazing that comply with Chapter 24 or Section 2610.

TABLE 1505.1^{a, b}

MINIMUM ROOF ASSEMBLY CLASSIFICATION FOR TYPES OF CONSTRUCTION

IA	IB	IIA	IIB	IIIA	IIIB	IV	VA	VB
B	B	B	C ^c	B	C ^c	B	B	C ^c

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m².

- a. Unless otherwise required in accordance with the *International Wildland-Urban Interface Code* or due to the location of the building within a fire district in accordance with Appendix D.
- b. Nonclassified roof assemblies shall be permitted on buildings of Group U occupancies, where there is a minimum fire-separation distance of 6 feet measured from the leading edge of the roof.
- c. Buildings that are not more than two stories above grade plane and having not more than 6,000 square feet of projected roof area and where there is a minimum 10-foot fire-separation distance from the leading edge of the roof to a lot line on all sides of the building, except for street fronts or public ways, shall be permitted to have roofs of No. 1 cedar or redwood shakes and No. 1 shingles constructed in accordance with Section 1505.7.

[BF] 1505.2 Class A Roof Assemblies

Class A roof assemblies are those that are effective against severe fire test exposure. Class A roof assemblies and roof coverings shall be *listed* and identified as Class A by an *approved* testing agency. Class A roof assemblies shall be permitted for use in buildings or structures of all types of construction.

Exceptions:

1. Class A roof assemblies include those with coverings of brick, masonry or an exposed concrete roof deck.

2. Class A roof assemblies also include ferrous or copper shingles or sheets, metal sheets and shingles, clay or concrete roof tile or slate installed on noncombustible decks or ferrous, copper or metal sheets installed without a roof deck on noncombustible framing.
3. Class A roof assemblies include minimum 16 ounce per square foot (0.0416 kg/m^2) copper sheets installed over combustible decks.
4. Reserved.

[BF] 1505.3 Class B Roof Assemblies

Class B roof assemblies are those that are effective against moderate fire-test exposure. Class B roof assemblies and roof coverings shall be *listed* and identified as Class B by an *approved* testing agency.

[BF] 1505.4 Class C Roof Assemblies

Class C roof assemblies are those that are effective against light fire-test exposure. Class C roof assemblies and roof coverings shall be *listed* and identified as Class C by an *approved* testing agency.

[BF] 1505.5 Nonclassified Roofing

Nonclassified roofing is *approved* material that is not *listed* as a Class A, B or C roof covering.

[BF] 1505.6 Fire-Retardant-Treated Wood Shingles and Shakes

Fire-retardant-treated wood shingles and shingles shall be treated by impregnation with chemicals by the full-cell vacuum-pressure process, in accordance with AWPA C1. Each bundle shall be marked to identify the manufactured unit and the manufacturer, and shall also be *labeled* to identify the classification of the material in accordance with the testing required in Section 1505.1, the treating company and the quality control agency.

[BF] 1505.7 Special Purpose Roofs

Reserved.

1505.8 Building-Integrated Photovoltaic Products

Building-integrated photovoltaic products installed as the roof covering shall be tested, *listed* and *labeled* for fire classification in accordance with Section 1505.1.

1505.9 Rooftop-Mounted Photovoltaic Panel Systems

Rooftop-mounted *photovoltaic panel systems* shall be tested, *listed* and identified with a fire classification in accordance with UL 1703 or UL 2703. The fire classification shall comply with Table 1505.1 based on the type of construction of the building.

[BF] 1505.10 Roof Gardens and Landscaped Roofs

Reserved.

Section 1506 Materials

1506.1 Scope

The requirements set forth in this section shall apply to the application of roof-covering materials specified herein. Roof coverings shall be applied in accordance with this chapter and the manufacturer's installation instructions. Installation of roof coverings shall comply with the applicable provisions of Section 1507.

1506.2 Material Specifications and Physical Characteristics

Roof-covering materials shall conform to the applicable standards listed in this chapter.

1506.2.1 Compatibility of Materials

Roofs and roof coverings shall be of materials that are compatible with each other and with the building or structure to which the materials are applied.

1506.3 Product Identification

Roof-covering materials shall be delivered in packages bearing the manufacturer's identifying marks and *approved* testing agency labels required in accordance with Section 1505. Bulk shipments and/or site manufactured materials shall be accompanied with the same information or issued in the form of a certificate or on a bill of lading by the manufacturer.

1506.4 Material Specifications and Physical Characteristics

Roof-covering materials shall conform to the applicable standards listed in this chapter. In the absence of applicable standards or where materials are of questionable suitability, testing by an approved agency shall be required by the building code official to determine the character, quality and limitations of application of the materials.

1506.5 Nails

Nails shall be corrosion-resistant nails conforming to ASTM F1667 or an equal corrosion resistance by coating, electro galvanization, mechanical galvanization, hot-dipped galvanization, stainless steel, nonferrous metal and alloys or other suitable corrosion-resistant material, or corrosion resistance shall be demonstrated in accordance with TAS114, Appendix E.

1506.6 Screws

Wood screws conform to ANSI/ASME B18.6.1. Screws shall be corrosion resistant by coating, galvanization, stainless steel, nonferrous metal or other suitable corrosion-resistant material. The corrosion resistance shall be demonstrated through one of the following methods:

1. Corrosion resistance equivalent to ASTM A641, Class 1;
2. Corrosion resistance in accordance with TAS114, Appendix E; or
3. Corrosion-resistant coating exhibiting not more than 5 percent red rust after 1000 hours exposure in accordance with ASTM B117.

1506.7 Clips

Clips shall be corrosion-resistant clips. The corrosion resistance shall meet 0.90 ounce per square foot (0.458 kg/m^2) measured according to ASTM A90/A90M, TAS 114, Appendix E or an equal corrosion-resistance coating, electro galvanization, mechanical galvanization, hot dipped galvanization, stainless steel, nonferrous metals and alloys or other suitable corrosion-resistant material. Stainless steel clips shall conform to ASTM A240/A240M, Type 304.

Section 1507 Requirements for Roof Coverings

1507.1 Scope

Roof coverings shall be applied in accordance with the applicable provisions of this section and the manufacturer's installation instructions.

1507.1.1 Underlayment

Underlayment for roof slopes 2:12 and greater shall conform to the applicable standards listed in this chapter. Underlayment materials required to comply with ASTM D226, D1970, D4869, D6757 and D8257 shall bear a label indicating compliance to the standard designation and, if applicable, type classification indicated. Underlayment for roof slopes 2:12 and greater shall be applied and attached in accordance with Section 1507.1.1.1 or 1507.1.1.2, as applicable.

Exceptions:

1. For areas of a roof that cover exterior walkways and roofs of agricultural buildings, underlayment shall comply with the manufacturer's installation instructions.
2. Compliance with Section 1507.1.1.1 is not required for structural metal panels that do not require a substrate or underlayment.

1507.1.1.1 Underlayment for Asphalt Shingles, Metal Roof Panels or Shingles, Mineral Surfaced Roll Roofing, Slate and Slate-Type Roof Shingles, Wood Shakes and Wood Shingles

Underlayment for asphalt shingles, metal roof panels or shingles, mineral surfaced roll roofing, slate and slate-type shingles, wood shakes and wood shingles shall comply with one of the following methods:

1. The entire roof deck shall be covered with an approved self-adhering polymer modified bitumen underlayment complying with ASTM D1970 installed in accordance with both the underlayment manufacturer's and roof covering manufacturer's installation instructions for the deck material, roof ventilation configuration and climate exposure for the roof covering to be installed.

Exceptions:

1. This method is not permitted for wood shingles or shakes.
2. An existing self-adhering modified bitumen underlayment that has been previously installed over the roof decking and, where it is required, renailing off the roof sheathing in accordance with Section 706.7.1 of the Florida Building Code, Existing Building can be confirmed or verified. An approved underlayment in accordance with Table 1507.1.1.1 for the applicable roof covering shall be applied over the entire roof over the existing self-adhered modified bitumen underlayment.
2. A minimum $3\frac{3}{4}$ -inch-wide (95 mm) strip of self-adhering polymer-modified bitumen membrane complying with ASTM D1970 or self-adhering flexible flashing tape complying with AAMA 711, Level 3 [for exposure up to 176°F (80°C)], installed in accordance with the manufacturer's instructions for the deck material, shall be applied over all joints in the roof decking. An approved underlayment in accordance with Table 1507.1.1.1 for the applicable roof covering shall be applied over the entire roof over the membrane strips.
3. Two layers of ASTM D226 Type II or ASTM D4869 Type III, Type IV or ASTM D8257 underlayment shall be installed as follows: Apply a strip of underlayment for the first course that is half the width of a full sheet parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply a full sheet of underlayment for the second course. Apply the third course of underlayment overlapping the second course half the width of a full sheet plus 2 inches (51 mm). Overlap all successive courses half the width of a full sheet plus 1 inch (25 mm). End laps shall be 6 inches (152 mm) and shall be offset by 6 feet (1829 mm). Underlayment shall be attached to a nailable deck with corrosion-resistant fasteners with a maximum fastener spacing measured horizontally and vertically of 12 inches (305 mm) o.c. between side laps, and one row at the end and side laps fastened 6 inches (152 mm) o.c. Underlayment shall be attached using annular ring or deformed shank nails with metal or plastic caps with a nominal cap diameter of not less than 1 inch (25.4 mm). Metal caps are required where the ultimate design wind speed, V_{ult} , equals or exceeds 170 mph. Metal caps shall have a thickness of not less than 32-gage sheet metal. The minimum thickness of the outside edge of plastic caps shall be 0.035 inch (0.889 mm). The cap nail shank shall be not less than 0.083 inch (2.1082 mm) for ring shank cap nails. The cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than $3\frac{3}{4}$ inch (19.05 mm) into the roof sheathing.

Exception:

1. Use of ASTM D8257 underlayment is not permitted for wood shingles or shakes.

TABLE 1507.1.1.1

UNDERLAYMENT WITH SELF-ADHERING STRIPS OVER ROOF DECKING JOINTS

Roof Covering	Underlayment Type	Underlayment Attachment	
		Roof Slope 2:12 and Less Than 4:12	Roof Slope 4:12 and Greater

Asphalt Shingles, Metal Roof Panels, Photovoltaic Shingles	ASTM D226 Type II ASTM D4869 Type III or IV ASTM D6757 ASTM D8257		Underlayment shall be applied shingle fashion, parallel to and starting from the eave and lapped 4 inches; end laps shall be 6 inches and shall be offset by 6 feet. Underlayment shall be attached to a nailable deck with corrosion-resistant fasteners with a maximum fastener spacing measured horizontally and vertically of 12 inches o.c. between side laps and one row at the end and side laps fastened 6 inches o.c.
Metal Roof Shingles, Mineral- Surface Roll Roofing, Slate and Slate-type Shingles	ASTM D226 Type II ASTM D4869 Type III or IV ASTM D8257	Apply in accordance with Section 1507.1.1.1, Item 3.	Underlayment shall be attached using annular ring or deformed shank nails with metal or plastic caps with a nominal cap diameter of not less than 1 inch. Metal caps are required where the ultimate design wind speed, V_{ult} , equals or exceeds 170 mph. Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a minimum thickness of 0.010 inch. The minimum thickness of the outside edge of plastic caps shall be 0.035 inch. The cap nail shank shall be not less than 0.083 inch for ring shank cap nails. The cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than $\frac{3}{4}$ inch into the roof sheathing.
Wood Shingles, Wood Shakes	ASTM D226 Type II ASTM D4869 Type III or IV		

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s.

1507.1.1.2 Underlayment for Concrete and Clay Tile

Underlayment for concrete and clay tile shall comply with Section 1507.3.3.

1507.2 Asphalt Shingles

The installation of asphalt shingles shall comply with the provisions of this section. or RAS 115.

1507.2.1 Deck Requirements

Asphalt shingles shall be fastened to solidly sheathed decks.

1507.2.2 Slope

Asphalt shingles shall only be used on roof slopes of two units vertical in 12 units horizontal (17- percent slope) or greater.

1507.2.3 Underlayment

Underlayment shall comply and be installed in accordance with Section 1507.1.1.

1507.2.4 Reserved

1507.2.5 Asphalt Shingles

Asphalt shingles shall have self-seal strips or be interlocking and comply with ASTM D3462.

1507.2.6 Fasteners

Fasteners for asphalt shingles shall be galvanized, stainless steel, aluminum or copper roofing nails, minimum 12-gage [0.105 inch (2.67 mm)] shank with a minimum $\frac{3}{8}$ -inch-diameter (9.5 mm) head, of a length to penetrate through the roofing materials and a minimum of $\frac{3}{4}$ inch (19.1 mm) into the roof sheathing. Where the roof sheathing is less than $\frac{3}{4}$ inch (19.1 mm) thick, the nails shall penetrate through the sheathing. Fasteners shall comply with ASTM F1667.

1507.2.6.1

The nail component of plastic cap nails shall meet the corrosion-resistance requirements of Section 1506.5.

1507.2.7 Attachment

Asphalt shingles shall have the minimum number of fasteners required by the manufacturer and Section 1504.1. Asphalt shingles shall be secured to the roof with not less than four fasteners per strip shingle or two fasteners per individual shingle. Where the roof slope exceeds 21 units vertical in 12 units horizontal (21:12), asphalt shingles shall be installed in accordance with the manufacturer's installation instructions for steep-slope roof applications.

1507.2.7.1 Wind Resistance of Asphalt Shingles

Asphalt shingles shall be tested and classified in accordance with ASTM D3161, ASTM D7158 or TAS 107. and shall meet the required classification in accordance with Table 1507.2.7.1 to resist the applicable wind speed per Figure 1609.3(1), 1609.3(2), 1609.3(3) or 1609.3(4) based on the risk category. Asphalt shingle wrappers shall be *labeled* to indicate compliance with one of the required classifications, as shown in Table 1507.2.7.1.

TABLE 1507.2.7.1

CLASSIFICATION OF ASPHALT SHINGLES

MAXIMUM BASIC WIND SPEED FROM FIGURE 1609.3(1), 1609.3(2), 1609.3(3), 1609.3(4) or ASCE 7	V_{asd} AS DETERMINED IN ACCORDANCE WITH SECTION 1609.3.1	ASTM D7158	ASTM D3161
110	85	D, G or H	D or F
116	90	D, G or H	D or F
129	100	G or H	D or F
142	110	G or H	F
155	120	G or H	F
168	130	H	F
181	140	H	F
194	150	H	F

1507.2.8 Underlayment Application

Underlayment shall comply with Section 1507.1.1.

1507.2.8.1 High Wind Attachment

Reserved.

1507.2.8.2 Ice Barrier

Reserved.

1507.2.9 Flashings

Flashing for asphalt shingles shall comply with this section or RAS 111. Flashing shall be applied in accordance with this section, the asphalt shingle manufacturer's instructions or RAS 111.

1507.2.9.1 Base and Counter Flashing

Base and counter flashing shall be installed as follows:

1. In accordance with manufacturer's installation instructions, or
2. In compliance with RAS-111, or
3. A continuous metal minimum 4 inches by 4 inches "L" flashing shall be set in approved flashing cement and set flush to the base of the wall and over the underlayment. Both horizontal and vertical metal flanges shall be fastened 6 inches (152 mm) on center with approved fasteners. All laps shall be a minimum of 4 inches (102 mm) fully sealed in approved flashing cement. Flashing shall start at the lower portion of roof to insure water-shedding capabilities of all metal laps. The entire edge of the horizontal flange shall be sealed covering all nail penetrations with approved flashing cement and membrane. Shingles will overlap the horizontal flange and shall be set in approved flashing cement.

Base flashing shall be of either corrosion-resistant metal with a minimum thickness provided in Table 1503.2 or mineral surface roll roofing weighing a minimum of 77 pounds per 100 square feet (3.76 kg/m^2). Counter flashing shall be corrosion-resistant metal with a minimum thickness provided in Table 1503.2.

1507.2.9.2 Valleys

Valley linings shall be installed in accordance with the manufacturer's instructions before applying shingles. Valley linings of the following types shall be permitted:

1. For open valleys (valley lining exposed) lined with metal, the valley lining shall be at least 16 inches (406 mm) wide and of any of the corrosion-resistant metals in Table 1503.2.
2. For open valleys, valley lining of two plies of mineral-surfaced roll roofing complying with ASTM D3909 or ASTM D6380 Class M shall be permitted. The bottom layer shall be 18 inches (457 mm) and the top layer a minimum of 36 inches (914 mm) wide.
3. For closed valleys (valleys covered with shingles), valley lining of one ply of smooth roll roofing complying with ASTM D6380 Class S, and at least 36 inches (914 mm) wide or types as described in Item 1 or 2 above shall be permitted. Self-adhering polymer modified bitumen underlayment complying with ASTM D1970 and not less than 36 inches (914 mm) wide shall be permitted in lieu of the lining material.

Table 1507.2.9.2 Valley Lining Material. Reserved.

1507.2.9.3 Drip Edge

Provide drip edge at eaves and gables of shingle roofs. Overlap is to be a minimum of 3 inches (76 mm). Eave drip edges shall extend $\frac{1}{2}$ inch (13 mm) below sheathing and extend back on the roof a minimum of 2 inches (51 mm). Drip edge shall be installed over the underlayment. Self-adhering, ASTM D1970 underlayment may be installed over a primed drip edge flange. There shall be a minimum 4 inches (51 mm) width of roof cement installed over the drip edge flange or the self-adhering underlayment. Drip edge shall be mechanically fastened a maximum of 12 inches (305 mm) on center. Where the V_{asd} , as determined in accordance with Section 1609.3.1, is 110 mph (177 km/h) or greater or the mean roof height exceeds 33 feet (10 058 mm), drip edges shall be mechanically fastened a maximum of 4 inches (102 mm) on center.

1507.3 Clay and Concrete Tile

The installation of clay and concrete tile shall comply with the provisions of this section.

1507.3.1 Deck Requirements

Concrete and clay tile shall be installed only over solid sheathing except where the roof covering is specifically designed and tested in accordance with Section 1609.6.2 to be applied over structural spaced sheathing boards

1507.3.2 Deck Slope

Clay and concrete roof tile shall be installed in accordance with the recommendations of FRSA/TRI *Florida High Wind Concrete and Clay Roof Tile Installation Manual*, Seventh Edition where the V_{asd} is determined in accordance with Section 1609.3.1.

1507.3.3 Underlayment

Unless otherwise noted, underlayment shall be applied according to the underlayment manufacturer's installation instructions or the recommendations of the FRSA/TRI *Florida High Wind Concrete and Clay Roof Tile Installation Manual*, Seventh Edition where the basic wind speed, V_{asd} , is determined in accordance with Section 1609.3.1.

Exception: Where an existing self-adhering modified bitumen underlayment that has been previously installed over the roof decking and, where it is required, renailing of the roof sheathing in accordance with Section 706.7.1 of the *Florida Building Code, Existing Building* can be confirmed or verified. An approved underlayment in accordance with a two-ply system as described in the FRSA/TRI *Florida High Wind Concrete and Clay Roof Tile Installation Manual*, Seventh Edition shall be applied over the entire roof over the existing self-adhered modified bitumen underlayment.

1507.3.3.1 Slope and Underlayment Requirements

Refer to FRSA/TRI *Florida High Wind Concrete and Clay Roof Tile Installation Manual*, Seventh Edition where the basic wind speed V_{asd} is determined in accordance with Section 1609.3.1 for underlayment and slope requirements for specific roof tile systems.

1507.3.3.2 High-Slope Roofs

Reserved.

1507.3.3.3 High Wind Attachment

Reserved.

1507.3.4 Clay Tile

Clay roof tile shall comply with ASTM C1167.

1507.3.5 Concrete Tile

Concrete roof tile shall comply with ASTM C1492.

1507.3.6 Fasteners

Tile fasteners shall be corrosion resistant and not less than 11-gage, [0.120 inch (3 mm)], $5/16$ -inch (8.0 mm) head, and of sufficient length to penetrate the deck a minimum of $3/4$ inch (19.1 mm) or through the thickness of the deck, whichever is less. Attaching wire for clay or concrete tile shall not be smaller than 0.083 inch (2.1 mm). Perimeter fastening areas include three tile courses but not less than 36 inches (914 mm) from either side of hips or ridges and edges of eaves and gable rakes.

1507.3.7 Attachment

Clay and concrete roof tiles shall be fastened in accordance with Section 1609 or in accordance with FRSA/TRI *Florida High Wind Concrete and Clay Roof Tile Installation Manual*, Seventh Edition where the basic wind speed, V_{asd} , is determined in accordance with Section 1609.3.1.

Table 1507.3.7 Clay and Concrete Tile Attachment. Reserved.

1507.3.8 Application

Tile shall be applied according to the manufacturer's installation instructions or recommendations of the FRSA/TRI *Florida High Wind Concrete and Clay Roof Tile Installation Manual*, Seventh Edition where the basic wind speed, V_{asd} , is determined in accordance with Section 1609.3.1.

1507.3.9 Flashing

At the juncture of the roof vertical surfaces, flashing and counterflashing shall be provided in accordance with the manufacturer's installation instructions or the recommendations of the FRSA/TRI *Florida High Wind Concrete and Clay Roof Tile Installation Manual*, Seventh Edition where the basic wind speed, V_{asd} , is determined in accordance with Section 1609.3.1.

1507.4 Metal Roof Panels

The installation of metal roof panels shall comply with the provisions of this section. Metal roofing panels shall be factory or field manufactured in accordance with the manufacturers' product approval specifications and limitations of use. Metal roofing panels shall be

factory or field manufactured under a quality assurance program that is audited by a third-party quality assurance entity approved by the Florida Building Commission for that purpose.

1507.4.1 Deck Requirements

Metal roof panel roof coverings shall be applied to a solid or closely fitted deck, except where the roof covering is specifically designed to be applied to spaced supports.

1507.4.2 Deck Slope

Minimum slopes for metal roof panels shall comply with the following:

1. The minimum slope for lapped, nonsoldered seam metal roof panels without applied lap sealant shall be three units vertical in 12 units horizontal (25-percent slope).
2. The minimum slope for lapped, nonsoldered seam metal roof panels with applied lap sealant shall be one-half unit vertical in 12 units horizontal (4-percent slope). Lap sealants shall be applied in accordance with the approved manufacturer's installation instructions.
3. The minimum slope for standing-seam metal roof panel systems shall be one-quarter unit vertical in 12 units horizontal (2-percent slope).

1507.4.3 Material Standards

Metal-sheet roof covering systems that incorporate supporting structural members shall be designed in accordance with Chapter 22. Metal-sheet roof coverings installed over structural decking shall comply with Table 1507.4.3(1). The materials used for metal-sheet roof coverings shall be naturally corrosion resistant or provided with corrosion resistance in accordance with the standards and minimum thicknesses shown in Table 1507.4.3(2).

TABLE 1507.4.3(1)

METAL ROOF COVERINGS

ROOF COVERING TYPE	STANDARD APPLICATION RATE/THICKNESS
Aluminum	ASTM B209, 0.024 inch minimum thickness for roll-formed panels and 0.019 inch minimum thickness for press-formed shingles.
Aluminum-zinc alloy coated steel	ASTM A792 AZ 50
Cold-rolled copper	ASTM B370 minimum 16 oz/sq. ft and 12 oz/sq. ft high yield copper for metal-sheet roof covering systems; 12 oz/sq. ft for preformed metal shingle systems.
Copper	16 oz/sq. ft for metal-sheet roof-covering systems; 12 oz/sq. ft for preformed metal shingle systems.
Galvanized steel	ASTM A653 G-90 zinc-coated. ^a
Hard lead	2 lb/sq. ft
Lead-coated copper	ASTM B101
Prepainted steel	ASTM A755
Soft lead	3 lb/sq. ft

Stainless steel	ASTM A240/A204M, 300 Series Alloys
Steel	ASTM A924
Terne and terne-coated stainless	Terne coating of 40 lb per double base box, field painted where applicable in accordance with manufacturer's installation instructions.
Zinc	0.027 inch minimum thickness; 99.995% electrolytic high grade zinc with alloy additives of copper (0.08% — 0.20%), titanium (0.07% — 0.12%) and aluminum (0.015%).

For SI: 1 ounce per square foot = 0.305 kg/m², 1 pound per square foot = 4.882 kg/m², 1 inch = 25.4 mm, 1 pound = 0.454 kg.

- a. For Group U buildings, the minimum coating thickness for ASTM A653 galvanized steel roofing shall be G-60.

TABLE 1507.4.3(2)

MINIMUM CORROSION RESISTANCE

55% Aluminum-zinc alloy coated steel	ASTM A792 AZ 50
5% Aluminum alloy-coated steel	ASTM A875 GF60
Aluminum-coated steel	ASTM A463 T2 65
Galvanized steel	ASTM A653 G-90
Prepainted steel	ASTM A755 ^a

- a. Paint systems in accordance with ASTM A755 shall be applied over steel products with corrosion-resistant coatings complying with ASTM A792, ASTM A875, ASTM A463 or ASTM A653.

1507.4.4 Attachment

Metal roof panels shall be secured to the supports in accordance with the approved manufacturer's fasteners. In the absence of manufacturer recommendations, the following fasteners shall be used:

1. Galvanized fasteners shall be used for steel roofs.
2. Copper, brass, bronze, copper alloy or 300 series stainless-steel fasteners shall be used for copper roofs.
3. Stainless-steel fasteners are acceptable for all types of metal roofs.
4. Aluminum fasteners are acceptable for aluminum roofs attached to aluminum supports.

1507.4.5 Underlayment and High Wind

Reserved.

1507.4.5.1 Underlayment

Underlayment shall comply with and be installed in accordance with Section 1507.1.1.

1507.5 Metal Roof Shingles

The installation of metal roof shingles shall comply with the provisions of this section.

1507.5.1 Deck Requirements

Metal roof shingles shall be applied to a solid or closely fitted deck, except where the roof covering is specifically designed to be applied to spaced sheathing.

1507.5.2 Deck Slope

Metal roof shingles shall not be installed on roof slopes below three units vertical in 12 units horizontal (25-percent slope).

1507.5.3 Underlayment

Underlayment shall comply with and be installed in accordance with Section 1507.1.1.

1507.5.3.1 Underlayment and High Wind

Reserved.

1507.5.4 Ice Barrier

Reserved.

1507.5.5 Material Standards

Metal roof shingle roof coverings shall comply with Table 1507.4.3(1). The materials used for metal-roof shingle roof coverings shall be naturally corrosion resistant or provided with corrosion resistance in accordance with the standards and minimum thicknesses specified in the standards listed in Table 1507.4.3(2).

1507.5.6 Attachment

Metal roof shingles shall be secured to the roof in accordance with the *approved* manufacturer's installation instructions.

1507.5.7 Flashing

Roof valley flashing shall be of corrosion-resistant metal of the same material as the roof covering or shall comply with the standards in Table 1507.4.3(1). The valley flashing shall extend at least 8 inches (203 mm) from the centerline each way and shall have a splash diverter rib not less than 0.75 inch (19.1 mm) high at the flow line formed as part of the flashing. Sections of flashing shall have an end lap of not less than 4 inches (102 mm).

1507.6 Mineral-Surfaced Roll Roofing

The installation of mineral-surfaced roll roofing shall comply with this section.

1507.6.1 Deck Requirements

Mineral-surfaced roll roofing shall be fastened to solidly sheathed roofs.

1507.6.2 Deck Slope

Mineral-surfaced roll roofing shall not be applied on roof slopes below one unit vertical in 12 units horizontal (8-percent slope).

1507.6.3 Underlayment

Underlayment shall comply with and be installed in accordance with Section 1507.1.1.

1507.6.3.1 Underlayment and High Wind

Reserved.

1507.6.4 Ice Barrier

Reserved.

1507.6.5 Material Standards

Mineral-surfaced roll roofing shall conform to ASTM D3909 or ASTM D6380 Class M or Class WS.

1507.7 Slate Shingles

The installation of slate shingles shall comply with the provisions of this section.

1507.7.1 Deck Requirements

Slate shingles shall be fastened to solidly sheathed roofs.

1507.7.2 Deck Slope

Slate shingles shall only be used on slopes of four units vertical in 12 units horizontal (4:12) or greater.

1507.7.3 Underlayment

Underlayment shall comply with and be installed in accordance with Section 1507.1.1.

1507.7.3.1 Underlayment and High Wind

Reserved.

1507.7.4 Ice Barrier

Reserved.

1507.7.5 Material Standards

Slate shingles shall comply with ASTM C406.

1507.7.6 Application

Minimum headlap for slate shingles shall be in accordance with Table 1507.7.6. Slate shingles shall be secured to the roof with two fasteners per slate.

TABLE 1507.7.6

SLATE SHINGLE HEADLAP

SLOPE	HEADLAP (inches)
4:12 < slope < 8:12	4
8:12 < slope < 20:12	3
slope = 20:12	2

For SI: 1 inch = 25.4 mm.

1507.7.7 Flashing

Flashing and counterflashing shall be made with sheet metal. Valley flashing shall be a minimum of 16 inches (381 mm) wide. Valley and flashing metal shall be a minimum thickness provided in Table 1503.2 nonferrous metal or stainless steel.

1507.8 Wood Shingles

All wood shingles shall be installed in accordance with this chapter and the manufacturer's installation instructions, the *Cedar Shake and Shingle Bureau New Roof Construction Manual* or RAS 130. The product approval shall state the allowable uplift resistance for the attachment system. The installation of wood shingles shall be limited to roofs where the allowable uplift resistance is equal to or greater than the design uplift pressure for the roof in compliance with Section 1504.1.

Table 1507.8 Wood Shingle and Shake Installation. Reserved.

1507.8.1 Deck Requirements

Reserved.

1507.8.1.1 Solid Sheathing Required

Reserved.

1507.8.2 Deck Slope

Reserved.

1507.8.3 Underlayment

Underlayment shall comply with and be installed in accordance with Section 1507.1.1.

1507.8.3.1 Underlayment and High Wind

Reserved.

1507.8.4 Ice Barrier

Reserved.

1507.8.5 Material Standards

Wood shingles shall be of naturally durable wood and comply with the requirements of Table 1507.8.5.

TABLE 1507.8.5**WOOD SHINGLE MATERIAL REQUIREMENTS**

MATERIAL	APPLICABLE MINIMUM GRADES	GRADING RULES
Wood shingles of naturally durable wood	1, 2 or 3	CSSB

CSSB = Cedar Shake and Shingle Bureau

1507.8.6 Attachment

Reserved.

1507.8.6.1 NailsFasteners to attach wood shingles shall be Type 304 (Type 316 for coastal areas) stainless steel ring-shank nails with a minimum penetration of $\frac{3}{4}$ inch (19.1 mm) into the sheathing. Each shingle shall be attached with a minimum of two fasteners.**1507.8.7 Application**

Reserved.

Table 1507.8.7 Wood Shingle Weather Exposure and Roof Slope. Reserved.**1507.8.8 Flashing**

Reserved.

1507.8.9 Label Required

Each bundle of shingles shall be identified by a label of an approved grading or inspection bureau or agency.

1507.9 Wood ShakesAll wood shakes shall be installed in accordance with this chapter and the manufacturer's installation instructions, the *Cedar Shake and Shingle Bureau New Roof Construction Manual* or RAS 130. The product approval shall state the allowable uplift resistance for the attachment system. The installation of wood shakes shall be limited to roofs where the allowable uplift resistance is equal to or greater than the design uplift pressure for the roof in compliance with Section 1504.1.**1507.9.1 Deck Requirements**

Reserved.

1507.9.1.1 Solid Sheathing Required

Reserved.

1507.9.2 Deck Slope

Reserved.

1507.9.3 Underlayment

Underlayment shall comply with and be installed in accordance with Section 1507.1.1.

1507.9.3.1 Underlayment and High Wind

Reserved.

1507.9.4 Ice Barrier

Reserved.

1507.9.5 Interlayment

Reserved.

1507.9.6 Material Standards

Wood shakes shall comply with the requirements of Table 1507.9.6.

TABLE 1507.9.6**WOOD SHAKE MATERIAL REQUIREMENTS**

MATERIAL	MINIMUM GRADES	APPLICABLE GRADING RULES
Wood shakes of naturally durable wood	1	CSSB
Taper sawn shakes of naturally durable wood	1 or 2	CSSB
Preservative-treated shakes and shingles of naturally durable wood	1	CSSB
Fire-retardant-treated shakes and shingles of naturally durable wood	1	CSSB
Preservative-treated taper sawn shakes of Southern pine treated in accordance with AWPA U1 (Commodity Specification A, Special Requirement 4.6)	1 or 2	TFS

CSSB = Cedar Shake and Shingle Bureau

TFS = Forest Products Laboratory of the Texas Forest Services

1507.9.7 Attachment

Reserved.

1507.9.7.1 NailsFasteners to attach wood shakes shall be Type 304 (Type 316 for coastal areas) stainless steel ring-shank nails with a minimum penetration of $\frac{3}{4}$ inch (19.1 mm) into the sheathing. Each shake shall be attached with a minimum of two fasteners.**1507.9.8 Application**

Reserved.

Table 1507.9.8 Wood Shake Weather Exposure and Roof Slope. Reserved.

1507.9.9 Flashing

Reserved.

1507.9.10 Label Required

Each bundle of shakes shall be identified by a label of an approved grading or inspection bureau or agency.

1507.10 Built-Up Roofs

The installation of built-up roofs shall comply with the provisions of this section.

1507.10.1 Slope

Built-up roofs shall have a design slope of not less than one-fourth unit vertical in 12 units horizontal (2-percent slope) for drainage, except for coal-tar built-up roofs that shall have a design slope of not less than one-eighth unit vertical in 12 units horizontal (1-percent slope).

1507.10.2 Material Standards

Built-up roof covering materials shall comply with the standards in Table 1507.10.2 or UL 55A.

TABLE 1507.10.2

BUILT-UP ROOFING MATERIAL STANDARDS

MATERIAL STANDARD	STANDARD
Acrylic coatings used in roofing	ASTM D6083
Aggregate surfacing	ASTM D1863
Asphalt adhesive used in roofing	ASTM D3747
Asphalt cements used in roofing	ASTM D3019; D2822; D4586
Asphalt-coated glass fiber base sheet	ASTM D4601
Asphalt coatings used in roofing	ASTM D1227; D2823; D2824; D4479
Asphalt glass felt	ASTM D2178
Asphalt primer used in roofing	ASTM D41
Asphalt-saturated and asphalt-coated organic felt base sheet	ASTM D2626
Asphalt-saturated organic felt (perforated)	ASTM D226
Asphalt used in roofing	ASTM D312
Coal-tar cements used in roofing	ASTM D4022; D5643
Coal-tar saturated organic felt	ASTM D227
Coal-tar pitch used in roofing	ASTM D450; Type I or II
Coal-tar primer used in roofing, dampproofing and waterproofing	ASTM D43
Glass mat, coal tar	ASTM D4990
Glass mat, venting type	ASTM D4897
Mineral-surfaced inorganic cap sheet	ASTM D3909

Thermoplastic fabrics used in roofing	ASTM D5665, D5726
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1507.10.3 Red Rosin Paper

Red rosin paper shall be used when the membrane is applied directly to a wood deck or cementitious fiber decks.

1507.11 Modified Bitumen Roofing

The installation of modified bitumen roofing shall comply with the provisions of this section.

1507.11.1 Slope

Modified bitumen membrane roofs shall have a design slope of not less than one-fourth unit vertical in 12 units horizontal (2-percent slope) for drainage.

1507.11.2 Material Standards

Modified bitumen roof coverings shall comply with ASTM D6162, ASTM D6163, ASTM D6164, ASTM D6222, ASTM D6223, ASTM D6298 or ASTM D6509.

1507.12 Single-Ply Roofing

The installation of single-ply roofing shall comply with the provisions of this section.

1507.12.1 Slope

Single-ply membrane roofs shall have a design slope of not less than one-fourth unit vertical in 12 units horizontal (2-percent slope) for drainage.

1507.12.2 Material Standards

Single-ply roof coverings shall comply with the material standards in Table 1507.12.2.

TABLE 1507.12.2

SINGLE-PLY ROOFING MATERIAL STANDARDS

MATERIAL	MATERIAL STANDARD
Chlorosulfanted polyethylene (CSPE) or polyisobutylene (PIB)	ASTM D5019
Ethylene propylene diene monomer (EPDM)	ASTM D4637
Ketone Ethylene Ester (KEE)	ASTM D6754
Ketone Ethylene Ester (KEE)	ASTM D4434
Thermoplastic polyolefin (TPO)	ASTM D6878

1507.12.3 Ballasted Low-Slope Roofs

Ballasted low-slope roofs (roof slope < 2:12) shall be installed in accordance with this section and Section 1504.4. Stone used as ballast shall comply with ASTM D448 or ASTM D7655.

1507.13

Reserved.

1507.14 Sprayed Polyurethane Foam Roofing

The installation of sprayed polyurethane foam roofing shall comply with the provisions of this section or in compliance with RAS 109 and 109-A.

1507.14.1 Slope

Sprayed polyurethane foam roofs shall have a design slope of not less than one-fourth unit vertical in 12 units horizontal (2-percent

1507.14.2 Material Standards

Spray-applied polyurethane foam insulation shall comply with Type III or IV as defined in ASTM C1029.

1507.14.3 Application

Foamed-in-place roof insulation shall be installed in accordance with the manufacturer's instructions. A liquid-applied protective coating that complies with Table 1507.14.3 shall be applied no less than 2 hours nor more than 72 hours following the application of the foam.

TABLE 1507.14.3

PROTECTIVE COATING MATERIAL STANDARDS

MATERIAL	STANDARD
Acrylic coating	ASTM D6083
Silicone coating	ASTM D6694
Moisture-cured polyurethane coating	ASTM D6947

1507.14.4 Foam Plastics

Foam plastic materials and installation shall comply with Chapter 26.

1507.15 Liquid-Applied Roofing

The installation of liquid-applied roofing shall comply with the provisions of this section.

1507.15.1 Slope

Liquid-applied roofing shall have a design slope of not less than one-fourth unit vertical in 12 units horizontal (2-percent slope).

1507.15.2 Material Standards

Liquid-applied roofing shall comply with ASTM C836, ASTM C957 or ASTM D3468.

1507.15.3 Application

Liquid-applied roofing shall be installed in accordance with the approved manufacturer's installation instructions.

1507.15.4 Flashings

Flashing shall be applied in accordance with Section 1507.15 and the liquid-applied roofing manufacturer's installation instructions.

1507.16 Vegetative Roofs, Roof Gardens and Landscaped Roofs

Vegetative roofs, roof gardens and landscaped roofs shall comply with the requirements of this chapter, Sections 1606.5 and 1607.13.2.2 and the Florida Fire Prevention Code.

[BF] 1507.16.1 Structural Fire Resistance

The structural frame and roof construction supporting the load imposed upon the roof by the *vegetative roof, roof gardens or landscaped roofs* shall comply with the requirements of Table 601.

1507.17 Photovoltaic Modules/Shingles

Building integrated *photovoltaic* roofing modules/*shingles*. The installation of building integrated photovoltaic roofing modules/*shingles* shall comply with the provisions of this section.

1507.17.1 Deck Requirements

Reserved.

1507.17.2 Deck Slope

Reserved.

1507.17.3 Underlayment

Underlayment shall comply and be installed in accordance with Section 1507.1.1.

1507.17.4 Underlayment Application

Reserved.

1507.17.4.1 High Wind Attachment

Reserved.

1507.17.4.2 Ice Barrier

Reserved.

1507.17.5 Fasteners

Reserved.

1507.17.6 Material Standards

Building integrated photovoltaic roofing modules/shingles shall be listed and labeled in accordance with UL 1703.

1507.17.7 Attachment

Building integrated photovoltaic roofing modules/shingles shall be attached in accordance with the manufacturer's installation instructions.

1507.17.8 Wind Resistance

Building integrated photovoltaic roofing modules/shingles shall be tested in accordance with procedures and acceptance criteria in ASTM D3161 or TAS 107. Building integrated photovoltaic roofing modules/shingles shall comply with the classification requirements of Table 1507.2.7.1 for the appropriate maximum basic wind speed. Building integrated photovoltaic roofing modules/shingles packaging shall bear a label to indicate compliance with the procedures in ASTM D3161 or TAS 107 and the required classification from Table 1507.2.7.1.

1507.18 Solar Photovoltaic Panels and Modules**1507.18.1 Photovoltaic Panels/Modules**

Solar photovoltaic panels/modules installed upon a roof or as an integral part of a roof assembly shall comply with the requirements of this code and the *Florida Fire Prevention Code*.

1507.18.1.1 Structural Fire Resistance

The structural frame and roof construction supporting the load imposed upon the roof by the photovoltaic panels/modules shall comply with the requirements of Table 601.

Section 1508 Roof Insulation**[BF] 1508.1 General**

The use of above-deck thermal insulation shall be permitted provided such insulation is covered with an approved roof covering and passes the tests of NFPA 276 or UL 1256 when tested as an assembly.

Exceptions:

1. Foam plastic roof insulation shall conform to the material and installation requirements of Chapter 26.
2. Where a concrete or composite metal and concrete roof deck is used and the above-deck thermal insulation is covered with an approved roof covering.

[BF] 1508.1.1 Cellulosic Fiberboard

Cellulosic fiberboard roof insulation shall conform to the material and installation requirements of Chapter 23.

[BF] 1508.2 Material Standards

Above-deck thermal insulation board shall comply with the standards in Table 1508.2.

[BF] TABLE 1508.2

MATERIAL STANDARDS FOR ROOF INSULATION

Cellular glass board	ASTM C552 or ASTM C1902
Composite boards	ASTM C1289, Type III, IV, V or VI
Expanded polystyrene	ASTM C578
Extruded polystyrene	ASTM C578
Fiber-reinforced gypsum board	ASTM C1278
Glass-faced gypsum board	ASTM C1177
Lightweight insulating concrete	ASTM C495, ASTM C513, ASTM C796, ASTM C869
Mineral fiber insulation board	ASTM C726
Perlite board	ASTM C728
Polyisocyanurate board	ASTM C1289, Type I or II
Wood fiberboard	ASTM C208

Section 1509 Roof Coatings

1509.1 General

The installation of a *roof coating* on a *roof covering* shall comply with the requirements of Section 1505 and this section.

1509.2 Material Standards

Roof coating materials shall comply with the standards in Table 1509.2.

TABLE 1509.2

ROOF COATING MATERIAL STANDARDS

MATERIAL	STANDARD
Acrylic coating	ASTM D6083
Asphaltic emulsion coating	ASTM D1227
Asphalt coating	ASTM D2823
Asphalt roof coating	ASTM D4479
Aluminum-pigmented asphalt coating	ASTM D2824
Silicone coating	ASTM D6694
Moisture-cured polyurethane coating	ASTM D6947

Section 1510 Rooftop Structures

[BG] 1510.1 General

The provisions of this section shall govern the construction of rooftop structures.

[BG] 1510.2 Penthouses

Penthouses in compliance with Sections 1510.2.1 through 1510.2.5 shall be considered as a portion of the story directly below the roof deck on which such penthouses are located. All other penthouses shall be considered as an additional story of the building.

[BG] 1510.2.1 Height Above Roof Deck

Penthouses constructed on buildings of other than Type I construction shall not exceed 18 feet (5486 mm) in height above the roof deck as measured to the average height of the roof of the penthouse.

Exceptions:

1. Where used to enclose tanks or elevators that travel to the roof level, penthouses shall be permitted to have a maximum height of 28 feet (8534 mm) above the roof deck.
2. Penthouses located on the roof of buildings of Type I construction shall not be limited in height.

[BG] 1510.2.2 Area Limitation

The aggregate area of penthouses and other enclosed rooftop structures shall not exceed one-third the area of the supporting roof deck. Such penthouses and other enclosed rooftop structures shall not be required to be included in determining the building area or number of stories as regulated by Section 503.1. The area of such penthouses shall not be included in determining the fire area specified in Section 901.7.

[BG] 1510.2.3 Use Limitations

Penthouses shall not be used for purposes other than the shelter of mechanical or electrical equipment, tanks, or vertical shaft openings in the roof assembly.

[BG] 1510.2.4 Weather Protection

Provisions such as louvers, louver blades or flashing shall be made to protect the mechanical and electrical equipment and the building interior from the elements.

[BG] 1510.2.5 Type of Construction

Penthouses shall be constructed with walls, floors and roofs as required for the type of construction of the building on which such penthouses are built.

Exceptions:

1. On buildings of Type I construction, the exterior walls and roofs of penthouses with a *fire separation distance* greater than 5 feet (1524 mm) and less than 20 feet (6096 mm) shall be permitted to have not less than a 1-hour fire-resistance rating. The exterior walls and roofs of penthouses with a fire separation distance of 20 feet (6096 mm) or greater shall not be required to have a fire-resistance rating.
2. On buildings of Type I construction two stories or less in height above grade plane or of Type II construction, the exterior walls and roofs of penthouses with a *fire separation distance* greater than 5 feet (1524 mm) and less than 20 feet (6096 mm) shall be permitted to have not less than a 1-hour fire-resistance rating or a lesser fire-resistance rating as required by Table 705.5 and be constructed of fire-retardant-treated wood. The exterior walls and roofs of penthouses with a *fire separation distance* of 20 feet (6096 mm) or greater shall be permitted to be constructed of fire-retardant-treated wood and shall not be required to have a fire-resistance rating. Interior framing and walls shall be permitted to be constructed of fire-retardant-treated wood.
3. On buildings of Type III, IV or V construction, the exterior walls of penthouses with a fire separation distance greater than 5 feet (1524 mm) and less than 20 feet (6096 mm) shall be permitted to have not less than a 1-hour fire-resistance rating or a lesser fire-resistance rating as required by Table 705.5. On buildings of Type III, IV or VA construction, the exterior walls of penthouses with a fire separation distance of 20 feet (6096 mm) or greater shall be permitted to be of heavy timber construction complying

with Sections 602.4 and 2304.11 or noncombustible construction or fire-retardant-treated wood and shall not be required to have a fire-resistance rating.

[BG] 1510.3 Tanks

Tanks having a capacity of more than 500 gallons (1893 L) located on the roof deck of a building shall be supported on masonry, reinforced concrete, steel or heavy timber construction complying with Section 2304.11 provided that, where such supports are located in the building above the lowest story, the support shall be fire-resistance rated as required for Type IA construction.

[BG] 1510.3.1 Valve and Drain

In the bottom or on the side near the bottom of the tank, a pipe or outlet, fitted with a suitable quick-opening valve for discharging the contents into a drain in an emergency shall be provided.

[BG] 1510.3.2 Location

Tanks shall not be placed over or near a stairway or an elevator shaft, unless there is a solid roof or floor underneath the tank.

[BG] 1510.3.3 Tank Cover

Unenclosed roof tanks shall have covers sloping toward the perimeter of the tanks.

[BG] 1510.4 Cooling Towers

Cooling towers located on the roof deck of a building and greater than 250 square feet (23.2 m^2) in base area or greater than 15 feet (4572 mm) in height above the roof deck, as measured to the highest point on the cooling tower, where the roof is greater than 50 feet (15 240 mm) in height above grade plane shall be constructed of noncombustible materials. The base area of cooling towers shall not exceed one-third the area of the supporting roof deck.

Exception: Drip boards and the enclosing construction shall be permitted to be of wood not less than 1 inch (25 mm) nominal thickness, provided the wood is covered on the exterior of the tower with noncombustible material.

[BG] 1510.5 Towers, Spires, Domes and Cupolas

Towers, spires, domes and cupolas shall be of a type of construction having fire-resistance ratings not less than required for the building on top of which such tower, spire, dome or cupola is built. Towers, spires, domes and cupolas greater than 85 feet (25 908 mm) in height above grade plane as measured to the highest point on such structures, and either greater than 200 square feet (18.6 m^2) in horizontal area or used for any purpose other than a belfry or an architectural embellishment, shall be constructed of and supported on Type I or II construction.

[BG] 1510.5.1 Noncombustible Construction Required

Towers, spires, domes and cupolas greater than 60 feet (18 288 mm) in height above the highest point at which such structure contacts the roof as measured to the highest point on such structure, or that exceeds 200 square feet (18.6 m^2) in area at any horizontal section, or which is intended to be used for any purpose other than a belfry or architectural embellishment, or is located on the top of a building greater than 50 feet (1524 mm) in building height shall be constructed of and supported by noncombustible materials and shall be separated from the building below by construction having a fire-resistance rating of not less than 1.5 hours with openings protected in accordance with Section 711. Such structures located on the top of a building greater than 50 feet (15 240 mm) in building height shall be supported by noncombustible construction.

[BG] 1510.5.2 Towers and Spires

Enclosed towers and spires shall have exterior walls constructed as required for the building on top of which such towers and spires are built. The roof covering of spires shall be not less than the same class of roof covering required for the building on top of which the spire is located.

[BG] 1510.6 Mechanical Equipment Screens

Mechanical equipment screens shall be constructed of the materials specified for the exterior walls in accordance with the type of construction of the building. Where the fire separation distance is greater than 5 feet (1524 mm), *mechanical equipment screens* shall not be required to comply with the fire-resistance rating requirements.

[BG] 1510.6.1 Height Limitations

Mechanical equipment screens shall not exceed 18 feet (5486 mm) in height above the roof deck, as measured to the highest point on the mechanical equipment screen.

Exception: Where located on buildings of Type IA construction, the height of *mechanical equipment screens* shall not be limited.

[BG] 1510.6.2 Type I, II, III and IV Construction

Regardless of the requirements in Section 1510.6, *mechanical equipment screens* that are located on the roof decks of buildings of Type I, II, III or IV construction shall be permitted to be constructed of combustible materials in accordance with any one of the following limitations:

1. The fire separation distance shall be not less than 20 feet (6096 mm) and the height of the *mechanical equipment screen* above the roof deck shall not exceed 4 feet (1219 mm) as measured to the highest point on the *mechanical equipment screen*.
2. The fire separation distance shall be not less than 20 feet (6096 mm) and the *mechanical equipment screen* shall be constructed of fire-retardant-treated wood complying with Section 2303.2 for exterior installation.
3. Where exterior wall covering panels are used, the panels shall have a flame spread index of 25 or less when tested in the minimum and maximum thicknesses intended for use, with each face tested independently in accordance with ASTM E84 or UL 723. The panels shall be tested in the minimum and maximum thicknesses intended for use in accordance with, and shall comply with the acceptance criteria of, NFPA 285 and shall be installed as tested. Where the panels are tested as part of an exterior wall assembly in accordance with NFPA 285, the panels shall be installed on the face of the *mechanical equipment screen* supporting structure in the same manner as they were installed on the tested exterior wall assembly.

[BG] 1510.6.3 Type V Construction

The height of mechanical equipment screens located on the roof decks of buildings of Type V construction, as measured from grade plane to the highest point on the mechanical equipment screen, shall be permitted to exceed the maximum building height allowed for the building by other provisions of this code where complying with any one of the following limitations, provided the fire separation distance is greater than 5 feet (1524 mm):

1. Where the fire separation distance is not less than 20 feet (6096 mm), the height above grade plane of the mechanical equipment screen shall not exceed 4 feet (1219 mm) more than the maximum building height allowed;
2. The *mechanical equipment screen* shall be constructed of noncombustible materials;
3. The *mechanical equipment screen* shall be constructed of fire-retardant-treated wood complying with Section 2303.2 for exterior installation; or
4. Where the fire separation distance is not less than 20 feet (6096 mm), the *mechanical equipment screen* shall be constructed of materials having a flame spread index of 25 or less when tested in the minimum and maximum thicknesses intended for use with each face tested independently in accordance with ASTM E84 or UL 723.

[BG] 1510.7 Photovoltaic Systems

Rooftop-mounted *photovoltaic* systems shall be designed in accordance with this section.

[BG] 1510.7.1 Wind Resistance

Rooftop-mounted *photovoltaic* systems shall be designed for wind loads in accordance with ASCE 7.

[BG] 1510.7.2 Fire Classification

Rooftop-mounted *photovoltaic* systems shall have the same fire classification as required for the roof assembly by Section 1505.

[BG] 1510.7.3 Installation

Rooftop-mounted *photovoltaic* systems shall be installed in accordance with the manufacturer's instructions.

[BG] 1510.7.4 Photovoltaic Panels and Modules

Photovoltaic panels and modules mounted on top of a roof shall be *listed* and labeled in accordance with UL 1703 and shall be installed in accordance with the manufacturer's installation instructions.

[BG] 1510.8 Other Rooftop Structures

Rooftop structures not regulated by Sections 1510.2 through 1510.7 shall comply with Sections 1510.8.1 through 1510.8.5, as applicable.

[BG] 1510.8.1 Aerial Supports

Aerial supports shall be constructed of noncombustible materials.

Exception: Aerial supports not greater than 12 feet (3658 mm) in height as measured from the roof deck to the highest point on the aerial supports shall be permitted to be constructed of combustible materials.

[BG] 1510.8.2 Bulkheads

Bulkheads used for the shelter of mechanical or electrical equipment or vertical shaft openings in the roof assembly shall comply with Section 1510.2 as penthouses. Bulkheads used for any other purpose shall be considered as an additional story of the building.

[BG] 1510.8.3 Dormers

Dormers shall be of the same type of construction as required for the roof in which such dormers are located or the exterior walls of the building.

[BG] 1510.8.4 Fences

Fences and similar structures shall comply with Section 1510.6 as *mechanical equipment screens*.

[BG] 1510.8.5 Flagpoles

Flagpoles and similar structures shall not be required to be constructed of noncombustible materials and shall not be limited in height or number.

[BG] 1510.9 Structural Fire Resistance

The structural frame and roof construction supporting imposed loads upon the roof by any rooftop structure shall comply with the requirements of Table 601. The fire-resistance reduction permitted by Table 601, Note a, shall not apply to roofs containing rooftop structures.

1510.10 Mechanical Units

Roof mounted mechanical units shall be mounted on curbs raised a minimum of 8 inches (203 mm) above the roof surface, or where roofing materials extend beneath the unit, on raised equipment supports providing a minimum clearance height in accordance with Table 1510.10.

Exception: In buildings where the existing rooftop equipment, in the opinion of the building official, provides sufficient clearance to repair, recover, replace and/or maintain the roofing system or any of its components, such existing equipment need not comply with Table 1510.10.

TABLE 1510.10

CLEARANCE BELOW RAISED ROOF MOUNTED MECHANICAL UNITS

WIDTH OF MECHANICAL UNIT (inches)	MINIMUM CLEARANCE ABOVE SURFACES (inches)
< 24	14
24 < 36	18
36 < 48	24
48 < 60	30
> 60	48

For SI: 1 inch = 25.4 mm.

1510.11 Cable- And Raceway-Type Wiring Methods

Cable- and raceway-type wiring methods installed on rooftops and not encased in structural concrete shall be supported above the roof system and covering. Cable- and raceway-type wiring methods installed in locations under metal-corrugated sheet roof decking shall be supported so there is not less than 38 mm (1 $\frac{1}{2}$ in.) measured from the lowest surface of the roof decking to the top of the cable or raceway. A cable or raceway shall not be installed in concealed locations in metal-corrugated sheet decking—type roof.

1510.12 Lines, Pipes, Conduit and Cables Under Roof Decks

Lines, pipes, conduit and cables installed below the roof deck shall have a minimum clearance of 1 $\frac{1}{2}$ -inch (38 mm) from the lowest surface of the roof deck except where they penetrate the roof deck.

Exclusion: Lines, pipes, conduit and cables installed under structural concrete decks.

Section 1511 Existing Roofing

1511.1 General

Materials and methods of application used for recovering or replacing an existing roof covering shall comply with the requirements of Chapter 15.

Exceptions:

1. Reroofing shall not be required to meet the minimum design slope requirement of one-quarter unit vertical in 12 units horizontal (2-percent slope) in Section 1507 for roofs that provide positive roof drainage.
2. An existing self-adhering modified bitumen underlayment that has been previously installed over the roof decking and, where it is required, renailing off the roof sheathing in accordance with Section 706.7.1 of the *Florida Building Code, Existing Building* can be confirmed or verified. An approved underlayment in accordance with Table 1507.1.1.1 for the applicable roof covering shall be applied over the entire roof over the existing self-adhered modified bitumen underlayment.

1511.1.1

Not more than 25 percent of the total roof area or roof section of any existing building or structure shall be repaired, replaced or recovered in any 12-month period unless the roof covering on the entire existing roof system or roof section is replaced or recovered to conform to the requirements of this code.

Exception: If an existing roofing system or roof section was built, repaired, or replaced in compliance with the requirements of the 2007 *Florida Building Code*, or any subsequent editions of the *Florida Building Code*, and 25 percent or more of such roofing system or roof section is being repaired, replaced, or recovered, only the repaired, replaced, or recovered portion is required to be constructed in accordance with the *Florida Building Code* in effect, as applicable. Pursuant to Section 553.844(5), *Florida Statutes*, a local government may not adopt by ordinance an administrative or technical amendment to this exception.

1511.2 Structural and Construction Loads

Structural roof components shall be capable of supporting the roof-covering system and the material and equipment loads that will be encountered during installation of the system.

1511.3 Recovering Versus Replacement

New roof coverings shall not be installed without first removing all existing layers of roof coverings down to the roof deck where any of the following conditions occur:

1. Where the existing roof or roof covering is water soaked or has deteriorated to the point that the existing roof or roof covering is not adequate as a base for additional roofing.
2. Where the existing roof covering is wood shake, slate, clay, cement or asbestos-cement tile.

3. Where the existing roof has two or more applications of any type of roof covering.
4. When blisters exist in any roofing, unless blisters are cut or scraped open and remaining materials secured down before applying additional roofing.
5. Where the existing roof covering is to be used for attachment for a new roof system and compliance with the securement provisions of Section 1504.1 cannot be met.

Exceptions:

1. Complete and separate roofing systems, such as standing-seam metal roof systems, that are designed to transmit the roof loads directly to the building's structural system and that do not rely on existing roofs and roof coverings for support, shall not require the removal of existing roof coverings.
2. Reserved.
3. The application of a new protective coating over an existing spray polyurethane foam roofing system shall be permitted without tear-off of existing roof coverings.
4. Where the existing roof assembly includes an ice barrier membrane that is adhered to the roof deck, the existing ice barrier membrane shall be permitted to remain in place and covered with an additional layer of ice barrier membrane in accordance with Section 1507.

1511.3.1 Roof Recover

Reserved.

1511.3.1.1 Exceptions

Reserved.

1511.4 Roof Recovering

Where the application of a new roof covering over wood shingle or shake roofs creates a combustible concealed space, the entire existing surface shall be covered with gypsum board, mineral fiber, glass fiber or other *approved* materials securely fastened in place.

1511.5 Reinstallation/Reuse of Materials

Existing or salvaged slate, clay or concrete tile shall be permitted for reinstallation or reuse, to repair an existing slate or tile roof, except that salvaged slate or tile shall be of like kind in both material and profile. Damaged, cracked or broken slate or tile shall not be reinstalled. The building official may permit salvaged slate, clay and concrete tile to be installed on additions and new construction, when the tile is tested in compliance with the provisions of Section 1507 and installed in accordance with Section 1507. Existing vent flashing, metal edgings, drain outlets, collars and metal counterflashings shall not be reinstalled where rusted, damaged or deteriorated. Aggregate surfacing materials shall not be reinstalled.

1511.6 Flashings

Flashings shall be reconstructed in accordance with *approved* manufacturer's installation instructions or RAS 111. Metal flashing to which bituminous materials are to be adhered shall be primed prior to installation.

Section 1512 High-Velocity Hurricane Zones—General**1512.1 Scope**

Sections 1512 through 1525 set forth minimum requirements for the materials and installation of roofing components, roofing systems, roofing assemblies and the waterproofing thereof.

1512.2 Application

These high-velocity hurricane zone roofing requirements with associated roofing application standards (RAS) and testing application standards (TAS) are to be implemented in the HVHZ, or where the jurisdiction having authority has adopted their use in accordance with Section 553.73 of the *Florida Statutes*.

1512.2.1

All roofing components, roofing systems and roofing assemblies for construction regulated by this code shall comply with this chapter. All roofing components, roofing systems and roofing assemblies shall have a valid and current product approval. In the event that the manufacturers published literature or instructions are in conflict with those of the product approval, the product approval shall prevail. Where items specifically and expressly addressed in this chapter are in conflict with the product approval, the provisions of this chapter shall prevail.

1512.2.2

Innovative products and/or systems outside those currently recognized under this chapter may have a product approval issued based on performance testing; in such case(s) the conditions set in the product approval shall prevail.

1512.2.3

For roofing systems to be installed on a specific building or structure, where an existing product approval may not be applied, such roofing system shall be permitted to be approved on a one-time project basis by the authority having jurisdiction, provided the applicant demonstrates, by testing and/or rational analysis that such roofing system complies with the provision of this code.

1512.2.4

Where a product approval does not address a detail for a specific job condition, the permit applicant may propose to the building official an alternate detail to address the specific need of the job. The building official shall be permitted to approve such proposal if it can be demonstrated that the provisions of this code will be met.

1512.2.5 Workmanship Standards

All roofing work shall be performed by a qualified contractor licensed to perform roofing, in compliance with the tolerances, quality and methods of construction established herein or set forth in the standards adopted by these high-velocity hurricane zone requirements. Roofing assemblies detailed in the product approval shall be installed in strict compliance with the method of application set forth in such product approval or, if not part of the product approval, in compliance with manufacturer's published application instructions, or as approved by the building official. (Aesthetic issues not affecting the performance of the roof are not part of this chapter.)

1512.2.5.1 Appearance

Where the architectural appearance of the underside of the roof is to be preserved, an alternate method of attachment complying with the windload requirements of Chapter 16 (HighVelocity Hurricane Zones) may be proposed unless otherwise addressed in Chapter 15. The alternative attachment shall be prepared, signed and sealed by a Florida-registered architect or a Florida-registered engineer, which architect or engineer shall be proficient in structural design.

1512.3

Permits outside these high-velocity hurricane zone requirements shall comply with Section 105. Permits within the HVHZ shall be required for all work in connection with the application, repair or maintenance of any roofing component or any roofing assembly and/or any of its components except as otherwise permitted in Section 105 of this code.

1512.3.1

All new roofing construction, including recovering and reroofing, repair or maintenance shall have an HVHZ Uniform Roofing Permit Application, as required by the authority having jurisdiction, completed and executed by a licensed contractor.

1512.3.2

The HVHZ Uniform Roofing Permit Application shall include calculations in accordance with Chapter 16 (High-Velocity Hurricane Zones) of this code, unless the roofing assembly is less than the height/pressure threshold allowed in the applicable protocols herein.

1512.3.3

Reserved.

1512.3.4

Attachments to the HVHZ Uniform Roofing Permit Application shall include two copies of each of the following documents: properly executed OWNERS NOTIFICATION FOR ROOFING CONSIDERATIONS herein; the fire directory listing pages, product approval, and

applicable detail drawings; the municipal permit application; other components approvals; and any other additional data required by the authority having jurisdiction needed to determine the integrity of the roofing system.

1512.4 Inspections

1512.4.1

All roofing work for which a permit is required shall be inspected by the building official. One or more inspections may be performed at the same time at the request of the roofing contractor or when feasible. Lack of roofing contractor's personnel at the job site, in and of itself, shall not be cause to fail the inspection. Certain roofing inspections shall be performed during specific phases of the applications as noted below:

1512.4.2

For discontinuous roofing systems (as defined herein or in Chapter 2):

1512.4.2.1

During or after application of the base sheet, anchor sheet or underlayment of any roofing system.

1512.4.2.2

During the installation of the cap sheet.

1512.4.2.3

During the installation of any prepared roof covering, such as shingles, tiles, slates, shakes and similar.

1512.4.2.4

Upon completion of all adhesive-set and mortar-set tile systems, and prior to the final inspection, a field verification and static uplift test, in compliance with TAS 106 shall be required to confirm tile adhesion to the underlayment. This test may be required by the building official for mechanically attached tile systems. All results of this test shall be submitted to the building official.

1512.4.3

For continuous roofing systems (as defined herein or in Chapter 2):

1512.4.3.1

During application of any roofing system prior to the full concealment of the adhesion/attachment process to the roof deck or to the existing roofing assembly.

1512.4.3.2

In cases where a roof area is less than 1,500 square feet (139 m^2), and when the building official is not able to perform any of the above requested inspection in a timely manner, the building official may authorize to continue with the work and may require that satisfactory evidence be provided to show that the covered work was performed in compliance with this code.

1512.4.3.3

After all roofing work has been completed, a final inspection shall be performed by the building official.

Section 1513 High-Velocity Hurricane Zones—Definitions

1513.1 Definitions

For definitions outside Sections 1512 through 1525 and accompanied RAS and TAS, see Chapter 2. For the purposes of Sections 1512 through 1525, accompanying RAS, TAS and roofing products approval, roofing terms shall be defined in compliance with ASTM D1079, unless otherwise defined below. The definitions listed below shall take preference. Other terms used herein shall be defined as set forth in Chapter 2 of this code.

AIR PERMEABLE ROOFING SYSTEM. A roofing system consisting of a prepared roof covering over an approved underlayment on a sloped roof. The components within the prepared roof covering are discontinuously laid and small, with unsealed side and head laps. Air permeable roofing systems shall be applied over sheathed decks with either mechanical attachment or a mortar/adhesive bond. Any roofing system with sealed side or head laps shall not be defined as an air permeable roofing system. The authority having jurisdiction may require testing in compliance with TAS 116, to determine whether a roofing system is air permeable.

ANCHOR SHEET. A roofing felt mechanically attached to a nailable deck with approved fasteners to which insulation is then installed in a solid mopping of asphalt. The roofing membrane is then installed to the insulation in the usual manner.

ARCHITECTURAL METAL PANEL. Water shedding (hydrokinetic) roof panel fastened to a roof deck.

ASTM (ASTM International). A scientific and technical organization that is responsible for the development of standards on characteristics and performance of materials, products, systems, as adopted for the high-velocity hurricane zone.

BASE SHEET. The bottom or first ply of a roofing assembly over which subsequent roofing plies are applied. A base sheet may be designed for mechanical attachment, full or partial adhesion to the substrate.

BUILDING INTEGRATED PHOTOVOLTAIC ROOFING. A roofing product consisting of electricity generating photovoltaic component integrated into a roof covering.

"CLASS A" ROOFING ASSEMBLY. A roofing assembly that, in combination with the roof slope, has been classified by an approved testing agency, with a listing and follow-up service, as "Class A" in compliance with ASTM E108 or UL 790.

"CLASS B" ROOFING ASSEMBLY. A roofing assembly that, in combination with the roof slope, has been classified by an approved testing agency, with a listing and follow-up service, as "Class B" in compliance with ASTM E108 or UL 790.

"CLASS C" ROOFING ASSEMBLY. A roofing assembly that, in combination with the roof slope, has been classified by an approved testing agency, with a listing and follow-up service, as "Class C" in compliance with ASTM E108 or UL 790.

CONTINUOUS ROOFING SYSTEM. A roof covering, composed from a single or multiple layers, forming a homogenous membrane over the entire roof surface, applied to either a flat or pitched roof surface(s).

CORROSION RESISTANT. Any component that passes FM Global Test Standard 4470's Appendix, as modified, and set forth in TAS 114.

COUNTER BATTENS. Vertical wood strips installed on sloped roofs over which horizontal battens are secured. The primary roof covering is attached or secured to these horizontal battens.

COUNTERFLASHING. Formed metal or elastomeric sheeting secured on or into a wall, curb, pipe, roof-top unit or other surface to cover and protect the upper edge of a base flashing and its associated fasteners.

DISCONTINUOUS ROOFING SYSTEM. A roofing system with unsealed overlapping components, where the combined roofing system has openings at the point of overlap, applied to a sloped surface with a pitch of 2:12, or greater. Discontinuous roofing systems include asphalt shingles; concrete, clay or metal tile; wood shingles or shakes; and cement fiber roofing systems.

DRY-IN. The process of applying the first layer of felt in a roofing system.

FASTENER WITHDRAWAL RESISTANCE TEST. A static pullout test of mechanical fasteners, which are used to anchor any roofing component, to determine the force required to withdraw a fastener from the substrate. Testing shall be in compliance with the test procedure detailed in TAS 105.

FIRE-RESISTANT ROOF COVERING. Any Class A, Class B or Class C roofing system applied to the appropriate deck type within the specified slope of the listed classification.

FLASHING. The roofing component used to seal roofing systems, where the system is interrupted or terminated.

FLAT ROOF TILE PROFILE. Those tiles with less than $\frac{1}{2}$ -inch (12.7 mm) rise.

FM APPROVALS. A research and testing organization that is responsible for examination and testing of construction and other products on behalf of member insurance companies.

HIGH ROOF TILE PROFILE. Those tiles having a rise-to-width ratio greater than 0.20.

LAP. See NRCA Manual, 4th edition.

LOW ROOF TILE PROFILE. Those tiles having a rise-to-width ratio less or equal than 0.20; except those tiles meeting the flat profile definition.

METAL PROFILE. Including but not limited to eave and gable drip, gravel stop, raised edge systems and fascia systems. All composite and nonmetallic flashing materials shall have a product approval.

METAL ROOF PANEL. An interlocking metal sheet having an installed weather exposure equal or greater than 3 square feet (0.3 m^2) per sheet.

METAL ROOF SHINGLE. An interlocking metal sheet having an installed weather exposure less than 3 square feet (0.3 m^2) per sheet.

MINIMUM CHARACTERISTIC RESISTANCE FORCE. A force or pressure which is representative of data from withdrawal resistance testing; static uplift testing; and/or wind uplift testing after the data has been statistically analyzed to a 95-percent level of precision.

MOMENT. A quantity that represents the effect of a force applied at a particular point in relation to a specific point or axis.

NET FREE VENTILATING AREA (NFVA). The gross area of the smallest plane area of the ventilating device reduced by the percentage of physical obstruction to the plane area.

NRCA. The *NRCA Roofing and Waterproofing Manual*, 5th edition, as published by the National Roofing Contractors Association.

PREPARED ROOF COVERING. Any manufactured or processed roof covering designed for use as the top layer of a discontinuous roofing system applied to a sloped roof.

RAS. Roofing Application Standards.

RECOVERING. The process of covering an existing roofing assembly with a new roofing system or a prepared roofing system.

REPAIR. The work of corrective procedures by replacing or altering an existing roofing component or system to eliminate water intrusion.

REROOFING. The process of recovering or replacing an existing roofing system, either in its entirety or in existing sections.

RIDGE VENT. A ventilator located within 18 inches (457 mm) of the ridge that allows the escape of warm and/or moist air from the attic area or rafter cavity.

ROOF COVERING. An assembly of multiple field-applied components or a single component designed to weatherproof a building's top surface. A roof covering may be a roofing assembly or form a portion thereof.

ROOF DECK. Solid or spaced sheathing to which the roofing or waterproofing system is applied.

ROOF REPLACEMENT. The process of removing the existing roof covering, repairing any damaged substrate and installing a new roof covering.

ROOF SECTION. A separation or division of a roof area by existing expansion joints, parapet walls, flashing (excluding valleys), difference of elevation (excluding hips and ridges), roof type or legal description; not including the roof area required for a proper tie-off with an existing system.

ROOFING ACCESSORY. A type of roofing product as described in Section 1517.6 of this code.

ROOFING ASSEMBLY. An assembly of interacting roofing components [includes the roof deck, vapor retarder (if present), insulation, and roof covering].

ROOFING COATINGS, ADHESIVES AND MASTICS. Any and all liquid materials applied to the roofing membrane layer to enhance ultraviolet light resistance; increase resistance to fire; increase reflectivity of the roofing assembly; or, in some way, enhance the performance of the roofing assembly. Roofing coatings, adhesives or mastics shall not contain asbestos materials.

ROOFING COMPONENT. A roofing product that is incorporated into various roofing assemblies.

ROOFING MAINTENANCE. The work of extending the longevity of a roofing system through preventative care, such as refilling pitch pans, applying coatings, regraveling, resurfacing and recaulking.

ROOFING SYSTEM. A system of interacting roofing components, generally consisting of membrane or primary roof covering and insulation (not including the roof deck) designed to weatherproof, and sometimes to improve, the building's thermal resistance.

STRUCTURAL METAL PANEL. Roof covering intended to be self-supporting between structural members (see Sections 2003.8.2 and 2222.4).

TAS. Testing Application Standard.

UNDERLayment. One or more water-shedding layers applied to a sloped roof prior to the application of a prepared roof covering. The primary purpose of an underlayment is defined as a water shedding layer to function in combination with a prepared roof covering.

WOOD SHAKES. Tapered or straight pieces of red cedar, or other wood types, of widths ranging from 3 inches to 14 inches (76 mm to 356 mm) ranging in lengths from 18 inches to 32 inches (457 mm to 813 mm) applied to a sloped roof, in conjunction with an approved underlayment, forming a discontinuous prepared roof system.

WOOD SHINGLES. Tapered pieces of red cedar, or other wood types, sawn on both faces, of widths ranging from 3 inches to 14 inches (76 mm to 356 mm) and lengths of 16 inches (406 mm), 18 inches (457 mm), and 24 inches (610 mm) applied to a sloped roof forming a discontinuous prepared roof system.

Section 1514 High-Velocity Hurricane Zones—Weather Protection

1514.1 General

Roof decks shall be covered with roof coverings secured to the building or structure in accordance with the provisions of this chapter. Roof coverings shall be designed, installed and maintained in accordance with this code and the manufacturer's installation instructions such that the roof covering shall serve to protect the building or structure. All roof coverings, roof systems and roof assemblies shall be designed and installed to resist the windload requirements of Chapter 16 (High-Velocity Hurricane Zones) of this code.

1514.2 Flashings

All roof flashing and terminations shall be designed and installed to resist the windload requirements of Chapter 16 (High-Velocity Hurricane Zones) of this code, and shall be in compliance with the provisions set forth in RAS 111.

1514.2.1 Locations

Where flashing is of metal, the metal shall conform with the provisions of RAS 111.

1514.2.2 Membrane Flashings

All membrane flashing shall be installed according to the roof assembly manufacturer's published literature and in accordance with the provisions set forth in RAS 111.

1514.2.2.1

Membrane flashings shall be embedded in hot bitumen or an approved adhesive.

1514.2.3 Metal Flashings and Terminations

Metal flashing and terminations shall be of the material and thickness described in Section 1517.6 and RAS 111 of this code, and shall be designed and installed in accordance with RAS 111.

1514.2.3.1

Metal surfaces shall be primed with an ASTM D41 or ASTM D43 primer, as appropriate and allowed to dry prior to receiving hot bitumen or cold adhesive.

1514.2.4 Metal Counterflashing

Metal counterflashing shall be of the material and thickness described in Section 1517.6 and RAS 111 of this code, and shall be installed in accordance with RAS 111.

1514.2.4.1

Metal counterflashing shall be built into walls, set in reglets or applied as stucco type and shall be turned down over base flashing not less than 3 inches (76 mm).

1514.2.4.2

Metal counterflashing shall be side lapped a minimum of 4 inches (102 mm).

1514.2.4.3

Metal counterflashing, where set in reglets or surface-mounted, shall be waterproofed, in accordance with applicable application standards.

1514.2.4.4

Where metal counterflashing is used as the means of sealing (such as a vented system) it shall be set in an approved sealant, sealed with an approved adhesive on the top flange and all joints shall be sealed with an approved sealant and lapped a minimum of 4

inches (102 mm).

1514.2.5 Roof Penetration Flashing

1514.2.5.1

All pipes shall be flashed with approved lead sleeve-type, pitch pans or other approved methods detailed in the roofing system assembly product approval. Lead flashing shall not be less than 2.5 pounds per square foot (12.2 kg/m^2). Flanges shall be a minimum of 4 inches (102 mm).

1514.2.5.2

Other roof penetrations shall be suitably flashed with curbs, collars, pitch pans, in compliance with RAS 111 or an approved method, in compliance with the roofing system assembly product approval.

1514.2.5.3

No roof penetration shall be located in roof valleys.

1514.3 Coping

Copings shall be designed and installed to resist the windload requirements of Chapter 16 (High-Velocity Hurricane Zones) of this code, and shall be in accordance with the provisions set forth in RAS 111.

1514.4 Roof Drainage

Unless roofs are sloped to drain over roof edges, roof drains shall be installed at each low point of the roof. If required, roof drains shall comply with the *Florida Building Code, Plumbing*. Where required for primary roof drainage, scuppers shall be placed level with the roof surface in a wall or parapet. The scupper shall be located as determined by the roof slope and contributing roof area. Scuppers shall be sized in accordance with the provisions contained in ASCE 7, Chapter 8 with commentary and shall comply with Section 1611 herein.

1514.4.1 Gutters

Gutters shall be in compliance with RAS 111.

1514.4.2 Overflow Drains and Scuppers

Where roof drains are required, overflow drains or overflow scuppers sized in accordance with *Florida Building Code, Plumbing* and ASCE 7, Chapter 8 with commentary shall be installed with the inlet flow line located not less than 2 inches (51 mm) or more than 4 inches (102 mm) above the low point of the finished roofing surface, excluding sumps. Overflow scuppers shall be a minimum of 4 inches (102 mm) in any dimension and shall be located as close as practical to required vertical leaders, conductors or downspouts. Overflow drains and scuppers shall also comply with the *Florida Building Code, Plumbing*, and Section 1611 of this code.

1514.4.2.1

When overflow scuppers and roof drains are installed, they shall be lined with approved metal or other approved materials set forth herein.

1514.4.2.2

When recovering, reroofing or repairing an existing roof, the existing number or size of required scuppers and/or roof drains shall not be reduced, unless a new drainage system is designed by a *registered design professional*, in compliance with the provisions of this code.

1514.4.3 Sizing and Discharge

Roof drains, gutters, conductors and leaders shall be sized and discharge in accordance with the *Florida Building Code, Plumbing* and ASCE 7, Chapter 8 with commentary.

Section 1515 High-Velocity Hurricane Zones—Performance Requirements

1515.1 General

All roof assemblies, roof coverings and roof systems shall have product approval, and shall meet the following minimum requirements.

1515.1.1

All continuous roofing assemblies shall be tested in compliance with FM Test Standards 4470 and/or 4471 (for metal roofing), as modified for the purposes of this code and set forth in TAS 114. Only those components listed within the roofing assembly product approval shall be approved for use with the roof covering. Roofing assemblies shall be acceptable for use in this code's jurisdiction providing they are in compliance with the fire classification required for the structure to which the roofing assembly is to be installed.

1515.1.2

All fastening devices and fastening assemblies used for insulation, anchor sheet or roof coverings shall be tested in compliance with Section 1523 of this code.

1515.1.3

All roofing assemblies shall be tested by a testing laboratory, certified by the certification agency in accordance with TAS 301, to confirm compliance with the fire classification and other sections of this code.

1515.1.4

All roofing membranes and components shall be tested in compliance with the physical property test requirements detailed in TAS 110.

1515.1.5

No loose laid ballasted or nonballasted system shall be permitted.

1515.2 Guidelines for Roofing Applications

TABLE 1515.2

MINIMUM SLOPE

SYSTEM TYPE	SLOPE
Fibrous Cement Shingles	4:12
Metal Panels	
Architectural	2:12 ¹
Metal Shingles	4:12
Mortar or Adhesive Tile	2:12
Mechanically Fastened Tile	4:12
Asphalt Shingles	
Laminated	2:12
3-Tab	2:12
Quarry Slate	3 ¹ / ₂ :12
Wood	
Shakes	4:12
Shingles	3 ¹ / ₂ :12

1. Standing seam metal roof panel systems that pass the requirements of the Static Water Leakage Test criteria of ASTM E2140 shall be permitted to be installed to a minimum slope of 1:12.

1515.2.1 Decks

All roofing systems and prepared roof coverings shall be installed over solid decks, unless otherwise specifically allowed in other

sections of this code.

1515.2.2 Minimum Slope

All roofing assemblies must be installed in compliance with the slope requirements specified in the product control approval, in compliance with Table 1515.2.

1515.2.2.1

In new construction the minimum deck slope shall be not less than 1/4:12.

1515.2.3 Deck Preparation

1515.2.3.1

Reserved.

1515.2.3.2

All eaves shall provide a firm nailable substrate for secure attachment of perimeter edge metal in compliance with RAS 111.

1515.2.3.3

Perimeter edge metal shall be fastened with nails or fasteners fabricated from similar or compatible material. The nails or fasteners shall be as set forth in the roofing assembly product approval.

1515.2.4 Impact Resistance

Roof coverings installed on low slope roofs in accordance with Section 1519 shall resist impact damage based on the results of tests conducted in accordance with ASTM D3746, ASTM D4272, FM 4470 or TAS 114.

1515.2.5 Ridge Vents

Ridge vents shall have a product approval, and shall be tested for wind driven rain in accordance with TAS 110 and Section 1523.

Section 1516 High-Velocity Hurricane Zones—Fire Classification

1516.1 General

Roof assemblies shall be divided into the classes defined below. Class A, B and C roof assemblies and roof coverings required to be listed by this section shall be tested in accordance with ASTM E108 or UL 790. In addition, fire-retardant-treated-wood roof coverings shall be tested in accordance with ASTM D2898.

1516.2

Fire-resistant roofing assemblies and coverings shall be provided on all structures. Fire classification of roofing assemblies and coverings shall be based on the exposure hazard as follows:

1516.2.1 Class A

Zero feet to 20 feet (0 to 6.1 m) distance separation measured horizontally from the closest point of any building edge to the nearest point to an adjoining structure, and all buildings with occupation greater than 300 persons.

Exception: Brick, masonry, slate, clay or concrete roof tile and exposed concrete roof deck are considered to meet Class A roof covering provisions without testing.

1516.2.2 Class B

All other structures, except as noted below.

1516.2.3 Class C

Structures not occupied by humans.

1516.2.4

All roofing assemblies shall be installed at a slope no greater than the maximum allowed for the required fire classification.

1516.2.5

Waterproofing assembly must possess a Class A, Class B or Class C fire rating as required herein.

Section 1517 High-Velocity Hurricane Zones—Materials

1517.1 Scope

Every roofing component shall comply with the applicable ASTM material standards adopted by this code. All such products shall bear the testing logo imprinted on the material and/or container or shall be marked in a distinctive manner to define compliance with the standards and shall be subject to be evaluated for compliance. The certification agency shall carry out random testing of labeled products to confirm compliance with ASTM material standard.

1517.2 Compatibility of Materials

Reserved.

1517.3 Material Specification and Physical Characteristics

Reserved.

1517.4 Product Identification

All roofing components shall be labeled and/or identified as mandated by the product approval.

1517.4.1

ASTM standard roll goods shall be marked with a yellow line to identify the ASTM standard, or such other marking as may be deemed appropriate by the product approval.

1517.5 Fasteners

1517.5.1

Nails shall be minimum 12 gage, annular ring shank nails having not less than 20 rings per inch, heads not less than $\frac{3}{8}$ inch (9.5 mm) in diameter; and lengths sufficient to penetrate through the thickness of plywood panel or wood plank decking not less than $\frac{3}{16}$ inch (4.8 mm), or to penetrate into a 1 inch (25 mm) or greater thickness of lumber not less than 1 inch. Nails or wood screws shall be hot-dipped electro- or mechanically galvanized to a thickness sufficient to resist corrosion in compliance with TAS 114, Appendix E, Section 2 (ASTM G85). All nails shall be listed by a certification agency. All nail cartons or carton labels shall be labeled to note compliance with the corrosion-resistance requirements. No roofing material shall be fully or partially adhered directly to a nailable deck, unless otherwise noted in the roof assembly product approval.

1517.5.2

Such fasteners shall be applied through "Tin caps" no less than $1\frac{5}{8}$ inches (41 mm) and not more than 2 inches (51 mm) in diameter and of not less than 32 gage (0.010 inch) sheet metal. "Cap nails" or prefabricated fasteners with integral heads complying with this section shall be an acceptable substitute. All "tin caps," "cap nails" or prefabricated fasteners with integral heads shall be tested for corrosion resistance in compliance with TAS 114 Appendix E, Section 2 (ASTM G85), and shall be product control listed. All of cartons or carton labels "tin caps," "cap nails" or prefabricated fasteners with integral heads shall be labeled to note compliance with the corrosion-resistance requirements.

1517.6 Metal Roofing Accessories

All metal accessories for roofs shall be not less than 26 gage G-90 galvanized or stainless steel, 16 ounce copper, 0.025-inch (0.6 mm) thick aluminum, lead sheet with a minimum 2.5 lb/sf (12.2 kg/m²) or equivalent noncorrosive metal alloys or composite materials manufactured for use as roof termination. All composite and nonmetallic flashing materials shall have a product approval.

1517.6.1

Metal accessories may be of a manufactured, shop-fabricated or field-fabricated type, providing the materials and fasteners are in compliance with the minimum requirements of this code and shall be sized, designed and installed in compliance with methods set forth in RAS 111.

1517.6.2

Gravel stop or drip edge profiles shall be as follows:

1517.6.2.1

The vertical face shall be a minimum of 1 $\frac{1}{2}$ inches (38 mm) and shall extend down not less than 1 $\frac{1}{2}$ inch (12.7 mm) below the sheathing or other member immediately contiguous thereto. In all cases, the deck flange shall be not less than 2 inches (51 mm) in width. Gravel stop or drip edge shall be sized, designed and installed in compliance with RAS 111.

1517.6.2.2

Gravel stop or drip edge shall be designed so that the bottom (the kick of the metal) of the drip edge shall have a minimum of 1 $\frac{1}{2}$ -inch (12.7 mm) clearance from the structure.

1517.6.2.3

Reserved.

1517.6.2.4

Gravel stops shall be installed after all roofing felts have been applied, or in compliance with the application method set forth in the roofing assembly product approval. All asphalt or approved cold adhesive bonding areas shall be coated with ASTM D41 or ASTM D43, as required, and allowed to dry prior to application.

1517.6.2.5

Gravel stops and drip edges shall be joined by lapping a minimum of 4 inches (102 mm) and the entire interior of the joints shall be coated with approved flashing cement. Cover and splice plates shall be of the same material as the gravel stop and drip edge, and shall be sized, fabricated and installed in compliance with RAS 111.

1517.6.2.6

The deck flange shall be nailed with an approved minimum 12 gage annular ring shank nail at 4 inches (102 mm) o.c. The nail shall be manufactured from similar and/or compatible material to the termination profile. All composite materials shall be fastened with nonferrous nails.

Section 1518 High-Velocity Hurricane Zones— Roof Coverings With Slopes 2:12 or Greater

1518.1 General

Roof coverings shall be applied in accordance with the applicable provisions of this section and the manufacturer's installation instructions.

1518.2 Underlays

Underlayment for roof slopes 2:12 and greater shall conform to the applicable standards listed in this chapter. Underlayment materials required to comply with ASTM D226, D1970, D4869, D6757 and D8257 shall bear a label indicating compliance with the standard designation and, if applicable, type classification indicated. Underlayment for roof slopes 2:12 and greater shall be applied and attached in accordance with Section 1518.1, 1518.2, 1518.5, 1518.6, 1518.7, 1518.8, 1518.9, 1518.10 or 1518.11, as applicable.

Exceptions:

1. For areas of a roof that cover exterior walkways and roofs of agricultural buildings, underlayment shall comply with the manufacturer's installation instructions.
2. Compliance with Section 1518.2.1 is not required for structural metal panels that do not require a substrate or underlayment.

1518.2.1 Underlayment for Asphalt Shingles, Metal Roof Panels or Shingles, Mineral Surfaced Roll Roofing, Slate and Slate-Type Shingles

Underlayment for asphalt shingles, metal roof panels or shingles, mineral surfaced roll roofing, slate and slate-type shingles shall comply with one of the following methods:

1. The entire roof deck shall be covered with an approved self-adhering polymer modified bitumen underlayment complying with ASTM D1970 installed in accordance with both the underlayment manufacturer's and roof covering manufacturer's installation instructions for the deck material, roof ventilation configuration and climate exposure for the roof covering to be installed.

Exception: An existing self-adhering modified bitumen underlayment that has been previously installed over the roof decking and, where it is required, renailing of the roof sheathing in accordance with Section 706.7.1 of the *Florida Building Code, Existing Building* can be confirmed or verified. An approved underlayment in accordance with Table 1507.1.1.1 for the applicable roof covering shall be applied over the entire roof over the existing self-adhered modified bitumen underlayment.

2. A minimum $3\frac{3}{4}$ -inch-wide (95 mm) strip of self-adhering polymer-modified bitumen membrane complying with ASTM D1970 or self-adhering flexible flashing tape complying with AAMA 711, Level 3 [for exposure up to 176°F (80°C)], installed in accordance with the manufacturer's instructions for the deck material, shall be applied over all joints in the roof decking. An approved underlayment in accordance with Table 1518.2.1 for the applicable roof covering shall be applied over the entire roof over the membrane strips.
3. Two layers of ASTM D226 Type II, D4869 Type III or IV, or D8257 underlayment shall be installed as follows: Apply a strip of underlayment for the first course that is half the width of a full sheet parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply a full sheet of underlayment for the second course. Apply the third course of underlayment overlapping the second course half the width of a full sheet plus 2 inches (51 mm). Overlap all successive courses half the width of a full sheet plus 1 inch (25.4 mm). End laps shall be 6 inches (152 mm) and shall be offset by 6 feet (1829 mm). Underlayment shall be attached to a nailable deck with corrosion-resistant fasteners with a maximum fastener spacing measured horizontally and vertically of 12 inches (305 mm) o.c. between side laps, and one row at the end and side laps fastened 6 inches (152 mm) o.c. Underlayment shall be attached using annular ring or deformed shank nails with metal or plastic caps with a nominal cap diameter of not less than 1 inch (25.4 mm). Metal caps are required where the ultimate design wind speed, V_{ult} , equals or exceeds 170 mph (76 m/s). Metal caps shall have a thickness of not less than 32-gage sheet metal. The minimum thickness of the outside edge of plastic caps shall be 0.035 inch (0.889 mm). The cap nail shank shall be not less than 0.083 inch (2.1082 mm) for ring shank cap nails. The cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than $\frac{3}{4}$ inch (19.05 mm) into the roof sheathing.

TABLE 1518.2.1

UNDERLAYMENT WITH SELF-ADHERING STRIPS OVER ROOF DECKING JOINTS

ROOF COVERING	UNDERLAYMENT TYPE	UNDERLAYMENT ATTACHMENT	
		Roof Slope 2:12 and Less Than 4:12	Roof Slope 4:12 and Greater
Asphalt Shingles, Metal Roof Panels, Photovoltaic Shingles	ASTM D226 Type II ASTM D4869 Type III or IV ASTM D6757	Apply in accordance with Section 1518.2.1, Item 3	Underlayment shall be applied shingle fashion, parallel to and starting from the eave and lapped 4 inches; end laps shall be 6 inches and shall be offset by 6 feet. Underlays shall be fastened with approved minimum 12 gage by $1\frac{1}{4}$ in. corrosion-resistant annular ring shank roofing nails fastened through minimum 32 gage by $1\frac{5}{8}$ in. diameter approved tin caps.
Metal Roof Shingles, Mineral-Surface Roll Roofing, Slate and Slate-type Shingles, Wood Shingles, Wood Shake	ASTM D226 Type II ASTM D4869 Type III or IV ASTM D8257		Underlayment shall be attached to a nailable deck in a grid pattern of 12 inches between the overlaps, with 6-inch spacing at the overlaps. Nails shall be of sufficient length to penetrate

			through the sheathing or wood plank a minimum of $\frac{1}{8}$ in. or penetrate 1 inch or greater thickness of lumber a minimum of 1 in., except where architectural appearance is to be preserved, in which case a minimum of $\frac{3}{4}$ in. nail may be used.
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For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s.

1518.2.2

Where the architectural appearance of the underside is to be preserved, the underlayment shall be secured in accordance with Section 1519.5.2.

1518.2.3

Tin caps and nails or cap nails shall be as defined in Section 1517.5.2.

1518.2.4

Underlayment nails shall be as defined in Section 1517.5.1.

1518.3

Reserved.

1518.4

Reserved.

1518.5 Fiber Cement Shingles

Fiber-cement shingles shall be applied in compliance with the shingle manufacturer's roofing assembly product approval. The roofing system assembly product approval shall meet the following minimum requirements:

1518.5.1

All nonasbestos fiber-cement shingles shall conform to ASTM C 1225.

1518.5.2

Fiber-cement shingles shall be installed in compliance with the nailing requirements set forth in the product approval; however, attachment of each component shall be with not less than two corrosion-resistant fasteners. If adhesive is used at the head or side laps, the system shall be defined as a "sealed system" with load calculations in compliance with Chapter 16 (High-Velocity Hurricane Zones).

1518.5.3

All intersections shall be flashed in metal as provided in Section 1517.6 and RAS 111.

1518.5.4

Fiber-cement shingles shall be tested as set forth in Section 1523.

1518.6 Quarry Slate

Quarry slates shall be applied in compliance with the slate manufacturer's product approval. The roofing assembly product approval shall meet the following minimum requirements:

1518.6.1

Quarry slates shall be installed with not less than two approved fasteners per slate.

1518.6.2

All terminations and intersections shall be flashed in metal as provided in Section 1517.6 and RAS 111.

1518.6.3

Quarry slates shall be tested in compliance with the requirements set forth in Section 1523.

1518.6.4

Installation of all quarry roof slates shall be limited to a roof mean height of 33 feet (10 m), unless otherwise specifically noted in the product approval.

1518.7 Asphalt Shingles

Asphalt shingles layout, alignment and placement of mechanical attachment shall be in compliance with the product approval, and shall be installed in accordance with RAS 115.

1518.7.1

Underlays meeting or exceeding minimum underlayment specifications, as detailed in Section 1518, shall be applied in compliance with the application methods detailed in the product approval. Where the architectural appearance of the underside of the roof is to be preserved, refer to Section 1519.5.2.

1518.7.2

Installation of all asphalt shingles shall be limited to a roof mean height of 33 feet (10 m), unless otherwise specifically noted in the product approval.

1518.7.3

The asphalt shingle product approval shall meet the following minimum requirements.

1518.7.3.1

Where asphalt shingles are to be installed over insulated roof deck, a suitable nailable substrate, in accordance with Section 1520.5.7 must be installed over the insulation prior to the installation of approved underlayment and shingles.

1518.7.3.2

Asphalt shingles shall be installed in compliance with the product approval, but in no case with less than six approved roofing nails or approved fastening devices which penetrate through the thickness of sheathing or wood plank a minimum of $\frac{1}{8}$ inch (3.2 mm) or penetrate into a 1 inch (25 mm) or greater thickness of lumber a minimum of 1 inch (25 mm), except where architectural appearance is to be preserved, in which case a minimum of $\frac{3}{4}$ inch (19 mm) ring shank roofing nail may be used.

1518.7.3.3

Intersections, eaves, rakes, valleys, gable ends, and the starter course of asphalt shingles shall be set in an 8-inch (203 mm) wide bed of approved cold adhesive or roofing cement. Application of adhesive or cement shall be in compliance with the application instructions of the product approval. Shingles shall not extend more than $\frac{1}{4}$ inch (6.4 mm) beyond the eave and rake drip.

1518.7.3.4

All perimeter termination and valleys shall be fabricated from metal. Minimum metal requirements are set forth in Section 1517.6 and RAS 111.

1518.7.3.5

Asphalt shingles shall be tested in compliance with the provisions set forth in Section 1523.

1518.8 Clay and Concrete Roof Tile

Tile shall be clay, concrete or composition material of various configurations complying with the physical property requirements of this code. All tile and tile systems shall be tested in compliance with the provisions set forth in Section 1523.

1518.8.1 Application

All tile systems shall be installed over solid sheathed decks. All tile installation shall be in accordance with RAS 118, RAS 119, and RAS 120, as applicable.

1518.8.1.1

Roof tile mortar shall either be a premixed unit having a product approval and tested in compliance with TAS 123 or a job-site mix approved by the building official and in compliance with RAS 113.

1518.8.2

The roof tile product approval shall specify the slope requirement for each tile and underlayment system in accordance with Table 1515.2.

1518.8.3

All roof tile fasteners shall be tested and comply with the requirements set forth in Section 1523.

1518.8.4 All Tile Systems

All tile application designs shall comply with the following limitations in order to withstand the wind loads prescribed in this section, as well as all wind load requirements set forth in Chapter 16 (HighVelocity Hurricane Zones).

1518.8.4.1

Roof tile systems, combining mechanically fastened tile and mortar and/or adhesive, shall be acceptable.

1518.8.4.2

In an air permeable tile roofing system: (1) the length of each tile shall be not less than 12 inches (305 mm) and not greater than 21 inches (533 mm) and the exposed width of the tile shall be between 8.5 inches and 15 inches (216 mm and 381 mm); (2) the maximum thickness of the nose (leading edge) of the tile shall not exceed 1.3 inches (33 mm); and (3) mortar or adhesive set system shall have at least two-thirds of the tile free of mortar and/or adhesive contact.

1518.8.5

The proposed method of attachment for tile systems which are considered to be air permeable, shall provide sufficient attachment resistance (M_f) (listed in tile product approval) to meet or exceed the moment of resistance (M_r) as determined by following the procedures outlined in RAS 127. The aerodynamic multiplier (k) needed in RAS 127 shall be part of the tile product approval and shall be derived from the following formulas:

$$\text{for direct deck application} \quad k = (0.156) \times (b) \times (l/2)$$

$$\text{for batten application} \quad k = (0.144) \times (b) \times (l/2)$$

Where b (in feet) = exposed width of the tiles

Where l (in feet) = length of tiles

1518.8.6

The proposed method of attachment for tile systems which are not considered air permeable shall provide a minimum characteristic force (F') (listed in tile product control approval) to meet or exceed the required uplift resistance (F_r) as determined by following the procedures outlined in RAS 127.

1518.8.7

Tile systems shall extend beyond the drip edge (not including the rake) not less than $\frac{3}{4}$ inch (19 mm) but not more than 2 inches (51 mm).

1518.8.8

Reserved.

1518.8.9

Reserved.

1518.8.10

Mortar or adhesive set tiles applied at an incline from 6:12 up to and including 7:12 shall have the first course of tile (this applies to pan only on two-piece barrel tile) mechanically fastened with not less than one fastener per tile. As an alternate, the first course of tile shall be applied in mortar over a single layer of minimum 20 gage galvanized wire mesh with openings of not less than $\frac{1}{2}$ inch (12.7 mm) or greater than $1\frac{1}{2}$ inches (38 mm) with minimum exposure of 12 inches (305 mm) which is mechanically attached to the deck through the

underlayment with approved fasteners and tin-cap when back-nailing the cap sheet. Additionally, for roof inclines of 6:12 up to and including 7:12, every third tile of every fifth course, shall be mechanically fastened with not less than one fastener per tile. For roof inclines above 7:12, in addition to the mortar or adhesive, all tiles shall be mechanically fastened with not less than one fastener per tile. Apply approved flashing cement to seal all tile fastener penetrations, for all roof inclines.

1518.8.11

All tile systems shall be shingle lapped interlocking and installed with the headlap as specified in the tile system product approval. In no case shall the minimum headlap be less than 2 inches (51 mm) for mortar or adhesive set tile, or less than 3 inches (76 mm) for mechanically set tile, unless restricted by product design.

1518.8.12

Where tiles are to be installed over an insulated roof deck, a suitable nailable substrate, in accordance with Sections 1520.5.6 and 1520.5.7 must be installed over the insulation prior to the installation of approved underlayment and tiles.

1518.8.13

For mortar or adhesive set tile, no more than two tiles shall be loose per roofing square [100 square feet (9.3 m²)]. No loose tile shall be adjacent to each other.

1518.9 Metal Panels/Shingles

Steel panels/shingles shall be a minimum of G-90 corrosion resistant, and shall be not less than 26 gage in thickness. Aluminum panels/shingles shall not be less than 0.025 inch (0.685 mm) thick. All other metal panel/shingle products shall be an equivalent weight. All metal panel/shingle assemblies shall be capable of withstanding foot traffic without damage to the metal panels/shingles. Metal panels/shingles shall have product approval for a complete metal system, which shall include the panel/shingle, underlayment and all related accessories to provide a complete waterproof system.

1518.9.1

All metal panels/shingles assemblies shall be tested in accordance with Section 1523 and TAS 125.

1518.9.2

The entire application method of all metal panel/shingle systems shall be detailed in the product approval and RAS 133, as applicable.

1518.9.3

Metal shingles may be applied as a recover over a single layer of asphalt shingles or smooth surface roofing, providing the deck is solid sheathed and in compliance with the provisions of this code, the existing prepared roof covering is in compliance with provisions of this code and the entire metal shingle system is applied as set forth in the product approval.

1518.9.4

Metal panel/shingle systems shall not extend more than 1 inch (25 mm) beyond the roof eave.

1518.9.5

All intersections shall be flashed in metal as provided in Section 1517.6, RAS 111 and the roof assembly product approval.

1518.10 Wood Shingles and Shakes

All wood shingles and shakes shall be installed in accordance with RAS 130. Installation of all wood shingles and shakes shall be limited to a roof mean height of 33 feet (10 m), unless otherwise specifically noted in the product approval.

1518.10.1

All wood shingle/shake systems shall be tested in accordance with Section 1523.

1518.11 Building Integrated Photovoltaic Roofing Modules/Shingles

The installation of building integrated photovoltaic roofing modules/shingles shall comply with the provisions of this section.

1518.11.1 Material Standards

Building integrated photovoltaic roofing modules/shingles shall be listed and labeled in accordance with UL 1703.

1518.11.2 Attachment

Building integrated photovoltaic roofing modules/shingles shall be attached in accordance with the manufacturer's product approval.

1518.11.3 Wind Resistance

Building integrated photovoltaic roofing modules/shingles shall be tested in accordance with procedures and acceptance criteria in TAS 107. Building integrated photovoltaic roofing modules/shingle packaging shall bear a label to indicate compliance with the procedures in TAS 107.

Section 1519 High-Velocity Hurricane Zones—Roof Coverings With Slopes Less Than 2:12

1519.1 General

All adhered roofing components shall be bonded to the various types of substrates in compliance with the requirements set forth in the roofing assembly product approval and the following minimum requirements. The authority having jurisdiction may adopt RAS 150 as the means of complying with the requirements listed in this section.

1519.2

All packaged asphalt shall have the following data printed on the carton wrapper:

1519.2.1

ASTM designation and type;

1519.2.2

Flash point as determined by ASTM D92, Flash and Fire Point by Cleveland Open Cup; and

1519.2.3

Equiviscous temperature (EVT) at which the asphalt attains a viscosity of 125 centipoise (25 centipoise for coal tar) as determined by ASTM D4402, Viscosity Determinations of Unfilled Asphalt Using the Brookfield Thermoset Apparatus.

1519.3

Asphalt types, as defined by ASTM D312, shall be employed in all roofing assemblies. Application of asphalt shall be in compliance with Table 1519.3A and Table 1519.3B or as detailed in the roofing assembly product approval.

TABLE 1519.3A

SLOPE AND APPLICATION TEMPERATURE CRITERIA

MAXIMUM¹				
		Slope (in./ft)	Temperature (°F)	
ASTM D312 TYPES OF ASPHALT			MOP	MECHANICAL
Type I	Dead Level	$\frac{1}{4}$	350 ± 25	375 ± 25
Type II	Flat	$\frac{1}{2}$	400 ± 25	425 ± 25
Type III	Steep	3	425 ± 25	450 ± 25
Type IV	Special Steep (All roof tile systems)	N/A	450 ± 25	475 ± 25

1 inch = 25.4 mm; °C = 5/9 (°F - 32).

- Temperature and slope measurements are at point of application.

TABLE 1519.3B
SLOPE AND APPLICATION TEMPERATURE CRITERIA

ASTM D450 COAL TAR TYPE NO.	TYPE OF COAL TAR	MAXIMUM SLOPE (in./ft)	TEMPERATURE RANGE (°F)
Type I	Coal Tar Pitch	$\frac{1}{4}$	360 ± 25
Type II	Coal Tar Bitumen	$\frac{1}{4}$	375 ± 25

1 inch = 25.4 mm; °C = 5/9 (°F - 32).

1519.4

Back nailing of interply sheets shall not be required when using ASTM D312 Type IV asphalt on slopes less than 3:12.

1519.5 Mechanical Attachment

All mechanically attached roofing components shall be attached to the various types of substrates in compliance with the requirements set forth in the roofing assembly product approval and the following minimum requirements.

1519.5.1 Base Sheet Attachment on Wood Decks

Nails shall be minimum 12 gage, annular ring shank nails having not less than 20 rings per inch; heads not less than $\frac{3}{8}$ inch (9.5 mm) in diameter; and lengths sufficient to penetrate through the thickness of plywood panel or wood plank decking not less than $\frac{3}{16}$ inch (5 mm), or to penetrate into a 1-inch (25.4 mm), or greater, thickness of lumber not less than 1 inch (25.4 mm). Nails shall be hot dipped; electro- or mechanically galvanized to a thickness sufficient to resist corrosion in compliance with Appendix E of TAS 114. All nails shall have product approval. All nail cartons or carton labels shall be labeled to note compliance with the corrosion-resistance requirements. No roofing material shall be fully or partially adhered, unless otherwise noted in the roof assembly product approval directly to a nailable deck.

1519.5.1.1

Tin caps shall meet the requirements of Section 1517.5.2.

1519.5.1.2

Prefabricated fastener systems complying with Sections 1519.5.1 and 1519.5.1.1 may be used, provided they are product approved.

1519.5.1.3

Spacing of such fasteners shall be in compliance with patterns set forth in the roofing assembly product approval.

1519.5.2

Where the architectural appearance of the underside is to be preserved, a base sheet may be secured in an alternate method of attachment prepared, signed, and sealed by a Florida-registered architect or engineer, or in buildings where the mean roof height does not exceed 15 feet (4.6 m), a base sheet may be secured with $1\frac{1}{4}$ -inch (32 mm) fasteners on supporting members, with a minimum of $1\frac{1}{2}$ -inch (12.7 mm) fasteners between the supporting members, all of which shall be secured through tin caps and nailed 6 inches (152 mm) o.c. in all directions.

1519.5.3 Lightweight Insulating Concrete

All lightweight insulating concrete shall be vented per roofing system manufacturer recommendations.

1519.5.3.1

Lightweight concrete shall not be applied over an existing roof deck unless the supporting structure has been approved as adequate to sustain the added weight. Calculations verifying the adequacy of the existing structure to sustain the added weight shall be

prepared, signed, sealed and dated by a Florida-registered architect or engineer, who is proficient in structural design, and submitted with the uniform roofing permit application.

1519.5.4 Other Nailable Decks

The mechanical attachment of roofing components to other nailable decks shall be governed by the roofing assembly product approval.

1519.6 Cast-in-Place and Precast Structural Concrete Decks

Cast-in-place and precast structural concrete decks are considered nonnailable. Concrete decks shall be clean, dry and fully primed with ASTM D41 or ASTM D43, as required, primer applied at a rate of not less than 1 gallon (3.8 L) per square. Hot asphalt or cold adhesive shall not be applied until the primer has fully dried.

1519.6.1

Reserved.

1519.7 Steel Decks

Steel decks shall be covered with a roof insulation panel having its own product approval and listed in the roofing assembly product approval. Insulation panels shall be mechanically fastened in compliance with the mechanical attachment patterns listed in the roofing assembly product approval and in accordance with the provisions of RAS 117.

1519.7.1

If the deck thickness on an existing steel deck is less than 22 gage, a field fastener withdrawal-resistance test shall be conducted in compliance with TAS 105 to confirm compliance with the wind load requirements of Chapter 16 (High-Velocity Hurricane Zones). Test results shall be submitted with the uniform roofing permit application for review prior to issuance of the roofing permit. The field fastener withdrawal-resistance test shall be carried out by an approved testing laboratory.

1519.7.2

Steel decks shall be welded or mechanically attached to the structure in compliance with the design pressure requirements set forth in Chapter 16 (HighVelocity Hurricane Zones).

1519.7.3

Composite wood and insulation panels shall be mechanically attached to steel decks in compliance with the attachment requirements enumerated in the insulation roofing component product approval. The composite wood insulation panel shall be in compliance with the minimum sheathing requirements of this code.

1519.8 Flashing

All flashing shall be installed according to the roof assembly manufacturer's published details and literature and in accordance with RAS 111.

1519.9 Valleys

Valleys in BUR shall be installed according to the roof assembly manufacturer's published literature for high wind areas and in compliance with the applicable detail described in the product approval.

1519.10 Parapet Walls

All parapet wall details shall be installed in accordance with the roofing system product approval, manufacturer's published details and literature and in accordance with approved methods detailed in RAS 111.

1519.11 Insulation

Roof insulation shall be applied in compliance with the roofing system product approval and RAS 117.

1519.12 Surfacing

Roofing assemblies shall be surfaced in compliance with the product approval. Surfacing shall be in sufficient quantity to comply with the required fire classification. Aggregate surfacing shall not be used on slopes greater than 3:12. Aggregate shall be embedded in a flood coat of bitumen applied over a prepared top ply.

1519.12.1

On slopes of 3:12 or less, not less than 400 pound (182 kg) of roofing gravel or 300 pounds (145 kg) of slag per square shall be applied. A minimum of 50 percent of the total aggregate shall be embedded in the flood coat of bitumen. Aggregate shall be dry and free from dirt and shall be in compliance with the sizing requirements set forth in ASTM D1863. A building official may request a test to confirm compliance with these requirements.

1519.12.2

On inclines greater than 3:12, a smooth surface coating shall be applied.

1519.12.3

Mineral surfaced cap sheet applications shall not require any additional surfacing unless required with the particular assembly for a fire classification.

1519.12.4

All smooth surface applications shall be coated with an aluminized or emulsion coating, having a valid and current product approval and shall be in compliance with the application instructions in said product approval. Coating quantity shall be in compliance with the required fire rating classification for the structure.

1519.13 Attachment of Metal Termination

All edge metal and terminations shall be installed according to manufacturer's published literature, provided it meets the minimum requirements as set forth in RAS 111 and Chapter 16 (HighVelocity Hurricane Zones).

1519.14 Expansion Joints

Expansion joint covers and expansion joint components shall be constructed and installed in accordance with the roofing assembly manufacturer's published literature.

1519.15 Venting Roofing Assemblies

All roof assemblies shall be applied to a dry substrate. Vapor retarders shall be installed, where applicable, to reduce moisture vapor flow into insulation from the warm, humid building interior, leading to internal condensation. Vents shall be installed to assist in the expulsion of moisture vapor where such vapor may enter the roofing assembly or moisture, as defined in Section 1521.12. Venting units shall not allow vapor to enter the roofing assembly when the high vapor pressure side is above the roofing membrane.

1519.16 Waterproofing

Waterproofing systems may be installed in lieu of an approved roof system over sloped or horizontal decks specifically designed for pedestrian and/or vehicular traffic, whether the deck is above occupied or unoccupied space. In new construction the minimum deck slope shall be 1/4:12.

1519.16.1

The waterproofing system must possess a current and valid product approval.

1519.16.2

If an overburden or wearing surface is not to be installed, the waterproofing system must be approved by the manufacturer for use in vehicular and/or pedestrian traffic locations.

1519.16.3

Reserved.

1519.16.4

If any portion of the waterproofing membrane is to remain exposed, the waterproofing system shall be ultra-violet resistant.

1519.16.5

Flashings must be installed in accordance with the waterproofing manufacturer's published specifications and in compliance with the material and attachment standards of RAS 111.

1519.16.6

The waterproofing system shall be flood tested in accordance with ASTM D5957.

1519.16.1

The flood test shall take place after installation of the waterproofing membrane and prior to the installation of any above membrane components, wearing surface or overburden.

1519.16.2

An approved testing lab shall provide written verification to the building official confirming that the flood test was performed along with the results, prior to final inspection.

Section 1520 High-Velocity Hurricane Zones—Roof Insulation**1520.1 General**

All roof insulation shall have a product approval as an approved roofing component for use in roofing assemblies. All insulation shall be tested for physical properties in accordance with TAS 110.

1520.2 Foam Plastic

Reserved.

1520.2.1

Foam insulation panels shall be overlaid with a perlite, fiberglass, wood fiber or mineral wool overlay unless specifically stated to the contrary in the roof assembly product approval.

1520.3 Cellulose Fiberboard

Reserved.

1520.4 Insulation Fasteners, Membrane Fasteners and Stress Plates

All insulation fasteners, membrane fasteners and stress plates shall have a roof component product approval, and shall be tested in compliance with RAS 117 Appendices A, B and C, and TAS 110 and TAS 114, Appendix E, Section 3 (DIN 50018), for corrosion resistance.

1520.5 Application

Roof insulation shall be applied in strict compliance with the application methods detailed in the roof assembly product approval and with the requirements set forth in RAS 117.

1520.5.1

Roof insulation, either on the ground or on the roof top, shall be kept dry. The building official shall instruct the removal of the insulation from the job when elevated moisture levels are found in the insulation or where panels cannot achieve 85-percent adhesion.

1520.5.2

When applied in hot asphalt or cold adhesive, no insulation panel's dimension shall be greater than 4 feet (1219 mm).

1520.5.3

Strip or spot mopping of insulation panels shall be used as an application method only when approved in the roof assembly product approval.

1520.5.4

Where more than one layer of insulation is applied, joints between layers shall be staggered.

1520.5.5

Application in approved cold adhesive shall be as detailed in the product approval and shall be in compliance with the required fire classification.

1520.5.6

Nail boards or composite panels with a nailable surface may be applied to sloped decks for the application of prepared roof covering or metal roofing systems, providing that the nailing surface is minimum $1\frac{5}{32}$ -inch (12 mm) exterior grade plywood sheathing, and has been attached to the deck with approved fastening assemblies in accordance with the windload requirements of Chapter 16 (High-

Velocity Hurricane Zones). Composite panels shall be gapped a minimum of $\frac{1}{8}$ inch (3.2 mm) to allow for expansion of the sheathing panel.

1520.5.7

Suitable nailable decks installed over rigid board roof insulation in buildings of mean roof height of 35 feet (10.7 m) or less, shall be a minimum of $1\frac{5}{32}$ -inch (12 mm) exterior grade plywood sheathing. These decks shall be fastened to every structural roof frame member or to the existing deck under the insulation, at intervals of not more than 24 inches (610 mm) apart, with a minimum #12 approved insulation fastener spaced at a maximum of 12 inches (305 mm) apart in one direction with a minimum penetration of $1\frac{1}{2}$ inches (38 mm) into the structural member or deck. In these cases the maximum thickness of the rigid insulation board shall not exceed 2 inches (51 mm). An alternate method of attachment may be proposed, provided it is in compliance with Chapter 16 (High-Velocity Hurricane Zones), and it is prepared, signed and sealed by a Florida-registered architect or a Florida professional engineer, which architect or engineer shall be proficient in structural design.

1520.5.8

Mechanical attachment of insulation panels at uneven areas shall be acceptable. Hollowing, cutting or scoring of insulation panels to provide contact shall not be acceptable.

Section 1521 High-Velocity Hurricane Zones—Reroofing

1521.1 General

Materials and methods of application used for recovering or replacing an existing roof covering, system or assembly shall comply with the requirements set forth in Sections 1512 through 1525.

1521.2

Repairs shall be carried out with roofing components as defined in this chapter having a product approval.

1521.3

Repairs shall be carried out in such a manner as to not create additional ponding water.

1521.4

Not more than 25 percent of the total roof area or roof section of any existing building or structure shall be repaired, replaced or recovered in any 12-month period unless the roof covering on the entire existing roof system or roof section is replaced or recovered to conform to the requirements of this code.

Exception: If an existing roofing system or roof section was built, repaired, or replaced in compliance with the requirements of the 2007 *Florida Building Code*, or any subsequent editions of the *Florida Building Code*, and 25 percent or more of such roofing system or roof section is being repaired, replaced, or recovered, only the repaired, replaced, or recovered portion is required to be constructed in accordance with the *Florida Building Code* in effect, as applicable. Pursuant to Section 553.844(5), *Florida Statutes*, a local government may not adopt by ordinance an administrative or technical amendment to this exception.

1521.5

A roofing system shall not be applied over an existing roof or over an existing roof deck where the roof sheathing has not been fastened in compliance with this code or where the roof sheathing will not permit effective fastening or where sheathing is water soaked or deteriorated so that effective attachment is not possible. All areas of deteriorated sheathing shall be removed and replaced. The building official shall not be required to inspect the renailing of the sheathing under this section.

1521.6

Structural concrete decks shall be allowed to dry or shall be dried prior to application of an ASTM D41 or ASTM D43, as required, or roofing system proprietary primer where the base sheet or base insulation layer is bonded to the concrete deck.

1521.7

On lightweight insulating concrete, gypsum and cementitious wood fiber roof decks a field fastener withdrawal-resistance test, in compliance with TAS 105, shall be carried out to confirm compliance with wind load requirements of Chapter 16 (High-Velocity Hurricane Zones).

1521.7.1

If the tested fasteners exhibit a minimum characteristic resistance force less than 80 percent than that listed in the product approval, a structural engineer shall examine the deck's integrity and provide a proposed attachment specification. Such specification shall be submitted with the uniform roofing permit application for review and approval by the building official prior to the issuance of a roofing permit. Calculations for the attachment of the anchor sheet/base sheet or insulation over these deck types shall be in compliance with RAS 117.

1521.8

Steel decks shall be examined prior to recover for indication of corrosion. Any corrosion identified and exposed on the roof side shall be treated with a rust inhibitor, providing the field fastener withdrawal resistance values of the proposed mechanical fasteners comply with the requirements of Chapter 16 (High-Velocity Hurricane Zones) of this code. All steel decks less than 22 gage shall be field tested for fastener withdrawal resistance for compliance with Chapter 16 (HighVelocity Hurricane Zones) prior to application of a new roofing system. Test results shall be submitted with the uniform roofing permit application.

1521.9

One additional roofing system may be applied over an original roofing assembly, providing the existing roofing assembly complies with the requirements of Section 1521.

1521.10

If the recover roofing assembly is to be bonded to an existing roofing membrane, the existing roofing membrane shall be tested in compliance with TAS 124 for uplift resistance. The existing roofing membrane shall resist the design pressures calculated under Chapter 16 (High-Velocity Hurricane Zones) of this code. Test results shall be submitted with the uniform roofing permit application.

1521.11

If the recover roofing assembly is mechanically attached through either a base sheet or insulation layer, the attachment assembly shall be field tested for fastener withdrawal resistance in compliance with TAS 105, and laboratory tested for pull-over resistance to insure compliance with wind uplift requirements set forth in Chapter 16 (High-Velocity Hurricane Zones) of this code. Test results shall be submitted with the uniform roofing permit application. Recover roofing assembly anchor sheet or base sheet shall not be mechanically fastened directly to existing gravel roof unless all gravel is completely removed.

1521.12

Moisture content of the existing roofing assembly to be covered by a new roofing system shall not exceed 5 percent by weight in the roofing membrane and 8 percent by weight in commercially manufactured rigid board roof insulation as verified by moisture survey performed in accordance with TAS 126. Test results shall be submitted with the Uniform Roofing Permit Application. Testing for moisture content shall not be required for existing lightweight insulating concrete, gypsum, and cementitious wood fiber roof decks. All existing lightweight insulating concrete, gypsum and cementitious wood fiber roof decks shall be tested in accordance with Section 1521.7 to confirm compliance with wind load requirements of Chapter 16 (High-Velocity Hurricane Zones).

1521.13

Prior to starting the work the contractor has the responsibility of notifying the owner of any possibility of ponding water and recommending a structural review if ponding water is a possibility.

1521.14

If the new roofing system is to be bonded to the existing roof surface, the surface shall be free of all loose gravel, dirt and silt and dry prior to commencement of the roofing application. All blisters shall be cut and repaired prior to roofing application.

1521.14.1

If the existing roof surface has gravel embedded in hot asphalt, all loose gravel shall be removed together with any dirt and silt. The dry membrane surface shall be primed with ASTM D41 primer or proprietary roofing system primer and allowed to dry thoroughly. A flood coat of ASTM D312, Type III or IV asphalt shall be applied to sufficient depth to cover the remaining embedded gravel. The prepared substrate shall be suitable for application of a new insulation layer only.

1521.14.2

In the case of existing coal tar assemblies, the existing roof surface shall be primed with ASTM D43 primer or covered with a mechanically attached separation board prior to application of a new coal tar assembly. If an existing coal tar assembly is to be covered with an asphalt applied roofing system, only the separation board is acceptable. The attachment of the entire assembly, including the separation board, shall meet the design pressure requirements set forth in Chapter 16 (High-Velocity Hurricane Zones).

1521.14.3

Insulation shall have a product approval as a roofing component approved for use as a part of the roofing assembly. The insulation panels shall be bonded or mechanically attached in compliance with the product approval and RAS 117.

1521.15

Where an existing sloped roof is sheathed with spaced sheathing, any existing prepared roof covering shall be removed. New sheathing shall be applied in compliance with Chapter 16 (High-Velocity Hurricane Zones), or open spacing shall be filled with dimensional lumber to create solid wood sheathing providing the spaced sheathing is in compliance with this code. Spaced sheathing is approved for use with wood shakes and wood shingles only.

1521.16

No recover application shall take place over existing wood shingles, shakes, slate, tile or metal shingles.

1521.17

Asphalt shingle assemblies may be applied over one existing layer of asphalt shingles having not more than $\frac{1}{8}$ -inch (3.2 mm) difference in level in the existing shingle material. Recover over an existing shingle system shall be with a product having a product approval as prepared roof covering, in strict compliance with the application method detailed in the product approval.

1521.17.1

Application of elastomeric and or maintenance coating systems over existing asphalt shingles shall be in accordance with the shingle manufacturer's approved installation instructions.

1521.18

Sprayed polyurethane foam (PUF) and elastomeric coating systems may be applied over existing roofing assemblies providing the PUF system has obtained a product approval, the deck has been prepared in compliance with the product approval and this code, the application is in strict compliance with the foam manufacturer's published application instructions for the environmental conditions at the time of application and post-application inspections conform to RAS 109.

1521.18.1

No PUF system shall be applied over existing composition shingles.

1521.18.2

Upon completion of a PUF system, an inspection of the system shall be carried out by an authorized representative of the coating manufacturer. A certification shall be furnished to the building official within 30 days of completion, confirming that the quality control tests detailed in the PUF system product approval have been carried out with satisfactory results.

1521.18.3

Should a PUF system have inadequate adhesion to meet the design pressures, as set forth in Chapter 16 (High-Velocity Hurricane Zones), the roofing system shall be removed and replaced with a roofing system tested to adequate adhesion. An additional inspection shall be required once the roofing system has been replaced. A field adhesion test may be requested by the building official during the application or at the completion of the project to confirm adequate adhesion.

1521.18.4

The PUF system shall comply with Section 1521.

1521.18.5

All PUF systems shall be installed by licensed roofing contractors holding an applicator's certificate from the manufacturer holding the product approval for the PUF system.

1521.19

Roof coverings or roofing components, such as tile, slate or similar, shall not be applied over an existing roofing system.

1521.20

Lightweight insulating concrete shall not be applied over an existing roofing system unless the existing roofing assembly is verified to be adequate to accept the new lightweight insulating concrete and is in compliance with the testing required herein.

1521.21

Reserved.

Section 1522 High-Velocity Hurricane Zones—Rooftop Structures and Components

1522.1 Rooftop Structures

Rooftop structures shall be designed and constructed in accordance with the *Florida Building Code*.

1522.2 Rooftop-Mounted Equipment

All rooftop equipment and supports shall be secured to the structure in compliance with the loading requirements of Chapter 16 (HighVelocity Hurricane Zones). The use of wood "sleepers" shall not be permitted.

1522.3

Machinery, piping, conduit, ductwork, signs and similar equipment may be mounted on roofs in compliance with the following:

TABLE 1522.3

ROOF MOUNTED EQUIPMENT HEIGHT REQUIREMENTS

WIDTH OF EQUIPMENT (in.)	HEIGHT OF LEGS (in.)
Up to 24	14
25 to 36	18
37 to 48	24
49 to 60	30
61 and wider	48

For SI: 1 inch = 25.4 mm.

1522.3.1

Permanently mounted rooftop equipment shall be installed to provide clearances, in accordance with Table 1522.3, to permit repairs, replacement and/or maintenance of the roofing system or any of its components.

1522.3.2

When reroofing, recovering, performing repair or roof maintenance, and where the roof top equipment is moved to properly execute such work, the minimum clearances of the said equipment support shall be in accordance with Table 1522.3.

1522.3.3

In buildings where the existing rooftop equipment, in the opinion of the building official, provides sufficient clearance to repair, recover, replace and/or maintain the roofing system or any of its components, such existing equipment need not comply with Table 1522.3.

1522.3.4

Electrical conduit, mechanical piping or any other service lines running on the roof shall be raised not less than 8 inches (203 mm) above the finished roof surface.

1522.3.5

Condensate lines shall not drain on the roofing system or any of its components. Condensate lines need not comply with the minimum clearance requirements.

Section 1523 High-Velocity Hurricane Zones—Testing

1523.1 Scope

This section defines the minimum testing requirements for substrates, roofing components, roofing systems and roofing assemblies. All roofing products shall be tested for physical properties, water-infiltration, uplift performance and fire resistance, as addressed within this code.

1523.1.1

Testing requirements for physical properties of all roofing products shall be as set forth in TAS 110.

1523.1.2

Reserved.

1523.2 Application

Testing for substrates, roofing components, roofing systems and roofing assemblies shall comply with the provisions herein and those of *Florida Building Code, Building*, TAS and RAS listed in this code.

1523.3 Laboratory Certification

All testing required by this code shall be performed by an approved testing laboratory.

1523.4 Margin of Safety

A margin of safety of 2:1 shall be applied to all wind uplift resistance test results. All in-situ (on-site) testing shall have an applied 1.45:1 margin of safety.

1523.5 Material Labeling

All products shall be identified with the product approval number or logo; or the manufacturer's name or logo. ASTM standard roll goods shall be marked with a yellow line to identify the ASTM standard, or such other marking indicated in the product approval.

1523.5.1

All asphalt shingles, tile products and metal roofing panels and clips shall be labeled on the underside with the *Florida Building Code, Building* insignia, or product approval number, or the wording "Florida Building Code, Building Product Approved," and manufacturer's initials or manufacturer's logo, or as specified in the manufacturer's product approval.

1523.6 Testing Requirements

1523.6.1

The certification agency, at its discretion, may carry out, observe or delegate the inspection and testing to an independent testing laboratory for any approved product. Should the manufacturer fail to meet the minimum requirements set forth in this code or specifically listed in the manufacturer's product control approval, the certification agency shall have the authority to withdraw the approval until such time as the manufacturer complies with the approved physical properties. The certification agency shall have the authority, and shall charge the manufacturer for any cost incurred.

1523.6.2 Continuous Roofing Systems

All continuous roofing systems shall be tested in compliance with TAS 110 and TAS 114 in its entirety. All continuous roofing systems shall resist a minimum of 90 pounds per square foot (psf) (4309 Pa) tested wind uplift pressure resistance. Continuous roofing system testing requirements shall be as follows:

1523.6.2.1 Spray Applied Polyurethane Foam

All spray applied polyurethane foam systems shall be tested in compliance to RAS 109 and TAS 110 and TAS 114.

1523.6.2.1.1

Physical properties testing for acrylic coatings used on spray applied polyurethane foam roofing assemblies shall be tested in compliance with ASTM D6083 and federal specification TTC-555B, Test Specification for Wind Driven Rain Infiltration Resistance.

1523.6.3 Liquid Applied Roofing Membranes Systems

All liquid applied roofing membranes systems shall be tested in compliance with TAS 114, in addition to the physical properties testing requirements set forth in TAS 110, and fire resistance.

1523.6.3.1

For liquid applied acrylic roofing membrane assemblies, physical properties testing shall be in compliance with ASTM D6083 and federal specification TTC-555B, Test Specification for Wind Driven Rain Infiltration Resistance.

1523.6.4

The building official may request that a quality control field uplift test be carried out on a continuous roofing system in compliance with test procedure TAS 124. Single-ply systems are not required to meet the deflection requirements established in the test protocol if mechanically attached. The roofing system shall resist the design pressures as calculated in compliance with Chapter 16 (High-Velocity Hurricane Zones), and as established in TAS 124, Section 4.

1523.6.4.1

Should a roofing system fail to meet a quality control field uplift test, the roofing contractor may propose to the building official an acceptable method of repair that is in compliance with the requirements of this code.

1523.6.5 Discontinuous Roofing Systems

All discontinuous roofing systems shall be tested in compliance with TAS 100 for wind-driven water infiltration resistance. Test specimens used for this test shall be constructed at the approved test facility. Testing requirements shall be as follows:

1523.6.5.1 Asphalt Shingle Systems

All asphalt shingle systems shall comply with the following requirements: TAS 100, TAS 107, ASTM D3462 and ASTM D3018. Asphalt shingle systems shall have a quality control testing program by an approved independent listing agency having an unannounced follow-up visit. Follow-up test results shall be made available to the certification agency upon request.

1523.6.5.2 Clay and Cement Roof Tiles

All roof tiles shall be tested in compliance with TAS 100. Physical properties testing for clay roof tiles shall be in compliance with ASTM C1167. Physical properties testing for concrete roof tiles shall be in compliance with TAS 112. All approved roof tile manufacturers shall submit a quarterly TAS 112 Appendix A test report to the certification agency for review. All roof tiles shall resist a minimum wind uplift resistance as determined by Chapter 16 (High-Velocity Hurricane Zones) of this code and RAS 127. Clay and cement roof tile systems requirements are as follows:

1523.6.5.2.1 Underlayment

All underlays used in discontinuous roof tile systems shall be tested in compliance with TAS 103 and TAS 104, unless otherwise specifically listed in the applicable RAS.

1523.6.5.2.2 Mortar or Adhesive Set Roof Tile Systems

All mortar or adhesive set tile systems shall be tested for static uplift resistance in compliance with TAS 101, the results of which shall be listed in the system manufacturer's product approval.

1523.6.5.2.2.1

Additionally, roof tile system manufacturers may test for wind characteristics in compliance with TAS 108, provided the system is determined to be air permeable by testing in compliance with TAS 116; and the tiles meet the size criteria set forth in TAS 108. The result from this testing shall be an aerodynamic multiplier (I) which represents the system's wind characteristics and shall be listed in the system manufacturer's product approval.

1523.6.5.2.2.2

Systems which are tested for wind characteristics, in compliance with TAS 108 as specified above, shall have the results of the TAS 101 testing treated as attachment resistance moment (M_f), which is representative of the tile bond's resistance to overturning moment, and the tile's restoring moment due to gravity (M_g). Such systems shall use the system's aerodynamic multiplier (I) in conjunction with the system's attachment resistance moment (M_f) and restoring moment due to gravity (M_g), as determined from the TAS 101 static uplift testing. These results shall be used in conjunction with the attachment calculations outlined in RAS 127 as a moment-based system. Such calculations shall be submitted to the building official for review.

1523.6.5.2.2.3

Systems that are not tested in compliance with TAS 108 as specified above shall have their product control approval based on the system's uplift minimum characteristic resistance force (F'), as determined from TAS 101 static uplift testing. These results

shall be used in conjunction with the attachment calculations outlined in RAS 127 as an uplift-based system. Such calculations shall be submitted to the building official for review.

1523.6.5.2.2.4

Testing in accordance with TAS 106 shall be considered a product application quality control test to determine the general adhesion properties of the system.

1523.6.5.2.3 Mechanically Fastened, Rigid Roofing Systems

All mechanically attached set tile systems shall be tested for static uplift resistance in compliance with TAS 102 or TAS 102(A), the results of which shall be listed in the system manufacturer's NOA.

1523.6.5.2.3.1

Additionally, roof tile system manufacturers may test for wind characteristics in compliance with TAS 108, provided the system is determined to be air permeable by testing in compliance with TAS 116; and the tiles meet the size criteria set forth in TAS 108. The result from this testing shall be an aerodynamic multiplier (k) which represents the system's wind characteristics and shall be listed in the system manufacturer's product approval.

1523.6.5.2.3.2

Systems which are tested for wind characteristics in compliance with TAS 108 as specified above shall have the results of the TAS 102 or TAS 102(A) testing treated as an attachment resistance moment (M_f) which is representative of the rigid component's attachment resistance to an overturning moment, and the tile's restoring moment due to gravity (M_g). Such systems shall use the system's aerodynamic multiplier (k), in conjunction with the system's attachment-resistance moment (M_f) and restoring moment due to gravity (M_g), as determined from the TAS 102 or TAS 102(A) static uplift testing. These results shall be used in conjunction with the attachment calculations outlined in RAS 127 as a moment-based system. Such calculations shall be submitted to the building official for review.

1523.6.5.2.3.3

Systems that are not tested in compliance with TAS 108 as specified above shall have their product control approval based on the system's uplift minimum characteristic resistance force (F'), as determined from TAS 102 or TAS 102(A) static uplift testing. These results shall be used in conjunction with the attachment calculations outlined in RAS 127 as an uplift-based system. Such calculations shall be submitted to the building official for review.

1523.6.5.2.3.4

TAS 106 quality control field static uplift testing shall be considered a product application quality control test to determine the general uplift-resistance properties of the system.

1523.6.5.2.4 Metal Shingles/Panels

All metal roofing shall be tested in compliance with TAS 100. All metal roofing shall resist a minimum wind uplift resistance as determined by Chapter 16 (High Velocity Hurricane Zones) for a roof slope of 9.5 degrees (0.0166 rad) and a roof mean height of 15 feet (4.6 m). All metal roofing systems testing requirements shall be as follows:

1523.6.5.2.4.1

All metal roofing shall be tested in compliance with requirements set forth in TAS 110 and TAS 125, and shall be tested for winddriven rain infiltration resistance in compliance with TAS 100.

1523.6.5.2.4.1.1

Standing seam metal roof panel systems that pass the requirements of the Static Water Leakage Test criteria of ASTM E2140 shall be permitted to be installed to a minimum slope of 1:12.

1523.6.5.2.4.2

Rigid metal shingle systems may be tested in an identical manner to nail-on or batten tile systems as set forth in this code.

1523.6.5.2.5 Wood Shingles or Shakes

All wood shingles and shakes shall be tested, as a system, for wind-driven rain infiltration resistance in compliance with TAS 100. The same specimens as tested in TAS 100 shall be tested for pull-through tear resistance, and such values shall be listed in the manufacturer's product approval.

1523.6.5.2.6 Fiber Cement Shingle or Tile Panels

All fiber cement shingles or tiles shall resist a minimum wind uplift resistance as determined by Chapter 16 (High-Velocity Hurricane Zones) for a roof slope of 9.5 degrees (0.0166 rad) and a roof mean height of 15 feet (4.6 m). All fiber cement shingle or tiles shall be tested in compliance with the following requirements. Wind-driven water resistance in compliance with TAS 100, physical properties in compliance with TAS 110, TAS 135 and uplift resistance.

1523.6.5.2.6.1

Additionally, fiber cement tile system manufacturers may test for wind characteristics in compliance with TAS 108, provided the system is determined to be air permeable by testing in compliance with TAS 116 and the tiles meet the size criteria set forth in TAS 108. The result from this testing shall be an aerodynamic multiplier (k) which represents the system's wind characteristics and shall be listed in the system manufacturer's product approval.

1523.6.5.2.6.2

Systems which are tested for wind characteristics in compliance with TAS 108 as specified above shall have the results of the TAS 102 or TAS 102(A) testing treated as an attachment-resistance moment (M_f) which is representative of the rigid component's attachment resistance to an overturning moment, and the tile's restoring moment due to gravity (M_g). Such systems shall use the system's aerodynamic multiplier (k), in conjunction with the system's attachment-resistance moment (M_f) and restoring moment due to gravity (M_g), as determined from the TAS 102 or TAS 102(A) static uplift testing. These results shall be used in conjunction with the attachment calculations outlined in RAS 127 as a moment-based system. Such calculations shall be submitted to the building official for review.

1523.6.5.2.6.3

Systems that are not tested in compliance with TAS 108 as specified above shall have their product approval based on the system's uplift minimum characteristic resistance force (F_c), as determined from TAS 102 or TAS 102(A) static uplift testing. These results shall be used in conjunction with the attachment calculations outlined in RAS 115 as an uplift-based system. Such calculations shall be submitted to the building official for review.

1523.6.5.2.6.4

TAS 106 quality control field static uplift testing shall be considered a product application quality control test to determine the general uplift-resistance properties of the system.

1523.6.5.2.7 Quarry Roof Slate

All quarry roof slate shall be tested in compliance with TAS 100 and TAS 110.

1523.6.5.2.8 Roof Board Insulation

All roof board insulation shall be tested for physical properties as set forth in Section 8 of TAS 110.

1523.6.5.2.9 Insulation Fasteners, Membrane Fasteners and Stress Plates

All insulation fasteners, membrane fasteners and stress plates shall be tested in compliance with TAS 117 Appendices A, B and C, and TAS 110 and TAS 114, Appendix E, Section 3, (DIN 50018), for corrosion resistance.

1523.6.5.2.10 Roofing Nails and Tin-Caps

All roofing nails and tin-caps shall be tested for corrosion resistance in compliance with TAS 114, Appendix E, Section 2 (ASTM G85).

1523.6.5.2.11 Roof Tile Nails or Fasteners

All roof tile nails or fasteners, except those made of copper, monel, aluminum or stainless steel, shall be tested for corrosion in compliance with TAS 114, Appendix E, Section 2 (ASTM G85), for salt spray for 1000 hours.

1523.6.5.2.11.1

Tile fasteners used in coastal building zones, as defined in Chapter 16 (HighVelocity Hurricane Zones), shall be copper, monel, aluminum or stainless steel.

1523.6.5.2.12 Roofing Adhesives, Mastics and Coatings

All roofing adhesives, mastics and coatings shall be tested in compliance with TAS 110 and TAS 121.

1523.6.5.2.12.1

All roofing adhesives, mastics and coatings shall have a quality control testing program by an approved independent listing agency having unannounced follow-up visits.

1523.6.5.2.12.2

Acrylic roof coatings shall be tested for physical properties in compliance with ASTM D6083.

1523.6.5.2.13 Ridge Vents of Metal, Plastic or Composition Material

All ridge vents shall be tested in compliance with TAS 100(A) for wind driven water infiltration. All ridge ventilators shall be restricted to roof mean height as tested in compliance with TAS 100(A), and shall be listed in the system manufacturer's product approval.

1523.6.5.2.13.1

All plastic ridge ventilators shall be tested for physical properties as set forth in TAS 110 and Chapter 26 of this code.

1523.6.5.2.13.2

All plastic ridge ventilator manufacturers shall have an unannounced follow-up quality control program from an approved listing agency. Follow-up test results shall be made available to the certification agency upon request.

1523.6.5.2.14 Edge Metal, Flashings, and Coping

All edge metal, flashing and copings, not specifically described in RAS 111, shall be tested in compliance with TAS 110, TAS 111(A), TAS 111(B) or TAS 111(C), respectively.

1523.6.5.2.15 Roof Tile Premixed Bagged Mortar

All premixed roof tile mortar shall comply with the requirements set forth in TAS 110 and TAS 123, and shall have a quality control testing program by an approved independent listing agency having unannounced follow-up visits. Follow-up test results shall be made available to the certification agency upon request.

1523.6.5.2.16 Roof Tile Adhesive Used in Repair or Supplemental Tile Attachment

All roof tile adhesive used in repair or supplemental tile attachment shall comply with the requirements set forth in TAS 110 and TAS 123(A).

1523.6.5.2.17 Roof Tile Adhesive Used in Adhesive Set Tiles Systems

All roof tile adhesive used in adhesive set tile systems shall comply with the requirements set forth in TAS 110 and TAS 123.

Physical properties shall be as follows:

1523.6.5.2.17.1

Tested for compressive strength in compliance with ASTM D1621 with a minimum strength of 18 psi (121 kPa) parallel to rise, and 12 psi (82.7 kPa) perpendicular to rise.

1523.6.5.2.17.2

Tested for density in compliance with ASTM D1622 with a minimum density of 1.6 lb/ft³ (25.6 kg/m³).

1523.6.5.2.17.3

Tested for tensile strength in compliance with ASTM D1623 with a minimum requirement of 28 psi (193 kPa) parallel to rise.

1523.6.5.2.17.4

Tested for dimensional stability taken from a free rise sample specimen. Tested in compliance with ASTM D2126 with a maximum volume change of +0.07-percent volume change at -40°F (-40°C) for two weeks; and +6.0-percent volume change at 158°F (70°C) and 100 percent RH for two weeks.

1523.6.5.2.17.5

Tested in compliance with ASTM D2856 from a free rise sample specimen with a minimum requirement for 85 percent.

1523.6.5.2.17.6

Tested for water absorption in compliance with ASTM D2842 with a maximum requirement of 10 percent.

1523.6.5.2.17.7

Tested in compliance with ASTM E96 for moisture vapor transmission for a maximum of 3.1 perms.

Section 1524 High-Velocity Hurricane Zones—Required Owner's Notification for Roofing Considerations

1524.1 Scope

As it pertains to this section, it is the responsibility of the roofing contractor to provide the owner with the required roofing permit, and to explain to the owner the content of this section. The provisions of Chapter 15 of the *Florida Building Code, Building* govern the minimum requirements and standards of the industry for roofing system installations. Additionally, the following items should be addressed as part of the agreement between the owner and the contractor. The owner's initials in the designated space indicates that the item has been explained.

1. **Aesthetics-workmanship.** Reserved.
2. **Renailing wood decks.** When replacing roofing, the existing wood roof deck may have to be renailed in accordance with the current provisions of Chapter 16 (High-Velocity Hurricane Zones) of the *Florida Building Code, Building*. (The roof deck is usually concealed prior to removing the existing roof system.)
3. **Common roofs.** Reserved.
4. **Exposed ceilings.** Exposed, open beam ceilings are where the underside of the roof decking can be viewed from below. The owner may wish to maintain the architectural appearance; therefore, roofing nail penetrations of the underside of the decking may not be acceptable. The owner provides the option of maintaining this appearance.
5. **Ponding water.** Reserved.
6. **Overflow scuppers (wall outlets).** It is required that rainwater flow off so that the roof is not overloaded from a buildup of water. Perimeter/edge walls or other roof extensions may block this discharge if overflow scuppers (wall outlets) are not provided. It may be necessary to install overflow scuppers in accordance with the requirements of: Chapters 15 and 16 herein and the *Florida Building Code, Plumbing*.

Section 1525 High-Velocity Hurricane Zones—Uniform Permit Application

Florida Building Code 8th Edition (2023)

High-Velocity Hurricane Zone Uniform Permit Application Form

INSTRUCTION PAGE

COMPLETE THE NECESSARY SECTIONS OF THE UNIFORM ROOFING PERMIT APPLICATION FORM AND ATTACH THE REQUIRED DOCUMENTS AS NOTED BELOW:

Roof System	Required Sections of the Permit Application Form	Attachments Required See List Below
Low Slope Application	A,B,C	1,2,3,4,5,6,7
Prescriptive BUR-RAS 150	A,B,C	4,5,6,7
Asphalt Shingles	A,B,D	1,2,4,5,6,7
Concrete or Clay Tile	A,B,D,E	1,2,3,4,5,6,7
Metal Roofs	A,B,D	1,2,3,4,5,6,7

Wood Shingles and Shakes	A,B,D	1,2,4,5,6,7
Other	As Applicable	1,2,3,4,5,6,7

ATTACHMENTS REQUIRED:

1.	Fire Directory Listing Page
2.	From Product Approval: Front Page Specific System Description Specific System Limitations General Limitations Applicable Detail Drawings
3.	Design Calculations per Chapter 16, or if applicable, RAS 127 or RAS 128
4.	Other Component of Product Approval
5.	Municipal Permit Application
6.	Owners Notification for Roofing Considerations (Reroofing Only)
7.	Any Required Roof Testing/Calculation Documentation

Section A (General Information)

Master Permit No._____	Process No. _____
Contractor's Name_____	
Job Address_____	

ROOF CATEGORY					
<input type="checkbox"/>	Low Slope	<input type="checkbox"/>	Mechanically Fastened Tile	<input type="checkbox"/>	Mortar/Adhesive Set Tiles
<input type="checkbox"/>	Asphalt Shingles	<input type="checkbox"/>	Metal Panel/Shingles	<input type="checkbox"/>	Wood Shingles/Shakes
		<input type="checkbox"/>	Prescriptive BUR-RAS 150		

ROOF TYPE							
<input type="checkbox"/>	New roof	<input type="checkbox"/>	Repair	<input type="checkbox"/>	Maintenance	<input type="checkbox"/>	Reroofing
<input type="checkbox"/>	Recovering						

ROOF SYSTEM INFORMATION		
Low Slope Roof Area (SF)_____	Steep Sloped Roof Area (SF)_____	Total (SF)_____

Section B (Roof Plan)

Sketch Roof Plan: Illustrate all levels and sections, roof drains, scuppers, overflow scuppers and overflow drains. Include dimensions of sections and levels, clearly identify dimensions of elevated pressure zones and location of parapets.

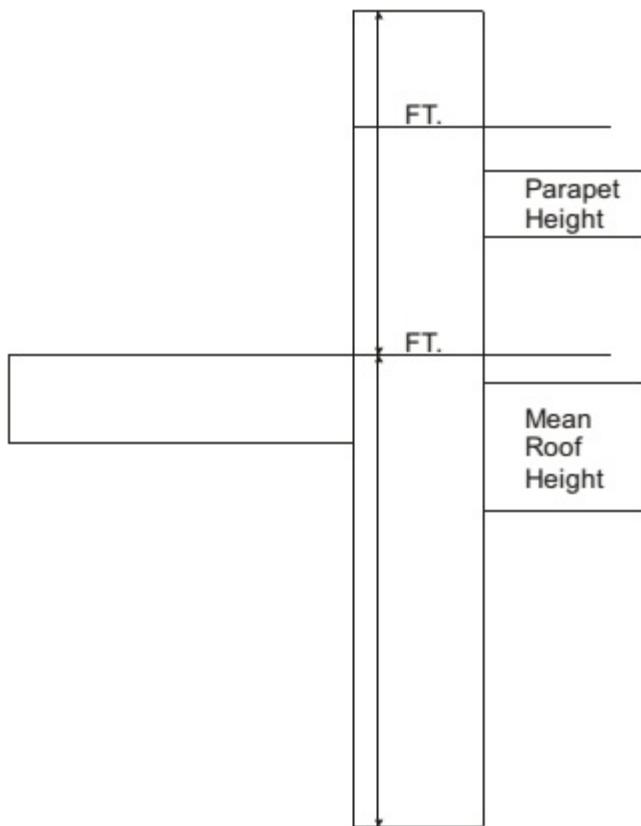
Section C (Low Slope Application)

Fill in specific roof assembly components and identify manufacturer

(If a component is not used, identify as "NA")

System Manufacturer:
Product Approval No.:
Design Wind Pressures, From RAS 128 or Calculations: Zone 1: ____ Zone 1: ____ Zone 2: ____ Zone 3: ____
Max. Design Pressure, from the specific product approval system: _____
Deck: Type: _____ Gauge/Thickness: _____ Slope: _____
Anchor/Base Sheet & No. of Ply(s): _____
Anchor/Base Sheet Fastener/Bonding Material: _____
Insulation Base Layer: _____
Base Insulation Size and Thickness: _____
Base Insulation Fastener/Bonding Material: _____
Top Insulation Layer: _____
Top Insulation Size and Thickness: _____

Top Insulation Fastener/Bonding Material: <hr/>
Base Sheet(s) & No. of Ply(s): _____
Base Sheet Fastener/Bonding Material: <hr/>
Ply Sheet(s) & No. of Ply(s): _____
Ply Sheet Fastener/Bonding Material: <hr/>
Top Ply: _____
Top Ply Fastener/Bonding Material: <hr/>
Surfacing: _____
Fastener Spacing for Anchor/Base Sheet Attachment: Zone 1': ____ " oc @ Lap, # Rows ____ @ ____ " oc Zone 1: ____ " oc @ Lap, # Rows ____ @ ____ " oc Zone 2: ____ " oc @ Lap, # Rows ____ @ ____ " oc Zone 3: ____ " oc @ Lap, # Rows ____ @ ____ " oc
Number of Fasteners Per Insulation Board: Zone 1': ____ Zone 1: ____ Zone 2: ____ Zone 3: ____
Illustrate Components Noted and Details as Applicable: Woodblocking, Gutter, Edge Termination, Stripping, Flashing, Continuous Cleat, Cant Strip, Base Flashing, Counterflashing, Coping, Etc. Indicate: Mean Roof Height, Parapet Height, Height of Base Flashing, Component Material, Material Thickness, Fastener Type, Fastener Spacing or Submit Manufacturers Details that Comply with RAS 111 and Chapter 16.

**Section D (Steep Sloped Roof System)**

Roof System Manufacturer: _____
Notice of Acceptance Number: _____
Minimum Design Wind Pressures, If Applicable (From RAS 127 or Calculations): Zone 1:_____ Zone 2:_____ Zone 3:_____

Roof Slope: <input type="text" value="_____ : 12"/>	Deck Type: <input type="text"/> Type Underlayment: <input type="text"/> Insulation: <input type="text"/> Ridge Ventilation? <input type="checkbox"/> <input type="text"/>
	Fire Barrier: <input type="text"/> Fastener Type & Spacing: <input type="text"/> Adhesive Type: <input type="text"/> Type Cap Sheet: <input type="text"/> Mean Roof Height: <input type="text"/> Roof Covering: <input type="text"/>
	Type & Size Drip Edge: <input type="text"/>

Section E (Tile Calculations)

For Moment based tile systems, choose either Method 1 or 2. Compare the values for M_r with the values from M_f . If the M_f values are greater than or equal to the M_r values, for each area of the roof then the tile attachment method is acceptable.

Method 1 "Moment Based Tile Calculations Per RAS 127"

(Zone 1: <input type="text"/> $\times \lambda$ <input type="text"/> = <input type="text"/>) — Mg: <input type="text"/> = M_{r1} <input type="text"/>	Product Approval M_f <input type="text"/>
(Zone 2: <input type="text"/> $\times \lambda$ <input type="text"/> = <input type="text"/>) — Mg: <input type="text"/> = M_{r2} <input type="text"/>	Product Approval M_f <input type="text"/>
(Zone 3: <input type="text"/> $\times \lambda$ <input type="text"/> = <input type="text"/>) — Mg: <input type="text"/> = M_{r3} <input type="text"/>	Product Approval M_f <input type="text"/>

Method 2 "Simplified Tile Calculations Per Table Below"

Required Moment of Resistance (M_r) From Table Below Product Approval M_f

M _r required Moment Resistance*					
Mean Roof Height Roof Slope	15'	20'	25'	30'	40'
2:12	-46	-47.6	-49.4	-50.9	-53.3
3:12	-47.3	-48.9	-50.7	-52.2	-54.6
4:12	-47.2	-52.0	-53.8	-55.3	-57.9
5:12	-39.8	-41.5	-42.8	-43.7	-45.7
6:12	-39.6	-40.6	-41.9	-42.9	-44.8
7:12	-39.4	-40.3	-41.6	-42.6	-44.6

Method 2 may be utilized within Broward County Exposure C only.

For Uplift based tile systems use Method 3. Compare the values for F' with the values for F_r . If the F' values are greater than or equal to the F_r values, for each area of the roof, then the tile attachment method is acceptable.

Method 3 "Uplift Based Tile Calculations Per RAS 127"

(Zone 1: $\text{---} \times L \text{ ---} = \text{---} \times w: = \text{---}$) — W: $\text{---} \times \cos r \text{ ---} = F_{r1} \text{ ---}$	Product Approval $F' \text{ ---}$
(Zone 2: $\text{---} \times L \text{ ---} = \text{---} \times w: = \text{---}$) — W: $\text{---} \times \cos r \text{ ---} = F_{r2} \text{ ---}$	Product Approval $F' \text{ ---}$
(Zone 3: $\text{---} \times L \text{ ---} = \text{---} \times w: = \text{---}$) — W: $\text{---} \times \cos r \text{ ---} = F_{r3} \text{ ---}$	Product Approval $F' \text{ ---}$

Where to Obtain Information		
Description	Symbol	Where to find
Design Pressure	Zones 1, 2, 3	From applicable table in RAS 127 or by an engineering analysis prepared by PE based on ASCE 7
Mean Roof Height	H	Job Site
Roof Slope	θ	Job Site
Aerodynamic Multiplier	λ	Product Approval
Restoring Moment due to Gravity	M_g	Product Approval
Attachment Resistance	M_f	Product Approval
Required Moment Resistance	M_g	Calculated
Minimum Attachment Resistance	F'	Product Approval
Required Uplift Resistance	F_r	Calculated
Average Tile Weight	W	Product Approval
Tile Dimensions	L = length W = width	Product Approval
All calculations must be submitted to the building official at the time of permit application.		

2023 FBC - Building, 8th edition**Chapter 16 Structural Design****Section 1601 General****1601.1 Scope**

The provisions of this chapter shall govern the structural design of buildings, structures and portions thereof regulated by this code.

Exception: Buildings and structures located within the high-velocity hurricane zone shall comply with the provisions of Sections 1605, 1607, 1611, 1616 through 1626, and, as applicable in flood hazard areas, Section 1612.

Section 1602 Definitions and Notations**1602.1 Definitions**

The following terms are defined in Chapter 2:

ALLOWABLE STRESS DESIGN.

DEAD LOADS.

DESIGN STRENGTH.

DIAPHRAGM.

Diaphragm, blocked.

Diaphragm boundary.

Diaphragm chord.

ESSENTIAL FACILITIES.

FABRIC PARTITION.

FACTORED LOAD.

HELIPAD.

ICE-SENSITIVE STRUCTURE.

IMPACT LOAD.

LIMIT STATE.

LIVE LOAD.

LIVE LOAD (ROOF).

LOAD AND RESISTANCE FACTOR DESIGN (LRFD).

LOAD EFFECTS.

LOAD FACTOR.

LOADS.

NOMINAL LOADS.

OTHER STRUCTURES.

PANEL (PART OF A STRUCTURE).

RESISTANCE FACTOR.

RISK CATEGORY.

STRENGTH, NOMINAL.

STRENGTH, REQUIRED.

STRENGTH DESIGN.

SUSCEPTIBLE BAY.

VEHICLE BARRIER.

NOTATIONS.

D	=	Dead load.
D_i	=	Weight of ice in accordance with Chapter 10 of ASCE 7.
F	=	Load due to fluids with well-defined pressures and maximum heights.
F_a	=	Flood load in accordance with Chapter 5 of ASCE 7.

H	=	Load due to lateral earth pressures, ground water pressure or pressure of bulk materials.
L	=	Live load.
L_r	=	Roof live load.
R	=	Rain load.
T	=	Cumulative effect of self-straining load forces and effects.
V_{asd}	=	Nominal design wind speed (3-second gust), miles per hour (mph) (km/hr) where applicable.
V_T	=	Tornado speed, miles per hour (mph) (m/s) determined from Chapter 32 of ASCE 7.
V_{ult}	=	Ultimate design wind speed (3-second gust), miles per hour (mph) (km/hr) determined from Figure 1609.3(1), 1609.3(2), 1609.3(3) or 1609.3(4) or ASCE 7.
W	=	Load due to wind pressure.
W_i	=	Wind-on-ice in accordance with Chapter 10 of ASCE 7.

Section 1603 Construction Documents

1603.1 General

Construction documents shall show the size, section and relative locations of structural members with floor levels, column centers and offsets dimensioned. The design loads and other information pertinent to the structural design required by Sections 1603.1.1 through 1603.1.9 shall be indicated on the *construction documents*.

1603.1.1 Floor Live Load

The uniformly distributed, concentrated and impact floor live load used in the design shall be indicated for floor areas. Use of live load reduction in accordance with Section 1607.11 shall be indicated for each type of live load used in the design.

1603.1.2 Roof Live Load

The roof live load used in the design shall be indicated for roof areas (Section 1607.13).

1603.1.3 Roof Snow Load Data

Reserved.

1603.1.4 Wind Design Data

The following information related to wind loads shall be shown, regardless of whether wind loads govern the design of the lateral force-resisting system of the structure:

1. Ultimate design wind speed, V_{ult} , (3-second gust), miles per hour (km/hr), tornado speed, V_T (mph) and nominal design wind speed, V_{asd} , (mph) as determined in accordance with Section 1609.3.1.
2. Risk category.
3. Effective plan area, A_e , for tornado design in accordance with Chapter 32 of ASCE 7.
4. Wind exposure. Applicable wind direction if more than one wind exposure is utilized.
5. Applicable internal pressure coefficients and applicable tornado internal pressure coefficients.
6. Design wind pressures and their applicable zones with dimensions to be used for exterior component and cladding materials not specifically designed by the registered design professional responsible for the design of the structure, psf (kN/m^2). Where design for tornado loads is required, the design pressures shown shall be the maximum of wind or tornado pressures.

1603.1.5 Earthquake Design Data

Reserved.

1603.1.6 Geotechnical Information

The design load-bearing values of soils shall be shown on the *construction documents*.

1603.1.7 Flood Design Data

For buildings located in whole or in part in *flood hazard areas* as established in Section 1612.3, the documentation pertaining to design, if required in Section 1612.5, shall be included and the following information, referenced to the datum on the community's Flood Insurance Rate Map (FIRM), shall be shown, regardless of whether flood loads govern the design of the building:

1. Flood design class assigned according to ASCE 24.
2. In *flood hazard areas* other than *coastal high hazard areas* or *coastal A zones*, the elevation of the proposed lowest floor, including the basement.
3. In *flood hazard areas* other than *coastal high hazard areas* or *coastal A zones*, the elevation to which any nonresidential building will be dry floodproofed.

4. In *coastal high hazard areas* and *coastal A zones*, the proposed elevation of the bottom of the lowest horizontal structural member of the lowest floor, including the basement.

1603.1.8 Special Loads

Special loads that are applicable to the design of the building, structure or portions thereof, including but not limited to the loads of machinery or equipment, that are of greater magnitude than the loads defined in the specified floor and roof loads shall be specified by their descriptions and locations.

1603.1.8.1 Photovoltaic Panel Systems

The dead load of rooftop-mounted *photovoltaic panel systems*, including rack support systems, shall be indicated on the construction documents.

1603.1.9 Roof Rain Load Data

Design rainfall intensity, i (in./hr) (cm/hr), shall be shown regardless of whether rain loads govern the design.

Section 1604 General Design Requirements

1604.1 General

Building, structures and parts thereof shall be designed and constructed in accordance with strength design, *load and resistance factor design*, *allowable stress design*, empirical design or conventional construction methods, as permitted by the applicable material chapters.

1604.2 Strength

Buildings and other structures, and parts thereof, shall be designed and constructed to support safely the factored loads in load combinations defined in this code without exceeding the appropriate strength limit states for the materials of construction. Alternatively, buildings and other structures, and parts thereof, shall be designed and constructed to support safely the *nominal loads* in load combinations defined in this code without exceeding the appropriate specified allowable stresses for the materials of construction.

Loads and forces for occupancies or uses not covered in this chapter shall be subject to the approval of the *building official*.

1604.3 Serviceability

Structural systems and members thereof shall be designed to have adequate stiffness to limit deflections and lateral drift.

TABLE 1604.3

DEFLECTION LIMITS^{a, b, c, h, i}

CONSTRUCTION	<i>L</i>	<i>S or W^f</i>	<i>D + L^{d, g}</i>
Roof members: ^e			
Supporting plaster or stucco ceiling	//360	//360	//240
Supporting nonplaster ceiling	//240	//240	//180
Not supporting ceiling	//180	//180	//120
Members supporting screen surface ^j			//60
Floor members	//360	—	//240
Exterior walls:			
With plaster or stucco finishes	—	//360	—
With other brittle finishes	—	//240	—
With flexible finishes	—	//120	—
Interior partitions: ^b			
With plaster or stucco finishes	//360	—	—
With other brittle finishes	//240	—	—
With flexible finishes	//120	—	—
Farm buildings	—	—	//180
Greenhouses	—	—	//120

For SI: 1 foot = 304.8 mm.

a. For structural roofing and siding made of formed metal sheets, the total load deflection shall not exceed //60. For secondary roof structural members supporting formed metal roofing, the live load deflection shall not exceed //150. For secondary wall members supporting formed metal siding, the design wind load deflection shall not exceed //90. For roofs, this exception only applies when the metal sheets have no roof covering.

b. Flexible, folding and portable partitions are not governed by the provisions of this section. The deflection criterion for interior partitions is based on the horizontal load defined in Section 1607.15.

c. See Section 2403 for glass supports.

- d. The deflection limit for the $D+L$ load combination only applies to the deflection due to the creep component of long-term dead load deflection plus the short-term live load deflection. For lumber, structural glued laminated timber, prefabricated wood I-joists and structural composite lumber members that are dry at time of installation and used under dry conditions in accordance with the ANSI/AWC NDS, the creep component of the long-term deflection shall be permitted to be estimated as the immediate dead load deflection resulting from $0.5D$. For lumber and glued laminated timber members installed or used at all other moisture conditions or cross-laminated timber and wood structural panels that are dry at time of installation and used under dry conditions in accordance with the ANSI/AWC NDS, the creep component of the long-term deflection is permitted to be estimated as the immediate dead load deflection resulting from D . The value of $0.5D$ shall not be used in combination with ANSI/AWC NDS provisions for long-term loading.
- e. The above deflections do not ensure against ponding. Roofs that do not have sufficient slope or camber to ensure adequate drainage shall be investigated for ponding. See Section 1611 for rain and ponding requirements and Section 1503.4 for roof drainage requirements.
- f. The wind load is permitted to be taken as 0.42 times the "component and cladding" loads for the purpose of determining deflection limits herein. Where members support glass in accordance with Section 2403 using the deflection limit therein, the wind load shall be no less than 0.6 times the "component and cladding" loads for the purpose of determining deflection.
- g. For steel structural members, the dead load shall be taken as zero.
- h. For aluminum structural members or aluminum panels used in skylights and sloped glazing framing, roofs or walls of sunroom additions or patio covers not supporting edge of glass or aluminum sandwich panels, the total load deflection shall not exceed $1/60$. For continuous aluminum structural members supporting edge of glass, the total load deflection shall not exceed $1/175$ for each glass lite or $1/60$ for the entire length of the member, whichever is more stringent. For aluminum sandwich panels used in roofs or walls of sunroom additions or patio covers, the total load deflection shall not exceed $1/120$.
- i. For cantilever members, l shall be taken as twice the length of the cantilever.
- j. Screen surfaces shall be permitted to include a maximum of 25-percent solid flexible finishes.

1604.3.1 Deflections

The deflections of structural members shall not exceed the more restrictive of the limitations of Sections 1604.3.2 through 1604.3.5 or that permitted by Table 1604.3.

1604.3.2 Reinforced Concrete

The deflection of reinforced concrete structural members shall not exceed that permitted by ACI 318.

1604.3.3 Steel

The deflection of steel structural members shall not exceed that permitted by AISC 360, AISI S100, ASCE 8, SJI 100 or SJI 200, as applicable.

1604.3.4 Masonry

The deflection of masonry structural members shall not exceed that permitted by TMS 402.

1604.3.5 Aluminum

The deflection of aluminum structural members shall not exceed that permitted by AA ADM1.

1604.3.6 Limits

The deflection limits of Section 1604.3.1 shall be used unless more restrictive deflection limits are required by a referenced standard for the element or finish material.

1604.4 Analysis

Load effects on structural members and their connections shall be determined by methods of structural analysis that take into account equilibrium, general stability, geometric compatibility and both short- and long-term material properties.

Members that tend to accumulate residual deformations under repeated service loads shall have included in their analysis the added eccentricities expected to occur during their service life.

Any system or method of construction to be used shall be based on a rational analysis in accordance with well-established principles of mechanics. Such analysis shall result in a system that provides a complete load path capable of transferring loads from their point of origin to the load-resisting elements.

The total lateral force shall be distributed to the various vertical elements of the lateral force-resisting system in proportion to their rigidities, considering the rigidity of the horizontal bracing system or diaphragm. Rigid elements assumed not to be a part of the lateral force-resisting system are permitted to be incorporated into buildings provided their effect on the action of the system is considered and provided for in the design. A diaphragm is rigid for the purpose of distribution of story shear and torsional moment when the lateral deformation of the diaphragm is less than or equal to two times the average story drift. Where required by ASCE 7, provisions shall be made for the increased forces induced on resisting elements of the structural system resulting from torsion due to eccentricity between the center of application of the lateral forces and the center of rigidity of the lateral force-resisting system.

Every structure shall be designed to resist the overturning effects caused by the lateral forces specified in this chapter. See Section 1609 for wind loads and Section 1610 for lateral soil loads.

1604.5 Risk Category

Each building and structure shall be assigned a risk category in accordance with Table 1604.5. Where a referenced standard specifies an occupancy category, the risk category shall not be taken as lower than the occupancy category specified therein. Where a referenced standard specifies that the assignment of a risk category be in accordance with ASCE 7, Table 1.5-1, Table 1604.5 shall be used in lieu of ASCE 7, Table 1.5-1.

TABLE 1604.5

RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES

RISK CATEGORY	NATURE OF OCCUPANCY
I	<p>Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to:</p> <ul style="list-style-type: none"> • Agricultural facilities. • Certain temporary facilities. • Minor storage facilities. • Screen enclosures.
II	Buildings and other structures except those listed in Risk Categories I, III and IV.
III	<p>Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to:</p> <ul style="list-style-type: none"> • Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300. • Buildings and other structures containing one or more public assembly spaces each having an occupant load greater than 300 and a cumulative occupant load of these public assembly spaces of greater than 2,500. • Buildings and other structures containing Group E or Group I-4 occupancies or combination thereof, with an occupant load greater than 250. • Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500. • Group I-2 occupancies with an occupant load of 50 or more resident care recipients but not having surgery or emergency treatment facilities. • Group I-3 occupancies. • Any other occupancy with an occupant load greater than 5,000.^a • Power-generating stations, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV. • Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: <p style="margin-left: 20px;">Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the <i>Florida Fire Prevention Code</i>; and</p> <p style="margin-left: 20px;">Are sufficient to pose a threat to the public if released.^b</p>
IV	<p>Buildings and other structures designated as essential facilities, including but not limited to:</p> <ul style="list-style-type: none"> • Group I-2 occupancies having surgery or emergency treatment facilities. • Fire, rescue, ambulance and police stations and emergency vehicle garages. • Designated earthquake, hurricane or other emergency shelters. • Designated emergency preparedness, communications and operations centers and other facilities required for emergency response. • Power-generating stations and other public utility facilities required as emergency backup facilities for Risk Category IV structures. • Buildings and other structures containing quantities of highly toxic materials that: <p style="margin-left: 20px;">Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the <i>Florida Fire Prevention Code</i>; and</p> <p style="margin-left: 20px;">Are sufficient to pose a threat to the public if released.^b</p> • Aviation control towers, air traffic control centers and emergency aircraft hangars. • Buildings and other structures having critical national defense functions. • Water storage facilities and pump structures required to maintain water pressure for fire suppression.

a. For purposes of occupant load calculation, occupancies required by Table 1004.5 to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load.

b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

1604.5.1 Multiple Occupancies

Where a building or structure is occupied by two or more occupancies not included in the same *risk category*, it shall be assigned the classification of the highest *risk category* corresponding to the various occupancies. Where buildings or structures have two or more portions that are structurally separated, each portion shall be separately classified. Where a separated portion of a building or structure provides required access to, required egress from or shares life safety components with another portion having a higher *risk category*, both portions shall be assigned to the higher *risk category*.

Exception: Where a *storm shelter* designed and constructed in accordance with ICC 500 is provided in a building, structure or portion thereof normally occupied for other purposes, the *risk category* for the normal occupancy of the building shall apply unless the *storm shelter* is a designated emergency shelter in accordance with Table 1604.5.

1604.6 In-Situ Load Tests

The *building official* is authorized to require an engineering analysis or a load test, or both, of any construction whenever there is reason to question the safety of the construction for the intended occupancy. Engineering analysis and load tests shall be conducted in accordance with Section 1708.

1604.7 Preconstruction Load Tests

Materials and methods of construction that are not capable of being designed by *approved* engineering analysis or that do not comply with the applicable referenced standards, or alternative test procedures in accordance with Section 1707, shall be load tested in accordance with Section 1709.

1604.8 Anchorage

Buildings and other structures, and portions thereof, shall be provided with anchorage in accordance with Sections 1604.8.1 through 1604.8.3, as applicable.

1604.8.1 General

Anchorage of the roof to walls and columns, and of walls and columns to foundations, shall be provided to resist the uplift and sliding forces that result from the application of the prescribed loads.

1604.8.2 Structural Walls

Walls that provide vertical load-bearing resistance or lateral shear resistance for a portion of the structure shall be anchored to the roof and to all floors and members that provide lateral support for the wall or that are supported by the wall. The connections shall be capable of resisting the horizontal forces specified in Section 1.4.5 of ASCE 7. Required anchors in masonry walls of hollow units or cavity walls shall be embedded in a reinforced grouted structural element of the wall. See Sections 1609 for wind design requirements.

1604.8.3 Decks

Where supported by attachment to an *exterior wall*, decks shall be positively anchored to the primary structure and designed for both vertical and lateral loads as applicable. Such attachment shall not be accomplished by the use of toenails or nails subject to withdrawal. Where positive connection to the primary building structure cannot be verified during inspection, decks shall be self-supporting. Connections of decks with cantilevered framing members to exterior walls or other framing members shall be designed for both of the following:

1. The reactions resulting from the dead load and live load specified in Section 1606 and Table 1607.1, in accordance with Section 1605, acting on all portions of the deck.
2. The reactions resulting from the dead load and live load specified in Section 1606 and Table 1607.1, in accordance with Section 1605, acting on the cantilevered portion of the deck, and no live load on the remaining portion of the deck.

1604.9 Counteracting Structural Actions

Structural members, systems, components and cladding shall be designed to resist forces due to wind, with consideration of overturning, sliding and uplift. Continuous load paths shall be provided for transmitting these forces to the foundation. Where sliding is used to isolate the elements, the effects of friction between sliding elements shall be included as a force.

Section 1605 Load Combinations

1605.1 General

Buildings and *other structures* and portions thereof shall be designed to resist the strength load combinations specified in ASCE 7, Section 2.3, the *allowable stress design* load combinations specified in ASCE 7, Section 2.4, or the alternative *allowable stress design* load combinations of Section 1605.2.

Exceptions:

1. The modifications to load combinations of ASCE 7, Section 2.3, ASCE 7, Section 2.4, and Section 1605.2 specified in ASCE 7, Chapters 18 and 19 shall apply.
2. Where the *allowable stress design* load combinations of ASCE 7, Section 2.4 are used, crane hook loads need not be combined with roof *live loads* or with more than one-half of the wind loads.
3. Where design for tornado loads is required, the alternative *allowable stress design* load combinations of Section 1605.2 shall not apply where tornado loads govern the design.

1605.1.1 Stability

Regardless of which load combinations are used to design for strength, where overall structure stability (such as stability against overturning, sliding, or buoyancy) is being verified, use of the load combinations specified in ASCE 7, Section 2.3, ASCE 7, Section 2.4, and in Section 1605.2 shall be permitted. Where the load combinations specified in ASCE 7, Section 2.3 are used, strength reduction factors applicable to soil resistance shall be provided by a *registered design professional*. The stability of retaining walls shall be verified in accordance with Section 1807.2.3.

1605.2 Alternative Allowable Stress Design Load Combinations

In lieu of the load combinations in ASCE 7, Section 2.4, structures and portions thereof shall be permitted to be designed for the most critical effects resulting from the following combinations. Where using these alternative allowable stress load combinations that include wind *load*, allowable stresses are permitted to be increased or *load* combinations reduced where permitted by the material chapter of this code or the referenced standards. For *load* combinations that include the counteracting effects of dead and wind loads, only two-thirds of the minimum *dead load* likely to be in place during a design wind event shall be used. Where using these alternative *load* combinations to evaluate sliding, overturning and soil bearing at the soil-structure interface, the reduction of foundation overturning from Section 12.13.4 in ASCE 7 shall not be used.

$$D + L + (L, \text{ or } R) \quad (\text{Equation 16-1})$$

$$D + L + 0.6W \quad (\text{Equation 16-2})$$

$$D + L + 0.6W \quad (\text{Equation 16-3})$$

$$D + L + 0.6W/2 \quad (\text{Equation 16-4})$$

$D + L$

0.9D

(Equation 16-5)

(Equation 16-6)

Exception: Crane hook *loads* need not be combined with roof live *loads* or one-half of the wind *load*.

Section 1606 Dead Loads

1606.1 General

Dead loads are those *loads* defined in Chapter 2 of this code. *Dead loads* shall be considered permanent *loads*.

1606.2 Weights of Materials of Construction

For purposes of design, the actual weights of materials of construction shall be used. In the absence of definite information, values used shall be subject to the approval of the *building official*.

1606.3 Weight of Fixed Service Equipment

In determining *dead loads* for purposes of design, the weight of fixed service equipment, including the maximum weight of the contents of fixed service equipment, shall be included. The components of fixed service equipment that are variable, such as liquid contents and movable trays, shall not be used to counteract forces causing overturning, sliding, and uplift conditions in accordance with Section 1.3.6 of ASCE 7.

Exception: Where force effects are the result of the presence of the variable components, the components are permitted to be used to counter those *load effects*. In such cases, the structure shall be designed for force effects with the variable components present and with them absent.

1606.4 Photovoltaic Panel Systems

The weight of *photovoltaic panel systems*, their support system, and ballast shall be considered as *dead load*.

1606.5 Vegetative and Landscaped Roofs

The weight of all landscaping and hardscaping materials for vegetative and landscaped roofs shall be considered as *dead load*. The weight shall be computed considering both fully saturated soil and drainage layer materials and fully dry soil and drainage layer materials to determine the most severe *load effects* on the structure.

Section 1607 Live Loads

1607.1 General

Live loads are those *loads* defined in Chapter 2 of this code.

TABLE 1607.1

MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L_0 , AND MINIMUM CONCENTRATED LIVE LOADS

OCCUPANCY OR USE	UNIFORM (psf)	CONCENTRATED (pounds)	ALSO SEE SECTION
1. Apartments (see residential)	—	—	—
2. Access floor systems			
Office use	50	2,000	
Computer use	100	2,000	
3. Armories and drill rooms	150 ^b	—	—
4. Assembly areas			
Fixed seats (fastened to floor)	60 ^a		
Follow spot, projections and control rooms	50		
Lobbies	100 ^a		
Movable seats	100 ^a		
Stage floors	150 ^b		
Platforms (assembly)	100 ^b		
Reviewing stands, grandstands and bleachers	100 ^a See Section 1607.21		
Stadiums and arenas with fixed seats (fastened to the floor)	60 ^a See Section 1607.21		
Other assembly areas	100 ^a		
5. Balconies and decks	1.5 times the live load for the area served. Not required to exceed 100 psf.	—	—
6. Catwalks for maintenance and service access	40	300	—

7. Cornices	60	—	—
8. Corridors			
First floor	100	—	—
Other floors	Same as occupancy served except as indicated	—	—
9. Dining rooms and restaurants	100 ^a	—	—
10. Dwellings (see residential)	—	—	—
11. Elevator machine room and control room grating (on area of 2 inches by 2 inches)	—	300	—
12. Finish light floor plate construction (on area of 1 inch by 1 inch)	—	200	—
13. Fire escapes	100	—	—
On single-family dwellings only	40	—	—
14. Fixed ladders	See Section 1607.16		—
15. Garages			—
Passenger vehicles only	40 ^c	See Section 1607.7	
Trucks and buses	See Section 1607.8		
16. Handrails, guards and grab bars	See Section 1607.9		—
17. Helipads	See Section 1607.6		—
18. Hospitals			—
Corridors above first floor	80	1,000	
Operating rooms, laboratories	60	1,000	
Patient rooms	40	1,000	
19. Hotels (see residential)	—	—	
20. Libraries			See Section 1607.17
Corridors above first floor	80	1,000	
Reading rooms	60	1,000	
Stack rooms	150 ^b	1,000	
21. Manufacturing			—
Heavy	250 ^b	3,000	
Light	125 ^b	2,000	
22. Marquees, except one- and two-family dwellings	75	—	—
23. Office buildings			—
Corridors above first floor	80	2,000	
File and computer rooms shall be designed for heavier loads based on anticipated occupancy	—	—	
Lobbies and first-floor corridors	100	2,000	
Offices	50	2,000	
24. Penal institutions			—
Cell blocks	40	—	
Corridors	100	—	
25. Recreational uses:			—
Bowling alleys, poolrooms and similar uses	75 ^a	—	
Dance halls and ballrooms	100 ^a	—	
Gymnasiums	100 ^a	—	
Ice skating rink	250 ^b	—	
Roller skating rink	100 ^a	—	

26. Residential				
One- and two-family dwellings				See Section 1607.20
Uninhabitable attics without storage	10			
Uninhabitable attics with storage	20			
Habitable attics and sleeping areas	30			
Canopies, including marquees	20			
All other areas	40			
Hotels and multifamily dwellings				
Private rooms and corridors serving them	40			
Public rooms ^m and corridors serving them	100			
27. Roofs				See Section 1607.13.2
Ordinary flat, pitched, and curved roofs (that are not occupiable)	20			
Roof areas used for assembly purposes	100 ^a			
Roof areas used for occupancies other than assembly	Same as occupancy served			
Vegetative and landscaped roofs:				
Roof areas not intended for occupancy	20			
Roof areas used for assembly purposes	100 ^a			
Roof areas used for other occupancies	Same as occupancy served			
Awnings and canopies:				
Fabric construction supported by a skeleton structure	5 ^a			
All other construction, except one-and two-family dwellings	20			
Primary roof members exposed to a work floor				
Single panel point of lower chord of roof trusses or any point along primary structural members supporting roofs over manufacturing, storage warehouses, and repair garages		2,000		
All other primary roof members		300		
All roof surfaces subject to maintenance workers		300		
28. Schools				—
Classrooms	40	1,000		
Corridors above first floor	80	1,000		
First-floor corridors	100	1,000		
29. Scuttles, skylight ribs and accessible ceilings	—	200	—	
30. Sidewalks, vehicular driveways and yards, subject to trucking	250 ^b	8,000	See Section 1607.18	
31. Stairs and exits				
One- and two-family dwellings	40	300	See Section 1607.19	
All other	100	300	See Section 1607.19	
32. Storage areas above ceilings	20	—	—	
33. Storage warehouses (shall be designed for heavier loads if required for anticipated storage)				—
Heavy	250 ^b	—	—	
Light	125 ^b	—	—	
34. Stores				—
Retail				

First floor	100	1,000	
Upper floors	75	1,000	
Wholesale, all floors	125 ^b	1,000	
35. Vehicle barriers	See Section 1607.9.3		—
36. Walkways and elevated platforms (other than exitways)	60	—	—
37. Yards and terraces, pedestrian	100 ^a	—	—

For SI: 1 inch = 25.4 mm, 1 square inch = 645.16 mm², 1 square foot = 0.0929 m², 1 pound per square foot = 0.0479 kN/m², 1 pound = 0.004448 kN, 1 pound per cubic foot = 16 kg/m³.

- a. Live load reduction is not permitted.
- b. Live load reduction is only permitted in accordance with Section 1607.11.1.2 or Item 1 of Section 1607.11.2.
- c. Live load reduction is only permitted in accordance with Section 1607.11.1.3 or Item 2 of Section 1607.11.2.

1607.2 Loads Not Specified

For occupancies or uses not designated in Section 1607, the *live load* shall be determined in accordance with a method *approved by the building official*.

1607.3 Uniform Live Loads

The *live loads* used in the design of buildings and other structures shall be the maximum *loads* expected by the intended use or occupancy but shall in no case be less than the minimum uniformly distributed *live loads* given in Table 1607.1.

1607.4 Concentrated Live Loads

Floors, roofs and other similar surfaces shall be designed to support the uniformly distributed *live loads* prescribed in Section 1607.3 or the concentrated *live loads*, given in Table 1607.1, whichever produces the greater *load effects*. Unless otherwise specified, the indicated concentration shall be assumed to be uniformly distributed over an area of 2½ feet by 2½ feet (762 mm) and shall be located so as to produce the maximum *load effects* in the structural members.

1607.5 Partition Loads

In office buildings and in other buildings where partition locations are subject to change, provisions for partition weight shall be made, whether or not partitions are shown on the construction documents, unless the specified *live load* is 80 psf (3.83 kN/m²) or greater. The partition *load* shall be not less than a uniformly distributed *live load* of 15 psf (0.72 kN/m²).

1607.6 Helipads

Helipads shall be designed for the following live loads:

1. A uniform *live load*, *L*, as specified below. This *load* shall not be reduced.
 1. 40 psf (1.92 kN/m²) where the design basis helicopter has a maximum take-off weight of 3,000 pounds (13.35 kN) or less.
 2. 60 psf (2.87 kN/m²) where the design basis helicopter has a maximum take-off weight greater than 3,000 pounds (13.35 kN).
2. A single concentrated *live load*, *L*, of 3,000 pounds (13.35 kN) applied over an area of 4.5 inches by 4.5 inches (114 mm by 114 mm) and located so as to produce the maximum *load effects* on the structural elements under consideration. The concentrated load is not required to act concurrently with other uniform or concentrated *live loads*.
3. Two single concentrated *live loads*, *L*, 8 feet (2438 mm) apart applied on the landing pad (representing the helicopter's two main landing gear, whether skid type or wheeled type), each having a magnitude of 0.75 times the maximum take-off weight of the helicopter, and located so as to produce the maximum *load effects* on the structural elements under consideration. The concentrated loads shall be applied over an area of 8 inches by 8 inches (203 mm by 203 mm) and are not required to act concurrently with other uniform or concentrated *live loads*.

Landing areas designed for a design basis helicopter with maximum take-off weight of 3,000-pounds (13.35 kN) shall be identified with a 3,000 pound (13.34 kN) weight limitation. The landing area weight limitation shall be indicated by the numeral "3" (kips) located in the bottom right corner of the landing area as viewed from the primary approach path. The indication for the landing area weight limitation shall be a minimum 5 feet (1524 mm) in height.

1607.7 Passenger Vehicle Garages

Floors in garages or portions of a building used for the storage of motor vehicles shall be designed for the uniformly distributed *live loads* indicated in Table 1607.1 or the following concentrated *load*:

1. For garages restricted to passenger vehicles accommodating not more than nine passengers, 3,000 pounds (13.35 kN) acting on an area of 4.5 inches by 4.5 inches(114 mm by 114 mm).
2. For mechanical parking structures without slab or deck that are used for storing passenger vehicles only, 2,250 pounds (10 kN) per wheel.

1607.8 Heavy Vehicle Loads

Floors and other surfaces that are intended to support vehicle *loads* greater than a 10,000-pound (4536 kg) gross vehicle weight rating shall comply with Sections 1607.8.1 through 1607.8.5.

1607.8.1 Loads

Where any structure does not restrict access for vehicles that exceed a 10,000-pound (4536 kg) gross vehicle weight rating, those portions of the structure subject to such *loads* shall be designed using the vehicular live *loads*, including consideration of impact and fatigue, in accordance with the codes and specifications required by the jurisdiction having authority for the design and construction of the roadways and bridges in the same location of the structure.

1607.8.2 Fire Truck and Emergency Vehicles

Where a structure or portions of a structure are accessed and loaded by fire department access vehicles and other similar emergency vehicles, the structure shall be designed for the greater of the following *loads*:

1. The actual operational *loads*, including outrigger reactions and contact areas of the vehicles as stipulated and approved by the *building official*; or
2. The live loading specified in Section 1607.8.1.

1607.8.3 Heavy Vehicle Garages

Garages designed to accommodate vehicles that exceed a 10,000-pound (4536 kg) gross vehicle weight rating, shall be designed using the live loading specified by Section 1607.8.1. For garages the design for impact and fatigue is not required.

Exception: The vehicular live *loads* and load placement are allowed to be determined using the actual vehicle weights for the vehicles allowed onto the garage floors, provided such *loads* and placement are based on rational engineering principles and are approved by the building official, but shall not be less than 50 psf (2.9 kN/m²). This *live load* shall not be reduced.

1607.8.4 Forklifts and Movable Equipment

Where a structure is intended to have forklifts or other movable equipment present, the structure shall be designed for the total vehicle or equipment *load* and the individual wheel loads for the anticipated vehicles as specified by the owner of the facility. These *loads* shall be posted in accordance with Section 1607.8.5.

1607.8.4.1 Impact and Fatigue

Impact *loads* and fatigue loading shall be considered in the design of the supporting structure. For the purposes of design, the vehicle and wheel *loads* shall be increased by 30 percent to account for impact.

1607.8.5 Posting

The maximum weight of vehicles allowed into or on a garage or other structure shall be posted by the owner or the owner's authorized agent in accordance with Section 106.1.

1607.9 Loads on Handrails, Guards, Grab Bars and Seats

Handrails and guards shall be designed and constructed for the structural loading conditions set forth in Section 1607.9.1. Grab bars, shower seats and accessible benches shall be designed and constructed for structural loading conditions set forth in Section 1607.9.2.

1607.9.1 Handrails and Guards

Handrails and *guards* shall be designed to resist a linear load of 50 pounds per linear foot (plf) (0.73 kN/m) in accordance with Section 4.5.1 of ASCE 7. Glass handrail assemblies and *guards* shall also comply with Section 2407.

Exceptions:

1. For one- and two-family dwellings, only the single concentrated load required by Section 1607.9.1.1 shall be applied.
2. In Group I-3, F, H and S occupancies, for areas that are not accessible to the general public and that have an *occupant load* less than 50, the minimum load shall be 20 pounds per foot (0.29 kN/m).

1607.9.1.1 Concentrated Load

Handrails and guards shall be designed to resist a concentrated load of 200 pounds (0.89 kN) in accordance with Section 4.5.1 of ASCE 7.

1607.9.1.2 Guard Component Loads

Balusters, panel fillers, and guard infill components, including all rails except the handrail and the top rail, shall be designed to resist a concentrated *load* of 50 pounds (0.22 kN) in accordance with Section 4.5.1.2 of ASCE 7.

1607.9.2 Grab Bars, Shower Seats and Accessible Benches

Grab bars, shower seats and *accessible* benches shall be designed to resist a single concentrated *load* of 250 pounds (1.11 kN) applied in any direction at any point on the grab bar, shower seat, or seat of the accessible bench so as to produce the maximum *load effects*.

1607.9.3 Vehicle Barriers

Vehicle barriers for passenger vehicles shall be designed to resist a concentrated *load* of 6,000 pounds (26.70 kN) in accordance with Section 4.5.3 of ASCE 7. Garages accommodating trucks and buses shall be designed in accordance with an *approved* method that contains provisions for traffic railings.

1607.10 Impact Loads

The *live loads* specified in Sections 1607.3 through 1607.9 shall be assumed to include adequate allowance for ordinary impact conditions. Provisions shall be made in the structural design for uses and *loads* that involve unusual vibration and impact forces.

1607.10.1 Elevators

Members, elements and components subject to dynamic *loads* from elevators shall be designed for impact *loads* and deflection limits prescribed by ASME A17.1/CSA B44.

1607.10.2 Machinery

For the purpose of design, the weight of machinery and moving *loads* shall be increased as follows to allow for impact: (1) light machinery, shaft-or motor-driven, 20 percent; and (2) reciprocating machinery or power-driven units, 50 percent. Percentages shall be increased where specified by the manufacturer.

1607.10.3 Elements Supporting Hoists for Façade Access and Building Maintenance Equipment

In addition to any other applicable *live loads*, structural elements that support hoists for façade access and building maintenance equipment shall be designed for a *live load* of 2.5 times the rated *load* of the hoist or the stall load of the hoist, whichever is larger.

1607.10.4 Fall Arrest, Lifeline and Rope Descent System Anchorages

In addition to any other applicable *live loads*, fall arrest, lifeline, and rope descent system anchorages and structural elements that support these anchorages shall be designed for a *live load* of not less than 3,100 pounds (13.8 kN) for each attached line, in any direction that the load can be applied.

Anchorage of horizontal lifelines and the structural elements that support these anchorages shall be designed for the maximum tension that develops in the horizontal lifeline from these *live loads*.

1607.11 Reduction in Uniform Live Loads

Except for uniform *live loads* at roofs, all other minimum uniformly distributed *live loads*, L_o , in Table 1607.1 are permitted to be reduced in accordance with Section 1607.11.1 or 1607.11.2. Uniform *live loads* at roofs are permitted to be reduced in accordance with Section 1607.13.2.

1607.11.1 Basic Uniform Live Load Reduction

Subject to the limitations of Sections 1607.11.1 through 1607.11.1.3 and Table 1607.1, members for which a value of $K_{LL}A_T$ is 400 square feet (37.16 m^2) or more are permitted to be designed for a reduced uniformly distributed live load, L , in accordance with the following equation:

$$L = L_o \left(0.25 + \frac{15}{\sqrt{K_{LL}A_T}} \right) \quad (\text{Equation 16-7})$$

$$\text{For SI: } L = L_o \left(0.25 + \frac{4.57}{\sqrt{K_{LL}A_T}} \right)$$

where:

L = Reduced design *live load* per square foot (m^2) of area supported by the member.

L_o = Unreduced design *live load* per square foot (m^2) of area supported by the member (see Table 1607.1).

K_{LL} = *Live load element factor* (see Table 1607.11.1).

A_T = Tributary area, in square feet (m^2).

L shall be not less than $0.50L_o$ for members supporting one floor and L shall be not less than $0.40L_o$ for members supporting two or more floors.

TABLE 1607.11.1

LIVE LOAD ELEMENT FACTOR, K_{LL}

ELEMENT	K_{LL}
Interior columns	4
Exterior columns without cantilever slabs	4
Edge columns with cantilever slabs	3
Corner columns with cantilever slabs	2
Edge beams without cantilever slabs	2
Interior beams	2
All other members not identified above including:	1
Edge beams with cantilever slabs	
Cantilever beams	
One-way slabs	
Two-way slabs	
Members without provisions for continuous shear transfer normal to their span	

1607.11.1.1 One-Way Slabs

The tributary area, A_T , for use in Equation 16-7 for one-way slabs shall not exceed an area defined by the slab span times a width normal to the span of 1.5 times the slab span.

1607.11.1.2 Heavy Live Loads

Live loads that exceed 100 psf (4.79 kN/m²) shall not be reduced.

Exceptions:

1. The *live loads* for members supporting two or more floors are permitted to be reduced by a maximum of 20 percent, but the *live load* shall be not less than L as calculated in Section 1607.11.1.
2. For uses other than storage, where *approved*, additional *live load* reductions shall be permitted where shown by the *registered design professional* that a rational approach has been used and that such reductions are warranted.

1607.11.1.3 Passenger Vehicle Garages

The *live loads* shall not be reduced in passenger vehicle garages.

Exception: The *live loads* for members supporting two or more floors are permitted to be reduced by a maximum of 20 percent, but the *live load* shall not be less than L as calculated in Section 1607.11.1.

1607.11.2 Alternative Uniform Live Load Reduction

As an alternative to Section 1607.11.1 and subject to the limitations of Table 1607.1, uniformly distributed *live loads* are permitted to be reduced in accordance with the following provisions. Such reductions shall apply to slab systems, beams, girders, columns, piers, walls and foundations.

1. A reduction shall not be permitted where the *live load* exceeds 100 psf (4.79 kN/m^2) except that the design *live load* for members supporting two or more floors is permitted to be reduced by a maximum of 20 percent.
- Exception:** For uses other than storage, where approved, additional *live load* reductions shall be permitted where shown by the *registered design professional* that a rational approach has been used and that such reductions are warranted.
2. A reduction shall not be permitted in passenger vehicle parking garages except that the *live loads* for members supporting two or more floors are permitted to be reduced by a maximum of 20 percent.
3. For *live loads* not exceeding 100 psf (4.79 kN/m^2), the design live load for any structural member supporting 150 square feet (13.94 m^2) or more is permitted to be reduced in accordance with Equation 16-8.
4. For one-way slabs, the area, A , for use in Equation 16-8 shall not exceed the product of the slab span and a width normal to the span of 0.5 times the slab span.

$$R = 0.08(A - 150)$$

(Equation 16-8)

For SI: $R = 0.861(A - 13.94)$

Such reduction shall not exceed the smallest of:

1. 40 percent for members supporting one floor.
2. 60 percent for members supporting two or more floors.
3. R as determined by the following equation:

$$R = 23.1(1 + D/L_o)$$

(Equation 16-9)

where:

A = Area of floor supported by the member, square feet (m^2).

D = *Dead load* per square foot (m^2) of area supported.

L_o = Unreduced *live load* per square foot (m^2) of area supported.

R = Reduction in percent.

1607.12 Distribution of Floor Loads

Where uniform floor *live loads* are involved in the design of structural members arranged so as to create continuity, the minimum applied loads shall be the full *dead loads* on all spans in combination with the floor *live loads* on spans selected to produce the greatest *load effect* at each location under consideration. Floor *live loads* are permitted to be reduced in accordance with Section 1607.11.

1607.13 Roof Loads

The structural supports of roofs and marquees shall be designed to resist wind and, where applicable, tornado loads, in addition to the *dead load* of construction and the appropriate *live loads* as prescribed in this section, or as set forth in Table 1607.1. The *live loads* acting on a sloping surface shall be assumed to act vertically on the horizontal projection of that surface.

1607.13.1 Distribution of Roof Loads

Where uniform roof *live loads* are reduced to less than 20 psf (0.96 kN/m²) in accordance with Section 1607.13.2.1 and are applied to the design of structural members arranged so as to create continuity, the reduced roof live load shall be applied to adjacent spans or to alternate spans, whichever produces the most unfavorable *load effect*. See Section 1607.13.2 for reductions in minimum *roof live loads*.

1607.13.2 Reduction in Uniform Roof Live Loads

The minimum uniformly distributed *live loads* of roofs and marquees, L_o , in Table 1607.1 are permitted to be reduced in accordance with Section 1607.13.2.1.

1607.13.2.1 Ordinary Roofs, Awnings and Canopies

Ordinary flat, pitched and curved roofs, and awnings and canopies other than of fabric construction supported by a skeleton structure, are permitted to be designed for a reduced uniformly distributed *roof live load*, L_r , as specified in the following equations or other controlling combinations of loads as specified in Section 1605, whichever produces the greater *load effect*.

In structures such as greenhouses, where special scaffolding is used as a work surface for workers and materials during maintenance and repair operations, a lower roof load than specified in the following equations shall not be used unless *approved* by the *building official*. Such structures shall be designed for a minimum *roof live load* of 12 psf (0.58 kN/m²).

$$L_r = L_o R_1 R_2 \quad (\text{Equation 16-10})$$

where: $12 \leq L_r \leq 20$

For SI: $L_r = L_o R_1 R_2$

where: $0.58 \leq L_r \leq 0.96$

L_o = Unreduced *roof live load* per square foot (m²) of horizontal projection supported by the member (see Table 1607.1).

L_r = Reduced *roof live load* per square foot (m²) of horizontal projection supported by the member.

The reduction factors R_1 and R_2 shall be determined as follows:

$$R_1 = 1 \text{ for } A_t \leq 200 \text{ square feet (} 18.58 \text{ m}^2\text{)} \quad (\text{Equation 16-11})$$

$$\begin{aligned} R_1 &= 1.2 - 0.001A_t \text{ for } 200 \text{ square feet} \\ &< A_t < 600 \text{ square feet} \end{aligned} \quad (\text{Equation 16-12})$$

For SI: $1.2 - 0.011A_t$ for 18.58 square meters $< A_t < 55.74$ square meters

$$R_1 = 0.6 \text{ for } A_t \geq 600 \text{ square feet (} 55.74 \text{ m}^2\text{)} \quad (\text{Equation 16-13})$$

where:

A_t = Tributary area (span length multiplied by effective width) in square feet (m²) supported by the member, and

$$R_2 = 1 \text{ for } F \leq 4 \quad (\text{Equation 16-14})$$

$$R_2 = 1.2 - 0.05F \text{ for } 4 < F < 12 \quad (\text{Equation 16-15})$$

$$R_2 = 0.6 \text{ for } F \geq 12 \quad (\text{Equation 16-16})$$

where:

F = For a sloped roof, the number of inches of rise per foot (for SI: $F = 0.12 \times$ slope, with slope expressed as a percentage), or for an arch or dome, the rise-to-span ratio multiplied by 32.

1607.13.2.2 Occupiable Roofs

Areas of roofs that are occupiable, such as *vegetative roofs*, roof gardens or for assembly or other similar purposes, and marquees are permitted to have their uniformly distributed *live loads* reduced in accordance with Section 1607.11.

1607.13.3 Awnings and Canopies

Awnings and canopies shall be designed for uniform *live loads* as required in Table 1607.1 as well as for wind and tornado loads as specified in Section 1609.

1607.13.4 Photovoltaic Panel Systems

Roof structures that provide support for *photovoltaic panel systems* shall be designed in accordance with Sections 1607.13.4.1 through 1607.13.4.4, as applicable.

1607.13.4.1 Roof Live Load

Roof structures that support *photovoltaic panel systems* shall be designed to resist each of the following conditions:

- Applicable uniform and concentrated roof *loads* with the *photovoltaic panel system dead loads*.

Exception: Roof *live loads* need not be applied to the area covered by *photovoltaic panels* where the clear space between the panels and the roof surface is 24 inches (610 mm) or less.

2. Applicable uniform and concentrated roof *loads* without the *photovoltaic panel system* present.

1607.13.4.2 Photovoltaic Panels or Modules

The structure of a roof that supports solar *photovoltaic panels* or modules shall be designed to accommodate the full solar *photovoltaic panels* or modules and ballast *dead load*, including concentrated *loads* from support frames in combination with the *loads* from Section 1607.13.4.1 and other applicable *loads*.

1607.13.4.3 Photovoltaic Panels Installed on Open Grid Roof Structures

Structures with open-grid framing and no *roof deck* or sheathing supporting *photovoltaic panel systems* shall be designed to support the uniform and concentrated *roof live loads* specified in Section 1607.13.4.1, except that the uniform *roof live load* shall be permitted to be reduced to 12 psf (0.57 kN/m²).

1607.13.4.4 Ground-Mounted Photovoltaic (PV) Panel Systems

Ground-mounted *photovoltaic (PV) panel systems* that are independent structures and do not have accessible/occupied space underneath are not required to accommodate a roof photovoltaic *live load*. Other *loads* and combinations in accordance with Section 1605 shall be accommodated.

1607.13.4.5 Ballasted Photovoltaic Panel Systems

Roof structures that provide support for ballasted *photovoltaic panel systems* shall be designed, or analyzed, in accordance with Section 1604.4; checked in accordance with Section 1604.3.6 for deflections; and checked in accordance with Section 1611 for ponding.

1607.14 Crane Loads

The crane *live load* shall be the rated capacity of the crane. Design *loads* for the runway beams, including connections and support brackets, of moving bridge cranes and monorail cranes shall include the maximum wheel loads of the crane and the vertical impact, lateral and longitudinal forces induced by the moving crane.

1607.14.1 Maximum Wheel Load

The maximum wheel *loads* shall be the wheel *loads* produced by the weight of the bridge, as applicable, plus the sum of the rated capacity and the weight of the trolley with the trolley positioned on its runway at the location where the resulting *load effect* is maximum.

1607.14.2 Vertical Impact Force

The maximum wheel *loads* of the crane shall be increased by the following percentages to account for the effects of vertical impact or vibration:

Monorail cranes (powered)	25 percent
Cab-operated or remotely operated bridge cranes (powered)	25 percent
Pendant-operated bridge cranes (powered)	10 percent
Bridge cranes or monorail cranes with hand-gearied bridge, trolley and hoist	0 percent

1607.14.3 Lateral Force

The lateral force on crane runway beams with electrically powered trolleys shall be calculated as 20 percent of the sum of the rated capacity of the crane and the weight of the hoist and trolley. The lateral force shall be assumed to act horizontally at the traction surface of a runway beam, in either direction perpendicular to the beam, and shall be distributed with due regard to the lateral stiffness of the runway beam and supporting structure.

1607.14.4 Longitudinal Force

The longitudinal force on crane runway beams, except for bridge cranes with hand-gearied bridges, shall be calculated as 10 percent of the maximum wheel *loads* of the crane. The longitudinal force shall be assumed to act horizontally at the traction surface of a runway beam, in either direction parallel to the beam.

1607.15 Interior Walls and Partitions

Interior walls and partitions that exceed 6 feet (1829 mm) in height, including their finish materials, shall have adequate strength and stiffness to resist the *loads* to which they are subjected but not less than a horizontal load of 5 psf (0.240 kN/m²).

1607.15.1 Fabric Partitions

Fabric partitions that exceed 6 feet (1829 mm) in height, including their finish materials, shall have adequate strength and stiffness to resist the following load conditions:

1. The horizontal distributed *load* need only be applied to the partition framing. The total area used to determine the distributed load shall be the area of the fabric face between the framing members to which the fabric is attached. The total distributed *load* shall be uniformly applied to such framing members in proportion to the length of each member.
2. A concentrated *load* of 40 pounds (0.176 kN) applied to an 8-inch-diameter (203 mm) area [50.3 square inches (32 452 mm²)] of the fabric face at a height of 54 inches (1372 mm) above the floor.

1607.15.2 Fire Walls

In order to meet the structural stability requirements of Section 706.2 where the structure on either side of the wall has collapsed, *fire walls* and their supports shall be designed to withstand a minimum horizontal allowable stress *load* of 5 psf (0.240 kN/m²).

1607.16 Fixed Ladders

Fixed ladders with rungs shall be designed to resist a single concentrated *load* of 300 lb (1.33 kN) in accordance with Section 4.5.4 of ASCE 7. Where rails of fixed ladders extend above a floor or platform at the top of the ladder, each side rail extension shall be designed to resist a single concentrated *load* of 100 lb (0.445 kN) in accordance with Section 4.5.4 of ASCE 7. Ship's ladders shall be designed to resist the *stair loads* given in Table 1607.1.

1607.17 Library Stack Rooms

The live loading indicated in Table 1607.1 for library stack rooms applies to stack room floors that support nonmobile, double-faced library book stacks, subject to the following limitations:

1. The nominal book stack unit height shall not exceed 90 inches (2,290 mm).
2. The nominal shelf depth shall not exceed 12 inches (305 mm) for each face.
3. Parallel rows of double-faced book stacks shall be separated by aisles not less than 36 inches (914 mm) wide.

1607.18 Sidewalks, Vehicular Driveways, and Yards Subject to Trucking

The live loading indicated in Table 1607.1 for sidewalks, vehicular driveways, and yards subject to trucking shall comply with the requirements of this section.

1607.18.1 Uniform Loads

In addition to the *loads* indicated in Table 1607.1, other uniform *loads* in accordance with an approved method which contains provisions for truck loading shall be considered where appropriate.

1607.18.2 Concentrated Loads

The concentrated wheel load indicated in Table 1607.1 shall be applied on an area of 4.5 inches by 4.5 inches (114 mm by 114 mm).

1607.19 Stair Treads

The concentrated *load* indicated in Table 1607.1 for *stair treads* shall be applied on an area of 2 inches by 2 inches (51 mm by 51 mm). This *load* need not be assumed to act concurrently with the uniform *load*.

1607.20 Residential Attics

The *live loads* indicated in Table 1607.1 for attics in residential occupancies shall comply with the requirements of this section.

1607.20.1 Uninhabitable Attics Without Storage

In residential occupancies, uninhabitable *attic* areas without storage are those where the maximum clear height between the joists and rafters is less than 42 inches (1067 mm), or where there are not two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches (1067 mm) in height by 24 inches (610 mm) in width, or greater, within the plane of the trusses. The *live load* in Table 1607.1 need not be assumed to act concurrently with any other *live load* requirement.

1607.20.2 Uninhabitable Attics With Storage

In residential occupancies, uninhabitable *attic* areas with storage are those where the maximum clear height between the joist and rafter is 42 inches (1067 mm) or greater, or where there are two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches (1067 mm) in height by 24 inches (610 mm) in width, or greater, within the plane of the trusses. The *live load* in Table 1607.1 need only be applied to those portions of the joists or truss bottom chords where both of the following conditions are met:

1. The *attic* area is accessed from an opening not less than 20 inches (508 mm) in width by 30 inches (762 mm) in length that is located where the clear height in the *attic* is not less than 30 inches (762 mm).
2. The slope of the joists or truss bottom chords is not greater than 2 units vertical in 12 units horizontal.

The remaining portions of the joists or truss bottom chords shall be designed for a uniformly distributed concurrent *live load* of not less than 10 pounds per square foot (0.48 kN/m²).

1607.20.3 Attics Served by Stairs

Attic spaces served by *stairways* other than the pull-down type shall be designed to support the minimum *live load* specified for habitable *attics* and sleeping rooms.

1607.21 Seating for Assembly Uses

Bleachers, folding and telescopic seating and grandstands shall be designed for the *loads* specified in ICC 300. Stadiums and arenas with fixed seats shall be designed for the horizontal sway *loads* in Section 1607.21.1.

1607.21.1 Horizontal Sway Loads

The design of stadiums and arenas with fixed seats shall include horizontal swaying forces applied to each row of seats as follows:

1. 24 pounds per linear foot (0.35 kN/m) of seat applied in a direction parallel to each row of seats.
2. 10 pounds per linear foot (0.15 kN/m) of seat applied in a direction perpendicular to each row of seats.

The parallel and perpendicular horizontal swaying forces are not required to be applied simultaneously.

Section 1608 Snow Loads

RESERVED

Section 1609 Wind Loads

1609.1 Applications

Buildings, structures and parts thereof shall be designed to withstand the minimum wind loads prescribed herein. Decreases in wind loads shall not be made for the effect of shielding by other structures. All exterior wall coverings and soffits shall be capable of resisting the design pressures specified for walls for components and cladding loads in accordance with Section 1609.1.1. Manufactured soffits shall be labeled in accordance with Section 1709.10 of this code.

1609.1.1 Determination of Wind Loads

Wind loads on every building or structure shall be determined in accordance with Chapters 26 to 30 of ASCE 7. Wind shall be assumed to come from any horizontal direction and wind pressures shall be assumed to act normal to the surface considered.

Exceptions:

1. Subject to the limitations of Section 1609.1.1.1, the provisions of ICC 600 shall be permitted for applicable Group R-2 and R-3 buildings.
2. Subject to the limitations of Section 1609.1.1.1, residential structures using the provisions of AWC WFCM.
3. Subject to the limitations of Section 1609.1.1.1, residential structures using the provisions of AISI S230.
4. Designs using NAAMM FP 1001, *Guide Specifications for Design of Metal Flagpoles*.
5. Designs using TIA-222 for antenna-supporting structures and antennas. Design using this standard shall be permitted for communication tower and steel antenna support structures.
6. Wind tunnel tests in accordance with ASCE 49 and Sections 31.4 and 31.5 of ASCE 7.
7. Wind loads for screen enclosures shall be determined in accordance with Section 2002.4.
8. Exposed mechanical equipment or appliances fastened to a roof or installed on the ground in compliance with the code using rated stands, platforms, curbs, slabs, walls, or other means are deemed to comply with the wind resistance requirements of the 2007 *Florida Building Code*, as amended. Further support or enclosure of such mechanical equipment or appliances is not required by a state or local official having authority to enforce the *Florida Building Code*.

The wind speeds in Figures 1609.3(1), 1609.3(2), 1609.3(3) and 1609.3(4) are ultimate design wind speeds, V_{ult} , and shall be converted in accordance with Section 1609.3.1 to nominal design wind speeds, V_{asd} , when the provisions of the standards referenced in Exceptions 4 and 5 are used.

1609.1.1.1 Applicability

The provisions of ICC 600 are applicable only to buildings located within Exposure B or C as defined in Section 1609.4. The provisions of ICC 600, AWC WFCM and AISI S230 shall not apply to buildings sited on the upper half of an isolated hill, ridge or escarpment meeting the following conditions:

1. The hill, ridge or escarpment is 60 feet (18 288 mm) or higher if located in Exposure B or 30 feet (9144 mm) or higher if located in Exposure C;
2. The maximum average slope of the hill exceeds 10 percent; and
3. The hill, ridge or escarpment is unobstructed upwind by other such topographic features for a distance from the high point of 50 times the height of the hill or 1 mile (1.61 km), whichever is greater.

1609.1.2 Protection of Openings

In *wind-borne debris regions*, glazed openings in buildings shall be impact resistant or protected with an impact-resistant covering meeting the requirements of ANSI/DASMA 115 (for garage doors and rolling doors) or TAS 201, 202 and 203, AAMA 506, ASTM E1996 and ASTM E1886 referenced herein, or an approved impact-resistant standard as follows:

1. Glazed openings located within 30 feet (9144 mm) of grade shall meet the requirements of the large missile test of ASTM E1996.
2. Glazed openings located more than 30 feet (9144 mm) above grade shall meet the provisions of the small missile test of ASTM E1996.
3. Storage sheds that are not designed for human habitation and that have a floor area of 720 square feet (67 m^2) or less are not required to comply with the mandatory windborne debris impact standards of this code.
4. Openings in sunrooms, balconies or enclosed porches constructed under existing roofs or decks are not required to be protected provided the spaces are separated from the building interior by a wall and all openings in the separating wall are protected in accordance with Section 1609.1.2 above. Such spaces shall be permitted to be designed as either partially enclosed or enclosed structures.

Exceptions:

1. Wood structural panels with a minimum thickness of $\frac{7}{16}$ inch (11.1 mm) and maximum span between lines of fasteners of 44 inches (1118 mm) shall be permitted for opening protection in Group R-3 or R-4 occupancy buildings with a mean roof height of 33 feet (10 058 mm) or less where V_{ult} is 180 mph (80 m/s) or less. Panels shall be precut to overlap the wall such that they extend a minimum of 2 inches (50.8 mm) beyond the lines of fasteners and are attached to the framing surrounding the opening containing the product with the glazed opening. Panels shall be predrilled as required for the attachment method and secured with corrosion-resistant attachment hardware permanently installed on the building.
 - a. Attachments shall be designed to resist the components and cladding loads determined in accordance with the provisions of ASCE 7, with corrosion-resistant attachment hardware provided and anchors permanently installed on the building.
 - b. As an alternative, panels shall be fastened at 16 inches (406.4 mm) on center along the edges of the opposing long sides of the panel.

- i. For wood frame construction, fasteners shall be located on the wall such that they are embedded into the wall framing members, nominally a minimum of 1 inch (25.4 mm) from the edge of the opening and 2 inches (50.8 mm) inward from the panel edge. Permanently installed anchors used for buildings with wood frame wall construction shall have the threaded portion that will be embedded into the wall framing based on $\frac{1}{4}$ -inch (6.35 mm) lag screws and shall be long enough to penetrate through the exterior wall covering with sufficient embedment length to provide an allowable minimum 300 pounds ASD design withdrawal capacity.
- ii. For concrete or masonry wall construction, fasteners shall be located on the wall a minimum of $1\frac{1}{2}$ inches (37.9 mm) from the edge of the opening and 2 inches (50.8 mm) inward of the panel edge. Permanently installed anchors in concrete or masonry wall construction shall have an allowable minimum 300 pounds ASD design withdrawal capacity and an allowable minimum 525 pounds ASD design shear capacity with a $1\frac{1}{2}$ inch edge distance. Hex nuts, washered wing-nuts, or bolts used to attach the wood structural panels to the anchors shall be minimum $\frac{1}{4}$ -inch (6.4 mm) hardware and shall be installed with or have integral washers with a minimum 1-inch (25 mm) outside diameter.
- iii. Vibration-resistant alternative attachments designed to resist the component and cladding loads determined in accordance with provisions of ASCE 7 shall be permitted.

2. Glazing in *Risk Category I* buildings, including greenhouses that are occupied for growing plants on a production or research basis, without public access shall be permitted to be unprotected.

3. Glazing in *Risk Category II, III or IV* buildings located over 60 feet (18 288 mm) above the ground and over 30 feet (9144 mm) above aggregate surface roofs located within 1,500 feet (458 m) of the building shall be permitted to be unprotected.

Table 1609.1.2 Wind-Borne Debris Protection Fastening Schedule for Wood Structural Panels. Reserved.

1609.1.2.1 Louvers

Louvers protecting the exterior wall opening that are located within 30 feet (9144 mm) of grade shall meet the requirements of AMCA 540 or shall be protected by an impact-resistant cover complying with the large missile test of ASTM E1996 or an approved impact-resistance standard. Louvers required to be open for life safety purposes such as providing a breathable atmosphere shall meet the requirements of AMCA 540.

1609.1.2.2 Application of ASTM E1996

The text of Section 6.2.2 of ASTM E1996 shall be substituted as follows:

6.2.2 Unless otherwise specified, select the wind zone based on the strength design wind speed, V_{ult} , as follows:

6.2.2.1 *Wind Zone 1*—130 mph \leq ultimate design wind speed, $V_{ult} < 140$ mph.

6.2.2.2 *Wind Zone 2*—140 mph \leq ultimate design wind speed, $V_{ult} < 150$ mph at greater than one mile (1.6 km) from the coastline. The coastline shall be measured from the mean high water mark.

6.2.2.3 *Wind Zone 3*—150 mph (58 m/s) \leq ultimate design wind speed, $V_{ult} \leq 170$ mph (63 m/s), or 140 mph (54 m/s) \leq ultimate design wind speed, $V_{ult} \leq 170$ mph (63 m/s) and within one mile (1.6 km) of the coastline. The coastline shall be measured from the mean high water mark.

6.2.2.4 *Wind Zone 4*— ultimate design wind speed, $V_{ult} > 170$ mph (63 m/s).

1609.1.2.3 Garage Doors

Garage door glazed opening protection for wind-borne debris shall meet the requirements of an *approved* impact-resisting standard or ANSI/DASMA 115.

1609.1.2.4 Impact-Resistant Coverings

1609.1.2.4.1

Impact-resistant coverings shall be tested at 1.5 times the design pressure (positive or negative) expressed in pounds per square feet as determined by the *Florida Building Code, Building Section 1609* or ASCE 7, for which the specimen is to be tested. The design pressures, as determined from ASCE 7, are permitted to be multiplied by 0.6.

1609.1.2.4.2 Impact-Resistant Coverings

Impact-resistant coverings shall be labeled in accordance with the provisions of Section 1709.9.

1609.1.3 Testing to Allowable or Nominal Loads

Where testing for wind load resistance is based on allowable or nominal wind loads, the design wind loads determined in accordance with ASCE 7 or Section 1609 are permitted to be multiplied by 0.6 for the purposes of the wind-load-resistance testing.

1609.2 Definitions

For the purposes of Section 1609 and as used elsewhere in this code, the following terms are defined in Chapter 2.

HURRICANE-PRONE REGIONS.

WIND-BORNE DEBRIS REGION.

WIND SPEED, V_{ult} .

WIND SPEED, V_{asd} .

1609.3 Ultimate Design Wind Speed

The ultimate design wind speed, V_{ult} , in mph, for the determination of the wind loads shall be determined by Figures 1609.3(1), 1609.3(2), 1609.3(3) and 1609.3(4). The ultimate design wind speed, V_{ult} , for use in the design of Risk Category II buildings and structures shall be obtained from Figure 1609.3(1). The ultimate design wind speed, V_{ult} , for use in the design of Risk

Category III buildings and structures shall be obtained from Figure 1609.3(2). The ultimate design wind speed, V_{ult} , for use in the design of Risk Category IV buildings and structures shall be obtained from Figure 1609.3(3). The ultimate design wind speed, V_{ult} , for use in the design of Risk Category I buildings and structures shall be obtained from Figure 1609.3(4). The ultimate design wind speed, V_{ult} , for the special wind regions indicated near mountainous terrain and near gorges shall be in accordance with local jurisdiction requirements. The ultimate design wind speeds, V_{ult} , determined by the local jurisdiction shall be in accordance with Chapter 26 of ASCE 7. The exact location of wind speed lines shall be established by local ordinance using recognized physical landmarks such as major roads, canals, rivers and lake shores wherever possible.

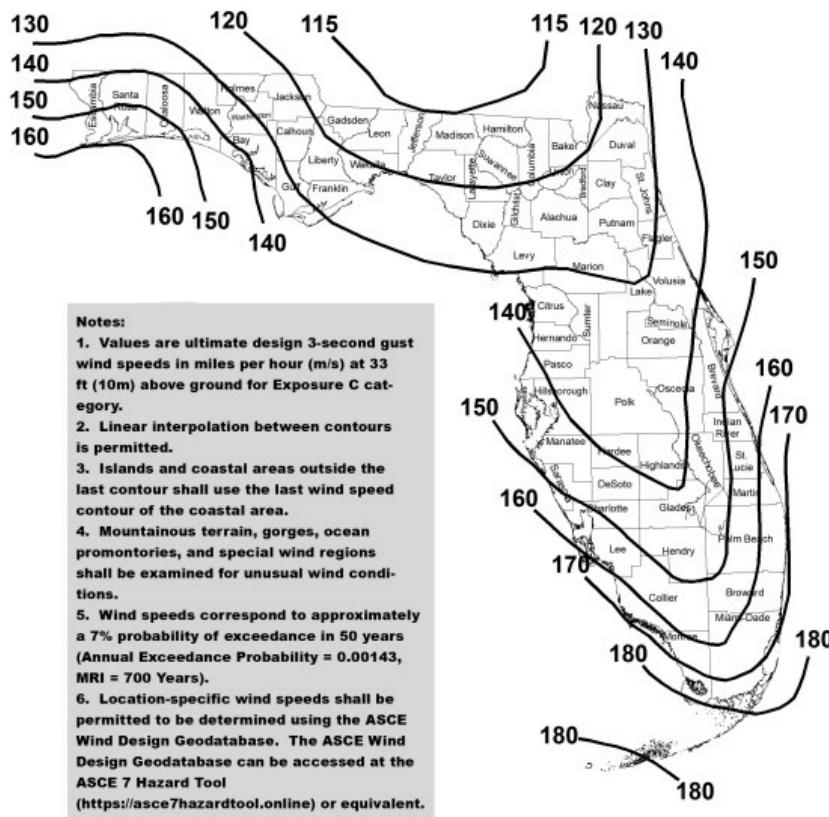


FIGURE 1609.3(1)

ULTIMATE DESIGN WIND SPEEDS, V_{ult} , FOR RISK CATEGORY II BUILDINGS AND OTHER STRUCTURES

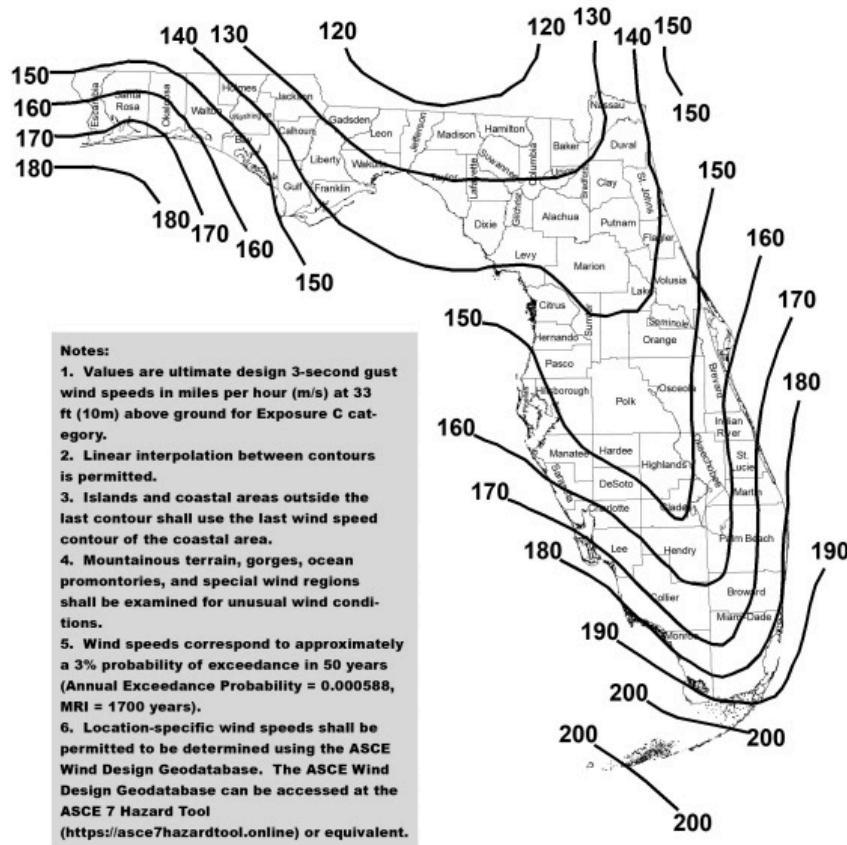


FIGURE 1609.3(2)

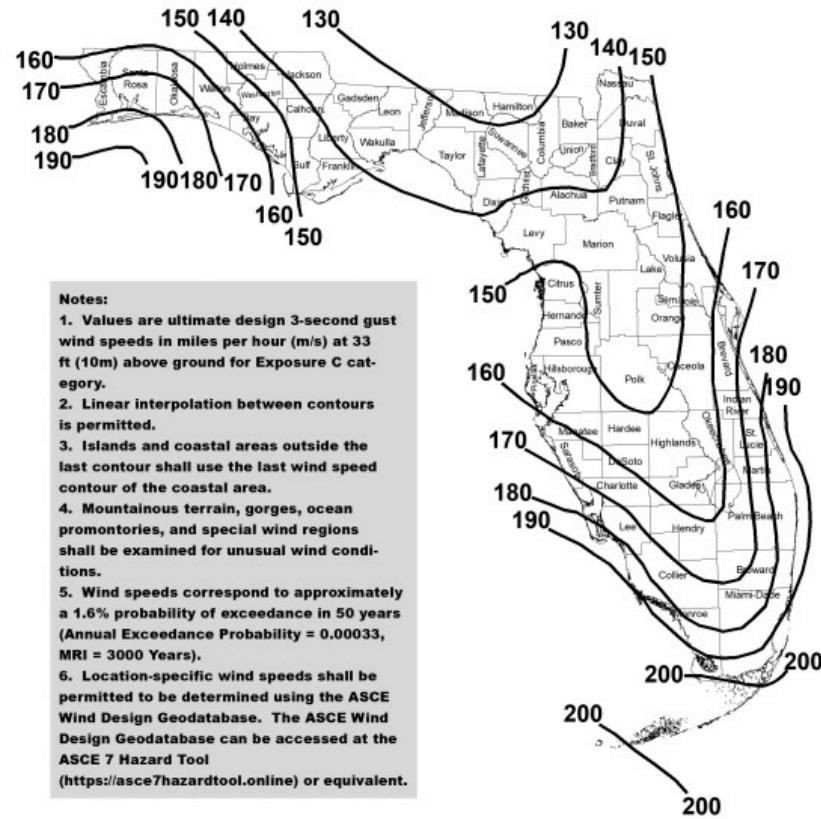
ULTIMATE DESIGN WIND SPEEDS, V_{ULT} , FOR RISK CATEGORY III BUILDINGS AND OTHER STRUCTURES

FIGURE 1609.3(3)

ULTIMATE DESIGN WIND SPEEDS, V_{ULT} , FOR RISK CATEGORY IV BUILDINGS AND OTHER STRUCTURES

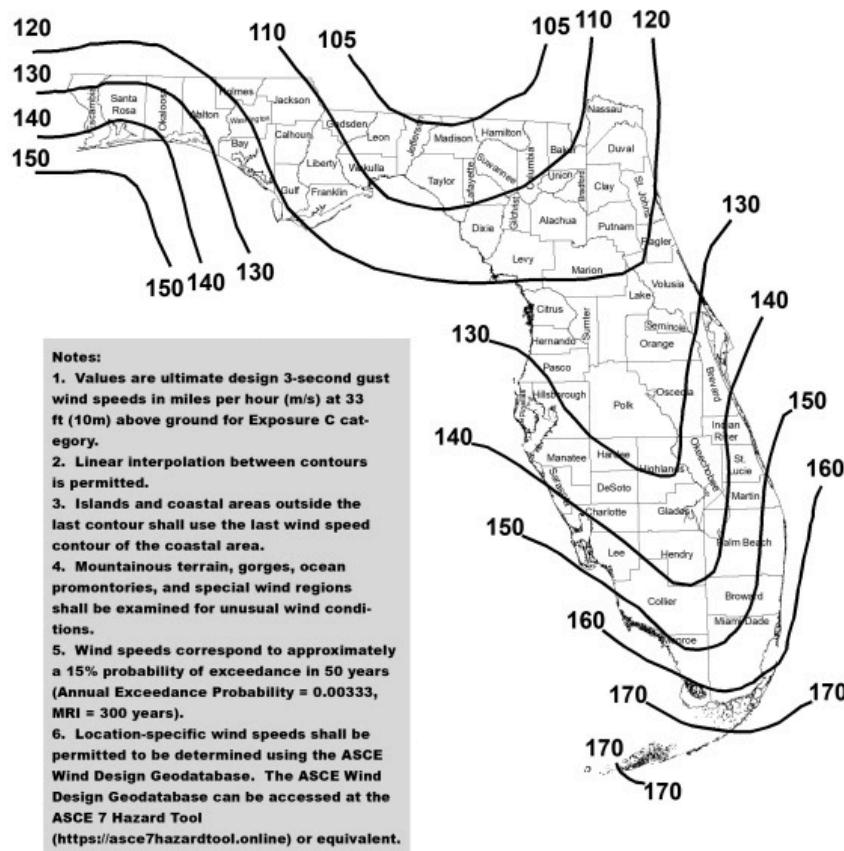


FIGURE 1609.3(4)

ULTIMATE DESIGN WIND SPEEDS, V_{ULT} , FOR RISK CATEGORY I BUILDINGS AND OTHER STRUCTURES**1609.3.1 Wind Speed Conversion**

Where required, the ultimate design wind speeds of Figures 1609.3(1), 1609.3(2), 1609.3(3) and 1609.3(4) shall be converted to nominal design wind speeds, V_{asd} , using Table 1609.3.1 or Equation 16-17.

$$V_{asd} = V_{ult} \sqrt{0.6} \quad (\text{Equation 16-17})$$

where:

V_{asd} = Nominal design wind speed applicable to methods specified in Exceptions 4 and 5 of Section 1609.1.1.

V_{ult} = Ultimate design wind speed determined from Figure 1609.3(1), 1609.3(2), 1609.3(3) or 1609.3(4).

1609.4 Exposure Category

For each wind direction considered, an exposure category that adequately reflects the characteristics of ground surface irregularities shall be determined for the site at which the building or structure is to be constructed. Account shall be taken of variations in ground surface roughness that arise from natural topography and vegetation as well as from constructed features.

1609.4.1 Wind Directions and Sectors

For each selected wind direction at which the wind loads are to be evaluated, the exposure of the building or structure shall be determined for the two upwind sectors extending 45 degrees (0.79 rad) either side of the selected wind direction. The exposures in these two sectors shall be determined in accordance with Sections 1609.4.2 and 1609.4.3 and the exposure resulting in the highest wind loads shall be used to represent winds from that direction.

1609.4.2 Surface Roughness Categories

A ground surface roughness within each 45-degree (0.79 rad) sector shall be determined for a distance upwind of the site as defined in Section 1609.4.3 from the categories defined below, for the purpose of assigning an exposure category as defined in Section 1609.4.3.

Surface Roughness B. Urban and suburban areas, wooded areas or other terrain with numerous closely spaced obstructions having the size of single-family dwellings or larger.

Surface Roughness C. Open terrain with scattered obstructions having heights generally less than 30 feet (9144 mm). This category includes flat open country, and grasslands.

Surface Roughness D. Flat, unobstructed areas and water surfaces. This category includes smooth mud flats, salt flats and unbroken ice.

1609.4.3 Exposure Categories

An exposure category shall be determined in accordance with the following:

Exposure B. For buildings with a mean roof height of less than or equal to 30 feet (9144 mm), Exposure B shall apply where the ground surface roughness, as defined by Surface Roughness B, prevails in the upwind direction for a distance of at least 1,500 feet (457 m). For buildings with a mean roof height greater than 30 feet (9144 mm), Exposure B shall apply where Surface Roughness B prevails in the upwind direction for a distance of at least 2,600 feet (792 m) or 20 times the height of the building, whichever is greater.

Exposure C. Exposure C shall apply for all cases where Exposure B or D does not apply.

Exposure D. Exposure D shall apply where the ground surface roughness, as defined by Surface Roughness D, prevails in the upwind direction for a distance of at least 5,000 feet (1524 m) or 20 times the height of the building, whichever is greater. Exposure D shall also apply where the ground surface roughness immediately upwind of the site is B or C, and the site is within a distance of 600 feet (183 m) or 20 times the building height, whichever is greater, from an Exposure D condition as defined in the previous sentence.

1609.5 Tornado Loads

The design and construction of *Risk Category III* and *IV* buildings and other structures shall be in accordance with Chapter 32 of ASCE 7, except as modified by this code.

1609.6 Roof Systems

Roof systems shall be designed and constructed in accordance with Sections 1609.6.1 through 1609.6.3, as applicable.

1609.6.1 Roof Deck

The roof deck shall be designed to withstand the wind pressures determined in accordance with ASCE 7. Where design for tornado loads is required, the roof deck shall be designed to withstand the greater of wind pressures or tornado pressures determined in accordance with ASCE 7.

1609.6.2 Roof Coverings

Roof coverings shall comply with Section 1609.6.1.

Exception: Rigid tile roof coverings that are air permeable and installed over a roof deck complying with Section 1609.6.1 are permitted to be designed in accordance with Section 1609.6.3.

1609.6.2.1 Asphalt Shingles

Asphalt shingles installed over a roof deck complying with Section 1609.6.1 shall comply with the wind-resistance requirements of Section 1504.1.1.

1609.6.3 Rigid Tile

Wind loads on rigid tile roof coverings shall be determined in accordance with the following equation:

$$M_a = q_h K_d C_L b L L_a [1.0 - G C_p]$$

(Equation 16-18)

For SI:

$$M_a = \frac{q_h K_d C_L b L L_a [1.0 - G C_p]}{1,000}$$

where:

b = Exposed width, feet (mm) of the roof tile.

C_L = Lift coefficient. The lift coefficient for concrete and clay tile shall be 0.2 or shall be determined by test in accordance with Section 1504.2.1.

$G C_p$ = Roof pressure coefficient for each applicable roof zone determined from Chapter 30 of ASCE 7. Roof coefficients shall not be adjusted for internal pressure.

K_d = Wind directionality factor determined from Chapter 26 of ASCE 7.

L = Length, feet (mm) of the roof tile.

L_a = Moment arm, feet (mm) from the axis of rotation to the point of uplift on the roof tile. The point of uplift shall be taken at 0.76L from the head of the tile and the middle of the exposed width. For roof tiles with nails or screws (with or without a tail clip), the axis of rotation shall be taken as the head of the tile for direct deck application or as the top edge of the batten for battened applications. For roof tiles fastened only by a nail or screw along the side of the tile, the axis of rotation shall be determined by testing. For roof tiles installed with battens and fastened only by a clip near the tail of the tile, the moment arm shall be determined about the top edge of the batten with consideration given for the point of rotation of the tiles based on straight bond or broken bond and the tile profile.

M_a = Aerodynamic uplift moment, feet-pounds (N-mm) acting to raise the tail of the tile.

q_h = Wind velocity pressure, psf (kN/m^2) determined from Section 26.10.2 of ASCE 7.

Concrete and clay roof tiles complying with the following limitations shall be designed to withstand the aerodynamic uplift moment as determined by this section.

1. The roof tiles shall be either loose laid on battens, mechanically fastened, mortar set or adhesive set.
2. The roof tiles shall be installed on solid sheathing that has been designed as components and cladding.
3. An underlayment shall be installed in accordance with Chapter 15.
4. The tile shall be single lapped interlocking with a minimum head lap of not less than 2 inches (51 mm).
5. The length of the tile shall be between 1.0 and 1.75 feet (305 mm and 533 mm).
6. The exposed width of the tile shall be between 0.67 and 1.25 feet (204 mm and 381 mm).
7. The maximum thickness of the tail of the tile shall not exceed 1.3 inches (33 mm).
8. Roof tiles using mortar set or adhesive set systems shall have at least two-thirds of the tile's area free of mortar or adhesive contact.

1609.6.3.1 Tornado Loads

Where design for tornado loads is required, tornado loads on rigid tile roof coverings shall be determined in accordance with Section 1609.6.3, replacing q_h with q_{hT} and GC_p with $K_{VT}(GC_p)$ in Equation 16-18, where:

q_{hT} = Tornado velocity pressure, psf (kN/m) determined in accordance with Section 32.10 of ASCE 7.

K_{VT} = Tornado pressure coefficient adjustment factor for vertical winds, determined in accordance with Section 32.14 of ASCE 7.

1609.7 Garage Doors and Rolling Doors

Pressures from Table 1609.7(1) for wind loading actions on garage doors and rolling doors for buildings designed as enclosed shall be permitted.

TABLE 1609.7(1)

NOMINAL (ASD) GARAGE DOOR AND ROLLING DOOR WIND LOADS FOR A BUILDING WITH A MEAN ROOF HEIGHT OF 30 FEET LOCATED IN EXPOSURE B (PSF)^{1, 2, 3, 4, 5}

ULTIMATE DESIGN WIND SPEED (V_{ult}) DETERMINED IN ACCORDANCE WITH SECTION 1609.3 (MPH - 3 SECOND GUST)																																	
Width (ft)	Height (ft)	100 MPH		110 MPH		120 MPH		130 MPH		140 MPH		150 MPH		160 MPH		170 MPH		180 MPH		190 MPH													
Roof Angle 0 — 10 degrees																																	
8	8	+ 10.0	— 10.0	+	10.5	— 11.9	+	12.5	— 14.2	+	14.7	— 16.6	+	17.1	— 19.3	+	19.6	— 22.2	+	22.3	— 25.2	+	25.1	— 28.5	+	28.2	— 31.9	+	31.4	— 35.5	+	34.8	— 39.4
10	10	+ 10.0	— 10.0	+	10.2	— 11.4	+	12.1	— 13.6	+	14.2	— 16.0	+	16.5	— 18.5	+	18.9	— 21.2	+	21.5	— 24.2	+	24.3	— 27.3	+	27.3	— 30.6	+	30.4	— 34.1	+	33.7	— 37.8
14	14	+ 10.0	— 10.0	+	10.8	— 11.5	+	12.8	— 13.5	+	15.0	— 15.7	+	17.4	— 18.0	+	20.0	— 20.5	+	22.8	— 23.1	+	25.7	— 25.9	+	28.8	— 28.9	— 32.1	+	32.0	— 35.6		
Roof Angle > 10 degrees																																	
9	7	+10.0	— 10.9	+	11.4	— 12.9	+	13.7	— 15.5	+	16.1	— 18.2	+	18.5	— 20.9	+	21.3	— 24.1	+	24.3	— 27.5	+	27.6	— 31.2	+	30.6	— 34.6	+	34.2	— 38.6	+	38.0	— 43.0
16	7	+10.0	— 10.3	+	10.9	— 12.2	+	13.1	— 14.6	+	15.5	— 17.2	+	17.7	— 19.7	+	20.4	— 22.7	+	23.3	— 26.0	+	26.4	— 29.4	+	29.3	— 32.6	+	32.7	— 36.5	+	36.4	— 40.6
		78 MPH		85 MPH		93 MPH		101 MPH		108 MPH		116 MPH		124 MPH		132 MPH		139 MPH		147 MPH		155 MPH											

For SI: 1 foot = 304.8 mm, 1 mile per hour = 1.609 km/h, 1 psf = 47.88 N/m².

Nominal Design Wind Speed (V_{asd}) converted from Ultimate Design Wind Speed per Section 1609.3.1.

- For door sizes or wind speeds between those given above the load may be interpolated, otherwise use the load associated with the lower door size.
- Table values shall be adjusted for height and exposure by multiplying by the adjustment coefficient in Table 1609.7(2). Minimum positive wind load shall be 10 psf and minimum negative wind load shall be 10 psf.
- Plus and minus signs signify pressures acting toward and away from the building surfaces.
- Negative pressures assume door has 2 feet of width in building's end zone.
- Table values include the 0.6 load reduction factor.

TABLE 1609.7(2)

ADJUSTMENT FACTOR FOR BUILDING HEIGHT AND EXPOSURE, (λ)

MEAN ROOF HEIGHT (feet)	EXPOSURE		
	B	C	D
15	0.82	1.21	1.47
20	0.89	1.29	1.55
25	0.94	1.35	1.61
30	1.00	1.40	1.66
35	1.05	1.45	1.70
40	1.06	1.49	1.74
45	1.10	1.53	1.78
50	1.13	1.56	1.81

55	1.16	1.59	1.84
60	1.19	1.62	1.87

Section 1610 Soil Loads and Hydrostatic Pressure

1610.1 Lateral Pressures

Foundation walls and retaining walls shall be designed to resist lateral soil loads from adjacent soil. Soil loads specified in Table 1610.1 shall be used as the minimum design lateral soil loads unless determined otherwise by a geotechnical investigation in accordance with Section 1803. Foundation walls and other walls in which horizontal movement is restricted at the top shall be designed for at-rest pressure. Retaining walls free to move and rotate at the top shall be permitted to be designed for active pressure. Lateral pressure from surcharge loads shall be added to the lateral soil load. Lateral pressure shall be increased if expansive soils are present at the site. Foundation walls shall be designed to support the weight of the full hydrostatic pressure of undrained backfill unless a drainage system is installed in accordance with Sections 1805.4.2 and 1805.4.3.

Exception: Foundation walls extending not more than 8 feet (2438 mm) below grade and laterally supported at the top by flexible diaphragms shall be permitted to be designed for active pressure.

TABLE 1610.1

LATERAL SOIL LOAD

DESCRIPTION OF BACKFILL MATERIAL ^c	UNIFIED SOIL CLASSIFICATION	DESIGN LATERAL SOIL LOAD ^a (pound per square foot per foot of depth)	
		Active pressure	At-rest pressure
Well-graded, clean gravels; gravel-sand mixes	GW	30	60
Poorly graded clean gravels; gravel-sand mixes	GP	30	60
Silty gravels, poorly graded gravel-sand mixes	GM	40	60
Clayey gravels, poorly graded gravel-and-clay mixes	GC	45	60
Well-graded, clean sands; gravelly sand mixes	SW	30	60
Poorly graded clean sands; sand-gravel mixes	SP	30	60
Silty sands, poorly graded sand-silt mixes	SM	45	60
Sand-silt clay mix with plastic fines	SM-SC	45	100
Clayey sands, poorly graded sand-clay mixes	SC	60	100
Inorganic silts and clayey silts	ML	45	100
Mixture of inorganic silt and clay	ML-CL	60	100
Inorganic clays of low to medium plasticity	CL	60	100
Organic silts and silt clays, low plasticity	OL	Note b	Note b
Inorganic clayey silts, elastic silts	MH	Note b	Note b
Inorganic clays of high plasticity	CH	Note b	Note b
Organic clays and silty clays	OH	Note b	Note b

For SI: 1 pound per square foot per foot of depth = 0.157 kPa/m, 1 foot = 304.8 mm.

a. Design lateral soil loads are given for moist conditions for the specified soils at their optimum densities. Actual field conditions shall govern. Submerged or saturated soil pressures shall include the weight of the buoyant soil plus the hydrostatic loads.

b. Unsuitable as backfill material.

c. The definition and classification of soil materials shall be in accordance with ASTM D2487.

1610.2 Uplift Loads on Floor and Foundations

Basement floors, slabs on ground, foundations, and similar approximately horizontal elements below grade shall be designed to resist uplift loads where applicable. The upward pressure of water shall be taken as the full hydrostatic pressure applied over the entire area. The hydrostatic load shall be measured from the underside of the element being evaluated. The design for upward loads caused by expansive soils shall comply with Section 1808.6.

Section 1611 Rain Loads

1611.1 Design Rain Loads

Each portion of a roof shall be designed to sustain the load of rainwater as per the requirements of Chapter 8 of ASCE 7. Rain loads shall be based on the summation of the static head, d_s , hydraulic head, d_h , and ponding head, d_p , using Equation 16-19. The hydraulic head shall be based on hydraulic test data or hydraulic calculations assuming a flow rate corresponding to a rainfall intensity equal to or greater than the 15-minute duration storm with return period given in Table 1611.1. The ponding head shall be based on structural analysis as the depth of water due to deflections of the roof subjected to unfactored rain load and unfactored dead load.

$$R = 5.2(d_s + d_h + d_p)$$

For SI: $R = 0.0098(d_s + d_h + d_p)$

where:

d_h = Hydraulic head equal to the depth of water on the undeflected roof above the inlet of the secondary drainage system for structural loading (SDSL) required to achieve the design flow in inches (mm).

d_p = Ponding head equal to the depth of water due to deflections of the roof subjected to unfactored rain load and unfactored dead load in inches (mm).

d_s = Static head equal to the depth of water on the undeflected roof up to the inlet of the secondary drainage system for structural loading (SDSL) in inches (mm).

R = Rain load in psf (kN/m^2).

SDSL is the roof draining system through which water is drained from the roof when the drainage systems listed in ASCE 7, Section 8.2(a) through (d) are blocked or not working.

TABLE 1611.1

DESIGN STORM RETURN PERIOD BY RISK CATEGORY

RISK CATEGORY	DESIGN STORM RETURN PERIOD
I & II	100 years
III	200 years
IV	500 years

1611.2 Ponding Instability

Susceptible bays of roofs shall be evaluated for ponding instability in accordance with Section 8.4 of ASCE 7.

1611.3 Controlled Drainage

Roofs equipped with hardware to control the rate of drainage shall be equipped with a secondary drainage system at a higher elevation that limits accumulation of water on the roof above that elevation. Such roofs shall be designed to sustain the load of rainwater that will accumulate on them to the elevation of the secondary drainage system plus the uniform load caused by water that rises above the inlet of the secondary drainage system at its design flow determined from Section 1611.1. Such roofs shall also be checked for ponding instability in accordance with Section 1611.2.

Section 1612 Flood Loads

1612.1 General

Within *flood hazard areas* as established in Section 1612.3, all new construction of buildings, structures and portions of buildings and structures, including substantial improvement and restoration of substantial damage to buildings and structures, shall be designed and constructed to resist the effects of flood hazards and flood loads. For buildings that are located in more than one *flood hazard area*, the provisions associated with the most restrictive *flood hazard area* shall apply.

TABLE 1612.1

CROSS REFERENCES DEFINING FLOOD-RESISTANT PROVISIONS OF THE FLORIDA BUILDING CODE

Florida Building Code — Building			
Section		Section	
Chapter 1	Scope and Administration	Chapter 14	Exterior Walls
102	Applicability	1403	Performance Requirements
105	Permits		
107	Submittal Documents	Chapter 16	Structural Design
110	Inspections	1601	General
111	Certificates of Occupancy	1603	Construction Documents
117	Variances in Flood Hazard Areas	1605	Load Combinations
		1612	Flood Loads
Chapter 2	Definitions		
202	Definitions	Chapter 18	Soils and Foundations
		1804	Excavation, Grading and Fill
Chapter 4	Special Detailed Requirements Based on Occupancy and Use	1805	Dampproofing and Waterproofing
449	Hospitals		
450	Nursing Homes	Chapter 27	Electrical
453	State Requirements for Educational Facilities	2702	Emergency and Standby Power Systems

454	Swimming Pools and Bathing Places (Public And Private)		
		Chapter 30	Elevators and Conveying Systems
Chapter 8	Interior Finishes and Decorative Materials	3001	General
801	General		
		Chapter 31	Special Construction
Chapter 12	Interior Environment	3102	Membrane Structures
1203	Ventilation	3109	Structures Seaward of a Coastal Construction Control Line
Florida Building Code — Residential			
Section		Section	
Chapter 2	Definitions	Chapter 21	Hydronic Piping
R202	Definitions	M2101	Hydronic Piping Systems Installation
		M2105	Ground-Source Heat-Pump System Loop Piping
Chapter 3	Building Planning		
R301	Design Criteria	Chapter 22	Special Piping and Storage Systems
R309	Garages and Carports	M2201	Oil Tanks
R322	Flood-Resistant Construction		
		Chapter 24	Fuel Gas
Chapter 4	Foundations	G2404 (301)	General
R401	General		
R404	Foundation and Retaining Walls	Chapter 26	General Plumbing Requirements
R408	Under-Floor Space	P2601	General
		P2602	Individual Water Supply and Sewage Disposal
Chapter 13	General Mechanical System Requirements		
M1301	General	Chapter 27	Plumbing Fixtures
		P2705	Installation
Chapter 14	Heating and Cooling Equipment and Appliances		
M1401	General	Chapter 30	Sanitary Drainage
		P3001	General
Chapter 19	Special Appliances, Equipment and Systems		
M1905	Residential Permanently Installed Stand-By Generators		
Chapter 16	Duct Systems	Chapter 20	Boilers and Water Heaters
M1601	Duct Construction	M2001	Boilers
		Chapter 31	Vents
Chapter 17	Combustion Air	P3101	Vent Systems
M1701	General		
Chapter 19	Special Appliances, Equipment and Systems	Chapter 45	Private Swimming Pools
M1905	Residential Permanently Installed Stand-By Generators	R4501	General
Florida Building Code — Existing Building			
Section		Section	
Chapter 2	Definitions	Chapter 7	Alterations — Level I
202	Definitions	701	General

Chapter 3	Provisions for All Compliance	Chapter 12	Historic Buildings
301	Administration	1201	General
Chapter 4	Repairs	Chapter 13	Relocated or Moved Buildings
401	General	1302	Requirements
406	Structural		
		Chapter 14	Performance Compliance Methods
Chapter 5	Prescriptive Compliance Method	1401	General
502	Additions		
503	Alterations		
Florida Building Code — Mechanical			
Section		Section	
Chapter 3	General Regulations	Chapter 6	Duct Systems
301	General	602	Plenums
		603	Duct Construction and Installation
Chapter 4	Ventilation		
401	General	Chapter 12	Hydronic Piping
		1206	Piping Installation
Chapter 5	Exhaust Systems		
501	General	Chapter 13	Fuel Oil Piping and Storage
		1305	Fuel Oil System Installation
Florida Building Code — Plumbing			
Section			
Chapter 3	General Regulations		
309	Flood Hazard Resistance		
Florida Building Code — Fuel Gas			
Section			
Chapter 3	General Regulations		
301	General (IFGC)		

1612.1.1 Cross References

See Table 1612.1.

1612.2 Definitions

The following terms are defined in Chapter 2:

BASE FLOOD.**BASE FLOOD ELEVATION.****BASEMENT.****COASTAL A ZONE.****COASTAL HIGH HAZARD AREA.****DESIGN FLOOD.****DESIGN FLOOD ELEVATION.****DRY FLOODPROOFING.****EXISTING STRUCTURE.****FLOOD or FLOODING.**

FLOOD DAMAGE-RESISTANT MATERIALS.**FLOOD HAZARD AREA.****FLOOD INSURANCE RATE MAP (FIRM).****FLOOD INSURANCE STUDY.****FLOODWAY.****LOWEST FLOOR.****SPECIAL FLOOD HAZARD AREA.****START OF CONSTRUCTION.****SUBSTANTIAL DAMAGE.****SUBSTANTIAL IMPROVEMENT.****1612.3 Establishment of Flood Hazard Areas**

To establish *flood hazard areas*, the applicable governing authority shall, by local flood plain management ordinance, adopt a flood hazard map and supporting data. The flood hazard map shall include, at a minimum, areas of special flood hazard as identified by the Federal Emergency Management Agency.

1612.3.1 Design Flood Elevations

Where design flood elevations are not included in the *flood hazard areas* established in Section 1612.3, or where floodways are not designated, the *building official* is authorized to require the applicant to:

1. Obtain and reasonably utilize any design flood elevation and floodway data available from a federal, state or other source; or
2. Determine the design flood elevation and/or floodway in accordance with accepted hydrologic and hydraulic engineering practices used to define special flood hazard areas. Determinations shall be undertaken by a *registered design professional* who shall document that the technical methods used reflect currently accepted engineering practice.

1612.3.2 Determination of Impacts

In riverine *flood hazard areas* where design flood elevations are specified but floodways have not been designated, the applicant shall provide a floodway analysis that demonstrates that the proposed work will not increase the design flood elevation more than 1 foot (305 mm) at any point within the jurisdiction of the applicable governing authority.

1612.4 Design and Construction

The design and construction of buildings and structures located in flood hazard areas, including coastal high hazard areas and Coastal A Zones, shall be in accordance with Chapter 5 of ASCE 7 and with ASCE 24.

1612.4.1 Modification of ASCE 24

Table 6-1 and Section 6.2.1 in ASCE 24 shall be modified as follows:

1. The title of Table 6.1 shall be "Minimum Elevation of Floodproofing, Relative to Base Flood Elevation (BFE) or Design Flood Elevation (DFE), in Coastal A Zones and in Other Flood Hazard Areas that are not High Risk Flood Hazard Areas."
2. Section 6.2.1 shall be modified to permit dry floodproofing in Coastal A Zones, as follows: "Dry floodproofing of nonresidential structures and nonresidential areas of mixed-use structures shall not be allowed unless such structures are located outside of High Risk Flood Hazard areas and Coastal High Hazard Areas. Dry floodproofing shall be permitted in Coastal A Zones provided wave loads and the potential for erosion and local scour are accounted for in the design. Dry floodproofing of residential structures or residential areas of mixed-use structures shall not be permitted."

1612.4.2 Modification of ASCE 24 9.6 Pools

Modify Section 9.6 in ASCE 24 by adding an exception as follows:

9.6 Pools. In-ground and above-ground pools shall be designed to withstand all flood-related loads and load combinations. Mechanical equipment for pools such as pumps, heating systems and filtering systems, and their associated electrical systems, shall comply with Chapter 7.

Exception: Equipment for pools, spas and water features shall be permitted below the elevation required in Table 7-1, provided it is elevated to the extent practical, is anchored to prevent flotation and resist flood forces, and is supplied by branch circuits that have ground-fault circuit-interrupter protection.

1612.5 Flood Hazard Documentation

The following documentation shall be prepared and sealed by a licensed professional surveyor and mapper or a *registered design professional*, as applicable, and submitted to the *building official*:

1. For construction in *flood hazard areas* other than *coastal high hazard areas* or *coastal A zones*:

1.1. The elevation of the lowest floor, including the basement, as required by the lowest floor elevation inspection in Section 110.3, Building, 1.1 and for the final inspection in Section 110.3, Building, 5.1.

1.2. For fully enclosed areas below the design flood elevation where provisions to allow for the automatic entry and exit of floodwaters do not meet the minimum requirements in Section 2.7.2.1 of ASCE 24, *construction documents* shall include a statement that the design will provide for equalization of hydrostatic flood forces in accordance with Section 2.7.2.2 of ASCE 24.

1.3. For *dry floodproofed* nonresidential buildings, *construction documents* shall include a statement that the *dry floodproofing* is designed in accordance with ASCE 24 and shall include the flood emergency plan specified in Chapter 6 of ASCE 24.

1.4. For *dry floodproofed* nonresidential buildings, the elevation to which the building is *dry floodproofed* as required for the final inspection in Section 110.3, Building, 6.1.

2. For construction in *coastal high hazard areas* and *coastal A zones*:

2.1. The elevation of the bottom of the lowest horizontal structural member as required by the lowest floor elevation inspection in Section 110.3, Building, 1.1 and for the final inspection in Section 110.3, Building, 5.1.

2.2. *Construction documents* shall include a statement that the building is designed in accordance with ASCE 24, including that the pile or column foundation and building or structure to be attached thereto is designed to be anchored to resist flotation, collapse and lateral movement due to the effects of wind and flood loads acting simultaneously on all building components, and other load requirements of Chapter 16.

2.3. For breakaway walls designed to have a resistance of more than 20 psf (0.96 kN/m²) determined using allowable stress design, *construction documents* shall include a statement that the breakaway wall is designed in accordance with ASCE 24.

2.4. For breakaway walls where provisions to allow for the automatic entry and exit of floodwaters do not meet the minimum requirements in Section 2.7.2.1 of ASCE 24, construction documents shall include a statement that the design will provide for equalization of hydrostatic flood forces in accordance with Section 2.7.2.2 of ASCE 24.

Section 1613 Earthquake Loads

RESERVED

Section 1614 Atmospheric Ice Loads

1614.1 General

Ice-sensitive structures shall be designed for atmospheric ice loads in accordance with Chapter 10 of ASCE 7.

Section 1615 Structural Integrity

1615.1 General

High-rise buildings that are assigned to *Risk Category III* or *IV* shall comply with the requirements of Section 1615.3 if they are frame structures, or Section 1615.4 if they are bearing wall structures.

1615.2 Definitions

The following words and terms are defined in Chapter 2:

BEARING WALL STRUCTURE.

FRAME STRUCTURE.

1615.3 Frame Structures

Frame structures shall comply with the requirements of this section.

1615.3.1 Concrete Frame Structures

Frame structures constructed primarily of reinforced or prestressed concrete, either cast-in-place or precast, or a combination of these, shall conform to the requirements of Section 4.10 of ACI 318. Where ACI 318 requires that nonprestressed reinforcing or prestressing steel pass through the region bounded by the longitudinal column reinforcement, that reinforcing or prestressing steel shall have a minimum nominal tensile strength equal to two-thirds of the required one-way vertical strength of the connection of the floor or roof system to the column in each direction of beam or slab reinforcement passing through the column.

Exception: Where concrete slabs with continuous reinforcement having an area not less than 0.0015 times the concrete area in each of two orthogonal directions are present and are either monolithic with or equivalently bonded to beams, girders or columns, the longitudinal reinforcing or prestressing steel passing through the column reinforcement shall have a nominal tensile strength of one-third of the required one-way vertical strength of the connection of the floor or roof system to the column in each direction of beam or slab reinforcement passing through the column.

1615.3.2 Structural Steel, Open Web Steel Joist or Joist Girder, or Composite Steel and Concrete Frame Structures

Frame structures constructed with a structural steel frame or a frame composed of open web steel joists, joist girders with or without other structural steel elements or a frame composed of composite steel or composite steel joists and reinforced concrete elements shall conform to the requirements of this section.

1615.3.2.1 Columns

Each column splice shall have the minimum design strength in tension to transfer the design dead and *live load* tributary to the column between the splice and the splice or base immediately below.

1615.3.2.2 Beams

End connections of all beams and girders shall have a minimum nominal axial tensile strength equal to the required vertical shear strength for *allowable stress design* (ASD) or two-thirds of the required shear strength for *load and resistance factor design* (LRFD) but not less than 10 kips (45 kN). For the purpose of this section, the shear force and the axial tensile force need not be considered to act simultaneously.

Exception: Where beams, girders, open web joist and joist girders support a concrete slab or concrete slab on metal deck that is attached to the beam or girder with not less than $\frac{3}{8}$ -inch-diameter (9.5 mm) headed shear studs, at a spacing of not more than 12 inches (305 mm) on center, averaged over the length of the member, or other attachment having equivalent shear strength, and the slab contains continuous distributed reinforcement in each of two orthogonal directions with an area not less than 0.0015 times the concrete area, the nominal axial tension strength of the end connection shall be permitted to be taken as half the required vertical shear strength for ASD or one-third of the required shear strength for LRFD, but not less than 10 kips (45 kN).

1615.4 Bearing Wall Structures

Bearing wall structures shall have vertical ties in all load-bearing walls and longitudinal ties, transverse ties and perimeter ties at each floor level in accordance with this section and as shown in Figure 1615.4.

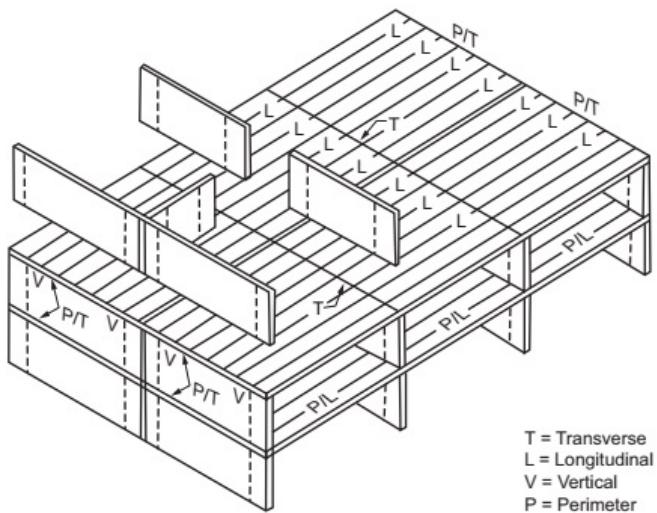


FIGURE 1615.4
LONGITUDINAL, PERIMETER, TRANSVERSE AND VERTICAL TIES

1615.4.1 Concrete Wall Structures

Precast bearing wall structures constructed solely of reinforced or prestressed concrete, or combinations of these shall conform to the requirements of Sections 16.2.4 and 16.2.5 of ACI 318.

1615.4.2 Other Bearing Wall Structures

Ties in bearing wall structures other than those covered in Section 1615.4.1 shall conform to this section.

1615.4.2.1 Longitudinal Ties

Longitudinal ties shall consist of continuous reinforcement in slabs; continuous or spliced decks or sheathing; continuous or spliced members framing to, within or across walls; or connections of continuous framing members to walls. Longitudinal ties shall extend across interior load-bearing walls and shall connect to exterior load-bearing walls and shall be spaced at not greater than 10 feet (3038 mm) on center. Ties shall have a minimum nominal tensile strength, T_T , given by Equation 16-20. For ASD the minimum nominal tensile strength shall be permitted to be taken as 1.5 times the allowable tensile stress times the area of the tie.

$$T_T = w LS \leq \alpha_T S \quad (\text{Equation 16-20})$$

where:

L = The span of the horizontal element in the direction of the tie, between bearing walls, feet (m).

w = The weight per unit area of the floor or roof in the span being tied to or across the wall, psf (N/m^2).

S = The spacing between ties, feet (m).

α_T = A coefficient with a value of 1,500 pounds per foot (2.25 kN/m) for masonry bearing wall structures and a value of 375 pounds per foot (0.6 kN/m) for structures with bearing walls of cold-formed steel light-frame construction.

1615.4.2.2 Transverse Ties

Transverse ties shall consist of continuous reinforcement in slabs; continuous or spliced decks or sheathing; continuous or spliced members framing to, within or across walls; or connections of continuous framing members to walls. Transverse ties shall be placed no farther apart than the spacing of load-bearing walls. Transverse ties shall have minimum nominal tensile strength T_T , given by Equation 16-20. For ASD the minimum nominal tensile strength shall be permitted to be taken as 1.5 times the allowable tensile stress times the area of the tie.

1615.4.2.3 Perimeter Ties

Perimeter ties shall consist of continuous reinforcement in slabs; continuous or spliced decks or sheathing; continuous or spliced members framing to, within or across walls; or connections of continuous framing members to walls. Ties around the perimeter of each floor and roof shall be located within 4 feet (1219 mm) of the edge and shall provide a nominal strength in tension not less than T_p , given by Equation 16-21. For ASD the minimum nominal tensile strength shall be permitted to be taken as 1.5 times the allowable tensile stress times the area of the tie.

$$T_p = 200w \leq \beta_T \quad (\text{Equation 16-21})$$

For SI: $T_p = 90.7w \beta_T$

where:

w = As defined in Section 1615.4.2.1.

β_T = A coefficient with a value of 16,000 pounds (7200 kN) for structures with masonry bearing walls and a value of 4,000 pounds (1300 kN) for structures with bearing walls of cold-formed steel light-frame construction.

1615.4.2.4 Vertical Ties

Vertical ties shall consist of continuous or spliced reinforcing, continuous or spliced members, wall sheathing or other engineered systems. Vertical tension ties shall be provided in bearing walls and shall be continuous over the height of the building. The minimum nominal tensile strength for vertical ties within a bearing wall shall be equal to the weight of the wall within that story plus the weight of the diaphragm tributary to the wall in the story below. No fewer than two ties shall be provided for each wall. The strength of each tie need not exceed 3,000 pounds per foot (450 kN/m) of wall tributary to the tie for walls of masonry construction or 750 pounds per foot (140 kN/m) of wall tributary to the tie for walls of cold-formed steel light-frame construction.

Section 1616 High-Velocity Hurricane Zones— General, Deflection, Volume Changes and Minimum Loads

1616.1 General Design Requirements

1616.1.1

Any system, method of design or method of construction shall admit of a rational analysis in accordance with well-established principles of mechanics and sound engineering practices.

1616.1.2

Buildings, structures and all parts thereof shall be designed and constructed to be of sufficient strength to support the estimated or actual imposed dead, live, wind, and any other loads, both during construction and after completion of the structure, without exceeding the allowable materials stresses specified by this code.

1616.1.3

Reserved.

1616.1.4

Reserved.

1616.1.5

Reserved.

1616.1.6

Floor and roof systems shall be designed and constructed to transfer horizontal forces to such parts of the structural frame as are designed to carry these forces to the foundation. Where roofs or floors are constructed of individual prefabricated units and the transfer of forces to the building frame and foundation is totally or partially dependent on such units, the units and their attachments shall be capable of resisting applied loads in both vertical and both horizontal directions. Where roofs or floors are constructed of individual prefabricated units and the transfer of forces to the building frame and foundation is wholly independent of such units, the units and their attachments shall be capable of resisting applied loads normal to the surface, in and out.

1616.2 General Design for Specific Occupancies and Structures

1616.2.1 Fences

Fences not exceeding 6 feet (1829 mm) in height from grade may be designed for allowable wind speeds of 75 mph (33 m/s) fastest mile wind speed or 115 mph (40 m/s) 3-second gust.

1616.2.1.1 Wood Fences

Wood fence design shall be as specified by Section 2328.

1616.2.2 Sway Forces in Stadiums

1. The sway force applied to seats in stadiums, grand-stands, bleachers and reviewing stands shall be not less than 24 pounds per lineal foot (350 N/m), applied perpendicularly and along the seats.

2. Sway forces shall be applied simultaneously with gravity loads.

3. Sway forces need not be applied simultaneously with other lateral forces.

1616.3 Deflection

1616.3.1 Allowable Deflections

The deflection of any structural member or component when subjected to live, wind and other superimposed loads set forth herein shall not exceed the following:

1.	Roof and ceiling or components supporting plaster	L/360
2.	Roof members or components not supporting plaster under	L/240
3.	Structural metal roof panels of cold-formed steel construction	L/180
4.	Floor members or components	L/360
5.	Vertical members and wall members or components consisting of or supporting material that hardens in place, is brittle or lacks resistance to cracking caused by bending strains	L/360
6.	Vertical members and wall members or components not required to meet the conditions of Section 1616.3, Item 5	L/180

7.	Roof and vertical members, wall members and panels of carports, canopies, marquees, the roof projection is greater than 12 feet (3.7 m) in the direction of the span, for free-standing roofs and roofs supported by existing structures. Existing structures supporting such roofs shall be capable of supporting the additional loading	L/180
8.	For Group R3 occupancies only, roof and vertical members, wall members and panels of carports, canopies, marquees, patio covers, utility sheds and similar minor structures not to be considered living areas, where the roof projection is 12 feet (3.7 m) or less in the direction of the span and for free-standing roofs and roofs supported by existing structures	L/80
9.	Members supporting screens only	L/80
10.	Storm shutters and fold-down awnings, which in the closed position shall provide a minimum clear separation from the glass of 1 inch (25 mm) but not to exceed 2 inches (51 mm) when the shutter or awning is at its maximum point of permissible deflection	L/30
11.	Roofs and exterior walls of utility sheds having maximum dimensions of 10 feet (3 m) length, 10 feet (3 m) width, and 7 feet (2.1 m) height	L/80
12.	Roofs and exterior walls of storage buildings larger than utility sheds	L/180

1616.4 Volume Change

In the design of any building, structure or portion thereof, consideration shall be given to the relief of stresses caused by expansion, contraction and other volume changes.

1616.5 Live Loads

Live loads for balconies and decks shall be designed in accordance with ASCE 7.

1616.6 Concentrated Loads

Reserved.

Section 1617 High-Velocity Hurricane Zones— Roof Drainage

RESERVED

Section 1618 High-Velocity Hurricane Zones— Special Load Considerations**1618.1 Floors**

Reserved.

1618.2 Below Grade Structures

Reserved.

1618.3 Heliports/Heliports

Reserved.

1618.4 Safeguards

Reserved.

1618.4.1

Reserved.

1618.4.2

Reserved.

1618.4.3

Reserved.

1618.4.4

Reserved.

1618.4.5

Reserved.

1618.4.6 Railing**1618.4.6.1**

Reserved.

1618.4.6.2

Reserved.

1618.4.6.3

Laminated glazing will be permitted as an equal alternate to pickets, if tested by an accredited laboratory to satisfy the resistance requirements of this code for wind, live and kinetic energy impact loading conditions. The kinetic energy impact loading shall comply with ANSI Z97.1 using a 400 foot-pound (542 N) energy impact. The safety requirements of the impact test shall be judged to have been satisfactorily met if breakage does not occur or numerous cracks and fissures occur but no shear or opening through which a 3-inch (76 mm) diameter sphere may freely pass. The glass panel shall remain within the supporting frame.

1618.4.6.4

If the posts that support the top rail of exterior railings are substituted with glass, the assembly shall be tested to TAS 201, where the impacted glass continues to support the top rail and all applicable loads after impact.

1618.5 Vehicle Safeguard Barriers

Reserved.

1618.6 Special Requirements for Cable Safeguard Barriers

Reserved.

1618.7 Ornamental Projections

Reserved.

1618.8 Interior Wall and Partitions

Reserved.

1618.9 Load Combination

Reserved.

Section 1619 High Velocity Hurricane Zones— Live Load Reductions

RESERVED

Section 1620 High-Velocity Hurricane Zones— Wind Loads**1620.1**

Buildings and structures, and every portion thereof, shall be designed and constructed to meet the requirements of Chapters 26 through 31 of ASCE 7.

Exception: Exposed mechanical equipment or appliances fastened to a roof or installed on the ground in compliance with the code using rated stands, platforms, curbs, slabs, walls, or other means are deemed to comply with the wind resistance requirements of the 2007 Florida Building Code, as amended. Further support or enclosure of such mechanical equipment or appliances is not required by a state or local official having authority to enforce the *Florida Building Code*.

1620.2

Wind velocity (3-second gust) used in structural calculations shall be as follows:

Miami-Dade County

Risk Category I Buildings and Structures: 165 mph

Risk Category II Buildings and Structures: 175 mph

Risk Category III Buildings and Structures: 186 mph

Risk Category IV Buildings and Structures: 195 mph

Broward County

Risk Category I Buildings and Structures: 156 mph

Risk Category II Buildings and Structures: 170 mph

Risk Category III Buildings and Structures: 180 mph

Risk Category IV Buildings and Structures: 185 mph

1620.3

All buildings and structures shall be considered to be in Exposure Category C, unless Exposure Category D applies, as defined in Section 26.7 of ASCE 7.

1620.4

For wind force calculations, roof *live loads* shall not be considered to act simultaneously with the wind load.

1620.5

Utility sheds shall be designed for a wind load of not less than 15 psf (718 Pa).

1620.6 Rooftop Equipment and Structures

Wind loads on rooftop equipment and other structures shall be in accordance with Chapter 29 of ASCE 7.

Exception: Exposed mechanical equipment or appliances fastened to a roof or installed on the ground in compliance with the code using rated stands, platforms, curbs, slabs, walls, or other means are deemed to comply with the wind-resistance requirements of the 2007 Florida Building Code, as amended. Further support or enclosure of such mechanical equipment or appliances is not required by a state or local official having authority to enforce the *Florida Building Code*.

1620.7 Tornado Loads

The design and construction of Risk Category III and IV buildings and other structures shall be in accordance with Chapter 32 of ASCE 7.

Section 1621 High-Velocity Hurricane Zones— Overturning Moment and Uplift**1621.1**

Computations for overturning moment and uplift shall be based on ASCE 7.

1621.2

Overturning and uplift stability of any building, structure or part thereof taken as a whole shall be provided and shall be satisfied by conforming to the load combination requirements of ASCE 7.

Section 1622 High-Velocity Hurricane Zones— Screen Enclosures**1622.1 Screen Enclosures****1622.1.1**

The wind loads on screen surfaces shall be in accordance with ASCE 7 based on the ratio of solid to gross area.

1622.1.2

Design shall be based on such loads applied horizontally inward and outward to the walls with a shape factor of 1.3 and applied vertically upward and downward on the roof with a shape factor of 0.7.

Exception: Screen enclosures shall be permitted to be designed in accordance with the AAF *Guide to Aluminum Construction in High Wind Areas*. Construction documents based on the AAF *Guide to Aluminum Construction in High Wind Areas* shall be prepared and signed and sealed by a Florida registered architect or engineer.

1622.2 Windbreakers**1622.2.1**

Vinyl and acrylic glazed panels shall be removable. Removable panels shall be identified as removable by a decal. The identification decal shall essentially state "Removable panel SHALL be removed when wind speeds exceed 75 mph (34 m/s)." Decals shall be placed such that the decal is visible when the panel is installed.

1622.2.2

Permanent frame shall be designed in accordance with Sections 1620 and 1622.1.2.

Section 1623 High-Velocity Hurricane Zones— Live Loads Posted and Occupancy Permits**RESERVED****Section 1624 High-Velocity Hurricane Zones— Foundation Design****RESERVED****Section 1625 High-Velocity Hurricane Zones— Load Tests****1625.1 Application**

Whenever there is insufficient evidence of compliance with the provisions of this code or evidence that any material or any construction does not conform to the requirements of this code, or in order to substantiate claims for alternate materials or methods of construction, the building official may require testing by an approved agency, at the expense of the owner or his agent, as proof of compliance. Testing methods shall be as specified by this code for the specific material.

1625.2 Testing Method

Such testing shall follow a nationally recognized standard test, or when there is no standard test procedure for the material or assembly in question, the building official shall require the material or assembly under dead plus *live load* shall deflect not more than as set forth in Section 1616.3, and that the material or assembly shall sustain dead load plus twice the *live load* for a period of 24 hours, with a recovery of at least 80 percent or a 100-percent recovery after one-half test load.

1625.3 Alternate Test Methods

When elements, assemblies or details of structural members are such that their load-carrying capacity, deformation under load, or deflection cannot be calculated by rational analysis, their structural performance shall be established by test in accordance with test procedures as approved by the building official based on consideration of all probable conditions of loading.

1625.4 Fatigue Load Testing

Where cladding assemblies (including cladding and connections) or roofing framing assemblies (including portions of roof structure and connections) are such that their load-carrying capacity or deformation under load cannot be calculated by rational analysis, the assemblies may be tested to resist the fatigue loading sequence given by Table 1625.4.

Assemblies shall be tested with no resultant failure or distress and shall have a recovery of at least 90 percent over maximum deflection.

Any cladding assembly not incorporated into the *Florida Building Code, Building* after successfully completing the impact test outlined in Section 1626, shall be subject to fatigue loading testing and shall obtain product approval by the building official.

TABLE 1625.4**FATIGUE LOADING SEQUENCE**

RANGE OF TEST	NUMBER OF CYCLES ¹
0 to $0.5p_{max}^2$	600
0 to $0.6p_{max}$	70
0 to $1.3p_{max}$	1

1. Each cycle shall have minimum duration of 1 second and a maximum duration of 3 seconds and must be performed in a continuous manner.

2. $p_{max} = 0.6 \times$ ultimate design load in accordance with ASCE 7.

Section 1626 High-Velocity Hurricane Zones— Impact Tests for Wind-Borne Debris**TABLE 1626****CYCLIC WIND PRESSURE LOADING**

INWARD ACTING PRESSURE		OUTWARD ACTING PRESSURE	
RANGE	NUMBER OF CYCLES ¹	RANGE	NUMBER OF CYCLES ¹
0.2 P _{MAX} to 0.5 P _{MAX} ²	3,500	0.3 P _{MAX} to 1.0 P _{MAX}	50
0.0 P _{MAX} to 0.6 P _{MAX}	300	0.5 P _{MAX} to 0.8 P _{MAX}	1,050
0.5 P _{MAX} to 0.8 P _{MAX}	600	0.0 P _{MAX} to 0.6 P _{MAX}	50
0.3 P _{MAX} to 1.0 P _{MAX}	100	0.2 P _{MAX} to 0.5 P _{MAX}	3,350

NOTES:

1. Each cycle shall have minimum duration of 1 second and a maximum duration of 3 seconds and must be performed in a continuous manner.
2. p_{max} = 0.6 × ultimate design load in accordance with ASCE 7. The pressure spectrum shall be applied to each test specimen beginning with inward acting pressures followed by the outward acting pressures in the order from the top of each column to the bottom of each column.

1626.1

All parts or systems of a building or structure envelope such as, but not limited, to exterior walls, roof, outside doors, skylights, glazing and glass block shall meet impact test criteria or be protected with an external protection device that meets the impact test criteria. Test procedures to determine resistance to wind-borne debris of wall cladding, outside doors, skylights, glazing, glass block, shutters and any other external protection devices shall be performed in accordance with this section.

Exception: The following structures or portion of structures shall not be required to meet the provisions of this section:

- a. Roof assemblies for screen rooms, porches, canopies, etc., attached to a building that do not breach the exterior wall or building envelope and have no enclosed sides other than screen.
- b. Soffits, soffit vents and ridge vents. Size and location of such vents shall be detailed by the designer and shall not compromise the integrity of the diaphragm boundary.
- c. Vents in a garage with four or fewer cars. Size and location of such vents shall be detailed by the designer and shall not exceed the minimum required area by more than 25 percent.
- d. Exterior wall or roof openings for wall- or roofmounted HVAC equipment.
- e. Openings for roof-mounted personnel access roof hatches.
- f. Storage sheds that are not designed for human habitation and that have a floor area of 720 square feet (67 m²) or less are not required to comply with the mandatory windborne debris impact standards of this code.
- g. Louvers as long as they properly considered ASCE 7 in the design of the building and meet the requirements of Section 1626.5.3.
- h. Buildings and structures for marinas, cabanas, swimming pools and greenhouses.
- i. Exterior balconies or porches under existing roofs or decks enclosed with screen or removable vinyl and acrylic panels complying with Section 1622.1 or 1622.2 shall not be required to be protected and openings in the wall separating the unit from the balcony or porch shall not be required to be protected unless required by other provisions of this code.

1626.2 Large Missile Impact Tests**1626.2.1**

This test shall be conducted on three test specimens in accordance with test protocols TAS 201 and TAS 203. This test shall be applicable to the construction units, assemblies and materials to be used up to and including 30 feet (9.1 m) in height in any and all structures.

1626.2.2

The test specimens shall consist of the entire assembled unit, including frame and anchorage as supplied by the manufacturer for installation in the building, or as set forth in a referenced specification, if applicable. Fasteners used in mounting the test specimen shall be identical in size and spacing to what is used in field installations.

1626.2.3

The large missile shall be comprised of a piece of timber having nominal dimensions of 2 inches by 4 inches (51 mm by 102 mm) weighing 9 pounds (4.1 kg).

1626.2.4

The large missile shall impact the surface of each test specimen at a speed of 50 feet per second (15.2 m/s); 80 feet per second (24.38 m/s) for Risk Category IV—Essential Facility buildings or structures.

1626.2.5

Each test specimen shall receive two impacts except as noted in Sections 1626.2.5.1 and 1626.2.5.2, the first within a 5-inch (127 mm) radius circle having its center on the midpoint of the test specimen and the second within a 5-inch (127 mm) radius circle in a corner having its center in a location 6 inches (152 mm) away from any supporting members.

1626.2.5.1

For window, glass block, fixed glass and skylight assemblies, both impacts shall be to glass or other glazing infill. For test specimens with more than one light of glass, a single light closest to the center of the assembly shall be selected and impacted twice in accordance with Section 1626.2.5. If a light of glass is sufficiently small to cause the 5-inch (127 mm) radius circle to overlap, two separate lights shall be impacted one time each.

1626.2.5.1.1

For window, fixed glass and skylight assemblies comprised of different glass thickness, types of glass or different types of glazing infill, each separate thickness or type shall be impacted twice in accordance with Section 1626.2.5.

1626.2.5.2

For doors, wall cladding and external protection devices, both impacts shall be to the thinnest section through the assembly. For doors, wall cladding and external protection devices with horizontal and/or vertical bracing, both impacts shall be within a single area that is not reinforced and shall be in accordance with Section 1626.2.5.

1626.2.5.2.1

For doors with glass, the glass shall be impacted twice and the thinnest section through the assembly that is not glass shall be impacted twice in accordance with Section 1626.2.5.

1626.2.6

In the case of glazing, if the three test specimens that comprise a test successfully reject the two missile impacts, they shall then be subjected to the cyclic pressure loading defined in Table 1626.

1626.2.6.1

If external protection devices are employed to protect windows, fixed doors or skylights, they must resist the large missile impacts specified in Sections 1626.2.3 and 1626.2.4 without deformations which result in contact with the windows, fixed glass, glass block, and doors or skylights they are intended to protect.

1626.2.6.2

If external protection devices are not designed to be airtight, following the large missile impact test, they must resist an application of force corresponding to those listed in Table 1625.4 (fatigue load testing) without detaching from their mountings. The acting pressure cycles shall be simulated with loads applied through a mechanical system attached to the shutter specimen to apply uniformly around the shutter perimeter a force equal to the product of the required pressure and the area of the shutter specimen.

1626.2.7

If air leakage through the test specimen is excessive, tape may be used to cover any cracks and joints through which leakage is occurring. Tape shall not be used when there is a probability that it may significantly restrict differential movement between adjoining members. It is also permissible to cover both sides of the entire specimen and mounting panel with a single thickness of polyethylene film no thicker than 0.050 mm (2 mils). The technique of application is important in order that the full load is transferred to the specimen and that the membrane does not prevent movement or failure of the specimen. Apply the film loosely with extra folds of material at each corner and at all offsets and recesses. When the load is applied, there shall be no fillet caused by tightness of plastic film.

1626.2.8

A particular system of construction shall be deemed to comply with this recommended practice if three test specimens reject the two missile impacts without penetration and resist the cyclic pressure loading with no crack forming longer than 5 inches (127 mm) and $\frac{1}{16}$ inch (1.6 mm) wide through which air can pass.

1626.2.9

If only one of the three test specimens in a test fails to meet the above listed criteria, one retest of this system of construction (another test sequence with three specimens) shall be permitted.

1626.3 Small Missile Impact Test

1626.3.1

This test shall be conducted on three test specimens in accordance with test protocols TAS 201 and TAS 203. This test shall be applicable to the construction units, assemblies, and materials to be used above 30 feet (9.1 m) in height in any and all structures; Risk Category IV—Essential Facility buildings or structures shall follow the large missile impact testing in Section 1626.2.4 at 50 feet per second (15.2 m/s).

1626.3.2

Each test specimen shall consist of the entire assembled unit, including frame and anchorage as supplied by the manufacturer for installation in the building, or as set forth in a referenced specification, if applicable. The fasteners used in mounting the test specimen shall be identical in size and spacing to those to be used in field installations.

1626.3.3

The missiles shall consist of solid steel balls each having a mass of 2 grams (0.07 oz) (+/- 5 percent) with a $\frac{5}{16}$ -inch (7.9 mm) nominal diameter.

1626.3.4

Each missile shall impact the surface of each test specimen at a speed of 130 feet per second (40 m/s).

1626.3.5

Each test specimen shall receive 30 small missile impacts except as noted in Sections 1626.3.5.1 and 1626.3.5.2 delivered in groups of 10 at a time: the first 10 distributed uniformly over a 2 square foot (0.19 m^2) area located at the center of the test specimen, the second 10 distributed uniformly over a 2 square foot area (0.19 m^2) located at the center of the long dimension of the specimen near the edge, and the third 10 distributed uniformly over a 2 square foot (0.19 m^2) area located at a corner of the specimen.

1626.3.5.1.1

For window and skylight assemblies, all impacts shall be to glass or other glazing infill. For test specimens with more than one light of glass, a single light closest to the center of the assembly shall be selected and impacted in accordance with Section 1626.3.5. If a light of glass is sufficiently small to cause the 5-inch (127 mm) radius circles to overlap, separate lights may be impacted; however, there must be a total of 30 impacts within the assembly.

1626.3.5.1.1.1

For window, fixed glass and skylight assemblies comprised of glass with different thickness, types of glass or different types of glazing infill, each separate thickness or type shall be impacted in accordance with Section 1626.3.5.

1626.3.5.2

For doors, wall cladding and external protection devices, all impacts shall be to the thinnest section through the assembly. For doors, wall cladding and external protection devices with horizontal and/or vertical bracing, all impacts shall be within a single area that is not reinforced and shall be impacted in accordance with Section 1626.3.5.

1626.3.5.2.1

For doors with glass, the glass shall be impacted in accordance with Section 1626.3.5 and the thinnest section through the assembly that is not glass shall be impacted in accordance with Section 1626.3.5.

1626.3.6

In the case of glazing, after completion of the small missile impacts, each test specimen shall then be subjected to the cyclic pressure loading defined in Table 1626.

1626.3.6.1

If external protection devices are employed to protect windows, doors or skylights, they must resist the small missile impacts specified in Sections 1626.3.3 and 1626.3.4 without deformations that result in contact with the windows, glass, doors or skylights they are intended to protect.

1626.3.6.2

If external protection devices are not designed to be airtight, following the small missile impact test, they must resist an application of force corresponding to those listed in Table 1625.4 (fatigue load testing) without detaching from their mountings. The acting pressure cycles shall be simulated with loads applied through a mechanical system attached to the shutter specimen to apply uniformly around the shutter perimeter a force equal to the product of the required pressure and the area of the shutter specimen.

1626.3.7

If air leakage through the test specimen is excessive, tape may be used to cover any cracks and joints through which leakage is occurring. Tape shall not be used when there is a probability that it may significantly restrict differential movement between adjoining members. It is also permissible to cover both sides of the entire specimen and mounting panel with a single thickness of polyethylene film no thicker than 0.050 mm (2 mils). The technique of application is important for the full load to be transferred to the specimen and to insure the membrane does not prevent movement or failure of the specimen. Apply the film loosely with extra folds of material at each corner and at all offsets and recesses. When the load is applied, there shall be no fillet caused by tightness of plastic film.

1626.3.8

A particular system of construction shall be deemed to comply with this test if three test specimens reject the small missile impacts without penetration and resist the cyclic pressure loading with no crack forming longer than 5 inches (127 mm) and $\frac{1}{16}$ inch (1.6 mm) in width through which air can pass.

1626.3.9

If only one of the three test specimens in a test fails to meet the previously listed criteria, one retest of the system (another test sequence with three specimens) of construction shall be permitted.

1626.4 Construction Assemblies Deemed to Comply With Section 1626

1. Exterior concrete masonry walls of minimum nominal 8-inch (203 mm) thickness, constructed in accordance with Chapter 21 (High-Velocity Hurricane Zones) of this code.
2. Exterior frame walls or gable ends constructed in accordance with Chapters 22 and 23 (High-Velocity Hurricane Zones) of this code, sheathed with a minimum $\frac{19}{32}$ -inch (15 mm) CD exposure 1 plywood and clad with wire lath and stucco installed in accordance with Chapter 25 of this code.
3. Exterior frame walls and roofs constructed in accordance with Chapter 22 (High-Velocity Hurricane Zones) of this code sheathed with a minimum 24-gage rib-deck-type material and clad with an approved wall finish.
4. Exterior reinforced concrete elements constructed of solid normal weight concrete (no voids), designed in accordance with Chapter 19 (High-Velocity Hurricane Zones) of this code and having a minimum 2 inches (51 mm) thickness.
5. Roof systems constructed in accordance with Chapter 22 or Chapter 23 (High-Velocity Hurricane Zones) of this code, sheathed with a minimum $\frac{19}{32}$ -inch (15 mm) CD exposure 1 plywood or minimum nominal 1-inch (25 mm) wood decking and surfaced with an approved roof system installed in accordance with Chapter 15 of this code.

All connectors shall be specified by the building designer of record for all loads except impact.

1626.5 Louvers**1626.5.1**

Louvers protecting the exterior wall envelope and are within 30 feet (9144 mm) of grade shall meet the requirements of AMCA 540 or TAS 201 (large missile test) or shall be protected by an impact-resistant cover complying with TAS 201 (large missile test), TAS 202 and TAS 203.

1626.5.2

Louvers required to be open for life safety purposes, such as providing a breathable atmosphere, that are protecting the exterior wall envelope and are within 30 feet (9144 mm) of grade shall meet the impact requirements of AMCA 540 or TAS 201 (large missile test).

1626.5.3

Open and closed louvers protecting the exterior wall envelope, regardless of their function or location from grade, shall also comply with uniform air pressure testing per TAS 202 protocol and either the cyclical wind pressure loading per TAS 203 protocol or by complying with both the impact and cyclical pressure testing of AMCA 540.

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Chapter 17 Special Inspections and Tests

Section 1701 General

1701.1 Scope

The provisions of this chapter shall govern the quality, workmanship and requirements for materials covered. Materials of construction and tests shall conform to the applicable standards listed in this code.

1701.2 New Materials

New building materials, equipment, appliances, systems or methods of construction not provided for in this code, and any material of questioned suitability proposed for use in the construction of a building or structure, shall be subjected to the tests prescribed in this chapter and in the *approved* rules to determine character, quality and limitations of use.

Section 1702 Definitions

1702.1 Definitions

The following terms are defined in Chapter 2:

APPROVED AGENCY.

APPROVED FABRICATOR.

CERTIFICATE OF COMPLIANCE.

FABRICATED ITEM.

GARAGE DOOR MANUFACTURER.

INTUMESCENT FIRE-RESISTANT COATINGS.

MAIN WINDFORCE-RESISTING SYSTEM.

MASTIC FIRE-RESISTANT COATINGS.

SPECIAL INSPECTION. Reserved.

Continuous special inspection. Reserved.

Periodic special inspection. Reserved.

SPECIAL INSPECTOR. Reserved.

SPRAYED FIRE-RESISTANT MATERIALS.

STRUCTURAL OBSERVATION. Reserved.

Section 1703 Approvals

1703.1 Approved Agency

An approved agency shall provide all information as necessary for the *building official* to determine that the agency meets the applicable requirements specified in Sections 1703.1.1 through 1703.1.3.

1703.1.1 Independence

An *approved agency* shall be objective, competent and independent from the contractor responsible for the work being inspected. The agency shall also disclose to the *building official* and the *registered design professional in responsible charge* possible conflicts of interest so that objectivity can be confirmed.

1703.1.2 Equipment

An *approved agency* shall have adequate equipment to perform required tests. The equipment shall be periodically calibrated.

1703.1.3 Personnel

An *approved agency* shall employ experienced personnel educated in conducting, supervising and evaluating tests and *special inspections*.

1703.2 Written Approval

Any material, appliance, equipment, system or method of construction meeting the requirements of this code shall be *approved* in writing after satisfactory completion of the required tests and submission of required test reports.

1703.3 Record of Approval

For any material, appliance, equipment, system or method of construction that has been *approved*, a record of such approval, including the conditions and limitations of the approval, shall be kept on file in the *building official's* office and shall be available for public review at appropriate times.

1703.4 Performance

Specific information consisting of test reports conducted by an *approved agency* in accordance with the appropriate referenced standards, or other such information as necessary, shall be provided for the *building official* to determine that the product, material or assembly meets the applicable code requirements.

1703.4.1 Research and Investigation

Sufficient technical data shall be submitted to the *building official* to substantiate the proposed use of any product, material or assembly. If it is determined that the evidence submitted is satisfactory proof of performance for the use intended, the *building official* shall approve the use of the product, material or assembly subject to the requirements of this code. The costs, reports and investigations required under these provisions shall be paid by the owner or the owner's authorized agent.

1703.4.2 Research Reports

Supporting data, where necessary to assist in the approval of products, materials or assemblies not specifically provided for in this code, shall consist of valid research reports from *approved* sources.

1703.5 Labeling

Products, materials or assemblies required to be *labeled* shall be *labeled* in accordance with the procedures set forth in Sections 1703.5.1 through 1703.5.4.

1703.5.1 Testing

An *approved agency* shall test a representative sample of the product, material or assembly being *labeled* to the relevant standard or standards. The *approved agency* shall maintain a record of the tests performed. The record shall provide sufficient detail to verify compliance with the test standard.

1703.5.2 Inspection and Identification

The *approved agency* shall periodically perform an inspection, which shall be in-plant if necessary, of the product or material that is to be *labeled*. The inspection shall verify that the labeled product, material or assembly is representative of the product, material or assembly tested.

1703.5.3 Label Information

The *label* shall contain the manufacturer's identification, model number, serial number or definitive information describing the performance characteristics of the product, material or assembly and the *approved agency's* identification.

1703.5.4 Method of Labeling

Information required to be permanently identified on the product, material or assembly shall be acid etched, sand blasted, ceramic fired, laser etched, embossed or of a type that, once applied, cannot be removed without being destroyed.

1703.6 Evaluation and Follow-Up Inspection Services

Where structural components or other items regulated by this code are not visible for inspection after completion of a prefabricated assembly, the owner or the owner's authorized agent shall submit a report of each prefabricated assembly. The report shall indicate the complete details of the assembly, including a description of the assembly and its components, the basis upon which the assembly is being

evaluated, test results and similar information and other data as necessary for the *building official* to determine conformance to this code. Such a report shall be *approved* by the *building official*.

1703.6.1 Follow-Up Inspection

Reserved.

1703.6.2 Test and Inspection Records

Copies of necessary test and *special inspection* records shall be filed with the building official.

1703.6.2.1 Concrete Testing Reports

Where this code, a referenced standard, a *building official* or inspection agency requires testing of concrete on a project, test reports shall be provided to the *building official* or inspection agency, the *registered design professional* of record, and the material supplier concurrent when reporting results to the client.

Section 1704 Special Inspections and Tests, Contractor Responsibility and Structural Observation

RESERVED

Section 1705 Required Special Inspections and Tests

RESERVED

Section 1706 Design Strengths of Materials

1706.1 Conformance to Standards

The design strengths and permissible stresses of any structural material that are identified by a manufacturer's designation as to manufacture and grade by mill tests, or the strength and stress grade is otherwise confirmed to the satisfaction of the *building official*, shall conform to the specifications and methods of design of accepted engineering practice or the *approved* rules in the absence of applicable standards.

1706.2 New Materials

For materials that are not specifically provided for in this code, the design strengths and permissible stresses shall be established by tests as provided for in Section 1707.

Section 1707 Alternative Test Procedure

1707.1 General

In the absence of *approved* rules or other *approved* standards, the *building official* shall make, or cause to be made, the necessary tests and investigations; or the *building official* shall accept duly authenticated reports from *approved agencies* in respect to the quality and manner of use of new materials or assemblies as provided for in Section 104.11. The cost of all tests and other investigations required under the provisions of this code shall be borne by the owner or the owner's authorized agent.

Section 1708 In-Situ Load Tests

1708.1 General

Whenever there is a reasonable doubt as to the stability or load-bearing capacity of a completed building, structure or portion thereof for the expected loads, an engineering assessment shall be required. The engineering assessment shall involve either a structural analysis or an in-situ load test, or both. The structural analysis shall be based on actual material properties and other as-built conditions that affect stability or load-bearing capacity, and shall be conducted in accordance with the applicable design standard. If the structural assessment determines that the load-bearing capacity is less than that required by the code, load tests shall be conducted in accordance with Section 1708.2. If the building, structure or portion thereof is found to have inadequate stability or load-bearing capacity for the expected loads, modifications to ensure structural adequacy or the removal of the inadequate construction shall be required.

1708.2 Test Standards

Structural components and assemblies shall be tested in accordance with the appropriate referenced standards. In the absence of a standard that contains an applicable load test procedure, the test procedure shall be developed by a *registered design professional* and

approved. The test procedure shall simulate loads and conditions of application that the completed structure or portion thereof will be subjected to in normal use.

1708.3 In-Situ Load Tests

In-situ load tests shall be conducted in accordance with Section 1708.3.1 or 1708.3.2 and shall be supervised by a *registered design professional*. The test shall simulate the applicable loading conditions specified in Chapter 16 as necessary to address the concerns regarding structural stability of the building, structure or portion thereof.

1708.3.1 Load Test Procedure Specified

Where a referenced standard contains an applicable load test procedure and acceptance criteria, the test procedure and acceptance criteria in the standard shall apply. In the absence of specific load factors or acceptance criteria, the load factors and acceptance criteria in Section 1708.3.2 shall apply.

1708.3.2 Load Test Procedure Not Specified

In the absence of applicable load test procedures contained within a standard referenced by this code or acceptance criteria for a specific material or method of construction, such *existing structure* shall be subjected to a test procedure developed by a *registered design professional* that simulates applicable loading and deformation conditions. At a minimum, the test load shall be equal to the specified factored design loads. For materials such as wood that have strengths that are dependent on load duration, the test load shall be adjusted to account for the difference in load duration of the test compared to the expected duration of the design loads being considered. For statically loaded components, the test load shall be left in place for a period of 24 hours. For components that carry dynamic loads (e.g., machine supports or fall arrest anchors), the load shall be left in place for a period consistent with the component's actual function. The structure shall be considered to have successfully met the test requirements where the following criteria are satisfied:

1. Under the design load, the deflection shall not exceed the limitations specified in Section 1604.3.
2. Within 24 hours after removal of the test load, the structure shall have recovered not less than 75 percent of the maximum deflection.
3. During and immediately after the test, the structure shall not show evidence of failure.

Section 1709 Preconstruction Load Tests

1709.1 General

Where proposed construction is not capable of being designed by *approved* engineering analysis, or where proposed construction design method does not comply with the applicable material design standard, the system of construction or the structural unit and the connections shall be subjected to the tests prescribed in Section 1709. The *building official* shall accept certified reports of such tests conducted by an *approved* testing agency, provided that such tests meet the requirements of this code and *approved* procedures.

1709.2 Load Test Procedures Specified

Where specific load test procedures, load factors and acceptance criteria are included in the applicable referenced standards, such test procedures, load factors and acceptance criteria shall apply. In the absence of specific test procedures, load factors or acceptance criteria, the corresponding provisions in Section 1709.3 shall apply.

1709.3 Load Test Procedures Not Specified

Where load test procedures are not specified in the applicable referenced standards, the load-bearing and deformation capacity of structural components and assemblies shall be determined on the basis of a test procedure developed by a *registered design professional* that simulates applicable loading and deformation conditions. The test shall be as specified in Section 1709.3.1. Load tests shall simulate the applicable loading conditions specified in Chapter 16.

1709.3.1 Test Procedure

The test assembly shall be subjected to an increasing superimposed load equal to not less than two times the superimposed design load. The test load shall be left in place for a period of 24 hours. The tested assembly shall be considered to have successfully met the test requirements if the assembly recovers not less than 75 percent of the maximum deflection within 24 hours after the removal of the test load. The test assembly shall then be reloaded and subjected to an increasing superimposed load until either structural failure

occurs or the superimposed load is equal to two and one-half times the load at which the deflection limitations specified in Section 1709.3.2 were reached, or the load is equal to two and one-half times the superimposed design load. In the case of structural components and assemblies for which deflection limitations are not specified in Section 1709.3.2, the test specimen shall be subjected to an increasing superimposed load until structural failure occurs or the load is equal to two and one-half times the desired superimposed design load. The allowable superimposed design load shall be taken as the lesser of:

1. The load at the deflection limitation given in Section 1709.3.2.
2. The failure load divided by 2.5.
3. The maximum load applied divided by 2.5.

1709.3.2 Deflection

The deflection of structural members under the design load shall not exceed the limitations in Section 1604.3. The HVHZ shall comply with Section 1616.3.1.

1709.4 Wall and Partition Assemblies

Load-bearing wall and partition assemblies shall sustain the test load both with and without window framing. The test load shall include all design load components. Wall and partition assemblies shall be tested both with and without door and window framing.

1709.5 Exterior Window and Door Assemblies

The design pressure rating of exterior windows and doors in buildings shall be determined in accordance with Section 1709.5.1 or 1709.5.2. For the purposes of this section, the required design pressure shall be determined using the allowable stress design load combinations of Section 1605.1.

Exception: Custom doors. Custom (one-of-a-kind) exterior door assemblies shall be tested by an approved testing laboratory or be designed and engineered in accordance with accepted engineering practices by a Florida registered design professional. Signed and sealed copies of the rational analysis and calculations shall be provided to the building official upon permit application.

1709.5.1 Exterior Windows and Doors

Exterior windows and sliding doors shall be tested and labeled as conforming to AAMA/WDMA/CSA101/I.S.2/A440 or TAS 202 (HVHZ shall comply with TAS 202 and ASTM E1300 or Section 2404). Exterior side-hinged doors shall be tested and *labeled* as conforming to AAMA/WDMA/CSA101/I.S.2/A440 or comply with Section 1709.5.2. Products tested and *labeled* as conforming to AAMA/WDMA/CSA101/I.S.2/A440 or TAS 202 shall not be subject to the requirements of Sections 2403.2 and 2403.3. Exterior windows and doors shall be labeled with a permanent label, marking, or etching providing traceability to the manufacturer and product. The following shall also be required either on a permanent label or on a temporary supplemental label applied by the manufacturer: information identifying the manufacturer, the product model/series number, positive and negative design pressure rating, product maximum size tested, impact-resistant rating if applicable, Florida product approval number or Miami-Dade product approval number, applicable test standard(s), and approved product certification agency, testing laboratory, evaluation entity or Miami-Dade product approval.

The labels are limited to one design pressure rating per referenced standard. The temporary supplemental label shall remain on the window or door until final approval by the building official.

Exceptions:

1. Door assemblies installed in nonhabitable areas where the door assembly and area are designed to accept water infiltration need not be tested for water infiltration.
2. Door assemblies installed where the overhang (OH) ratio is equal to or more than 1 need not be tested for water infiltration. The overhang ratio shall be calculated by the following equation:

$$\text{OH ratio} = \text{OH Length}/\text{OH Height}$$

where:

OH length = The horizontal measure of how far an overhang over a door projects out from door surface.

OH height = The vertical measure of the distance from the door sill to the bottom of the overhang over a door.

3. Structural wind load design pressures for window and door assemblies other than the size tested in accordance with Section 1709.5.1 shall be permitted to be different than the design value of the tested assembly provided such different pressures are determined by accepted engineering analysis such as AAMA 2502 or WDMA I.S.11. All components of the alternate size assembly shall be the same as the tested or labeled assembly; however, lineal components shall be permitted to vary in length compared to the tested or labeled assembly.

i. Operable windows and doors rated in this manner shall comply with the following:

1. For windows and doors (other than sliding or bi-fold), the frame area of the alternate size unit shall not exceed the frame area of the tested approved unit.
2. For sliding or bi-fold doors, the panel area of the alternate size unit shall not exceed the panel area of the tested approved unit.
3. Shall vary from the tested approved unit only in width, height or load requirements.
4. Shall not exceed 100 percent of the proportional deflection and fiber stress of the intermediate members of the approved unit.
5. Shall not exceed 100 percent of the concentrated load at the juncture of the intermediate members and the frame of the approved unit.
6. Shall not exceed the air and water infiltration resistance of the tested approved unit.
7. Shall not exceed the maximum cyclic pressure of the tested approved unit when tested in accordance with TAS 201 and TAS 203 or ASTM E1886 and ASTM E1996 where applicable.

ii. Nonoperable windows and doors rated in this manner shall comply with the following:

1. The frame area of the alternate size unit shall not exceed the frame area of the tested approved unit.
2. Shall vary from the tested approved unit only in width, height or load requirements.
3. The maximum uniform load distribution (ULD) of any side shall be equal to the uniform load carried by the side divided by the length of the side.
4. The ULD of any member shall not exceed the ULD of the corresponding member of the tested approved unit.
5. The ULD of each member shall be calculated in accordance with standard engineering analysis.
6. Shall not exceed the air and water infiltration resistance of the tested approved unit.
7. Shall not exceed the maximum cyclic pressure of the tested approved unit when tested in accordance with TAS 201 and TAS 203 or ASTM E1886 and ASTM E1996 where applicable.

4. Pass-through windows for serving from a single-family kitchen, where protected by a roof overhang of 5 feet (1.5 m) or more shall be exempted from the requirements of the water infiltration test.

1709.5.2 Exterior Windows and Door Assemblies Not Provided for in Section 1709.5.1

Exterior window and door assemblies shall be tested in accordance with ASTM E330 or TAS 202 (HVHZ shall comply with TAS 202). Exterior window and door assemblies containing glass shall comply with Section 2403. The design pressure for testing shall be calculated in accordance with Chapter 16. Each assembly shall be tested for 10 seconds at a load equal to 1.5 times the design pressure.

Exceptions:

1. Door assemblies installed in nonhabitable areas where the door assembly and area are designed to accept water infiltration need not be tested for water infiltration.
2. Door assemblies installed where the overhang (OH) ratio is equal to or more than 1 need not be tested for water infiltration. The overhang ratio shall be calculated by the following equation:

$$\text{OH ratio} = \text{OH Length}/\text{OH Height}$$

where:

OH Length = The horizontal measure of how far an overhang over a door projects out from the door's surface.

OH Height = The vertical measure of the distance from the door's sill to the bottom of the overhang over a door.

3. For window and door assemblies tested in accordance with this section, structural wind load design pressures for window and door assemblies other than the size tested in accordance with this section shall be permitted to be different than the design value of the tested assembly provided such different pressures are determined by accepted engineering analysis. All components of the alternate size assembly shall be the same as the tested assembly except for length. Where engineering analysis is used, the glass shall comply with Section 2403.

1709.5.2.1 Sectional Garage Doors and Rolling Doors

Sectional garage doors and rolling doors shall be tested for determination of structural performance under uniform static air pressure difference in accordance with ANSI/DASMA 108, ASTM E330 Procedure A, or TAS 202. For sectional garage doors and rolling doors tested in accordance with ASTM E330, acceptance criteria shall be in accordance with ANSI/DASMA 108. (HVHZ shall comply with TAS 202.) Design pressures shall be determined from Table 1609.7(1) or ASCE 7. The design pressures, as determined from ASCE 7, are permitted to be multiplied by 0.6.

1709.5.2.1.1 Garage Door Labeling

Garage doors shall be labeled with a permanent label provided by the garage door manufacturer. The label shall identify the garage door manufacturer, the garage door model/series number, the positive and negative design pressure rating, indicate impact rated if applicable, the installation instruction drawing reference number, the Florida product approval or MiamiDade product approval number if applicable, and the applicable test standards. The required garage door components for an approved garage door assembly may be indicated using a checklist form on the label. If a checklist format is used on the label, the door installer or the garage door manufacturer shall mark the selected components on the checklist that are required to assemble an approved garage door system. The installation instructions shall be provided and available on the job site.

1709.5.3

Door components evaluated by an approved product evaluation entity, certification agency, testing laboratory or engineer may be interchangeable in exterior door assemblies provided that the door components provide equal or greater structural performance as demonstrated by accepted engineering practices.

1709.6 Skylights and Sloped Glazing

Skylights and sloped glazing shall comply with the requirements of Chapter 24.

1709.7 Test Specimens

Test specimens and construction shall be representative of the materials, workmanship and details normally used in practice. The properties of the materials used to construct the test assembly shall be determined on the basis of tests on samples taken from the load assembly or on representative samples of the materials used to construct the load test assembly. Required tests shall be conducted or witnessed by an *approved agency*.

1709.8 Mullions

Mullions or mulled fenestration assemblies shall be tested by an approved testing laboratory in accordance with either ASTM E330, or TAS 202 (HVHZ shall comply with TAS 202), or shall be engineered using accepted engineering practice such as AAMA 450. Mullions tested as stand-alone units or qualified by engineering shall use performance criteria cited in Sections 1709.8.1, 1709.8.2 and 1709.8.3.

1709.8.1 Load Transfer

Mullions shall be designed to transfer the design pressure loads applied by the window and door assemblies to the rough opening substrate.

1709.8.2 Deflection

Mullions shall be capable of resisting the design pressure loads applied by the window and door assemblies to be supported without deflecting more than L/175, for spans up to and including 13 feet 6 inches, and L/240 + $\frac{1}{4}$ inch for spans over 13 feet 6 inches, where L is the span of the mullion in inches.

1709.8.3 Structural Safety Factor

Mullions that are tested by an approved testing laboratory shall be capable of resisting a load of 1.5 times the design pressure loads applied by the window and door assemblies to be supported. The design pressures, as determined from ASCE 7, are permitted to be multiplied by 0.6. Mullions that are qualified by engineering shall be capable of resisting the design pressure loads applied by the window and door assemblies to be supported without exceeding the allowable stress of the mullion elements.

1709.8.4

Glazed curtain wall, window wall and storefront systems shall be tested in accordance with the requirements of this section and the laboratory test requirements of the American Architectural Manufacturers Association (AAMA) Standard 501, HVHZ shall comply with Section 2411.3.2.1.1.

1709.9 Impact-Resistant Coverings

1709.9.1 Labels

A permanent label shall be provided by the product approval holder on all impact-resistant coverings.

1709.9.2

The following information shall be included on the labels on impact-resistant coverings:

1. Product approval holder name and address.
2. All applicable methods of approval. Methods of approval include, but are not limited to Miami-Dade NOA; Florida Building Commission, TDI Product Evaluation; ICC-ES.
3. The test standard or standards specified in Section 1609.1.2, including standards referenced within the test standards specified in Section 1609.1.2 used to demonstrate code compliance.
4. For products with a Florida product approval number or a Miami-Dade County Building and Neighborhood Compliance Department Notice of Acceptance Number (NOA), such numbers shall be included on the label.

1709.9.3 Location of Label

The location of the label on the impact-resistant covering shall be as follows:

1. Accordions: Bottom of the locking bar or center mate facing the exterior or outside.
2. Rollup: On the bottom of the hood facing the exterior or outside or on the bottom slat facing the exterior or outside.
3. Bahama Awning or Colonial Hinged: On the bottom, placed on the back of the shutter.
4. Panels: For metal and plastic panels, the label may be embossed or printed spaced not more than every 3 lineal feet on each panel. The label shall be applied by the holder of the product approval and shall face the exterior or outside.
5. Framed products: The label shall be on the side or bottom facing the exterior or outside.
6. Labels on all other products shall face the exterior or outside.

1709.9.4 Installation

All impact-resistant coverings shall be installed in accordance with the manufacturer's installation instructions and in accordance with the product approval. Installation instructions shall be provided and shall be available to inspection personnel on the job site. Opening protection components, fasteners, and other parts evaluated by an approved product evaluation entity, certification agency, testing laboratory, architect, or engineer and approved by the holder of the product approval may be interchangeable in opening protection assemblies provided that the opening protection component(s) provide equal or greater structural performance and durability as demonstrated by testing in accordance with approved test standards.

1709.10 Soffit

1709.10.1 Product Approval

Manufactured soffit materials and systems shall be subject to statewide or local product approval as specified in *Florida Administrative Code* Rule 61G-20. The net free area of the manufactured soffit material or system shall be included in the product approval submittal documents.

1709.10.2 Labels

Individual manufactured soffit pieces shall be marked at not more than 4 feet (1.2 m) on center with a number or marking that ties the product back to the manufacturer.

1709.10.3

The following information shall be included on the manufactured soffit material packaging or on the individual manufactured soffit material or system pieces:

1. Product approval holder and/or manufacturer name and city and state of manufacturing plant.
2. Product model number or name.
3. Method of approval and approval numbers as applicable. Methods of approval include, but are not limited to: Florida Building Commission FL #; MiamiDade NOA; TDI Product Evaluation; and ICC-ES.
4. The test standard or standards specified in Chapter 14 used to demonstrate code compliance.
5. The net free area shall be included on the packaging or label.

Section 1710 Anchorage

1710.1 Anchorage Methods

The methods cited in this section apply only to anchorage of window and door assemblies to the main windforce-resisting system.

1710.2 Anchoring Requirements

Window and door assemblies shall be anchored in accordance with the published manufacturer's recommendations to achieve the design pressure specified. Substitute anchoring systems used for substrates not specified by the fenestration manufacturer shall provide equal or greater anchoring performance as demonstrated by accepted engineering practice.

1710.3 Masonry, Concrete or Other Structural Substrate

Where the wood shim or buck thickness is less than $1\frac{1}{2}$ inches (38 mm), window and door assemblies shall be anchored through the main frame or by jamb clip or subframe system, in accordance with the manufacturer's published installation instructions. Anchors shall be securely fastened directly into the masonry, concrete or other structural substrate material. Unless otherwise tested, bucks shall fully support the window or door frame. Shims shall be made from materials capable of sustaining applicable loads, located and applied in a thickness capable of sustaining applicable loads. Anchors shall be provided to transfer load from the window or door frame to the rough opening substrate.

Where the wood buck thickness is $1\frac{1}{2}$ inches (38 mm) or greater, the buck shall be securely fastened to transfer load to the masonry, concrete or other structural substrate and the buck shall fully support the window or door frame. Window and door assemblies shall be anchored through the main frame or by jamb clip or subframe system or through the flange to the secured wood buck in accordance with the manufacturer's published installation instructions. Unless otherwise tested, bucks shall fully support the window or door. Shims shall be made from materials capable of sustaining applicable loads, located and applied in a thickness capable of sustaining applicable loads. Anchors shall be provided to transfer load from the window or door frame assembly to the secured wood buck.

1710.4 Wood or Other Approved Framing Materials

Where the framing material is wood or other approved framing material, window and door assemblies shall be anchored through the main frame or by jamb clip or subframe system or through the flange in accordance with the manufacturer's published installation instructions. Shims shall be made from materials capable of sustaining applicable loads, located and applied in a thickness capable of sustaining applicable loads. Anchors shall be provided to transfer load from the window or door frame to the rough opening substrate.

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Chapter 18 Soils and Foundations

Section 1801 General

1801.1 Scope

The provisions of this chapter shall apply to building and foundation systems.

1801.2 Design Basis

Allowable bearing pressures, allowable stresses and design formulas provided in this chapter shall be used with the *allowable stress design* load combinations specified in Section 1605.1. The quality and design of materials used structurally in excavations and foundations shall comply with the requirements specified in Chapters 16, 19, 21, 22 and 23 of this code. Excavations and fills shall also comply with Chapter 33.

Section 1802 Definitions

1802.1 Definitions

The following words and terms are defined in Chapter 2:

COMBINED PILE RAFT.

DEEP FOUNDATION.

DRILLED SHAFT.

Socketed drilled shaft.

HELICAL PILE.

MICROPILE.

SHALLOW FOUNDATION.

Section 1803 Geotechnical Investigations

1803.1 General

Geotechnical investigations shall be conducted in accordance with Section 1803.2 and reported in accordance with Section 1803.6. Where required by the *building official* or where geotechnical investigations involve in-situ testing, laboratory testing or engineering calculations, such investigations shall be conducted by a *registered design professional*.

1803.2 Investigations Required

Geotechnical investigations shall be conducted in accordance with Sections 1803.3 through 1803.5.

Exception: The *building official* shall be permitted to waive the requirement for a geotechnical investigation where satisfactory data from adjacent areas is available that demonstrates an investigation is not necessary for any of the conditions in Sections 1803.5.1 through 1803.5.6 and Section 1803.5.10.

1803.3 Basis of Investigation

Soil classification shall be based on observation and any necessary tests of the materials disclosed by borings, test pits or other subsurface exploration made in appropriate locations. Additional studies shall be made as necessary to evaluate slope stability, soil strength, position and adequacy of load-bearing soils, the effect of moisture variation on soil-bearing capacity, compressibility, liquefaction and expansiveness.

1803.3.1 Scope of Investigation

The scope of the geotechnical investigation including the number and types of borings or soundings, the equipment used to drill or sample, the in-situ testing equipment and the laboratory testing program shall be determined by a *registered design professional*.

1803.4 Qualified Representative

The investigation procedure and apparatus shall be in accordance with generally accepted engineering practice. The *registered design professional* shall have a fully qualified representative on site during all boring or sampling operations.

1803.5 Investigated Conditions

Geotechnical investigations shall be conducted as indicated in Sections 1803.5.1 through 1803.5.10.

1803.5.1 Classification

Soil materials shall be classified in accordance with ASTM D2487.

1803.5.2 Questionable Soil

Where the classification, strength or compressibility of the soil is in doubt or where a load-bearing value superior to that specified in this code is claimed, the *building official* shall be permitted to require that a geotechnical investigation be conducted.

1803.5.3 Expansive Soil

In areas likely to have expansive soil, the *building official* shall require soil tests to determine where such soils do exist.

Soils meeting all four of the following provisions shall be considered expansive, except that tests to show compliance with Items 1, 2 and 3 shall not be required if the test prescribed in Item 4 is conducted:

1. Plasticity index (PI) of 15 or greater, determined in accordance with ASTM D4318.
2. More than 10 percent of the soil particles pass a No. 200 sieve (75 µm), determined in accordance with ASTM D422.
3. More than 10 percent of the soil particles are less than 5 micrometers in size, determined in accordance with ASTM D422.
4. Expansion index greater than 20, determined in accordance with ASTM D4829.

1803.5.4 Ground-Water Table

A subsurface soil investigation shall be performed to determine whether the existing ground-water table is above or within 5 feet (1524 mm) below the elevation of the lowest floor level where such floor is located below the finished ground level adjacent to the foundation.

Exception: A subsurface soil investigation to determine the location of the ground-water table shall not be required where waterproofing is provided in accordance with Section 1805.

1803.5.5 Deep Foundations

Where deep foundations will be used, a geotechnical investigation shall be conducted and shall include all of the following, unless sufficient data upon which to base the design and installation is otherwise available:

1. Recommended deep foundation types and installed capacities.
2. Recommended center-to-center spacing of deep foundation elements.
3. Driving criteria.
4. Installation procedures.
5. Field inspection and reporting procedures (to include procedures for verification of the installed bearing capacity where required).
6. Load test requirements.
7. Suitability of deep foundation materials for the intended environment.

8. Designation of bearing stratum or strata.
9. Reductions for group action, where necessary.

1803.5.6 Rock Strata

Where subsurface explorations at the project site indicate variations in the structure of rock upon which foundations are to be constructed, a sufficient number of borings shall be drilled to sufficient depths to assess the competency of the rock and its load-bearing capacity.

1803.5.7 Excavation Near Foundations

Where excavation will reduce support from any foundation, a *registered design professional* shall prepare an assessment of the structure as determined from examination of the structure, available design documents, available subsurfacing data, and, if necessary, excavation of test pits. The *registered design professional* shall determine the requirements for support and protection of any existing foundation and prepare site-specific plans, details and sequence of work for submission. Such support shall be provided by underpinning, bracing, excavation retention systems, or by other means acceptable to the *building official*.

1803.5.8 Compacted Fill Material

Where shallow foundations will bear on compacted fill material more than 12 inches (305 mm) in depth, a geotechnical investigation shall be conducted and shall include all of the following:

1. Specifications for the preparation of the site prior to placement of compacted fill material.
2. Specifications for material to be used as compacted fill.
3. Test methods to be used to determine the maximum dry density and optimum moisture content of the material to be used as compacted fill.
4. Maximum allowable thickness of each lift of compacted fill material.
5. Field test method for determining the in-place dry density of the compacted fill.
6. Minimum acceptable in-place dry density expressed as a percentage of the maximum dry density determined in accordance with Item 3.
7. Number and frequency of field tests required to determine compliance with Item 6.

1803.5.9 Controlled Low-Strength Material (CLSM)

Where shallow foundations will bear on controlled low-strength material (CLSM), a geotechnical investigation shall be conducted and shall include all of the following:

1. Specifications for the preparation of the site prior to placement of the CLSM.
2. Specifications for the CLSM.
3. Laboratory or field test method(s) to be used to determine the compressive strength or bearing capacity of the CLSM.
4. Test methods for determining the acceptance of the CLSM in the field.

5. Number and frequency of field tests required to determine compliance with Item 4.

1803.5.10 Alternate Setback and Clearance

Where setbacks or clearances other than those required in Section 1808.7 are desired, the *building official* shall be permitted to require a geotechnical investigation by a *registered design professional* to demonstrate that the intent of Section 1808.7 would be satisfied. Such an investigation shall include consideration of material, height of slope, slope gradient, load intensity and erosion characteristics of slope material.

1803.6 Reporting

Where geotechnical investigations are required, a written report of the investigations shall be submitted to the *building official* by the permit applicant at the time of permit application. This geotechnical report shall include, but need not be limited to, the following information:

1. A plot showing the location of the soil investigations.
2. A complete record of the soil boring and penetration test logs and soil samples.
3. A record of the soil profile.
4. Elevation of the water table, if encountered.
5. Recommendations for foundation type and design criteria, including but not limited to: bearing capacity of natural or compacted soil; provisions to mitigate the effects of expansive soils; mitigation of the effects of liquefaction, differential settlement and varying soil strength; and the effects of adjacent loads.
6. Expected total and differential settlement.
7. Deep foundation information in accordance with Section 1803.5.5.
8. Special design and construction provisions for foundations of structures founded on expansive soils, as necessary.
9. Compacted fill material properties and testing in accordance with Section 1803.5.8.
10. Controlled low-strength material properties and testing in accordance with Section 1803.5.9.

Section 1804 Excavation, Grading and Fill

1804.1 Excavation Near Foundations

Excavation for any purpose shall not reduce vertical or lateral support for any foundation or adjacent foundation without first underpinning or protecting the foundation against detrimental lateral or vertical movement, or both, in accordance with Section 1803.5.7.

1804.2 Underpinning

Where underpinning is chosen to provide the protection or support of adjacent structures, the underpinning system shall be designed and installed in accordance with provisions of this chapter and Chapter 33.

1804.2.1 Underpinning Sequencing

Underpinning shall be installed in a sequential manner that protects the neighboring structure and the working construction site. The sequence of installation shall be identified in the *approved construction documents*.

1804.3 Placement of Backfill

The excavation outside the foundation shall be backfilled with soil that is free of organic material, construction debris, cobbles and boulders or with a controlled low-strength material (CLSM). The backfill shall be placed in lifts and compacted in a manner that does not damage the foundation or the waterproofing or dampproofing material.

Exception: CLSM need not be compacted.

1804.4 Site Grading

The ground immediately adjacent to the foundation shall be sloped away from the building at a slope of not less than one unit vertical in 20 units horizontal (5-percent slope) for a minimum distance of 10 feet (3048 mm) measured perpendicular to the face of the wall. If physical obstructions or lot lines prohibit 10 feet (3048 mm) of horizontal distance, a 5-percent slope shall be provided to an *approved* alternative method of diverting water away from the foundation. Swales used for this purpose shall be sloped a minimum of 2 percent where located within 10 feet (3048 mm) of the building foundation. Impervious surfaces within 10 feet (3048 mm) of the building foundation shall be sloped a minimum of 2 percent away from the building, except as otherwise permitted in Section 1010.1.4, 1012.3 or 1012.6.1.

Exception: Where climatic or soil conditions warrant, the slope of the ground away from the building foundation shall be permitted to be reduced to not less than one unit vertical in 48 units horizontal (2-percent slope).

The procedure used to establish the final ground level adjacent to the foundation shall account for additional settlement of the backfill.

1804.5 Grading and Fill in Flood Hazard Areas

In *flood hazard areas* established in Section 1612.3, grading, fill, or both, shall not be *approved*:

1. Unless such fill is placed, compacted and sloped to minimize shifting, slumping and erosion during the rise and fall of flood water and, as applicable, wave action.
2. In floodways, unless it has been demonstrated through hydrologic and hydraulic analyses performed by a *registered design professional* in accordance with standard engineering practice that the proposed grading or fill, or both, will not result in any increase in flood levels during the occurrence of the *design flood*.
3. In *coastal high hazard areas*, unless such fill is conducted and/or placed to avoid diversion of water and waves toward any building or structure.
4. Where design flood elevations are specified but floodways have not been designated, unless it has been demonstrated that the cumulative effect of the proposed *flood hazard area* encroachment, when combined with all other existing and anticipated *flood hazard area* encroachment, will not increase the design flood elevation more than 1 foot (305 mm) at any point.

1804.6 Compacted Fill Material

Where shallow foundations will bear on compacted fill material, the compacted fill shall comply with the provisions of an *approved* geotechnical report, as set forth in Section 1803.

Exception: Compacted fill material 12 inches (305 mm) in depth or less need not comply with an *approved* report, provided the in-place dry density is not less than 90 percent of the maximum dry density at optimum moisture content determined in accordance with ASTM D1557.

1804.7 Controlled Low-Strength Material (CLSM)

Where shallow foundations will bear on controlled low-strength material (CLSM), the CLSM shall comply with the provisions of an *approved* geotechnical report, as set forth in Section 1803.

Section 1805 Dampproofing and Waterproofing

1805.1 General

Walls or portions thereof that retain earth and enclose interior spaces and floors below grade shall be waterproofed and dampproofed in accordance with this section, with the exception of those spaces containing groups other than residential and institutional where such omission is not detrimental to the building or occupancy.

Ventilation for crawl spaces shall comply with Section 1203.4.

1805.1.1 Story Above Grade Plane

Where a basement is considered a *story above grade plane* and the finished ground level adjacent to the basement wall is below the basement floor elevation for 25 percent or more of the perimeter, the floor and walls shall be dampproofed in accordance with Section 1805.2 and a foundation drain shall be installed in accordance with Section 1805.4.2. The foundation drain shall be installed around the portion of the perimeter where the basement floor is below ground level. The provisions of Sections 1803.5.4, 1805.3 and 1805.4.1 shall not apply in this case.

1805.1.2 Under-Floor Space

The finished ground level of an under-floor space such as a crawl space shall not be located below the bottom of the footings. Where there is evidence that the ground-water table rises to within 6 inches (152 mm) of the ground level at the outside building perimeter, or that the surface water does not readily drain from the building site, the ground level of the under-floor space shall be as high as the outside finished ground level, unless an *approved* drainage system is provided. The provisions of Sections 1803.5.4, 1805.2, 1805.3 and 1805.4 shall not apply in this case.

1805.1.2.1 Flood Hazard Areas

For buildings and structures in *flood hazard areas* as established in Section 1612.3, the finished ground level of an under-floor space such as a crawl space shall be equal to or higher than the outside finished ground level on at least one side.

Exception: Under-floor spaces of Group R-3 buildings that meet the requirements of FEMA TB 11.

1805.1.3 Ground-Water Control

Where the ground-water table is lowered and maintained at an elevation not less than 6 inches (152 mm) below the bottom of the lowest floor, the floor and walls shall be dampproofed in accordance with Section 1805.2. The design of the system to lower the ground-water table shall be based on accepted principles of engineering that shall consider, but not necessarily be limited to, permeability of the soil, rate at which water enters the drainage system, rated capacity of pumps, head against which pumps are to operate and the rated capacity of the disposal area of the system.

1805.2 Dampproofing

Where hydrostatic pressure will not occur as determined by Section 1803.5.4, floors and walls for other than wood foundation systems shall be dampproofed in accordance with this section. Wood foundation systems shall be constructed in accordance with AWC PWF.

1805.2.1 Floors

Dampproofing materials for floors shall be installed between the floor and the base course required by Section 1805.4.1, except where a separate floor is provided above a concrete slab.

Where installed beneath the slab, dampproofing shall consist of not less than 6-mil (0.006 inch; 0.152 mm) polyethylene with joints lapped not less than 6 inches (152 mm), or other *approved* methods or materials. Where permitted to be installed on top of the slab, dampproofing shall consist of mopped-on bitumen, not less than 4-mil (0.004 inch; 0.102 mm) polyethylene, or other *approved* methods or materials. Joints in the membrane shall be lapped and sealed in accordance with the manufacturer's installation instructions.

1805.2.2 Walls

Dampproofing materials for walls shall be installed on the exterior surface of the wall, and shall extend from the top of the footing to above ground level.

Dampproofing shall consist of a bituminous material, 3 pounds per square yard (16 N/m^2) of acrylic modified cement, $\frac{1}{8}$ inch (3.2 mm) coat of surface-bonding mortar complying with ASTM C887, any of the materials permitted for waterproofing by Section 1805.3.2 or other *approved* methods or materials.

1805.2.2.1 Surface Preparation of Walls

Prior to application of dampproofing materials on concrete walls, holes and recesses resulting from the removal of form ties shall be sealed with a bituminous material or other *approved* methods or materials. Unit masonry walls shall be parged on the exterior surface below ground level with not less than $\frac{3}{8}$ inch (9.5 mm) of Portland cement mortar. The parging shall be coved at the footing.

Exception: Parging of unit masonry walls is not required where a material is *approved* for direct application to the masonry.

1805.3 Waterproofing

Where the ground-water investigation required by Section 1803.5.4 indicates that a hydrostatic pressure condition exists, and the design does not include a ground-water control system as described in Section 1805.1.3, walls and floors shall be waterproofed in accordance with this section.

1805.3.1 Floors

Floors required to be waterproofed shall be of concrete and designed and constructed to withstand the hydrostatic pressures to which the floors will be subjected.

Waterproofing shall be accomplished by placing a membrane of rubberized asphalt, butyl rubber, fully adhered/fully bonded HDPE or polyolefin composite membrane or not less than 6-mil [0.006 inch (0.152 mm)] polyvinyl chloride with joints lapped not less than 6 inches (152 mm) or other *approved* materials under the slab. Joints in the membrane shall be lapped and sealed in accordance with the manufacturer's installation instructions.

1805.3.2 Walls

Walls required to be waterproofed shall be of concrete or masonry and shall be designed and constructed to withstand the hydrostatic pressures and other lateral loads to which the walls will be subjected.

Waterproofing shall be applied from the bottom of the wall to not less than 12 inches (305 mm) above the maximum elevation of the ground-water table. The remainder of the wall shall be dampproofed in accordance with Section 1805.2.2. Waterproofing shall consist of two-ply hot-mopped felts, not less than 6-mil (0.006 inch; 0.152 mm) polyvinyl chloride, 40-mil (0.040 inch; 1.02 mm) polymer-modified asphalt, 6-mil (0.006 inch; 0.152 mm) polyethylene or other *approved* methods or materials capable of bridging nonstructural cracks. Joints in the membrane shall be lapped and sealed in accordance with the manufacturer's installation instructions.

1805.3.2.1 Surface Preparation of Walls

Prior to the application of waterproofing materials on concrete or masonry walls, the walls shall be prepared in accordance with Section 1805.2.2.1.

1805.3.3 Joints and Penetrations

Joints in walls and floors, joints between the wall and floor and penetrations of the wall and floor shall be made water tight utilizing *approved* methods and materials.

1805.4 Subsoil Drainage System

Where a hydrostatic pressure condition does not exist, dampproofing shall be provided and a base shall be installed under the floor and a drain installed around the foundation perimeter. A subsoil drainage system designed and constructed in accordance with Section 1805.1.3 shall be deemed adequate for lowering the ground-water table.

1805.4.1 Floor Base Course

Floors of basements, except as provided for in Section 1805.1.1, shall be placed over a floor base course not less than 4 inches (102 mm) in thickness that consists of gravel or crushed stone containing not more than 10 percent of material that passes through a No. 4 (4.75 mm) sieve.

Exception: Where a site is located in well-drained gravel or sand/gravel mixture soils, a floor base course is not required.

1805.4.2 Foundation Drain

A drain shall be placed around the perimeter of a foundation that consists of gravel or crushed stone containing not more than 10-percent material that passes through a No. 4 (4.75 mm) sieve. The drain shall extend a minimum of 12 inches (305 mm) beyond the outside edge of the footing. The thickness shall be such that the bottom of the drain is not higher than the bottom of the base under the floor, and that the top of the drain is not less than 6 inches (152 mm) above the top of the footing. The top of the drain shall be covered with an *approved* filter membrane material. Where a drain tile or perforated pipe is used, the invert of the pipe or tile shall not be higher than the floor elevation. The top of joints or the top of perforations shall be protected with an *approved* filter membrane material. The pipe or tile shall be placed on not less than 2 inches (51 mm) of gravel or crushed stone complying with Section 1805.4.1, and shall be covered with not less than 6 inches (152 mm) of the same material.

1805.4.3 Drainage Discharge

The floor base and foundation perimeter drain shall discharge by gravity or mechanical means into an *approved* drainage system that complies with the *Florida Building Code, Plumbing*.

Exception: Where a site is located in well-drained gravel or sand/gravel mixture soils, a dedicated drainage system is not required.

Section 1806 Presumptive Load-Bearing Values of Soils

1806.1 Load Combinations

The presumptive load-bearing values provided in Table 1806.2 shall be used with the *allowable stress design* load combinations specified in Section 1605.1. The values of vertical foundation pressure and lateral bearing pressure given in Table 1806.2 shall be permitted to be increased by one-third where used with the alternative basic load combinations of Section 1605.2 that include wind loads.

1806.2 Presumptive Load-Bearing Values

The load-bearing values used in design for supporting soils near the surface shall not exceed the values specified in Table 1806.2 unless data to substantiate the use of higher values are submitted and *approved*. Where the *building official* has reason to doubt the classification, strength or compressibility of the soil, the requirements of Section 1803.5.2 shall be satisfied.

Presumptive load-bearing values shall apply to materials with similar physical characteristics and dispositions. Mud, organic silt, organic clays, peat or unprepared fill shall not be assumed to have a presumptive load-bearing capacity unless data to substantiate the use of such a value are submitted.

Exception: A presumptive load-bearing capacity shall be permitted to be used where the *building official* deems the load-bearing capacity of mud, organic silt or unprepared fill is adequate for the support of lightweight or temporary structures.

TABLE 1806.2

PRESUMPTIVE LOAD-BEARING VALUES

CLASS OF MATERIALS	VERTICAL FOUNDATION PRESSURE (psf)	LATERAL BEARING PRESSURE (psf/ft below natural grade)	LATERAL SLIDING RESISTANCE	
			Coefficient of friction ^a	Cohesion (psf) ^b
1. Crystalline bedrock	12,000	1,200	0.70	—
2. Sedimentary and foliated rock	4,000	400	0.35	—
3. Sandy gravel and/or gravel (GW and GP)	3,000	200	0.35	—
4. Sand, silty sand, clayey sand, silty gravel and clayey gravel (SW, SP, SM, SC, GM and GC)	2,000	150	0.25	—
5. Clay, sandy clay, silty clay, clayey silt, silt and sandy silt (CL, ML, MH and CH)	1,500	100	—	130

For SI: 1 pound per square foot = 0.0479 kPa, 1 pound per square foot per foot = 0.157 kPa/m.

a. Coefficient to be multiplied by the dead load.

b. Cohesion value to be multiplied by the contact area, as limited by Section 1806.3.2.

1806.3 Lateral Load Resistance

Where the presumptive values of Table 1806.2 are used to determine resistance to lateral loads, the calculations shall be in accordance with Sections 1806.3.1 through 1806.3.4.

1806.3.1 Combined Resistance

The total resistance to lateral loads shall be permitted to be determined by combining the values derived from the lateral bearing pressure and the lateral sliding resistance specified in Table 1806.2.

1806.3.2 Lateral Sliding Resistance Limit

For clay, sandy clay, silty clay, clayey silt, silt and sandy silt, in no case shall the lateral sliding resistance exceed one-half the dead load.

1806.3.3 Increase for Depth

The lateral bearing pressures specified in Table 1806.2 shall be permitted to be increased by the tabular value for each additional foot (305 mm) of depth to a maximum of 15 times the tabular value.

1806.3.4 Increase for Poles

Isolated poles for uses such as flagpoles or signs and poles used to support buildings that are not adversely affected by a $\frac{1}{2}$ -inch (12.7 mm) motion at the ground surface due to short-term lateral loads shall be permitted to be designed using lateral bearing pressures equal to two times the tabular values.

Section 1807 Foundation Walls, Retaining Walls and Embedded Posts and Poles**1807.1 Foundation Walls**

Foundation walls shall be designed and constructed in accordance with Sections 1807.1.1 through 1807.1.6. Foundation walls shall be supported by foundations designed in accordance with Section 1808.

1807.1.1 Design Lateral Soil Loads

Foundation walls shall be designed for the lateral soil loads set forth in Section 1610.

1807.1.2 Unbalanced Backfill Height

Unbalanced backfill height is the difference in height between the exterior finish ground level and the lower of the top of the concrete footing that supports the foundation wall or the interior finish ground level. Where an interior concrete slab on grade is provided and is in contact with the interior surface of the foundation wall, the unbalanced backfill height shall be permitted to be measured from the exterior finish ground level to the top of the interior concrete slab.

1807.1.3 Rubble Stone Foundation Walls

Foundation walls of rough or random rubble stone shall not be less than 16 inches (406 mm) thick.

1807.1.4 Permanent Wood Foundation Systems

Permanent wood foundation systems shall be designed and installed in accordance with AWC PWF. Lumber and plywood shall be preservative treated in accordance with AWPA U1 (Commodity Specification A, Special Requirement 4.2) and shall be identified in accordance with Section 2303.1.9.1.

1807.1.5 Concrete and Masonry Foundation Walls

Concrete and masonry foundation walls shall be designed in accordance with Chapter 19 or 21, as applicable.

Exception: Concrete and masonry foundation walls shall be permitted to be designed and constructed in accordance with Section 1807.1.6.

1807.1.6 Prescriptive Design of Concrete and Masonry Foundation Walls

Concrete and masonry foundation walls that are laterally supported at the top and bottom shall be permitted to be designed and constructed in accordance with this section.

1807.1.6.1 Foundation Wall Thickness

The thickness of prescriptively designed foundation walls shall not be less than the thickness of the wall supported, except that foundation walls of at least 8-inch (203 mm) nominal width shall be permitted to support brick-veneered frame walls and 10-inch-wide (254 mm) cavity walls provided the requirements of Section 1807.1.6.2 or 1807.1.6.3 are met.

1807.1.6.2 Concrete Foundation Walls

Concrete foundation walls shall comply with the following:

1. The thickness shall comply with the requirements of Table 1807.1.6.2.
2. The size and spacing of vertical reinforcement shown in Table 1807.1.6.2 are based on the use of reinforcement with a minimum yield strength of 60,000 pounds per square inch (psi) (414 MPa). Vertical reinforcement with a minimum yield strength of 40,000 psi (276 MPa) or 50,000 psi (345 MPa) shall be permitted, provided the same size bar is used and the spacing shown in the table is reduced by multiplying the spacing by 0.67 or 0.83, respectively.
3. Vertical reinforcement, when required, shall be placed nearest the inside face of the wall a distance, d , from the outside face (soil face) of the wall. The distance, d , is equal to the wall thickness, t , minus 1.25 inches (32 mm) plus one-half the bar diameter, d_b , [$d = t - (1.25 + d_b/2)$]. The reinforcement shall be placed within a tolerance of $\pm \frac{3}{8}$ inch (9.5 mm) where d is less than or equal to 8 inches (203 mm) or $\pm \frac{1}{2}$ inch (12.7 mm) where d is greater than 8 inches (203 mm).
4. In lieu of the reinforcement shown in Table 1807.1.6.2, smaller reinforcing bar sizes with closer spacings that provide an equivalent cross-sectional area of reinforcement per unit length shall be permitted.
5. Concrete cover for reinforcement measured from the inside face of the wall shall not be less than $\frac{3}{4}$ inch (19.1 mm). Concrete cover for reinforcement measured from the outside face of the wall shall not be less than $1\frac{1}{2}$ inches (38 mm) for No. 5 bars and smaller, and not less than 2 inches (51 mm) for larger bars.
6. Concrete shall have a specified compressive strength, f'_c , of not less than 2,500 psi (17.2 MPa).
7. The unfactored axial load per linear foot of wall shall not exceed $1.2 t f'_c$ where t is the specified wall thickness in inches.

TABLE 1807.1.6.2**CONCRETE FOUNDATION WALLS^{b, c}**

MAXIMUM WALL HEIGHT (feet)	MAXIMUM UNBALANCED BACKFILL HEIGHT ^e (feet)	MINIMUM VERTICAL REINFORCEMENT-BAR SIZE AND SPACING (inches)								
		Design lateral soil load ^a (psf per foot of depth)								
		30 ^d			45 ^d			60		
		7.5	9.5	11.5	7.5	9.5	11.5	7.5	9.5	11.5
5	4	PC	PC	PC	PC	PC	PC	PC	PC	PC
	5	PC	PC	PC	PC	PC	PC	PC	PC	PC
6	4	PC	PC	PC	PC	PC	PC	PC	PC	PC
	5	PC	PC	PC	PC	PC	PC	PC	PC	PC
	6	PC	PC	PC	PC	PC	PC	PC	PC	PC
7	4	PC	PC	PC	PC	PC	PC	PC	PC	PC
	5	PC	PC	PC	PC	PC	PC	PC	PC	PC
	6	PC	PC	PC	PC	PC	PC	#5 at 48	PC	PC
	7	PC	PC	PC	#5 at 46	PC	PC	#6 at 48	PC	PC
8	4	PC	PC	PC	PC	PC	PC	PC	PC	PC

	5	PC	PC	PC	PC	PC	PC	PC	PC	PC
	6	PC	PC	PC	PC	PC	PC	#5 at 43	PC	PC
	7	PC	PC	PC	#5 at 41	PC	PC	#6 at 43	PC	PC
	8	#5 at 47	PC	PC	#6 at 43	PC	PC	#6 at 32	#6 at 44	PC
9	4	PC	PC	PC	PC	PC	PC	PC	PC	PC
	5	PC	PC	PC	PC	PC	PC	PC	PC	PC
	6	PC	PC	PC	PC	PC	PC	#5 at 39	PC	PC
	7	PC	PC	PC	#5 at 37	PC	PC	#6 at 38	#5 at 37	PC
	8	#5 at 41	PC	PC	#6 at 38	#5 at 37	PC	#7 at 39	#6 at 39	#4 at 48
	9 ^d	#6 at 46	PC	PC	#7 at 41	#6 at 41	PC	#7 at 31	#7 at 41	#6 at 39
10	4	PC	PC	PC	PC	PC	PC	PC	PC	PC
	5	PC	PC	PC	PC	PC	PC	PC	PC	PC
	6	PC	PC	PC	PC	PC	PC	#5 at 37	PC	PC
	7	PC	PC	PC	#6 at 48	PC	PC	#6 at 35	#6 at 48	PC
	8	#5 at 38	PC	PC	#7 at 47	#6 at 47	PC	#7 at 35	#7 at 47	#6 at 45
	9 ^d	#6 at 41	#4 at 48	PC	#7 at 37	#7 at 48	#4 at 48	#6 at 22	#7 at 37	#7 at 47
	10 ^d	#7 at 45	#6 at 45	PC	#7 at 31	#7 at 40	#6 at 38	#6 at 22	#7 at 30	#7 at 38

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot per foot = 0.157 kPa/m.

- a. For design lateral soil loads, see Section 1610.
- b. Provisions for this table are based on design and construction requirements specified in Section 1807.1.6.2.
- c. "PC" means plain concrete.
- d. Where unbalanced backfill height exceeds 8 feet and design lateral soil loads from Table 1610.1 are used, the requirements for 30 and 45 psf per foot of depth are not applicable (see Section 1610).
- e. For height of unbalanced backfill, see Section 1807.1.2.

1807.1.6.2.1 Minimum Requirements

Concrete foundation walls designed using Table 1807.1.6.2 shall have not less than one No. 5 bar provided around window, door and similar sized openings. The bar shall be anchored to develop f_y in tension at the corners of openings.

1807.1.6.3 Masonry Foundation Walls

Masonry foundation walls shall comply with the following:

1. The thickness shall comply with the requirements of Table 1807.1.6.3(1) for plain masonry walls or Table 1807.1.6.3(2), 1807.1.6.3(3) or 1807.1.6.3(4) for masonry walls with reinforcement.
2. Vertical reinforcement shall have a minimum yield strength of 60,000 psi (414 MPa).
3. The specified location of the reinforcement shall equal or exceed the effective depth distance, d , noted in Tables 1807.1.6.3(2), 1807.1.6.3(3) and 1807.1.6.3(4) and shall be measured from the face of the exterior (soil) side of the wall to the center of the vertical reinforcement. The reinforcement shall be placed within the tolerances specified in TMS 602, Article 3.4.B.11, of the specified location.
4. Grout shall comply with Section 2103.3.
5. Concrete masonry units shall comply with ASTM C90.
6. Clay masonry units shall comply with ASTM C652 for hollow brick, except compliance with ASTM C62 or ASTM C216 shall be permitted where solid masonry units are installed in accordance with Table 1807.1.6.3(1) for plain masonry.
7. Masonry units shall be laid in running bond and installed with Type M or S mortar in accordance with Section 2103.2.1.
8. The unfactored axial load per linear foot of wall shall not exceed $1.2 t f'_m$ where t is the specified wall thickness in inches and f'_m is the specified compressive strength of masonry in pounds per square inch.
9. At least 4 inches (102 mm) of solid masonry shall be provided at girder supports at the top of hollow masonry unit foundation walls.
10. Corbeling of masonry shall be in accordance with Section 2104.1. Where an 8-inch (203 mm) wall is corbeled, the top corbel shall not extend higher than the bottom of the floor framing and shall be a full course of headers at least 6 inches (152 mm) in length or the top course bed joint shall be tied to the vertical wall projection. The tie shall be W2.8 (4.8 mm) and spaced at a maximum horizontal distance of 36 inches (914 mm). The hollow space behind the corbelled masonry shall be filled with mortar or grout.

TABLE 1807.1.6.3(1)**PLAIN MASONRY FOUNDATION WALLS^{a, b, c}**

MAXIMUM WALL HEIGHT (feet)	MAXIMUM UNBALANCED BACKFILL HEIGHT ^e (feet)	MINIMUM NOMINAL WALL THICKNESS (inches)		
		Design lateral soil load ^a (psf per foot of depth)		
		30 ^f	45 ^f	60
7	4 (or less)	8	8	8
	5	8	10	10
	6	10	12	10 (solid ^c)
	7	12	10 (solid ^c)	10 (solid ^c)

	4 (or less)	8	8	8
8	5	8	10	12
	6	10	12	12 (solid ^c)
	7	12	12 (solid ^c)	Note d
	8	10 (solid ^c)	12 (solid ^c)	Note d
	4 (or less)	8	8	8
9	5	8	10	12
	6	12	12	12 (solid ^c)
	7	12 (solid ^c)	12 (solid ^c)	Note d
	8	12 (solid ^c)	Note d	Note d
	9 ^f	Note d	Note d	Note d

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot per foot = 0.157 kPa/m.

- a. For design lateral soil loads, see Section 1610.
- b. Provisions for this table are based on design and construction requirements specified in Section 1807.1.6.3.
- c. Solid grouted hollow units or solid masonry units.
- d. A design in compliance with Chapter 21 or reinforcement in accordance with Table 1807.1.6.3(2) is required.
- e. For height of unbalanced backfill, see Section 1807.1.2.
- f. Where unbalanced backfill height exceeds 8 feet and design lateral soil loads from Table 1610.1 are used, the requirements for 30 and 45 psf per foot of depth are not applicable (see Section 1610).

TABLE 1807.1.6.3(2)

8-INCH MASONRY FOUNDATION WALLS WITH REINFORCEMENT WHERE $d \geq 5$ INCHES^{a, b, c}

MAXIMUM WALL HEIGHT (feet-inches)	MAXIMUM UNBALANCED BACKFILL HEIGHT ^d (feet-inches)	MINIMUM VERTICAL REINFORCEMENT-BAR SIZE AND SPACING (inches)		
		Design lateral soil load ^a (psf per foot of depth)		
		30 ^e	45 ^e	60
7-4	4-0 (or less)	#4 at 48	#4 at 48	#4 at 48
	5-0	#4 at 48	#4 at 48	#4 at 48
	6-0	#4 at 48	#5 at 48	#5 at 48
	7-4	#5 at 48	#6 at 48	#7 at 48
8-0	4-0 (or less)	#4 at 48	#4 at 48	#4 at 48

	5-0	#4 at 48	#4 at 48	#4 at 48
	6-0	#4 at 48	#5 at 48	#5 at 48
	7-0	#5 at 48	#6 at 48	#7 at 48
	8-0	#5 at 48	#6 at 48	#7 at 48
8-8	4-0 (or less)	#4 at 48	#4 at 48	#4 at 48
	5-0	#4 at 48	#4 at 48	#5 at 48
	6-0	#4 at 48	#5 at 48	#6 at 48
	7-0	#5 at 48	#6 at 48	#7 at 48
	8-8 ^e	#6 at 48	#7 at 48	#8 at 48
9-4	4-0 (or less)	#4 at 48	#4 at 48	#4 at 48
	5-0	#4 at 48	#4 at 48	#5 at 48
	6-0	#4 at 48	#5 at 48	#6 at 48
	7-0	#5 at 48	#6 at 48	#7 at 48
	8-0	#6 at 48	#7 at 48	#8 at 48
	9-4 ^e	#7 at 48	#8 at 48	#9 at 48
10-0	4-0 (or less)	#4 at 48	#4 at 48	#4 at 48
	5-0	#4 at 48	#4 at 48	#5 at 48
	6-0	#4 at 48	#5 at 48	#6 at 48
	7-0	#5 at 48	#6 at 48	#7 at 48
	8-0	#6 at 48	#7 at 48	#8 at 48
	9-0 ^e	#7 at 48	#8 at 48	#9 at 48
	10-0 ^e	#7 at 48	#9 at 48	#9 at 48

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot per foot = 0.157 kPa/m.

- a. For design lateral soil loads, see Section 1610.
- b. Provisions for this table are based on design and construction requirements specified in Section 1807.1.6.3.
- c. For alternative reinforcement, see Section 1807.1.6.3.1.
- d. For height of unbalanced backfill, see Section 1807.1.2.
- e. Where unbalanced backfill height exceeds 8 feet and design lateral soil loads from Table 1610.1 are used, the requirements for 30 and 45 psf per foot of depth are not applicable. See Section 1610.

TABLE 1807.1.6.3(3)

10-INCH MASONRY FOUNDATION WALLS WITH REINFORCEMENT WHERE $d \geq 6.75$ INCHES^{a, b, c}

MAXIMUM WALL HEIGHT (feet-inches)	MAXIMUM UNBALANCED BACKFILL HEIGHT ^d (feet-inches)	MINIMUM VERTICAL REINFORCEMENT-BAR SIZE AND SPACING (inches)		
		Design lateral soil load ^a (psf per foot of depth)		
		30 ^e	45 ^e	60
	4-0 (or less)	#4 at 56	#4 at 56	#4 at 56
	5-0	#4 at 56	#4 at 56	#4 at 56
7-4	6-0	#4 at 56	#4 at 56	#5 at 56
	7-4	#4 at 56	#5 at 56	#6 at 56
	4-0 (or less)	#4 at 56	#4 at 56	#4 at 56
	5-0	#4 at 56	#4 at 56	#4 at 56
8-0	6-0	#4 at 56	#4 at 56	#5 at 56
	7-0	#4 at 56	#5 at 56	#6 at 56
	8-0	#5 at 56	#6 at 56	#7 at 56
	4-0 (or less)	#4 at 56	#4 at 56	#4 at 56
	5-0	#4 at 56	#4 at 56	#4 at 56
8-8	6-0	#4 at 56	#4 at 56	#5 at 56
	7-0	#4 at 56	#5 at 56	#6 at 56
	8-8 ^e	#5 at 56	#7 at 56	#8 at 56
	4-0 (or less)	#4 at 56	#4 at 56	#4 at 56
	5-0	#4 at 56	#4 at 56	#4 at 56
9-4	6-0	#4 at 56	#5 at 56	#5 at 56
	7-0	#4 at 56	#5 at 56	#6 at 56
	8-0	#5 at 56	#6 at 56	#7 at 56
	9-4 ^e	#6 at 56	#7 at 56	#7 at 56
	4-0 (or less)	#4 at 56	#4 at 56	#4 at 56
	5-0	#4 at 56	#4 at 56	#4 at 56
	6-0	#4 at 56	#5 at 56	#5 at 56
10-0	7-0	#5 at 56	#6 at 56	#7 at 56
	8-0	#5 at 56	#7 at 56	#8 at 56
	9-0 ^e	#6 at 56	#7 at 56	#9 at 56
	10-0 ^e	#7 at 56	#8 at 56	#9 at 56

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot per foot = 1.157 kPa/m.

a. For design lateral soil loads, see Section 1610.

b. Provisions for this table are based on design and construction requirements specified in Section 1807.1.6.3.

c. For alternative reinforcement, see Section 1807.1.6.3.1.

d. For height of unbalanced backfill, see Section 1807.1.2.

e. Where unbalanced backfill height exceeds 8 feet and design lateral soil loads from Table 1610.1 are used, the requirements for 30 and 45 psf per foot of depth are not applicable. See Section 1610.

TABLE 1807.1.6.3(4)

12-INCH MASONRY FOUNDATION WALLS WITH REINFORCEMENT WHERE $d \geq 8.75$ INCHES^{a, b, c}

MAXIMUM WALL HEIGHT (feet-inches)	MAXIMUM UNBALANCED BACKFILL HEIGHT ^d (feet-inches)	MINIMUM VERTICAL REINFORCEMENT-BAR SIZE AND SPACING (inches)		
		Design lateral soil load ^a (psf per foot of depth)		
		30 ^e	45 ^e	60
7-4	4 (or less)	#4 at 72	#4 at 72	#4 at 72
	5-0	#4 at 72	#4 at 72	#4 at 72
	6-0	#4 at 72	#4 at 72	#5 at 72
	7-4	#4 at 72	#5 at 72	#6 at 72
8-0	4 (or less)	#4 at 72	#4 at 72	#4 at 72
	5-0	#4 at 72	#4 at 72	#4 at 72
	6-0	#4 at 72	#4 at 72	#5 at 72
	7-0	#4 at 72	#5 at 72	#6 at 72
	8-0	#5 at 72	#6 at 72	#8 at 72
8-8	4 (or less)	#4 at 72	#4 at 72	#4 at 72
	5-0	#4 at 72	#4 at 72	#4 at 72
	6-0	#4 at 72	#4 at 72	#5 at 72
	7-0	#4 at 72	#5 at 72	#6 at 72
	8-8 ^e	#5 at 72	#7 at 72	#8 at 72
9-4	4 (or less)	#4 at 72	#4 at 72	#4 at 72
	5-0	#4 at 72	#4 at 72	#4 at 72
	6-0	#4 at 72	#5 at 72	#5 at 72
	7-0	#4 at 72	#5 at 72	#6 at 72
	8-0	#5 at 72	#6 at 72	#7 at 72
	9-4 ^e	#6 at 72	#7 at 72	#8 at 72
10-0	4 (or less)	#4 at 72	#4 at 72	#4 at 72

	5-0	#4 at 72	#4 at 72	#4 at 72
	6-0	#4 at 72	#5 at 72	#5 at 72
	7-0	#4 at 72	#6 at 72	#6 at 72
	8-0	#5 at 72	#6 at 72	#7 at 72
	9-0 ^e	#6 at 72	#7 at 72	#8 at 72
	10-0 ^e	#7 at 72	#8 at 72	#9 at 72

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot per foot = 0.157 kPa/m.

- a. For design lateral soil loads, see Section 1610.
- b. Provisions for this table are based on design and construction requirements specified in Section 1807.1.6.3.
- c. For alternative reinforcement, see Section 1807.1.6.3.1.
- d. For height of unbalanced backfill, see Section 1807.1.2.
- e. Where unbalanced backfill height exceeds 8 feet and design lateral soil loads from Table 1610.1 are used, the requirements for 30 and 45 psf per foot of depth are not applicable. See Section 1610.

1807.1.6.3.1 Alternative Foundation Wall Reinforcement

In lieu of the reinforcement provisions for masonry foundation walls in Table 1807.1.6.3(2), 1807.1.6.3(3) or 1807.1.6.3(4), alternative reinforcing bar sizes and spacings having an equivalent cross-sectional area of reinforcement per linear foot (mm) of wall shall be permitted to be used, provided the spacing of reinforcement does not exceed 72 inches (1829 mm) and reinforcing bar sizes do not exceed No. 11.

1807.2 Retaining Walls

Retaining walls shall be designed in accordance with Sections 1807.2.1 through 1807.2.3.

1807.2.1 General

Retaining walls shall be designed to ensure stability against overturning, sliding, excessive foundation pressure and water uplift. Where a keyway is extended below the wall base with the intent to engage passive pressure and enhance sliding stability, lateral soil pressures on both sides of the keyway shall be considered in the sliding analysis.

1807.2.2 Design Lateral Soil Loads

Retaining walls shall be designed for the lateral soil loads set forth in Section 1610.

1807.2.3 Safety Factor

Retaining walls shall be designed to resist the lateral action of soil to produce sliding and overturning with a minimum safety factor of 1.5 in each case. The load combinations of Section 1605 shall not apply to this requirement. Instead, design shall be based on 1.0 times all applicable *nominal loads*, and investigation with one or more of the variable loads set to zero. The safety factor against lateral sliding shall be taken as the available soil resistance at the base of the retaining wall foundation divided by the net lateral force applied to the retaining wall.

1807.2.4 Segmental Retaining Walls

Dry-cast concrete units used in the construction of segmental retaining walls shall comply with ASTM C1372.

1807.3 Embedded Posts and Poles

Designs to resist both axial and lateral loads employing posts or poles as columns embedded in earth or in concrete footings in earth shall be in accordance with Sections 1807.3.1 through 1807.3.3.

1807.3.1 Limitations

The design procedures outlined in this section are subject to the following limitations:

1. The frictional resistance for structural walls and slabs on silts and clays shall be limited to one-half of the normal force imposed on the soil by the weight of the footing or slab.
2. Posts embedded in earth shall not be used to provide lateral support for structural or nonstructural materials such as plaster, masonry or concrete unless bracing is provided that develops the limited deflection required.

Wood poles shall be treated in accordance with AWPA U1 for sawn timber posts (Commodity Specification A, Use Category 4B) and for round timber posts (Commodity Specification B, Use Category 4B).

1807.3.2 Design Criteria

The depth to resist lateral loads shall be determined using the design criteria established in Sections 1807.3.2.1 through 1807.3.2.3, or by other methods *approved by the building official*.

1807.3.2.1 Nonconstrained

The following formula shall be used in determining the depth of embedment required to resist lateral loads where no lateral constraint is provided at the ground surface, such as by a rigid floor or rigid ground surface pavement, and where no lateral constraint is provided above the ground surface, such as by a structural diaphragm.

$$d = 0.5A\{1 + [1 + (4.36h/A)]^{1/2}\} \quad (\text{Equation 18-1})$$

where:

A = $2.34P/(S_1b)$.

b = Diameter of round post or footing or diagonal dimension of square post or footing, feet (m).

d = Depth of embedment in earth in feet (m) but not over 12 feet (3658 mm) for purpose of computing lateral pressure.

h = Distance in feet (m) from ground surface to point of application of " P ".

P = Applied lateral force in pounds (kN).

S_1 = Allowable lateral soil-bearing pressure as set forth in Section 1806.2 based on a depth of one-third the depth of embedment in pounds per square foot (psf) (kPa).

1807.3.2.2 Constrained

The following formula shall be used to determine the depth of embedment required to resist lateral loads where lateral constraint is provided at the ground surface, such as by a rigid floor or pavement.

$$d = \sqrt{\frac{4.25Ph}{S_3b}} \quad (\text{Equation 18-2})$$

or alternatively

$$d = \sqrt{\frac{4.25M_g}{S_3b}} \quad (\text{Equation 18-3})$$

where:

M_g = Moment in the post at grade, in foot-pounds (kN-m).

S_3 = Allowable lateral soil-bearing pressure as set forth in Section 1806.2 based on a depth equal to the depth of embedment in pounds per square foot (kPa).

1807.3.2.3 Vertical Load

The resistance to vertical loads shall be determined using the vertical foundation pressure set forth in Table 1806.2.

1807.3.3 Backfill

The backfill in the annular space around columns not embedded in poured footings shall be by one of the following methods:

1. Backfill shall be of concrete with a specified compressive strength of not less than 2,000 psi (13.8 MPa). The hole shall not be less than 4 inches (102 mm) larger than the diameter of the column at its bottom or 4 inches (102 mm) larger than the diagonal dimension of a square or rectangular column.
2. Backfill shall be of clean sand. The sand shall be thoroughly compacted by tamping in layers not more than 8 inches (203 mm) in depth.
3. Backfill shall be of controlled low-strength material (CLSM).

Section 1808 Foundations

1808.1 General

Foundations shall be designed and constructed in accordance with Sections 1808.2 through 1808.9. Shallow foundations shall also satisfy the requirements of Section 1809. Deep foundations shall also satisfy the requirements of Section 1810.

1808.2 Design for Capacity and Settlement

Foundations shall be so designed that the allowable bearing capacity of the soil is not exceeded, and that differential settlement is minimized. Foundations in areas with expansive soils shall be designed in accordance with the provisions of Section 1808.6.

1808.3 Design Loads

Foundations shall be designed for the most unfavorable effects due to the combinations of loads specified in Section 1605.1 or 1605.2. The dead load is permitted to include the weight of foundations and overlying fill. Reduced live loads, as specified in Sections 1607.11 and 1607.13, shall be permitted to be used in the design of foundations.

1808.3.1 Seismic Overturning

Reserved.

1808.3.2 Surcharge

No fill or other surcharge loads shall be placed adjacent to any building or structure unless such building or structure is capable of withstanding the additional loads caused by the fill or the surcharge. Existing footings or foundations that will be affected by any excavation shall be underpinned or otherwise protected against settlement and shall be protected against detrimental lateral or vertical movement or both.

Exception: Minor grading for landscaping purposes shall be permitted where done with walk-behind equipment, where the grade is not increased more than 1 foot (305 mm) from original design grade or where *approved* by the *building official*.

1808.4 Vibratory Loads

Where machinery operations or other vibrations are transmitted through the foundation, consideration shall be given in the foundation design to prevent detrimental disturbances of the soil.

1808.5 Shifting or Moving Soils

Where it is known that the shallow subsoils are of a shifting or moving character, foundations shall be carried to a sufficient depth to ensure stability.

1808.6 Design for Expansive Soils

Foundations for buildings and structures founded on expansive soils shall be designed in accordance with Section 1808.6.1 or 1808.6.2.

Exception: Foundation design need not comply with Section 1808.6.1 or 1808.6.2 where one of the following conditions is satisfied:

1. The soil is removed in accordance with Section 1808.6.3.
2. The *building official* approves stabilization of the soil in accordance with Section 1808.6.4.

1808.6.1 Foundations

Foundations placed on or within the active zone of expansive soils shall be designed to resist differential volume changes and to prevent structural damage to the supported structure. Deflection and racking of the supported structure shall be limited to that which will not interfere with the usability and serviceability of the structure.

Foundations placed below where volume change occurs or below expansive soil shall comply with the following provisions:

1. Foundations extending into or penetrating expansive soils shall be designed to prevent uplift of the supported structure.
2. Foundations penetrating expansive soils shall be designed to resist forces exerted on the foundation due to soil volume changes or shall be isolated from the expansive soil.

1808.6.2 Slab-on-Ground Foundations

Moments, shears and deflections for use in designing slab-on-ground, mat or raft foundations on expansive soils shall be determined in accordance with *WRI/CRSI Design of Slab-on-Ground Foundations* or *PTI DC 10.5*. Using the moments, shears and deflections determined above, nonprestressed slabs-on-ground, mat or raft foundations on expansive soils shall be designed in accordance with *WRI/CRSI Design of Slab-on-Ground Foundations* and post-tensioned slab-on-ground, mat or raft foundations on expansive soils shall be designed in accordance with *PTI DC 10.5*. It shall be permitted to analyze and design such slabs by other methods that account for soil-structure interaction, the deformed shape of the soil support, the plate or stiffened plate action of the slab as well as both center lift and edge lift conditions. Such alternative methods shall be rational and the basis for all aspects and parameters of the method shall be available for peer review.

1808.6.3 Removal of Expansive Soil

Where expansive soil is removed in lieu of designing foundations in accordance with Section 1808.6.1 or 1808.6.2, the soil shall be removed to a depth sufficient to ensure a constant moisture content in the remaining soil. Fill material shall not contain expansive soils and shall comply with Section 1804.5 or 1804.6.

Exception: Expansive soil need not be removed to the depth of constant moisture, provided the confining pressure in the expansive soil created by the fill and supported structure exceeds the swell pressure.

1808.6.4 Stabilization

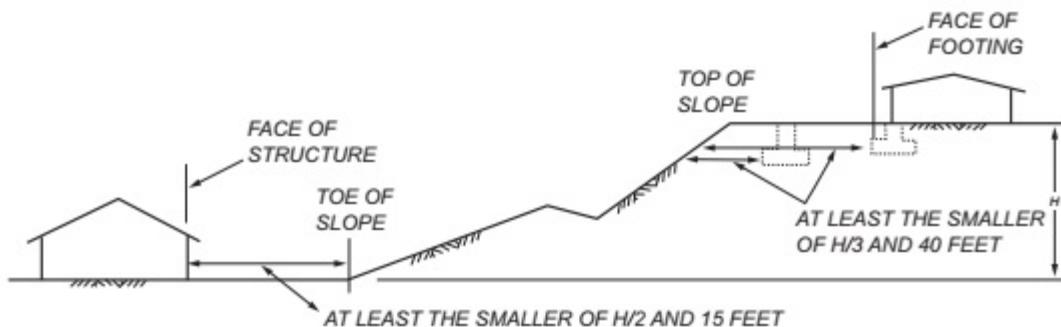
Where the active zone of expansive soils is stabilized in lieu of designing foundations in accordance with Section 1808.6.1 or 1808.6.2, the soil shall be stabilized by chemical, dewatering, presaturation or equivalent techniques.

1808.7 Foundations on or Adjacent to Slopes

The placement of buildings and structures on or adjacent to slopes steeper than one unit vertical in three units horizontal (33.3-percent slope) shall comply with Sections 1808.7.1 through 1808.7.5.

1808.7.1 Building Clearance From Ascending Slopes

In general, buildings below slopes shall be set a sufficient distance from the slope to provide protection from slope drainage, erosion and shallow failures. Except as provided in Section 1808.7.5 and Figure 1808.7.1, the following criteria will be assumed to provide this protection. Where the existing slope is steeper than one unit vertical in one unit horizontal (100-percent slope), the toe of the slope shall be assumed to be at the intersection of a horizontal plane drawn from the top of the foundation and a plane drawn tangent to the slope at an angle of 45 degrees (0.79 rad) to the horizontal. Where a retaining wall is constructed at the toe of the slope, the height of the slope shall be measured from the top of the wall to the top of the slope.



For SI: 1 foot = 304.8 mm.

FIGURE 1808.7.1

FOUNDATION CLEARANCES FROM SLOPES

1808.7.2 Foundation Setback From Descending Slope Surface

Foundations on or adjacent to slope surfaces shall be founded in firm material with an embedment and set back from the slope surface sufficient to provide vertical and lateral support for the foundation without detrimental settlement. Except as provided for in Section 1808.7.5 and Figure 1808.7.1, the following setback is deemed adequate to meet the criteria. Where the slope is steeper than 1 unit vertical in 1 unit horizontal (100-percent slope), the required setback shall be measured from an imaginary plane 45 degrees (0.79 rad) to the horizontal, projected upward from the toe of the slope.

1808.7.3 Pools

The setback between pools regulated by this code and slopes shall be equal to one-half the building footing setback distance required by this section. That portion of the pool wall within a horizontal distance of 7 feet (2134 mm) from the top of the slope shall be capable of supporting the water in the pool without soil support.

1808.7.4 Foundation Elevation

On graded sites, the top of any exterior foundation shall extend above the elevation of the street gutter at point of discharge or the inlet of an *approved* drainage device a minimum of 12 inches (305 mm) plus 2 percent. Alternate elevations are permitted subject to the approval of the *building official*, provided it can be demonstrated that required drainage to the point of discharge and away from the structure is provided at all locations on the site.

1808.7.5 Alternate Setback and Clearance

Alternate setbacks and clearances are permitted, subject to the approval of the *building official*. The *building official* shall be permitted to require a geotechnical investigation as set forth in Section 1803.5.10.

1808.8 Concrete Foundations

The design, materials and construction of concrete foundations shall comply with Sections 1808.8.1 through 1808.8.5 and the provisions of Chapter 19.

Exception: Where concrete footings supporting walls of light-frame construction are designed in accordance with Table 1809.7, a specific design in accordance with Chapter 19 is not required.

1808.8.1 Concrete or Grout Strength and Mix Proportioning

Concrete or grout in foundations shall have a specified compressive strength (f'_c) not less than the largest applicable value indicated in Table 1808.8.1.

Where concrete or grout is to be pumped, the mix design including slump shall be adjusted to produce a pumpable mixture.

TABLE 1808.8.1

MINIMUM SPECIFIED COMPRESSIVE STRENGTH f'_c OF CONCRETE OR GROUT

FOUNDATION ELEMENT OR CONDITION	SPECIFIED COMPRESSIVE STRENGTH, f'_c
1. Foundations	2,500 psi

2. Precast non prestressed driven piles	4,000 psi
3. Socketed drilled shafts	4,000 psi
4. Micropiles	4,000 psi
5. Precast prestressed driven piles	5,000 psi

For SI: 1 pound per square inch = 0.00689 MPa.

1808.8.2 Concrete Cover

The concrete cover provided for prestressed and nonprestressed reinforcement in foundations shall be no less than the largest applicable value specified in Table 1808.8.2. Longitudinal bars spaced less than $1\frac{1}{2}$ inches (38 mm) clear distance apart shall be considered bundled bars for which the concrete cover provided shall also be no less than that required by Section 20.5.1.3.5 of ACI 318. Concrete cover shall be measured from the concrete surface to the outermost surface of the steel to which the cover requirement applies. Where concrete is placed in a temporary or permanent casing or a mandrel, the inside face of the casing or mandrel shall be considered the concrete surface.

TABLE 1808.8.2

MINIMUM CONCRETE COVER

FOUNDATION ELEMENT OR CONDITION	MINIMUM COVER
1. Shallow foundations	In accordance with Section 20.5 of ACI 318
2. Precast nonprestressed deep foundation elements	
Exposed to seawater	3 inches
Not manufactured under plant conditions	2 inches
Manufactured under plant control conditions	In accordance with Section 20.5.1.3.3 of ACI 318
3. Precast prestressed deep foundation elements	
Exposed to seawater	2.5 inches
Other	In accordance with Section 20.5.1.3.3 of ACI 318
4. Cast-in-place deep foundation elements not enclosed by a steel pipe, tube or permanent casing	2.5 inches
5. Cast-in-place deep foundation elements enclosed by a steel pipe, tube or permanent casing	1 inch
6. Structural steel core within a steel pipe, tube or permanent casing	2 inches
7. Cast-in-place drilled shafts enclosed by a stable rock socket	1.5 inches

For SI: 1 inch = 25.4 mm.

1808.8.3 Placement of Concrete

Concrete shall be placed in such a manner as to ensure the exclusion of any foreign matter and to secure a full-size foundation. Concrete shall not be placed through water unless a tremie or other method *approved* by the *building official* is used. Where placed under or in the presence of water, the concrete shall be deposited by *approved* means to ensure minimum segregation of the mix and negligible turbulence of the water. Where depositing concrete from the top of a deep foundation element, the concrete shall be chuted

directly into smooth-sided pipes or tubes or placed in a rapid and continuous operation through a funnel hopper centered at the top of the element.

1808.8.4 Protection of Concrete

Concrete foundations shall be protected from freezing during depositing and for a period of not less than five days thereafter. Water shall not be allowed to flow through the deposited concrete.

1808.8.5 Forming of Concrete

Concrete foundations are permitted to be cast against the earth where, in the opinion of the *building official*, soil conditions do not require formwork. Where formwork is required, it shall be in accordance with Section 26.11 of ACI 318.

1808.9 Vertical Masonry Foundation Elements

Vertical masonry foundation elements that are not foundation piers as defined in Section 202 shall be designed as piers, walls or columns, as applicable, in accordance with TMS 402.

Section 1809 Shallow Foundations

1809.1 General

Shallow foundations shall be designed and constructed in accordance with Sections 1809.2 through 1809.12.

1809.2 Supporting Soils

Shallow foundations shall be built on undisturbed soil, compacted fill material or controlled low-strength material (CLSM). Compacted fill material shall be placed in accordance with Section 1804.5. CLSM shall be placed in accordance with Section 1804.6.

1809.3 Stepped Footings

The top surface of footings shall be level. The bottom surface of footings shall be permitted to have a slope not exceeding one unit vertical in 10 units horizontal (10-percent slope). Footings shall be stepped where it is necessary to change the elevation of the top surface of the footing or where the surface of the ground slopes more than one unit vertical in 10 units horizontal (10-percent slope).

1809.4 Depth and Width of Footings

The minimum depth of footings below the undisturbed ground surface shall be 12 inches (305 mm). Where applicable, the requirements of Section 1809.5 shall also be satisfied. The minimum width of footings shall be 12 inches (305 mm).

1809.5 Frost Protection

Except where otherwise protected from frost, foundations and other permanent supports of buildings and structures shall be protected from frost by one or more of the following methods:

1. Extending below the frost line of the locality.
2. Constructing in accordance with ASCE 32.
3. Erecting on solid rock.

Exception: Free-standing buildings meeting all of the following conditions shall not be required to be protected:

1. Assigned to *Risk Category I*.
2. Area of 600 square feet (56 m^2) or less for light-frame construction or 400 square feet (37 m^2) or less for other than light-frame construction.
3. Eave height of 10 feet (3048 mm) or less.

Shallow foundations shall not bear on frozen soil unless such frozen condition is of a permanent character.

1809.5.1 Frost Protection at Required Exits

Frost protection shall be provided at exterior landings for all required *exits* with outward swinging doors. Frost protection shall only be required to the extent necessary to ensure the unobstructed opening of the required *exit* doors.

1809.6 Location of Footings

Footings on granular soil shall be so located that the line drawn between the lower edges of adjoining footings shall not have a slope steeper than 30 degrees (0.52 rad) with the horizontal, unless the material supporting the higher footing is braced or retained or otherwise laterally supported in an *approved* manner or a greater slope has been properly established by engineering analysis.

1809.7 Prescriptive Footings for Light-Frame Construction

Where a specific design is not provided, concrete or masonry-unit footings supporting walls of light-frame construction shall be permitted to be designed in accordance with Table 1809.7.

TABLE 1809.7

PRESCRIPTIVE FOOTINGS SUPPORTING WALLS OF LIGHT-FRAME CONSTRUCTION^{a, b, c, e}

NUMBER OF FLOORS SUPPORTED BY THE FOOTING ^f	WIDTH OF FOOTING (inches)	THICKNESS OF FOOTING (inches)
1	12	6
2	15	6
3	18	8 ^g

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

- a. Depth of footings shall be in accordance with Section 1809.4.
- b. The ground under the floor shall be permitted to be excavated to the elevation of the top of the footing.
- c. Interior stud-bearing walls shall be permitted to be supported by isolated footings. The footing width and length shall be twice the width shown in this table, and footings shall be spaced not more than 6 feet on center.
- d. Reserved.
- e. For thickness of foundation walls, see Section 1807.1.6.
- f. Footings shall be permitted to support a roof in addition to the stipulated number of floors. Footings supporting roof only shall be as required for supporting one floor.
- g. Plain concrete footings for Group R-3 occupancies shall be permitted to be 6 inches thick.

1809.8 Plain Concrete Footings

The edge thickness of plain concrete footings supporting walls of other than light-frame construction shall not be less than 8 inches (203 mm) where placed on soil or rock.

Exception: For plain concrete footings supporting Group R-3 occupancies, the edge thickness is permitted to be 6 inches (152 mm), provided that the footing does not extend beyond a distance greater than the thickness of the footing on either side of the supported wall.

1809.9 Masonry-Unit Footings

The design, materials and construction of masonry-unit footings shall comply with Sections 1809.9.1 and 1809.9.2, and the provisions of Chapter 21.

Exception: Where a specific design is not provided, masonry-unit footings supporting walls of light-frame construction shall be permitted to be designed in accordance with Table 1809.7.

1809.9.1 Dimensions

Masonry-unit footings shall be laid in Type M or S mortar complying with Section 2103.2.1 and the depth shall not be less than twice the projection beyond the wall, pier or column. The width shall not be less than 8 inches (203 mm) wider than the wall supported thereon.

1809.9.2 Offsets

The maximum offset of each course in brick foundation walls stepped up from the footings shall be $1\frac{1}{2}$ inches (38 mm) where laid in single courses, and 3 inches (76 mm) where laid in double courses.

1809.10 Pier and Curtain Wall Foundations

Pier and curtain wall foundations shall be permitted to be used to support light-frame construction not more than two stories above grade plane, provided the following requirements are met:

1. All load-bearing walls shall be placed on continuous concrete footings bonded integrally with the *exterior wall* footings.
2. The minimum actual thickness of a load-bearing masonry wall shall not be less than 4 inches (102 mm) nominal or $3\frac{5}{8}$ inches (92 mm) actual thickness, and shall be bonded integrally with piers spaced 6 feet (1829 mm) on center (o.c.).
3. Piers shall be constructed in accordance with Chapter 21 and the following:
 - 3.1. The unsupported height of the masonry piers shall not exceed 10 times their least dimension.
 - 3.2. Where structural clay tile or hollow concrete masonry units are used for piers supporting beams and girders, the cellular spaces shall be filled solidly with concrete or Type M or S mortar.
4. Hollow piers shall be capped with 4 inches (102 mm) of solid masonry or concrete or the cavities of the top course shall be filled with concrete or grout.
5. The maximum height of a 4-inch (102 mm) load-bearing masonry foundation wall supporting wood frame walls and floors shall not be more than 4 feet (1219 mm) in height.
6. The unbalanced fill for 4-inch (102 mm) foundation walls shall not exceed 24 inches (610 mm) for solid masonry, nor 12 inches (305 mm) for hollow masonry.

Exception: Unfilled hollow piers shall be permitted where the unsupported height of the pier is not more than four times its least dimension.

3.3. Hollow piers shall be capped with 4 inches (102 mm) of solid masonry or concrete or the cavities of the top course shall be filled with concrete or grout.

4. The maximum height of a 4-inch (102 mm) load-bearing masonry foundation wall supporting wood frame walls and floors shall not be more than 4 feet (1219 mm) in height.

5. The unbalanced fill for 4-inch (102 mm) foundation walls shall not exceed 24 inches (610 mm) for solid masonry, nor 12 inches (305 mm) for hollow masonry.

1809.11 Steel Grillage Footings

Grillage footings of *structural steel elements* shall be separated with *approved* steel spacers and be entirely encased in concrete with at least 6 inches (152 mm) on the bottom and at least 4 inches (102 mm) at all other points. The spaces between the shapes shall be completely filled with concrete or cement grout.

1809.12 Timber Footings

Timber footings shall be permitted for buildings of Type V construction and as otherwise *approved* by the *building official*. Such footings shall be treated in accordance with AWPA U1 (Commodity Specification A, Use Category 4B). Treated timbers are not required where placed entirely below permanent water level, or where used as capping for wood piles that project above the water level over submerged or marsh lands. The compressive stresses perpendicular to grain in untreated timber footings supported upon treated piles shall not exceed 70 percent of the allowable stresses for the species and grade of timber as specified in the ANSI/AWC NDS.

Section 1810 Deep Foundations

1810.1 General

Deep foundations shall be analyzed, designed, detailed and installed in accordance with Sections 1810.1 through 1810.4.

1810.1.1 Geotechnical Investigation

Deep foundations shall be designed and installed on the basis of a geotechnical investigation as set forth in Section 1803.

1810.1.2 Use of Existing Deep Foundation Elements

Deep foundation elements left in place where a structure has been demolished shall not be used for the support of new construction unless satisfactory evidence is submitted to the *building official*, which indicates that the elements are sound and meet the requirements of this code. Such elements shall be load tested or redriven to verify their capacities. The design load applied to such elements shall be the lowest allowable load as determined by tests or redriving data.

1810.1.3 Deep Foundation Elements Classified as Columns

Deep foundation elements standing unbraced in air, water or fluid soils shall be classified as columns and designed as such in accordance with the provisions of this code from their top down to the point where adequate lateral support is provided in accordance with Section 1810.2.1.

Exception: Where the unsupported height to least horizontal dimension of a cast-in-place deep foundation element does not exceed three, it shall be permitted to design and construct such an element as a pedestal in accordance with ACI 318.

1810.1.4 Special Types of Deep Foundations

The use of types of deep foundation elements not specifically mentioned herein is permitted, subject to the approval of the *building official*, upon the submission of acceptable test data, calculations and other information relating to the structural properties and load capacity of such elements. The allowable stresses for materials shall not in any case exceed the limitations specified herein.

1810.2 Analysis

The analysis of deep foundations for design shall be in accordance with Sections 1810.2.1 through 1810.2.5.

1810.2.1 Lateral Support

Any soil other than fluid soil shall be deemed to afford sufficient lateral support to prevent buckling of deep foundation elements and to permit the design of the elements in accordance with accepted engineering practice and the applicable provisions of this code.

Where deep foundation elements stand unbraced in air, water or fluid soils, it shall be permitted to consider them laterally supported at a point 5 feet (1524 mm) into stiff soil or 10 feet (3048 mm) into soft soil unless otherwise *approved* by the *building official* on the basis of a geotechnical investigation by a *registered design professional*.

1810.2.2 Stability

Deep foundation elements shall be braced to provide lateral stability in all directions. Three or more elements connected by a rigid cap shall be considered braced, provided that the elements are located in radial directions from the centroid of the group not less than 60 degrees (1 rad) apart. A two-element group in a rigid cap shall be considered to be braced along the axis connecting the two elements. Methods used to brace deep foundation elements shall be subject to the approval of the *building official*.

Deep foundation elements supporting walls shall be placed alternately in lines spaced at least 1 foot (305 mm) apart and located symmetrically under the center of gravity of the wall load carried, unless effective measures are taken to provide for eccentricity and lateral forces, or the foundation elements are adequately braced to provide for lateral stability.

Exceptions:

1. Isolated cast-in-place deep foundation elements without lateral bracing shall be permitted where the least horizontal dimension is no less than 2 feet (610 mm), adequate lateral support in accordance with Section 1810.2.1 is provided for the entire height and the height does not exceed 12 times the least horizontal dimension.

2. A single row of deep foundation elements without lateral bracing is permitted for one- and two-family dwellings and lightweight construction not exceeding two *stories above grade plane* or 35 feet (10 668 mm) in *building height*, provided the centers of the elements are located within the width of the supported wall.

1810.2.3 Settlement

The settlement of a single deep foundation element or group thereof shall be estimated based on *approved* methods of analysis. The predicted settlement shall cause neither harmful distortion of, nor instability in, the structure, nor cause any element to be loaded beyond its capacity.

1810.2.4 Lateral Loads

The moments, shears and lateral deflections used for design of deep foundation elements shall be established considering the nonlinear interaction of the shaft and soil, as determined by a *registered design professional*. Where the ratio of the depth of embedment of the element to its least horizontal dimension is less than or equal to six, it shall be permitted to assume the element is rigid.

1810.2.5 Group Effects

The analysis shall include group effects on lateral behavior where the center-to-center spacing of deep foundation elements in the direction of lateral force is less than eight times the least horizontal dimension of an element. The analysis shall include group effects on axial behavior where the center-to-center spacing of deep foundation elements is less than three times the least horizontal dimension of an element. Group effects shall be evaluated using a generally accepted method of analysis; the analysis for uplift of grouped elements with center-to-center spacing less than three times the least horizontal dimension of an element shall be evaluated in accordance with Section 1810.3.3.1.6.

1810.3 Design and Detailing

Deep foundations shall be designed and detailed in accordance with Sections 1810.3.1 through 1810.3.11.

1810.3.1 Design Conditions

Design of deep foundations shall include the design conditions specified in Sections 1810.3.1.1 through 1810.3.1.6, as applicable.

1810.3.1.1 Design Methods for Concrete Elements

Where concrete deep foundations are laterally supported in accordance with Section 1810.2.1 for the entire height and applied forces cause bending moments no greater than those resulting from accidental eccentricities, structural design of the element using the allowable stress design load combinations of Section 1605.1 and the allowable stresses specified in this chapter shall be permitted. Otherwise, the structural design of concrete deep foundation elements shall use the strength design load combinations of Section 1605.1 and *approved* strength design methods.

1810.3.1.2 Composite Elements

Where a single deep foundation element comprises two or more sections of different materials or different types spliced together, each section of the composite assembly shall satisfy the applicable requirements of this code, and the maximum allowable load in each section shall be limited by the structural capacity of that section.

1810.3.1.3 Mislocation

The foundation or superstructure shall be designed to resist the effects of the mislocation of any deep foundation element by no less than 3 inches (76 mm). To resist the effects of mislocation, compressive overload of deep foundation elements to 110 percent of the allowable design load shall be permitted.

1810.3.1.4 Driven Piles

Driven piles shall be designed and manufactured in accordance with accepted engineering practice to resist all stresses induced by handling, driving and service loads.

1810.3.1.5 Helical Piles

Helical piles shall be designed and manufactured in accordance with accepted engineering practice to resist all stresses induced by installation into the ground and service loads.

1810.3.1.6 Casings

Temporary and permanent casings shall be of steel and shall be sufficiently strong to resist collapse and sufficiently water tight to exclude any foreign materials during the placing of concrete. Where a permanent casing is considered reinforcing steel, the steel shall be protected under the conditions specified in Section 1810.3.2.5. Horizontal joints in the casing shall be spliced in accordance with Section 1810.3.6.

1810.3.2 Materials

The materials used in deep foundation elements shall satisfy the requirements of Sections 1810.3.2.1 through 1810.3.2.8, as applicable.

1810.3.2.1 Concrete

Where concrete is cast in a steel pipe or where an enlarged base is formed by compacting concrete, the maximum size for coarse aggregate shall be $\frac{3}{4}$ inch (19.1 mm). Concrete to be compacted shall have a zero slump.

1810.3.2.1.1 Seismic Hooks

Reserved.

1810.3.2.1.2 ACI 318 Equation (25.7.3.3)

Where this chapter requires detailing of concrete deep foundation elements in accordance with Section 18.7.5.4 of ACI 318, compliance with Equation (25.7.3.3) of ACI 318 shall not be required.

1810.3.2.2 Prestressing Steel

Prestressing steel shall conform to ASTM A416.

1810.3.2.3 Steel

Structural steel H-piles and structural steel sheet piling shall conform to the material requirements in ASTM A6. Steel pipe piles shall conform to the material requirements in ASTM A252. Fully welded steel piles shall be fabricated from plates that conform to the material requirements in ASTM A36, ASTM A283, ASTM A572, ASTM A588 or ASTM A690.

1810.3.2.4 Timber

Timber deep foundation elements shall be designed as piles or poles in accordance with ANSI/AWC NDS. Round timber elements shall conform to ASTM D25. Sawn timber elements shall conform to DOC PS-20.

1810.3.2.4.1 Preservative Treatment

Timber deep foundation elements used to support permanent structures shall be treated in accordance with this section unless it is established that the tops of the untreated timber elements will be below the lowest ground-water level assumed to exist during the life of the structure. Preservative and minimum final retention shall be in accordance with AWPA U1 (Commodity Specification E, Use Category 4C) for round timber elements and AWPA U1 (Commodity Specification A, Use Category 4B) for sawn timber elements. Preservative-treated timber elements shall be subject to a quality control program administered by an *approved agency*. Element cutoffs shall be treated in accordance with AWPA M4.

1810.3.2.5 Protection of Materials

Where boring records or site conditions indicate possible deleterious action on the materials used in deep foundation elements because of soil constituents, changing water levels or other factors, the elements shall be adequately protected by materials, methods or processes *approved* by the *building official*. Protective materials shall be applied to the elements so as not to be rendered ineffective by installation. The effectiveness of such protective measures for the particular purpose shall have been thoroughly established by satisfactory service records or other evidence.

1810.3.2.6 Allowable Stresses

The allowable stresses for materials used in deep foundation elements shall not exceed those specified in Table 1810.3.2.6.

TABLE 1810.3.2.6

ALLOWABLE STRESSES FOR MATERIALS USED IN DEEP FOUNDATION ELEMENTS

MATERIAL TYPE AND CONDITION	MAXIMUM ALLOWABLE STRESS ^a
1. Concrete or grout in compression	

Cast-in-place with a permanent casing in accordance with Section 1810.3.2.7 or Section 1810.3.5.3.4	$0.4 f'_c$
Cast-in-place in other permanent casing or rock	$0.33 f'_c$
Cast-in-place without a permanent casing	$0.3 f'_c$
Precast nonprestressed	$0.33 f'_c$
Precast prestressed	$0.33 f'_c - 0.27 f_{pc}$
2. Nonprestressed reinforcement in compression	$0.4 f_y \leq 30,000 \text{ psi}$
3. Steel in compression	
Cores within concrete-filled pipes or tubes	$0.5 F_y \leq 32,000 \text{ psi}$
Pipes, tubes or H-piles, where justified in accordance with Section 1810.3.2.8	$0.5 F_y \leq 32,000 \text{ psi}$
Pipes or tubes for micropiles	$0.4 F_y \leq 32,000 \text{ psi}$
Other pipes, tubes or H-piles	$0.35 F_y \leq 24,000 \text{ psi}$
Helical piles	$0.6 F_y \leq 0.5 F_u$
4. Nonprestressed reinforcement in tension	
Within micropiles	
Other conditions	$0.6 f_y$
For load combinations that do not include wind loads	$0.5 f_y \leq 30,000 \text{ psi}$
For load combinations that include wind loads	$0.5 f_y \leq 40,000 \text{ psi}$
5. Steel in tension	
Pipes, tubes or H-piles, where justified in accordance with Section 1810.3.2.8	$0.5 F_y \leq 32,000 \text{ psi}$
Other pipes, tubes or H-piles	$0.35 F_y \leq 24,000 \text{ psi}$
Helical piles	$0.6 F_y \leq 0.5 F_u$
6. Timber	In accordance with the ANSI/AWC NDS

- a. f'_c is the specified compressive strength of the concrete or grout; f_{pc} is the compressive stress on the gross concrete section due to effective prestress forces only; f_y is the specified yield strength of reinforcement; F_y is the specified minimum yield stress of steel; F_u is the specified minimum tensile stress of structural steel.
- b. The stresses specified apply to the gross cross-sectional area of the concrete for precast prestressed piles and to the net cross-sectional area for all other piles. Where a temporary or permanent casing is used, the inside face of the casing shall be considered the outer edge of the concrete cross-section.

1810.3.2.7 Increased Allowable Compressive Stress for Cased Cast-in-Place Elements

The allowable compressive stress in the concrete shall be permitted to be increased as specified in Table 1810.3.2.6 for those portions of permanently cased cast-in-place elements that satisfy all of the following conditions:

1. The design shall not use the casing to resist any portion of the axial load imposed.

2. The casing shall have a sealed tip and be mandrel driven.
3. The thickness of the casing shall not be less than manufacturer's standard gage No. 14 (0.068 inch) (1.75 mm).
4. The casing shall be seamless or provided with seams of strength equal to the basic material and be of a configuration that will provide confinement to the cast-in-place concrete.
5. The ratio of steel yield strength (F_y) to specified compressive strength (f'_c) shall not be less than six.
6. The nominal diameter of the element shall not be greater than 16 inches (406 mm).

1810.3.2.8 Justification of Higher Allowable Stresses

Use of allowable stresses greater than those specified in Section 1810.3.2.6 shall be permitted where supporting data justifying such higher stresses is filed with the *building official*. Such substantiating data shall include the following:

1. A geotechnical investigation in accordance with Section 1803.
2. Load tests in accordance with Section 1810.3.3.1.2, regardless of the load supported by the element.

The design and installation of the deep foundation elements shall be under the direct supervision of a *registered design professional* knowledgeable in the field of soil mechanics and deep foundations who shall submit a report to the *building official* stating that the elements as installed satisfy the design criteria.

1810.3.3 Determination of Allowable Loads

The allowable axial and lateral loads on deep foundation elements shall be determined by an *approved* formula, load tests or method of analysis.

1810.3.3.1 Allowable Axial Load

The allowable axial load on a deep foundation element shall be determined in accordance with Sections 1810.3.3.1.1 through 1810.3.3.1.9.

Exception: Where approved by the *building official*, load testing is not required.

1810.3.3.1.1 Driving Criteria

The allowable compressive load on any driven deep foundation element where determined by the application of an *approved* driving formula shall not exceed 40 tons (356 kN). For allowable loads above 40 tons (356 kN), the wave equation method of analysis shall be used to estimate driveability for both driving stresses and net displacement per blow at the ultimate load. Allowable loads shall be verified by load tests in accordance with Section 1810.3.3.1.2. The formula or wave equation load shall be determined for gravity-drop or power-actuated hammers and the hammer energy used shall be the maximum consistent with the size, strength and weight of the driven elements. The use of a follower is permitted only with the approval of the *building official*. The introduction of fresh hammer cushion or pile cushion material just prior to final penetration is not permitted.

1810.3.3.1.2 Load Tests

Where design compressive loads are greater than those determined using the allowable stresses specified in Section 1810.3.2.6, where the design load for any deep foundation element is in doubt, or where cast-in-place deep foundation elements have an enlarged base formed either by compacting concrete or by driving a precast base, control test elements shall be tested in accordance with ASTM D1143 or ASTM D4945. At least one element shall be load tested in each area of uniform subsoil conditions. Where required by the *building official*, additional elements shall be load tested where necessary to establish the safe design capacity. The resulting allowable loads shall not be more than one-half of the ultimate axial load capacity of the test element as assessed by one of the published methods listed in Section 1810.3.3.1.3 with consideration for the test type, duration and subsoil. The ultimate axial load capacity shall be determined by a *registered design professional* with consideration given to tolerable total and differential settlements at design load in accordance with Section 1810.2.3. In subsequent installation of the balance of deep foundation elements, all elements shall be deemed to have a supporting capacity equal to that of the control

element where such elements are of the same type, size and relative length as the test element; are installed using the same or comparable methods and equipment as the test element; are installed in similar subsoil conditions as the test element; and, for driven elements, where the rate of penetration (e.g., net displacement per blow) of such elements is equal to or less than that of the test element driven with the same hammer through a comparable driving distance.

1810.3.3.1.3 Load Test Evaluation Methods

It shall be permitted to evaluate load tests of deep foundation elements using any of the following methods:

1. Davisson Offset Limit.
2. Brinch-Hansen 90-percent Criterion.
3. Butler-Hoy Criterion.
4. Other methods *approved* by the *building official*.

1810.3.3.1.4 Allowable Frictional Resistance

The assumed frictional resistance developed by any uncased cast-in-place deep foundation element shall not exceed one-sixth of the bearing value of the soil material at minimum depth as set forth in Table 1806.2, up to a maximum of 500 psf (24 kPa), unless a greater value is allowed by the *building official* on the basis of a geotechnical investigation as specified in Section 1803 or a greater value is substantiated by a load test in accordance with Section 1810.3.3.1.2. Frictional resistance and bearing resistance shall not be assumed to act simultaneously unless determined by a geotechnical investigation in accordance with Section 1803.

1810.3.3.1.5 Uplift Capacity of a Single Deep Foundation Element

Where required by the design, the uplift capacity of a single deep foundation element shall be determined by an *approved* method of analysis based on a minimum factor of safety of three or by load tests conducted in accordance with ASTM D3689. The maximum allowable uplift load shall not exceed the ultimate load capacity as determined in Section 1810.3.3.1.2, using the results of load tests conducted in accordance with ASTM D3689, divided by a factor of safety of two.

Exception: Where uplift is due to wind loading, the minimum factor of safety shall be two where capacity is determined by an analysis and one and one-half where capacity is determined by load tests.

1810.3.3.1.6 Allowable Uplift Load of Grouped Deep Foundation Elements

For grouped deep foundation elements subjected to uplift, the allowable uplift load for the group shall be calculated by a generally accepted method of analysis. Where the deep foundation elements in the group are placed at a center-to-center spacing less than three times the least horizontal dimension of the largest single element, the allowable uplift load for the group is permitted to be calculated as the lesser of:

1. The proposed individual allowable uplift load times the number of elements in the group.
2. Two-thirds of the effective weight of the group and the soil contained within a block defined by the perimeter of the group and the length of the element, plus two-thirds of the ultimate shear resistance along the soil block.

1810.3.3.1.7 Load-Bearing Capacity

Deep foundation elements shall develop ultimate load capacities of at least twice the design working loads in the designated load-bearing layers. Analysis shall show that no soil layer underlying the designated load-bearing layers causes the load-bearing capacity safety factor to be less than two.

1810.3.3.1.8 Bent Deep Foundation Elements

The load-bearing capacity of deep foundation elements discovered to have a sharp or sweeping bend shall be determined by an *approved* method of analysis or by load testing a representative element.

1810.3.3.1.9 Helical Piles

The allowable axial design load, P_a , of helical piles shall be determined as follows:

$$P_a = 0.5 P_u$$

(Equation 18-4)

where P_u is the least value of:

1. Base capacity plus shaft resistance of the helical pile. The base capacity is equal to the sum of the areas of the helical bearing plates times the ultimate bearing capacity of the soil or rock comprising the bearing stratum. The shaft resistance is equal to the area of the shaft above the uppermost helical bearing plate times the ultimate skin resistance.
2. Ultimate capacity determined from well-documented correlations with installation torque.
3. Ultimate capacity determined from load tests when required by Section 1810.3.3.1.2.
4. Ultimate axial capacity of pile shaft.
5. Ultimate axial capacity of pile shaft couplings.
6. Sum of the ultimate axial capacity of helical bearing plates affixed to pile.

1810.3.3.2 Allowable Lateral Load

Where required by the design, the lateral load capacity of a single deep foundation element or a group thereof shall be determined by an *approved* method of analysis or by lateral load tests to at least twice the proposed design working load. The resulting allowable load shall not be more than one-half of the load that produces a gross lateral movement of 1 inch (25 mm) at the lower of the top of foundation element and the ground surface, unless it can be shown that the predicted lateral movement shall cause neither harmful distortion of, nor instability in, the structure, nor cause any element to be loaded beyond its capacity.

1810.3.4 Subsiding Soils or Strata

Where deep foundation elements are installed through subsiding soils or other subsiding strata and derive support from underlying firmer materials, consideration shall be given to the downward frictional forces that may be imposed on the elements by the subsiding upper strata.

Where the influence of subsiding soils or strata is considered as imposing loads on the element, the allowable stresses specified in this chapter shall be permitted to be increased where satisfactory substantiating data are submitted.

1810.3.5 Dimensions of Deep Foundation Elements

The dimensions of deep foundation elements shall be in accordance with Sections 1810.3.5.1 through 1810.3.5.3, as applicable.

1810.3.5.1 Precast

The minimum lateral dimension of precast concrete deep foundation elements shall be 8 inches (203 mm). Corners of square elements shall be chamfered.

1810.3.5.2 Cast-in-Place or Grouted-in-Place

Cast-in-place and grouted-in-place deep foundation elements shall satisfy the requirements of this section.

1810.3.5.2.1 Cased

Cast-in-place or grouted-in-place deep foundation elements with a permanent casing shall have a nominal outside diameter of not less than 8 inches (203 mm).

1810.3.5.2.2 Uncased

Cast-in-place or grouted-in-place deep foundation elements without a permanent casing shall have a specified diameter of not less than 12 inches (305 mm). The element length shall not exceed 30 times the specified diameter.

Exception: The length of the element is permitted to exceed 30 times the specified diameter, provided the design and installation of the deep foundations are under the direct supervision of a *registered design professional* knowledgeable in the field of soil mechanics and deep foundations. The *registered design professional* shall submit a report to the *building official* stating that the elements were installed in compliance with the *approved construction documents*.

1810.3.5.2.3 Micropiles

Micropiles shall have a nominal diameter of 12 inches (305 mm) or less. The minimum diameter set forth elsewhere in Section 1810.3.5 shall not apply to micropiles.

1810.3.5.3 Steel

Steel deep foundation elements shall satisfy the requirements of this section.

1810.3.5.3.1 Structural Steel H-Piles

Sections of structural steel H-piles shall comply with the requirements for HP shapes in ASTM A6, or the following:

1. The flange projections shall not exceed 14 times the minimum thickness of metal in either the flange or the web and the flange widths shall not be less than 80 percent of the depth of the section.
2. The nominal depth in the direction of the web shall not be less than 8 inches (203 mm).
3. Flanges and web shall have a minimum nominal thickness of $\frac{3}{8}$ inch (9.5 mm).

1810.3.5.3.2 Fully Welded Steel Piles Fabricated From Plates

Sections of fully welded steel piles fabricated from plates shall comply with the following:

1. The flange projections shall not exceed 14 times the minimum thickness of metal in either the flange or the web, and the flange widths shall not be less than 80 percent of the depth of the section.
2. The nominal depth in the direction of the web shall not be less than 8 inches (203 mm).
3. Flanges and web shall have a minimum nominal thickness of $\frac{3}{8}$ inch (9.5 mm).

1810.3.5.3.3 Structural Steel Sheet Piling

Individual sections of structural steel sheet piling shall conform to the profile indicated by the manufacturer, and shall conform to the general requirements specified by ASTM A6.

1810.3.5.3.4 Steel Pipes and Tubes

Steel pipes and tubes used as deep foundation elements shall have a nominal outside diameter of not less than 8 inches (203 mm). Where steel pipes or tubes are driven open ended, they shall have a minimum of 0.34 square inch (219 mm²) of steel in cross section to resist each 1,000 foot-pounds (1356 Nm) of pile hammer energy, or shall have the equivalent strength for steels having a yield strength greater than 35,000 psi (241 MPa) or the wave equation analysis shall be permitted to be used to assess compression stresses induced by driving to evaluate if the pile section is appropriate for the selected hammer. Where a pipe or tube with wall thickness less than 0.179 inch (4.6 mm) is driven open ended, a suitable cutting shoe shall be provided. The pipe or tube casing for socketed drilled shafts shall have a nominal outside diameter of not less than 18 inches (457 mm), a wall thickness of not less than $\frac{3}{8}$ inch (9.5 mm) and a suitable steel driving shoe welded to the bottom; the diameter of the rock socket shall be approximately equal to the inside diameter of the casing.

Exceptions:

1. There is no minimum diameter for steel pipes or tubes used in micropiles.

2. For mandrel-driven pipes or tubes, the minimum wall thickness shall be $\frac{1}{10}$ inch (2.5 mm).

1810.3.5.3.5 Helical Piles

Dimensions of the central shaft and the number, size and thickness of helical bearing plates shall be sufficient to support the design loads.

1810.3.6 Splices

Splices shall be constructed so as to provide and maintain true alignment and position of the component parts of the deep foundation element during installation and subsequent thereto and shall be designed to resist the axial and shear forces and moments occurring at the location of the splice during driving and for design load combinations. Where deep foundation elements of the same type are being spliced, splices shall develop not less than 50 percent of the bending strength of the weaker section. Where deep foundation elements of different materials or different types are being spliced, splices shall develop the full compressive strength and not less than 50 percent of the tension and bending strength of the weaker section. Where structural steel cores are to be spliced, the ends shall be milled or ground to provide full contact and shall be full-depth welded.

Splices occurring in the upper 10 feet (3048 mm) of the embedded portion of an element shall be designed to resist at allowable stresses the moment and shear that would result from an assumed eccentricity of the axial load of 3 inches (76 mm), or the element shall be braced in accordance with Section 1810.2.2 to other deep foundation elements that do not have splices in the upper 10 feet (3048 mm) of embedment.

1810.3.7 Top of Element Detailing at Cutoffs

Where a minimum length for reinforcement or the extent of closely spaced confinement reinforcement is specified at the top of a deep foundation element, provisions shall be made so that those specified lengths or extents are maintained after cutoff.

1810.3.8 Precast Concrete Piles

Precast concrete piles shall be designed and detailed in accordance with Sections 1810.3.8.1 through 1810.3.8.3.

1810.3.8.1 Reinforcement

Longitudinal steel shall be arranged in a symmetrical pattern and be laterally tied with steel ties or wire spiral spaced center to center as follows:

1. At not more than 1 inch (25 mm) for the first five ties or spirals at each end; then
2. At not more than 4 inches (102 mm), for the remainder of the first 2 feet (610 mm) from each end; and then
3. At not more than 6 inches (152 mm) elsewhere.

The size of ties and spirals shall be as follows:

1. For piles having a least horizontal dimension of 16 inches (406 mm) or less, wire shall not be smaller than 0.22 inch (5.6 mm) (No. 5 gage).
2. For piles having a least horizontal dimension of more than 16 inches (406 mm) and less than 20 inches (508 mm), wire shall not be smaller than 0.238 inch (6 mm) (No. 4 gage).
3. For piles having a least horizontal dimension of 20 inches (508 mm) and larger, wire shall not be smaller than $\frac{1}{4}$ inch (6.4 mm) round or 0.259 inch (6.6 mm) (No. 3 gage).

1810.3.8.2 Precast Nonprestressed Piles

Precast non-prestressed concrete piles shall comply with the requirements of Section 1810.3.8.2.1.

1810.3.8.2.1 Minimum Reinforcement

Longitudinal reinforcement shall consist of at least four bars with a minimum longitudinal reinforcement ratio of 0.008.

1810.3.8.3 Precast Prestressed Piles

Precast prestressed concrete piles shall comply with the requirements of Section 1810.3.8.3.1.

1810.3.8.3.1 Effective Prestress

The effective prestress in the pile shall not be less than 400 psi (2.76 MPa) for piles up to 30 feet (9144 mm) in length, 550 psi (3.79 MPa) for piles up to 50 feet (15 240 mm) in length and 700 psi (4.83 MPa) for piles greater than 50 feet (15 240 mm) in length.

Effective prestress shall be based on an assumed loss of 30,000 psi (207 MPa) in the prestressing steel. The tensile stress in the prestressing steel shall not exceed the values specified in ACI 318.

1810.3.9 Cast-in-Place Deep Foundations

Cast-in-place deep foundation elements shall be designed and detailed in accordance with Sections 1810.3.9.1 through 1810.3.9.6.

1810.3.9.1 Design Cracking Moment

The design cracking moment (ϕM_n) for a cast-in-place deep foundation element not enclosed by a structural steel pipe or tube shall be determined using the following equation:

$$\phi M_n = 3 \sqrt{f'_c} S_m \quad (\text{Equation 18-5})$$

$$\text{For SI: } \phi M_n = 0.25 \sqrt{f'_c} S_m$$

where:

f'_c = Specified compressive strength of concrete or grout, psi (MPa).

S_m = Elastic section modulus, neglecting reinforcement and casing, cubic inches (mm^3).

1810.3.9.2 Required Reinforcement

Where subject to uplift or where the required moment strength determined using the strength design load combinations of Section 1605.1 exceeds the design cracking moment determined in accordance with Section 1810.3.9.1, cast-in-place deep foundations not enclosed by a structural steel pipe or tube shall be reinforced.

1810.3.9.3 Placement of Reinforcement

Reinforcement where required shall be assembled and tied together and shall be placed in the deep foundation element as a unit before the reinforced portion of the element is filled with concrete.

Exceptions:

1. Steel dowels embedded 5 feet (1524 mm) or less shall be permitted to be placed after concreting, while the concrete is still in a semifluid state.
2. For deep foundation elements installed with a hollow-stem auger, tied reinforcement shall be placed after elements are concreted, while the concrete is still in a semifluid state. Longitudinal reinforcement without lateral ties shall be placed either through the hollow stem of the auger prior to concreting or after concreting, while the concrete is still in a semifluid state.
3. For Group R-3 and U occupancies not exceeding two stories of light-frame construction, reinforcement is permitted to be placed after concreting, while the concrete is still in a semifluid state, and the concrete cover requirement is permitted to be reduced to 2 inches (51 mm), provided the construction method can be demonstrated to the satisfaction of the *building official*.

1810.3.9.4

Reserved.**1810.3.9.5 Bellied Drilled Shafts**

Where drilled shafts are bellied at the bottom, the edge thickness of the bell shall not be less than that required for the edge of footings. Where the sides of the bell slope at an angle less than 60 degrees (1 rad) from the horizontal, the effects of vertical shear shall be considered.

1810.3.9.6 Socketed Drilled Shafts

Socketed drilled shafts shall have a permanent pipe or tube casing that extends down to bedrock and an uncased socket drilled into the bedrock, both filled with concrete. Socketed drilled shafts shall have reinforcement or a structural steel core for the length as indicated by an *approved* method of analysis.

The depth of the rock socket shall be sufficient to develop the full load-bearing capacity of the element with a minimum safety factor of two, but the depth shall not be less than the outside diameter of the pipe or tube casing. The design of the rock socket is permitted to be predicated on the sum of the allowable load-bearing pressure on the bottom of the socket plus bond along the sides of the socket.

Where a structural steel core is used, the gross cross-sectional area of the core shall not exceed 25 percent of the gross area of the drilled shaft.

1810.3.10 Micropiles

Micropiles shall be designed and detailed in accordance with Sections 1810.3.10.1 through 1810.3.10.3.

1810.3.10.1 Construction

Micropiles shall develop their load-carrying capacity by means of a bond zone in soil, bedrock or a combination of soil and bedrock. Micropiles shall be grouted and have either a steel pipe or tube or steel reinforcement at every section along the length. It shall be permitted to transition from deformed reinforcing bars to steel pipe or tube reinforcement by extending the bars into the pipe or tube section by at least their development length in tension in accordance with ACI 318.

1810.3.10.2 Materials

Reinforcement shall consist of deformed reinforcing bars in accordance with ASTM A615 Grade 60 or 75 or ASTM A722 Grade 150.

The steel pipe or tube shall have a minimum wall thickness of $\frac{3}{16}$ inch (4.8 mm). Splices shall comply with Section 1810.3.6. The steel pipe or tube shall have a minimum yield strength of 45,000 psi (310 MPa) and a minimum elongation of 15 percent as shown by mill certifications or two coupon test samples per 40,000 pounds (18 160 kg) of pipe or tube.

1810.3.10.3 Reinforcement

For micropiles or portions thereof grouted inside a temporary or permanent casing or inside a hole drilled into bedrock or a hole drilled with grout, the steel pipe or tube or steel reinforcement shall be designed to carry at least 40 percent of the design compression load. Micropiles or portions thereof grouted in an open hole in soil without temporary or permanent casing and without suitable means of verifying the hole diameter during grouting shall be designed to carry the entire compression load in the reinforcing steel. Where a steel pipe or tube is used for reinforcement, the portion of the grout enclosed within the pipe is permitted to be included in the determination of the allowable stress in the grout.

1810.3.11 Pile Caps

Pile caps shall conform with ACI 318 and this section. Pile caps shall be of reinforced concrete, and shall include all elements to which vertical deep foundation elements are connected, including grade beams and mats. The soil immediately below the pile cap or grade beam shall not be considered as carrying any vertical load, with the exception of a combined pile raft. The tops of vertical deep foundation elements shall be embedded not less than 3 inches (76 mm) into pile caps or grade beam and the caps shall extend not less than 4 inches (102 mm) beyond the edges of the elements. The tops of elements shall be cut or chipped back to sound material before capping.

1810.4 Installation

Deep foundations shall be installed in accordance with Section 1810.4. Where a single deep foundation element comprises two or more sections of different materials or different types spliced together, each section shall satisfy the applicable conditions of installation.

1810.4.1 Structural Integrity

Deep foundation elements shall be installed in such a manner and sequence as to prevent distortion or damage that may adversely affect the structural integrity of adjacent structures or of foundation elements being installed or already in place and as to avoid compacting the surrounding soil to the extent that other foundation elements cannot be installed properly.

1810.4.1.1 Compressive Strength of Precast Concrete Piles

A precast concrete pile shall not be driven before the concrete has attained a compressive strength of at least 75 percent of the specified compressive strength (f'_c), but not less than the strength sufficient to withstand handling and driving forces.

1810.4.1.2 Shafts in Unstable Soils

Where cast-in-place deep foundation elements are formed through unstable soils, the open hole shall be stabilized by a casing, slurry, or other *approved* method prior to placing the concrete. Where the casing is withdrawn during concreting, the level of concrete shall be maintained above the bottom of the casing at a sufficient height to offset any hydrostatic or lateral soil pressure. Driven casings shall be mandrel driven their full length in contact with the surrounding soil.

1810.4.1.3 Driving Near Uncased Concrete

Deep foundation elements shall not be driven within six element diameters center to center in granular soils or within one-half the element length in cohesive soils of an uncased element filled with concrete less than 48 hours old unless *approved* by the *building official*. If driving near uncased concrete elements causes the concrete surface in any completed element to rise or drop significantly or bleed additional water, the previously completed element shall be replaced.

1810.4.1.4 Driving Near Cased Concrete

Deep foundation elements shall not be driven within four and one-half average diameters of a cased element filled with concrete less than 24 hours old unless *approved* by the *building official*. Concrete shall not be placed in casings within heave range of driving.

1810.4.1.5 Defective Timber Piles

Any substantial sudden increase in rate of penetration of a timber pile shall be investigated for possible damage. If the sudden increase in rate of penetration cannot be correlated to soil strata, the pile shall be removed for inspection or rejected.

1810.4.2 Identification

Deep foundation materials shall be identified for conformity to the specified grade with this identity maintained continuously from the point of manufacture to the point of installation or shall be tested by an *approved agency* to determine conformity to the specified grade. The *approved agency* shall furnish an affidavit of compliance to the *building official*.

1810.4.3 Location Plan

A plan showing the location and designation of deep foundation elements by an identification system shall be filed with the *building official* prior to installation of such elements. Detailed records for elements shall bear an identification corresponding to that shown on the plan.

1810.4.4 Preexcavation

The use of jetting, augering or other methods of preexcavation shall be subject to the approval of the *building official*. Where permitted, preexcavation shall be carried out in the same manner as used for deep foundation elements subject to load tests and in such a manner that will not impair the carrying capacity of the elements already in place or damage adjacent structures. Element tips shall be advanced below the preexcavated depth until the required resistance or penetration is obtained.

1810.4.5 Vibratory Driving

Vibratory drivers shall only be used to install deep foundation elements where the element load capacity is verified by load tests in accordance with Section 1810.3.3.1.2. The installation of production elements shall be controlled according to power consumption, rate of penetration or other *approved* means that ensure element capacities equal or exceed those of the test elements.

Exceptions:

1. The pile installation is completed by driving with an impact hammer in accordance with Section 1810.3.3.1.1.
2. The pile is to be used only for lateral resistance.

1810.4.6 Heaved Elements

Deep foundation elements that have heaved during the driving of adjacent elements shall be redriven as necessary to develop the required capacity and penetration, or the capacity of the element shall be verified by load tests in accordance with Section 1810.3.3.1.2.

1810.4.7 Enlarged Base Cast-in-Place Elements

Enlarged bases for cast-in-place deep foundation elements formed by compacting concrete or by driving a precast base shall be formed in or driven into granular soils. Such elements shall be constructed in the same manner as successful prototype test elements driven for the project. Shafts extending through peat or other organic soil shall be encased in a permanent steel casing. Where a cased shaft is used, the shaft shall be adequately reinforced to resist column action or the annular space around the shaft shall be filled sufficiently to reestablish lateral support by the soil. Where heave occurs, the element shall be replaced unless it is demonstrated that the element is undamaged and capable of carrying twice its design load.

1810.4.8 Hollow-Stem Augered, Cast-in-Place Elements

Where concrete or grout is placed by pumping through a hollow-stem auger, the auger shall be permitted to rotate in a clockwise direction during withdrawal. As the auger is withdrawn at a steady rate or in increments not to exceed 1 foot (305 mm), concreting or grouting pumping pressures shall be measured and maintained high enough at all times to offset hydrostatic and lateral earth pressures. Concrete or grout volumes shall be measured to ensure that the volume of concrete or grout placed in each element is equal to or greater than the theoretical volume of the hole created by the auger. Where the installation process of any element is interrupted or a loss of concreting or grouting pressure occurs, the element shall be redrilled to 5 feet (1524 mm) below the elevation of the tip of the auger when the installation was interrupted or concrete or grout pressure was lost and reformed. Augered cast-in-place elements shall not be installed within six diameters center to center of an element filled with concrete or grout less than 12 hours old, unless approved by the *building official*. If the concrete or grout level in any completed element drops due to installation of an adjacent element, the element shall be replaced.

1810.4.9 Socketed Drilled Shafts

The rock socket and pipe or tube casing of socketed drilled shafts shall be thoroughly cleaned of foreign materials before filling with concrete. Steel cores shall be bedded in cement grout at the base of the rock socket.

1810.4.10 Micropiles

Micropile deep foundation elements shall be permitted to be formed in holes advanced by rotary or percussive drilling methods, with or without casing. The elements shall be grouted with a fluid cement grout. The grout shall be pumped through a tremie pipe extending to the bottom of the element until grout of suitable quality returns at the top of the element. The following requirements apply to specific installation methods:

1. For micropiles grouted inside a temporary casing, the reinforcing bars shall be inserted prior to withdrawal of the casing. The casing shall be withdrawn in a controlled manner with the grout level maintained at the top of the element to ensure that the grout completely fills the drill hole. During withdrawal of the casing, the grout level inside the casing shall be monitored to verify that the flow of grout inside the casing is not obstructed.
2. For a micropile or portion thereof grouted in an open drill hole in soil without temporary casing, the minimum design diameter of the drill hole shall be verified by a suitable device during grouting.
3. For micropiles designed for end bearing, a suitable means shall be employed to verify that the bearing surface is properly cleaned prior to grouting.
4. Subsequent micropiles shall not be drilled near elements that have been grouted until the grout has had sufficient time to harden.
5. Micropiles shall be grouted as soon as possible after drilling is completed.
6. For micropiles designed with a full-length casing, the casing shall be pulled back to the top of the bond zone and reinserted or some other suitable means employed to assure grout coverage outside the casing.

1810.4.11 Helical Piles

Helical piles shall be installed to specified embedment depth and torsional resistance criteria as determined by a *registered design professional*. The torque applied during installation shall not exceed the manufacturer's rated maximum installation torque resistance of

the helical pile.

1810.4.12 Special Inspection

Reserved.

Section 1811 Through 1815

RESERVED

Section 1816 Termite Protection

1816.1 Termite Protection

Termite protection shall be provided by registered termiticides, including soil applied pesticides, baiting systems, and pesticides applied to wood, or other approved methods of termite protection labeled for use as a preventative treatment to new construction. See Section 202, "Registered termicide." Upon completion of the application of the termite protective treatment, a certificate of compliance shall be issued to the building department by the licensed pest control company that contains the following statement: "The building has received a complete treatment for the prevention of subterranean termites. Treatment is in accordance with rules and laws established by the Florida Department of Agriculture and Consumer Services."

1816.1.1

If soil treatment is used for subterranean termite prevention, the initial chemical soil treatment inside the foundation perimeter shall be done after all excavation, backfilling and compaction is complete.

1816.1.2

If soil treatment is used for subterranean termite prevention, soil area disturbed after initial chemical soil treatment shall be retreated with a chemical soil treatment, including spaces boxed or formed.

1816.1.3

If soil treatment is used for subterranean termite prevention, space in concrete floors boxed out or formed for the subsequent installation of plumbing traps, drains or any other purpose shall be created by using plastic or metal permanently placed forms of sufficient depth to eliminate any planned soil disturbance after initial chemical soil treatment.

1816.1.4

If soil treatment is used for subterranean termite prevention, chemically treated soil shall be protected with a minimum 6 millimeter vapor retarder to protect against rainfall dilution. If rainfall occurs before vapor retarder placement, retreatment is required. Any work, including placement of reinforcing steel, done after chemical treatment until the concrete floor is poured, shall be done in such manner as to avoid penetrating or disturbing treated soil.

1816.1.5

If soil treatment is used for subterranean termite prevention, concrete overpour or mortar accumulated along the exterior foundation perimeter shall be removed prior to exterior chemical soil treatment, to enhance vertical penetration of the chemicals.

1816.1.6

If soil treatment is used for subterranean termite prevention, chemical soil treatments shall also be applied under all exterior concrete or grade within 1 foot (305 mm) of the primary structure sidewalls. Also, a vertical chemical barrier shall be applied promptly after construction is completed, including initial landscaping and irrigation/sprinkler installation. Any soil disturbed after the chemical vertical barrier is applied shall be promptly retreated.

1816.1.7

If a registered termicide formulated and registered as a bait system is used for subterranean termite prevention, Sections 1816.1.1 through 1816.1.6 do not apply; however, a signed contract assuring the installation, maintenance and monitoring of the baiting system that is in compliance with the requirements of Chapter 482, *Florida Statutes* shall be provided to the building official prior to the pouring of the slab, and the system must be installed prior to final building approval. If the baiting system directions for use require a monitoring phase prior to installation of the pesticide active ingredient, the installation of the monitoring phase components shall be deemed to constitute installation of the system.

1816.1.8

If a registered termiticide formulated and registered as a wood treatment is used for subterranean termite prevention, Sections 1816.1.1 through 1816.1.6 do not apply. Application of a wood treatment termiticide shall be as required by label directions for use, and must be completed prior to final building approval. Changes in framing or additions to framing in areas of the structure requiring treatment that occur after the initial wood treatment must be treated prior to final building approval.

1816.2 Penetration

Protective sleeves around piping penetrating concrete slab-on-grade floors shall not be of cellulose-containing materials. If soil treatment is used for subterranean termite protection, the sleeve shall have a maximum wall thickness of 0.010 inch, and be sealed within the slab using a noncorrosive clamping device to eliminate the annular space between the pipe and the sleeve. No termiticides shall be applied inside the sleeve.

Section 1817 High-Velocity Hurricane Zones— Excavations

RESERVED

Section 1818 High-Velocity Hurricane Zones— Bearing Capacity of Soil

RESERVED

Section 1819 High-Velocity Hurricane Zones— Soil Bearing Foundations

RESERVED

Section 1820 High-Velocity Hurricane Zones— Concrete Slabs on Fill

RESERVED

Section 1821 High-Velocity Hurricane Zones— Monolithic Footings

RESERVED

Section 1822 High-Velocity Hurricane Zones— Pile Foundations

RESERVED

Section 1823 High-Velocity Hurricane Zones— Wood Piles

RESERVED

Section 1824 High-Velocity Hurricane Zones— Precast Concrete Piles

RESERVED

Section 1825 High-Velocity Hurricane Zones— Prestressed Precast Concrete Piles

RESERVED

Section 1826 High-Velocity Hurricane Zones— Cast-in-Place

RESERVED

Section 1827 High-Velocity Hurricane Zones— Rolled Structural Shapes

RESERVED

Section 1828 High-Velocity Hurricane Zones— Special Piles or Special Conditions

RESERVED

Section 1829 High-Velocity Hurricane Zones— Load Tests on Piles

RESERVED

Section 1830 High-Velocity Hurricane Zones— Foundation Walls and Grade Beams

RESERVED

Section 1831 High-Velocity Hurricane Zones— Grades Under Buildings

RESERVED

Section 1832 High-Velocity Hurricane Zones— Retaining Walls**RESERVED****Section 1833 High-Velocity Hurricane Zones—Seawalls and Bulkheads****RESERVED****Section 1834 High-Velocity Hurricane Zones— Soil Improvement****RESERVED**

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Chapter 19 Concrete

Italics are used for text within Sections 1903 through 1905 of this code to indicate provisions that differ from ACI 318.

Section 1901 General

1901.1 Scope

The provisions of this chapter shall govern the materials, quality control, design and construction of concrete used in structures.

1901.2 Plain and Reinforced Concrete

Structural concrete shall be designed and constructed in accordance with the requirements of this chapter and ACI 318 as amended in Section 1905 of this code. Except for the provisions of Sections 1904 and 1907, the design and construction of slabs on grade shall not be governed by this chapter unless they transmit vertical loads or lateral forces from other parts of the structure to the soil.

1901.3 Anchoring to Concrete

Anchoring to concrete shall be in accordance with ACI 318 as amended in Section 1905, and applies to cast-in (headed bolts, headed studs and hooked J- or L-bolts), post-installed expansion (torque-controlled and displacement-controlled), undercut, screw, and adhesive anchors.

1901.4 Composite Structural Steel and Concrete Structures

Systems of structural steel acting compositely with reinforced concrete shall be designed in accordance with Section 2206 of this code.

1901.5 Construction Documents

The *construction documents* for structural concrete construction shall include:

1. The specified compressive strength of concrete at the stated ages or stages of construction for which each concrete element is designed.
2. The specified strength or grade of reinforcement.
3. The size and location of structural elements, reinforcement and anchors.
4. Provision for dimensional changes resulting from creep, shrinkage and temperature.
5. The magnitude and location of prestressing forces.
6. Anchorage length of reinforcement and location and length of lap splices.
7. Type and location of mechanical and welded splices of reinforcement.
8. Details and location of contraction or isolation joints specified for plain concrete.
9. Minimum concrete compressive strength at time of posttensioning.
10. Stressing sequence for posttensioning tendons.
11. Reserved.

1901.6 Special Inspections and Tests

Reserved.

1901.7 Tolerances for Structural Concrete

Where not indicated in construction documents, structural tolerances for concrete structural elements shall be in accordance with this section.

1901.7.1 Cast-in-Place Concrete Tolerances

Structural tolerances for cast-in-place concrete structural elements shall be in accordance with ACI 117.

Exceptions:

1. Group R-3 detached one- or two-family dwellings are not required to comply with this section
2. Shotcrete is not required to comply with this section

1901.7.2 Precast Concrete Tolerances

Structural tolerances for precast concrete structural elements shall be in accordance with ACI ITG-7.

Exception: Group R-3 detached one- or two-family dwellings are not required to comply with this section.

Section 1902 Coordination of Terms**1902.1 General**

Coordination of terminology used in ACI 318 and ASCE 7 shall, for the purposes of this chapter and as used elsewhere in this code for concrete construction, have the meanings shown in ACI 318 as modified by Section 1905.1.

Section 1903 Specifications for Tests and Materials**1903.1 General**

Materials used to produce concrete, concrete itself and testing thereof shall comply with the applicable standards listed in ACI 318.

1903.2 Special Inspections

Where required, special inspections and tests shall be in accordance with Chapter 17.

1903.3 Glass Fiber-Reinforced Concrete

Glass fiber-reinforced concrete (GFRC) and the materials used in such concrete shall be in accordance with the PCI MNL 128 standard.

1903.4 Flat Wall Insulating Concrete Form (ICF) Systems

Insulating concrete form material used for forming flat concrete walls shall conform to ASTM E2634.

Section 1904 Durability Requirements**1904.1 Structural Concrete**

Structural concrete shall conform to the durability requirements of ACI 318.

Exception: For Group R-2 and R-3 occupancies not more than three stories above grade plane, the specified compressive strength, f'_c for concrete in basement walls, foundation walls, exterior walls and other vertical surfaces exposed to the weather shall be not less than 3,000 psi (20.7 MPa).

1904.2 Nonstructural Concrete

The registered design professional shall assign nonstructural concrete a freeze-thaw exposure class, as defined in ACI 318, based on the anticipated exposure of nonstructural concrete. Nonstructural concrete shall have a minimum specified compressive strength, f'_c of 2,500 psi (17.2 MPa) for Class F0; 3,000 psi (20.7 MPa) for Class F1; and 3,500 psi (24.1 MPa) for Classes F2 and F3. Nonstructural concrete shall be air entrained in accordance with ACI 318.

Section 1905 Modifications to ACI 318

1905.1 General

The text of ACI 318 shall be modified as indicated in Sections 1905.1.1 through 1905.1.6.

1905.1.1 ACI 318, Section 2.3

Modify existing definitions and add the following definitions to ACI 318, Section 2.3.

DETAILED PLAIN CONCRETE STRUCTURAL WALL. A wall complying with the requirements of Chapter 14, including 14.6.2.

ORDINARY PRECAST STRUCTURAL WALL. A precast wall complying with the requirements of Chapters 1 through 13, 15, 16 and 19 through 26.

ORDINARY REINFORCED CONCRETE STRUCTURAL WALL. A *cast-in-place* wall complying with the requirements of Chapters 1 through 13, 15, 16 and 19 through 26.

ORDINARY STRUCTURAL PLAIN CONCRETE WALL. A wall complying with the requirements of Chapter 14, *excluding* 14.6.2.

1905.1.2 ACI 318, Section 18.2.1

Modify ACI 318 Section 18.2.1.2 to read as follows:

18.2.1.2 — *Structures shall satisfy requirements of Chapters 1 through 17 and 19 through 26; Chapter 18 does not apply.*

1905.1.3 ACI 318, Section 18.5

Modify ACI 318, Section 18.5, by adding new Section 18.5.2.2 and renumbering existing Section 18.5.2.2 to become 18.5.2.3.

18.5.2.2 — *Connections that are designed to yield shall be capable of maintaining 80 percent of their design strength at the deformation induced by the design displacement or shall use Type 2 mechanical splices.*

18.5.2.3 — For elements of the connection that are not designed to yield, the required strength shall be based on $1.5 S_y$ of the yielding portion of the connection.

1905.1.4 ACI 318, Section 18.11

Modify ACI 318, Section 18.11.2.1, to read as follows:

18.11.2.1 — Special structural walls constructed using precast concrete shall satisfy all the requirements of 18.10 for *cast-in-place special structural walls* in addition to 18.5.2.

1905.1.5 ACI 318, Section 18.13.1.1

Reserved.

1905.1.6 ACI 318, Section 14.6

Modify ACI 318, Section 14.6, by adding new Section 14.6.2 to read as follows:

14.6.2 — *Detailed plain concrete structural walls.*

14.6.2.1 — *Detailed plain concrete structural walls are walls conforming to the requirements of ordinary structural plain concrete walls and 14.6.2.2.*

14.6.2.2 — Reinforcement shall be provided as follows:

- (a) *Vertical reinforcement of at least 0.20 square inch (129 mm²) in cross-sectional area shall be provided continuously from support to support at each corner, at each side of each opening and at the ends of walls. The continuous vertical bar required beside an opening is permitted to substitute for one of the two No. 5 bars required by 14.6.1.*
- (b) *Horizontal reinforcement at least 0.20 square inch (129 mm²) in cross-sectional area shall be provided:*
 - 1. *Continuously at structurally connected roof and floor levels and at the top of walls;*

2. At the bottom of load-bearing walls or in the top of foundations where doweled to the wall; and

3. At a maximum spacing of 120 inches (3048 mm).

Reinforcement at the top and bottom of openings, where used in determining the maximum spacing specified in Item 3 above, shall be continuous in the wall.

Section 1906 Footings for Light-Frame Construction

1906.1 Plain Concrete Footings

For Group R-3 occupancies and buildings of other occupancies less than two stories above grade plane of light-frame construction, the required thickness of plain concrete footings is permitted to be 6 inches (152 mm), provided that the footing does not extend more than 4 inches (102 mm) on either side of the supported wall.

Section 1907 Minimum Slab Provisions

1907.1 General

The thickness of concrete floor slabs supported directly on the ground shall not be less than $3\frac{1}{2}$ inches (89 mm). A 6-mil (0.006 inch; 0.15 mm) polyethylene vapor retarder with joints lapped not less than 6 inches (152 mm) shall be placed between the base course or subgrade and the concrete floor slab, or other *approved* equivalent methods or materials shall be used to retard vapor transmission through the floor slab.

Exception: A vapor retarder is not required:

1. For detached structures accessory to occupancies in Group R-3, such as garages, utility buildings or other unheated facilities.
2. For unheated storage rooms having an area of less than 70 square feet (6.5 m^2) and carports attached to occupancies in Group R-3.
3. For buildings of other occupancies where migration of moisture through the slab from below will not be detrimental to the intended occupancy of the building.
4. For driveways, walks, patios and other flatwork that will not be enclosed at a later date.
5. Where *approved* based on local site conditions.

1907.2 Control and Contraction Joints

Concrete slabs-on-ground shall be provided with control and contraction joints in accordance with ACI 360 or other approved industry standards. Control and contraction joints shall be designed by an architect or engineer.

Exception: One- and two-family dwellings and townhouses shall comply with the *Florida Building Code, Residential* Section R506.2.4.

In addition to control and contraction joints, concrete slabs-on-ground shall be provided with crack containment complying with one of the following:

1. Concrete slabs-on-ground shall contain micro- or macro-synthetic fiber reinforcement. Fiber length shall be $\frac{1}{2}$ inch to 2.25 inches (13 to 56 mm) in length. Dosage amounts shall be from 0.75 to 3.0 pounds per cubic yard (0.45 to 1.78 kg/m³) in accordance with the manufacturer's recommendations. Synthetic fibers shall comply with ASTM C1116. The manufacturer or supplier shall provide certification of compliance with ASTM C1116 when requested by the building official; or,

2. Concrete slabs-on-ground containing 6×6 W1.4 × W1.4 welded wire reinforcement fabric located in the middle to the upper one-third of the slab. Welded wire reinforcement fabric shall be supported with approved materials or supports at spacing of 3 feet (914 mm) or less. Welded plain wire reinforcement fabric for concrete shall conform to ASTM A1064/A1064M Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

Exception: Where random cracking is acceptable to the building owner, contraction joints are not required where crack containment complying with one of the above methods is provided.

Section 1908 Shotcrete

1908.1 General

Shotcrete shall be in accordance with the requirements of ACI 318.

Section 1909 Special Wind Provisions for Concrete

1909.1 Reinforced Concrete

The design and construction of reinforced concrete for buildings sited in areas where the ultimate design wind speed, V_{ult} , is equal to or greater than 115 mph (45 m/s) in accordance with Figure 1609.3(1), 1609.3(2), 1609.3(3) or 1609.3(4) shall conform to the requirements of ACI 318 or with Section 1609.1.1, Exception 1, as applicable, except as modified in this section.

1909.2 Insulated Concrete Form Wall

Insulated concrete form (ICF) wall construction for buildings shall be in accordance with ACI 318 or with Section 1609.1.1, Exception 1, as applicable.

1909.3 Gable Endwalls

1909.3.1 General

Gable endwalls shall be structurally continuous between points of lateral support.

1909.3.2 Cathedral Endwalls

Gable endwalls adjacent to cathedral ceilings shall be structurally continuous from the uppermost floor to ceiling diaphragm or to the roof diaphragm.

Section 1910 Through 1916

RESERVED

Section 1917 Lightweight Insulating Concrete Roofs

1917.1 Lightweight Insulating Concrete

Material produced with or without aggregate additions to Portland cement, water and air to form a hardened material possessing insulating qualities, which, when oven dried shall have a unit weight no greater than 50pcf (801 kg/m^3).

1917.1.1 Aggregate Lightweight Insulating Concrete

Insulating concrete formulated predominantly with perlite or vermiculite aggregate having a minimum compressive strength of 125 psi (861.8 kPa) when tested in compliance with ASTM C495.

1917.1.2 Cellular Lightweight Insulating Concrete

Insulating concrete formulated by mixing a hydrated cementitious matrix around noninterconnecting air cells created by the addition of preformed foam formed from hydrolyzed proteins or synthetic surfactants. The cured cellular lightweight insulating concrete shall have minimum compressive strength of 160 psi (1103 kPa) when tested in compliance with ASTM C495 and C796.

1917.1.3 Cellular/Aggregate (Hybrid) Lightweight Insulating Concrete

Insulated concrete formulated by combining preformed foam with low density aggregates to impart properties of both aggregate and cellular lightweight insulating concrete. It shall have a minimum compressive strength of 200 psi (1379 kPa) when tested in compliance

with ASTM C495 and C796.

1917.2 Inspection

1917.2.1

Application of all lightweight insulating concrete roof decks shall be by applicators approved by the light-weight insulating concrete deck manufacturer. Product approval shall be required for all lightweight insulating concrete systems.

1917.2.2

The permit holder shall notify the building official 48 hours prior to the pouring of lightweight insulating concrete.

1917.2.3

The permit holder shall make available to the building official a job log with the following minimum items.

1. Cast density recordings/hour.
2. Product evaluation for application.
3. Date and job locations identified.
4. Results of any field test conducted.

1917.2.4

Once the roof deck system can support foot traffic, the building official shall have clear access and clear path at his option for inspection of lightweight insulating concrete.

1917.3 Testing

The building official may require tests of the lightweight insulating concrete to confirm the fastener withdrawal resistance, compressive strength or drainage ability.

1917.3.1

Existing roof assemblies to receive lightweight insulating concrete other than galvanized G-90 steel deck or structural concrete deck shall be tested for uplift for adhesion to the substrate to confirm compliance with design pressure.

1917.4 Materials and Limitations of Use

Lightweight insulating concrete, in conjunction with galvanized formed steel sheets, shall not be used as a roof deck in areas where highly corrosive chemicals are used or stored.

1917.4.1

Lightweight insulating concrete shall be poured over bottom slotted galvanized (G-90) steel decking as follows; cellular, 0.5-percent open; hybrid, 0.75-percent open, aggregate, 1.5-percent open. No lightweight insulating concrete shall be poured over a painted or nongalvanized steel deck.

1. Lightweight insulating concrete over structural concrete slabs, twin tees, precast units or other nonventing substrates shall be vented to allow the escape of excess moisture.

1917.4.2

Minimum thickness of lightweight insulating concrete shall be 2 inches (51 mm) over the top plane of the substrate unless otherwise specified in the product approval. Lightweight insulating concrete shall be of sufficient thickness to receive the specified base ply fastener length.

1917.4.3

Galvanized coatings of formed steel sheets shall be in accordance with ASTM A525 with a minimum coating designation of G-90. Base steel shall conform to ASTM A446, Grade A, B, C, D or greater and ASTM A611 C, D or E.

1917.4.4

Chemical admixtures shall be in compliance with ASTM C494. Calcium chloride or any admixture containing chloride salts shall not be used in insulating concrete. Fiber reinforcement may be used to control cracking. Mineral admixtures shall conform to ASTM C618.

1917.4.5

Vermiculite or perlite shall be in compliance with ASTM C332, Group I. Foam concentrates shall be in compliance with ASTM C796 and ASTM C869.

1917.4.6

Mixing, placing and finishing shall be in compliance with the deck system product approval. Slurry coating, two-density casting and double casting shall be acceptable in accordance with the specific manufacturer's recommendations.

1917.4.7

If the lightweight insulating concrete deck is to receive product approval for a direct-adhered roofing system, the deck surface shall be prepared to the requirements set forth in the roof system product approval.

1917.4.8

All base ply fasteners for use in lightweight insulating concrete roof decks shall have a product approval for use with the specific lightweight insulating concrete roof system in compliance with manufacturer's recommendations and the design pressure of Section 1609 (Section 1620 for the High-Velocity Hurricane Zone).

1917.4.9

The lightweight insulating concrete fastener withdrawal shall have a minimum resistance for new pours of:

1. 60 pounds (267 N) in 28 days when the fastener is installed and allowed to age in the concrete.
2. 40 pounds (178 N) at time of roofing.

1917.4.10

Insulation board with lightweight insulating concrete shall conform to Type I expanded polystyrene insulation as defined in ASTM C578.

1. Packaged insulation board delivered to the job site shall comply with the provisions of Section 2603.2.
2. Installation of insulating board in conjunction with lightweight insulating concrete shall comply with uplift requirements set forth in Section 1609 (Section 1620 for the High-Velocity Hurricane Zone). Insulation panels shall be placed in a minimum $\frac{1}{8}$ -inch (3.2 mm) slurry of insulating concrete while the material is still in a plastic state. The insulating concrete shall be cast over the insulation boards according to the insulating concrete manufacturer's product approval. Insulation panels shall be provided with holes and/or slots for keying and venting.

1917.4.11

Reinforcing mesh shall be provided as required to meet fire-rating and/or special structural design requirements. Refer to a specific product approval for the specific requirements applicable to the product being installed.

Section 1918**RESERVED****Section 1919 High-Velocity Hurricane Zones—General**

RESERVED**Section 1920 High-Velocity Hurricane Zones—Standards****RESERVED****Section 1921 High-Velocity Hurricane Zones—Definitions****RESERVED****Section 1922 High-Velocity Hurricane Zones—Materials****RESERVED****Section 1923 High-Velocity Hurricane Zones—Concrete Quality****RESERVED****Section 1924 High-Velocity Hurricane Zones—Mixing and Placing Concrete****RESERVED****Section 1925 High-Velocity Hurricane Zones—Formwork, Embedded Pipes and Construction Joints****RESERVED****Section 1926 High-Velocity Hurricane Zones—Details of Reinforcement****RESERVED****Section 1927 High-Velocity Hurricane Zones—Precast Concrete Units****RESERVED****Section 1928 High-Velocity Hurricane Zones—Prestressed Concrete****RESERVED****Section 1929 High-Velocity Hurricane Zones— Pneumatically Placed Concrete (Shotcrete)****RESERVED**

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Chapter 20 Aluminum

Section 2001 General

2001.1 Scope

This chapter shall govern the quality, design, fabrication and erection of aluminum. The quality, design, fabrication and erection of aluminum used structurally in buildings or structures shall conform to good engineering practice, the provisions of this chapter and other applicable requirements of this code.

Exception: Buildings and structures located within the high-velocity hurricane zone shall comply with the provisions of Sections 2002.7 and 2003.

Section 2002 Materials

2002.1 General

Aluminum used for structural purposes in buildings and structures shall comply with AA ASM 35 and AA ADM 1. The *nominal loads* shall be the minimum design loads required by Chapter 16. The use of aluminum alloys not listed in the manual shall be permitted provided their standard of performance is not less than those required in the manual and the performance is substantiated to the satisfaction of the building official.

2002.2 Definitions

PRIMARY MEMBER. Structural framing members providing structural support to other members and/or surfaces of a structure including, but not limited to beams, posts, columns, joists, structural gutters, headers, eave rail, purlins, roof brace.

SECONDARY MEMBERS. Structural framing members which do not provide basic support for the entire structure, generally including, but not limited to, such members as kickplate rails, chair rails, roof or wall panels, wall brace.

STRUCTURAL MEMBERS. Members or sections that provide support to an assembly and/or resist applied loads.

2002.3 Screen Enclosures

2002.3.1 Thickness

Actual wall thickness of extruded aluminum members shall be not less than 0.040 inch (1 mm).

2002.3.2

Reserved.

2002.3.3 Vinyl, Tempered Glass, and Acrylic Panels

Vinyl, tempered glass, and acrylic panels shall be removable. Removable panels shall be identified as removable by a decal. The identification decal shall essentially state "Removable panel SHALL be removed when wind speeds exceed 75 mph (34 m/s)." Decals shall be placed such that the decal is visible when the panel is installed.

2002.4 Loads

Structural members supporting screened enclosures shall be designed for wind in both of two orthogonal directions using the pressures given in Table 2002.4. Each primary member shall also be designed for a 300 pound (1.33 kN) load applied vertically downward along any 1 foot (305 mm) of any member, not occurring simultaneously with wind load.

Exception: In addition to wind pressures, purlins shall also be designed for a 200 pound (0.89 kN) load applied vertically downward along any 1 foot (305 mm) of any member, not occurring simultaneously with wind load.

TABLE 2002.4

DESIGN WIND PRESSURES SCREENED ENCLOSURES^{a, b, f, g, h}

(STRENGTH DESIGN OR LRFD ONLY)

	ULTIMATE DESIGN WIND SPEED V_{ULT} (MPH)																				
	110		120		130		140		150		160		170								
Surface	Design Pressures by Exposure Category (psf)																				
	B	C	D	B	C	D	B	C	D	B	C	D	B	C	D	B	C	D	B	C	D
Horizontal Pressures on Windward Surfaces ^d	17	24	28	20	28	33	23	32	38	27	38	44	31	43	51	36	49	58	40	56	66
Horizontal Pressures on Leeward Surfaces ^d	13	18	21	15	22	26	20	26	31	21	29	34	22	34	40	25	39	46	29	44	52
Vertical Pressures on Screen Surfaces ^c	4	7	8	6	8	9	6	9	11	8	11	12	9	12	14	10	14	16	11	15	18
Vertical Pressures on Solid Surfaces ^e	17	24	29	21	29	34	24	34	40	28	39	46	32	45	53	36	51	60	41	58	68

For SI: 1 pound per square foot = 9.479 kN/m².

NOTES:

- a. Pressures apply to enclosures with a mean enclosure roof height of 30 feet (10 m). For other heights, multiply the pressures in this table by the factors in Table 2002.4A.
- b. Apply horizontal pressures to the area of the enclosure projected on a vertical plane normal to the assumed wind direction, simultaneously inward on the windward side and outward on the leeward side.
- c. Apply vertical pressures upward or downward to the area of the enclosure projected on a horizontal plane.
- d. Apply horizontal pressures simultaneously with vertical pressures.
- e. Table pressures are MWFRS Loads. The design of solid roof panels and their attachments shall be based on component and cladding loads for enclosed structures, partially enclosed structures, or attached canopies, as appropriate.
- f. Table pressures apply to 20 × 20 × 0.013" mesh screen. For 18 × 14 × 0.013" mesh screen, pressures on screen surfaces may be multiplied by 0.88. For screen densities greater than 20 × 20 × 0.013", use pressures for enclosed buildings.
- g. Table pressures may be interpolated using ASCE 7 methodology.
- h. For allowable stress design (ASD) pressures shall be permitted to be multiplied by 0.6.

TABLE 2002.4A

HEIGHT ADJUSTMENT FACTORS

MEAN ROOF HEIGHT	EXPOSURE		
	B	C	D
0—15	0.81	0.86	0.89
20	0.89	0.92	0.93
25	0.94	0.96	0.97
30	1	1	1
35	1.05	1.03	1.03
40	1.09	1.06	1.05
45	1.12	1.09	1.07
50	1.16	1.11	1.09
55	1.19	1.14	1.11
60	1.22	1.16	1.13

2002.4.1 Design Guide

The AAF Guide to Aluminum Construction in High Wind Areas shall be accepted as conforming to accepted engineering practices.

2002.5 Wall Panels

The minimum thickness for formed sheet aluminum structural wall panels shall be not less than 0.024 inch (0.6 mm), subject to approved tolerances.

2002.6 Sunroom Design

2002.6.1

Sunrooms shall comply with AAMA/NPEA/NSA 2100.

2002.6.2

For the purpose of applying the criteria of AAMA/NPEA/NSA 2100 based on the intended use, sunrooms shall be identified as one of the following categories by the permit applicant, design professional or the property owner or owner's agent in the construction documents. Component and cladding pressures shall be used for the design of elements that do not qualify as main windforce-resisting systems. Main windforce-resisting system pressures shall be used for the design of elements assigned to provide support and stability for the overall sunroom.

Category I: A thermally isolated sunroom with walls that are open or enclosed with insect screening or 0.5 mm (20 mil) maximum thickness plastic film. The space is nonhabitable and unconditioned.

Category II: A thermally isolated sunroom with enclosed walls. The openings are enclosed with translucent or transparent plastic or glass. The space is nonhabitable and unconditioned.

Category III: A thermally isolated sunroom with enclosed walls. The openings are enclosed with translucent or transparent plastic or glass. The sunroom fenestration complies with additional requirements for air infiltration resistance and water penetration resistance. The space is defined as a nonhabitable and unconditioned.

Category IV: A thermally isolated sunroom with enclosed walls. The sunroom is designed to be heated or cooled by a separate temperature control or system and is thermally isolated from the primary structure. The sunroom fenestration complies with additional requirements for water penetration resistance, air infiltration resistance and thermal performance. The space is nonhabitable and conditioned.

Category V: A sunroom with enclosed walls. The sunroom is designed to be heated or cooled and is open to the main structure. The sunroom fenestration complies with additional requirements for water penetration resistance, air infiltration resistance and thermal performance. The space is habitable and conditioned.

2002.7 Alternative Design Method for Screen Enclosure

- (1) The purpose of this section is to provide an alternate method for designing aluminum screen enclosures as defined by the *Florida Building Code*, permitting the loads of the structural frame to be based on portions of the screen in the screen walls removed, retracted, moved to the open position, or cut. The use of framing materials other than aluminum is allowed in accordance with Section 104.11. The method applies only to walls and roofs with 100-percent screen.
 - (a) Screen enclosure frames designed in accordance with the screen removal alternates of this section, shall be designed using signed and sealed site-specific engineering and shall be designed in accordance with the wind load provisions of Section 1609.1.1,
 - (b) Designs that consider these screen alternates shall comply with Section 2002.4 and Table 2002.4, using the 110 mph column as modified by Table 2002.4A with all screen panels in place.
 - (c) Designs using strength design or load and resistance factor design in accordance with Section 1605.1 or allowable stress design methods of Section 1605.1 shall be permitted.
 - (d) The design shall be by rational analysis or by 3D finite element analysis. Either method will be acceptable.
- (2) Where screen enclosures are designed in accordance with the screen removal alternates of this section, removable screen may consist of removable panels, retractable panels, or by designating specific screen panels in the design in which the screen is to be removed by cutting the screen. Removable panels shall be removed, retractable panels shall be placed in the retracted position without increasing the load on the affected area. Screen designated in the design to be cut shall be completely cut when wind speeds are forecast to exceed 75 mph.
- (3) Where screen enclosures designed in accordance with the screen removal alternates of this section serve as the barrier required by Section 454.2.17 the required minimum height of the barrier shall be maintained when screen panels are retracted, removed, moved to the open position, or cut.
- (4) Where screen enclosures are designed in accordance with the screen removal alternates of this section, retractable screen panels, removable screen panels, and screen panels identified to be cut shall be clearly identified on adjacent structural members with highly visible permanent labels, at each panel, or by other means approved by the local building department.
- (5) Where screen enclosures are designed in accordance with the screen removal alternates of this section, the retraction of screen panels, removal of screen panels, or cutting of screen panels shall not require the use of ladders or scaffolding.
- (6) Engineering documents submitted with building permit applications shall identify the panels to be removed, retracted, opened, or cut.
- (7) Where screen enclosures are designed in accordance with the screen removal alternates of this section based on removing screen panels by cutting the screen, the contractor shall provide replacement screen for a one-time replacement of all screen and spline designated by the design to be cut.
- (8) Where screen enclosures are designed in accordance with the screen removal alternates of this section, the contractor shall provide written notice to the owner and the local building code enforcement department that the owner must retract, remove, or cut a panel or panels of the screen enclosure in accordance with the project engineering design or the manufacturer's instructions when wind speeds are expected to exceed 75 mph (34 m/s).

2002.8 Sun Control Structure Design

A registered design professional shall design sun control structures.

2002.8.1

Free-standing sun control structures shall be permitted to be designed to resist wind speeds for *Risk Category I* of Figure 1609.3(4). Sun control structures relying on a host structure for support shall be designed for the *risk category* of the host structure.

2002.8.2

Operable louvers shall be repositioned and locked in the vertical open position when wind speeds are predicted to be 75 mph (34 m/s) or greater. The contractor shall post a legible and readily visible permanent decal or sign stating words to the effect that the operable louvers are to be locked in the vertically open position when wind speeds are predicted to be 75 mph (34 m/s) and during a hurricane warning or alert as designated by the National Weather Service. The warning label should essentially read:

THIS SUN CONTROL STRUCTURE SHALL HAVE
LOUVERED BLADES LOCKED IN THE VERTICAL
POSITION DURING A HURRICANE WARNING
OR ALERT AS DESIGNATED BY THE NATIONAL
WEATHER SERVICE OR WHEN WIND SPEEDS
ARE PREDICTED TO BE 75 MPH.

2002.8.3 Electrical Installations

All electrical components and installations shall comply with Chapter 27.

Section 2003 High-Velocity Hurricane Zones—Aluminum**2003.1 Design**

Aluminum members shall be designed by methods admitting of rational analysis according to established principles of mechanics.

2003.2 Standards

The design, fabrication, and erection of structural aluminum shall conform to the *Aluminum Design Manual*.

2003.3 Workmanship

Aluminum construction shall be in conformance with the tolerances, quality and methods of construction as set forth in Section 2003.2 and the American Welding Society's *Structural Welding Code—Aluminum (D1.2)*.

2003.4 Definitions

Reserved.

2003.5 Identification

Reserved.

2003.6 Allowable Unit Stresses**2003.6.1**

The design, fabrication and assembly of aluminum members for building and other structures shall conform to the standard set forth in Section 2003.2 and as otherwise set forth herein.

2003.6.2

Reserved.

2003.6.3

Aluminum members shall be limited by the deflections set forth in Section 1616.3.

2003.7

The building official may require that any structure using aluminum primary or secondary members be designed by a Florida-registered

professional engineer.

2003.7.1

Reserved.

2003.7.2

In addition to flexural and shearing stresses, the critical factors of buckling, fatigue, stress raisers such as notches or holes or shape re-entrant corners, deflection and connections shall be considered and provided for by proper design.

2003.7.3

All solid roof systems shall be designed for a minimum 30 psf (1436 Pa) live load.

2003.7.4

All buildings and structures shall be designed to resist uplift. In the case of placement on existing slabs and foundations, sufficient information and calculations shall be provided by the professional engineer and/or architect to verify the ability of the slab or foundation to resist uplift loads.

2003.7.5

All connection devices shall be rated by load testing by an approved testing laboratory.

2003.7.5.1

All expansion anchors shall not be installed less than 3 inches (76 mm) from the edge of concrete slab and/or footings. All expansion anchors shall develop an ultimate withdrawal resisting force equal to four times the imposed load, with no stress increase for duration of load.

2003.8 Fabrication and Construction Details**2003.8.1 Connections**

Aluminum members shall be designed as set forth in the standards in Section 2003.2.

2003.8.1.1 Fasteners

Bolts and other fasteners shall be aluminum, stainless steel, hot-dip or electro-galvanized steel. Double cadmium plated steel bolts may also be used.

2003.8.1.2 Painting

Reserved.

2003.8.1.3 Welding

Aluminum parts shall be welded with an inert-gas-shielded arc or resistance welding process. No welding process that requires a welding flux shall be used. Filler alloys complying with the requirements of the standard in this chapter shall be used.

2003.8.1.4 Welder Qualifications

All welding of structural aluminum member shall be performed by certified welders.

2003.8.1.5 Erection

During erection, structural aluminum shall be adequately braced and fastened to resist dead, wind and erection loads.

2003.8.2 Structural Aluminum Decking and Siding**2003.8.2.1**

Aluminum sections spanning between supports shall be limited in span to satisfactorily support the positive and negative loads set forth in Chapter 16 (High-Velocity Hurricane Zones). The deflection of decking shall not exceed that set forth in Section 1616.

2003.8.2.2

Aluminum sheet used for roof decking or siding shall be not less than 0.032 inch (0.8 mm) in thickness.

2003.8.2.3

Aluminum sheets shall be secured to the supports to adequately resist positive and negative loads. Attachments shall be at intervals not exceeding 8 inches (203 mm) on center and shall be secured to each other at side laps at intervals as required by rational analysis and/or tests, but shall not exceed 12 inches (305 mm) on center.

2003.8.2.4

Fasteners shall have a head, and/or be provided with washers not less than $\frac{1}{2}$ inch (13 mm) in diameter.

2003.8.2.5

Fasteners located at end laps shall be placed not more than 2 inches (51 mm) nor less than 1 inch (25 mm) from the end of overlapping sheets.

2003.8.2.6

Where roof or wall cladding is of aluminum, an approved membrane to protect against water intrusion to the interior shall be provided or the aluminum cladding shall be designed and constructed with an approved continuous edge-interlock, overlap or seam to prevent water intrusion.

2003.8.3 Nonstructural Aluminum Decking and Siding**2003.8.3.1**

Nonstructural aluminum sheets shall be backed with cladding as set forth in Chapters 23 and 24 (High-Velocity Hurricane Zones).

2003.8.3.2

Nonstructural aluminum sheets shall have a minimum thickness of 0.032 inches (0.8 mm).

2003.8.3.3

Reserved.

2003.8.3.4

Nonstructural decking and siding shall be attached as set forth in Section 2003.8.2 except that the attachment of aluminum residential siding shall be by rational analysis and/or tests using a minimum 0.120-inch (3 mm) diameter aluminum nails of sufficient length to penetrate studs a minimum of 2 inches (51 mm). Nails at wood studs shall be as required by rational analysis and/or tests, but spaced not greater than 24 inches (610 mm) on center horizontally and no greater than 8 inches (203 mm) on center vertically.

2003.8.4 Dissimilar Materials

Reserved.

2003.8.5 Expansion and Contraction

Reserved.

2003.9 Sunrooms**2003.9.1 Wind Loads**

Basic wind speed in miles per hour (mph) shall be determined in accordance with Section 1620. Sunrooms including exposed structures, components, cladding, and roof covering shall be designed to resist the wind loads as established in Section 1620.1.

2003.9.2 Sunroom Categories

Sunrooms shall be categorized in one of the following categories by the permit applicant, design professional, or the property owner where the sunroom is being constructed:

Category I: A roof or a covering of an outdoor space. The openings shall be permitted to be enclosed with insect screening or 0.5 mm (20 mil) maximum thickness plastic film. The space is defined as nonhabitable and unconditioned.

Category II: A roof or a covering of an outdoor space with enclosed walls. The openings are permitted to be enclosed with translucent or transparent plastic or glass. The space is defined as nonhabitable and unconditioned.

Category III: A roof or a covering of an outdoor space with enclosed walls. The openings are permitted to be enclosed with translucent or transparent plastic or glass. The sunroom complies with additional requirements for forced entry resistance, air leakage resistance and water penetration resistance. The space is defined as nonhabitable and unconditioned.

Category IV: A roof or a covering of an outdoor space with enclosed walls. The sunroom is designed to be heated and/or cooled by a separate temperature control or system and is thermally isolated from the primary structure. The sunroom complies with additional requirements for forced entry resistance, water penetration resistance, air leakage resistance, and thermal performance. The space is defined as habitable and conditioned.

Category V: A roof or a covering of an outdoor space with enclosed walls. The sunroom is designed to be heated and/or cooled and is open to the main structure. The sunroom complies with additional requirements for forced entry resistance, water penetration resistance, air leakage resistance, and thermal performance. The space is defined as habitable and conditioned.

2003.10 Sun Control Structure Design

A registered design professional shall design sun control structures.

2003.10.1 Wind Loads

Basic wind speed in miles per hour (mph) shall be determined in accordance with Section 1620.2. Sun control structures, including exposed structures, components, and cladding, shall be designed to resist the wind loads as established in Section 1620.1.

2003.10.2

Operable louvers shall be repositioned and locked in the vertical open position when wind speeds are predicted to be 75 mph (34 m/s) or greater. The contractor shall post a legible and readily visible permanent decal or sign stating words to the effect that the operable louvers are to be locked in the vertically open position when wind speeds are predicted to be 75 mph (34 m/s) and during a hurricane warning or alert as designated by the National Weather Service. The warning label should essentially read:

THIS SUN CONTROL STRUCTURE SHALL HAVE
LOUVERED BLADES LOCKED IN THE VERTICAL
POSITION DURING A HURRICANE WARNING
OR ALERT AS DESIGNATED BY THE NATIONAL
WEATHER SERVICE OR WHEN WIND SPEEDS
ARE PREDICTED TO BE 75 MPH.

2003.10.3 Electrical Installations

All electrical components and installations shall comply with Chapter 27.

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Chapter 21 Masonry

Section 2101 General

2101.1 Scope

This chapter shall govern the materials, design, construction and quality of masonry.

Exception: Buildings and structures located within the high-velocity hurricane zone shall comply with the provisions of Sections 2103 through 2105, 2107, 2108, 2110, 2114 and Sections 2119 through 2122.

2101.2 Design Methods

Masonry shall comply with the provisions of TMS 402, TMS 403 or TMS 404 as well as applicable requirements of this chapter.

2101.2.1 Masonry Veneer

Masonry veneer shall comply with the provisions of Chapter 14.

2101.3 Special Inspection

Reserved.

Section 2102 Definitions and Notations

2102.1 General

The following terms are defined in Chapter 2:

AAC MASONRY.

ADOBÉ CONSTRUCTION.

Adobe, stabilized.

Adobe, unstabilized.

AREA.

Gross cross-sectional.

Net cross-sectional.

AUTOCLAVED AERATED CONCRETE (AAC).

BED JOINT.

BRICK.

Calcium silicate (sand lime brick).

Clay or shale.

Concrete.

CAST STONE.

CELL.

CHIMNEY.

CHIMNEY TYPES.

High-heat appliance type.

Low-heat appliance type.

Masonry type.

Medium-heat appliance type.

COLLAR JOINT.

DIMENSIONS.

Nominal.

Specified.

FIREPLACE.

FIREPLACE THROAT.

FOUNDATION PIER.

HEAD JOINT.

MASONRY.

Glass unit masonry.

Plain masonry.

Reinforced masonry.

Solid masonry.

Unreinforced (plain) masonry.

MASONRY UNIT.

Hollow.

Solid.

MORTAR.

MORTAR, SURFACE-BONDING.

PRESTRESSED MASONRY.

RUNNING BOND.

SPECIFIED COMPRESSIVE STRENGTH OF MASONRY, f'_m .

STONE MASONRY.

STRENGTH.

Design strength.

Nominal strength.

Required strength.

TIE, WALL.

TILE, STRUCTURAL CLAY.

WALL.

Cavity wall.

Dry-stacked, surface-bonded wall.

Parapet wall.**WYTHE.****NOTATIONS.**

d_b	=	Diameter of reinforcement, inches (mm).
F_s	=	Allowable tensile or compressive stress in reinforcement, psi (MPa).
f_r	=	Modulus of rupture, psi (MPa).
f'_{AAC}	=	Specified compressive strength of AAC masonry, the minimum compressive strength for a class of AAC masonry as specified in ASTM C1386, psi (MPa).
f'_m	=	Specified compressive strength of masonry at age of 28 days, psi (MPa).
f'_{mi}	=	Specified compressive strength of masonry at the time of prestress transfer, psi (MPa).
K	=	The lesser of the masonry cover, clear spacing between adjacent reinforcement, or five times d_b , inches (mm).
L_s	=	Distance between supports, inches (mm).
l_d	=	Required development length or lap length of reinforcement, inches (mm).
P	=	The applied load at failure, pounds (N).
S_t	=	Thickness of the test specimen measured parallel to the direction of load, inches (mm).
S_w	=	Width of the test specimen measured parallel to the loading cylinder, inches (mm).

Section 2103 Masonry Construction Materials**2103.1 Masonry Units**

Concrete masonry units, clay or shale masonry units, stone masonry units, glass unit masonry and AAC masonry units shall comply with Article 2.3 of TMS 602. Architectural cast stone shall conform to ASTM C1364 and TMS 504. Adhered manufactured stone masonry veneer units shall conform to ASTM C1670.

Exception: Structural clay tile for nonstructural use in fireproofing of structural members and in wall furring shall not be required to meet the compressive strength specifications. The fire-resistance rating shall be determined in accordance with ASTM E119 or UL 263 and shall comply with the requirements of Table 705.5.

2103.1.1 Second-Hand Units

Second-hand masonry units shall not be reused unless they conform to the requirements of new units. The units shall be of whole, sound materials and free from cracks and other defects that will interfere with proper laying or use. Old mortar shall be cleaned from the unit before reuse.

2103.2 Mortar

Mortar for masonry construction shall comply with Section 2103.2.1, 2103.2.2, 2103.2.3 or 2103.2.4.

2103.2.1 Masonry Mortar

Mortar for use in masonry construction shall conform to Articles 2.1 and 2.6 A of TMS 602.

2103.2.2 Surface-Bonding Mortar

Surface-bonding mortar shall comply with ASTM C887. Surface bonding of concrete masonry units shall comply with ASTM C946.

2103.2.3 Mortars for Ceramic Wall and Floor Tile

Portland cement mortars for installing ceramic wall and floor tile shall comply with ANSI A108.1A and ANSI A108.1B and be of the compositions indicated in Table 2103.2.3.

TABLE 2103.2.3**CERAMIC TILE MORTAR COMPOSITIONS**

LOCATION	MORTAR	COMPOSITION
Walls	Scratchcoat	1 cement; $\frac{1}{5}$ hydrated lime; 4 dry or 5 damp sand
	Setting bed and leveling coat	1 cement; $\frac{1}{2}$ hydrated lime; 5 damp sand to 1 cement 1 hydrated lime, 7 damp sand
Floors	Setting bed	1 cement; $\frac{1}{10}$ hydrated lime; 5 dry or 6 damp sand; or 1 cement; 5 dry or 6 damp sand
Ceilings	Scratchcoat and sand bed	1 cement; $\frac{1}{2}$ hydrated lime; $2\frac{1}{2}$ dry sand or 3 damp sand

2103.2.3.1 Dry-Set Portland Cement Mortars

Premixed prepared Portland cement mortars, which require only the addition of water and are used in the installation of ceramic tile, shall comply with ANSI A118.1. The shear bond strength for tile set in such mortar shall be as required in accordance with ANSI A118.1. Tile set in dry-set Portland cement mortar shall be installed in accordance with ANSI A108.5.

2103.2.3.2 Latex-Modified Portland Cement Mortar

Latex-modified Portland cement thin-set mortars in which latex is added to dry-set mortar as a replacement for all or part of the gauging water that are used for the installation of ceramic tile shall comply with ANSI A118.4. Tile set in latex-modified Portland cement shall be installed in accordance with ANSI A108.5.

2103.2.3.3 Epoxy Mortar

Ceramic tile set and grouted with chemical-resistant epoxy shall comply with ANSI A118.3. Tile set and grouted with epoxy shall be installed in accordance with ANSI A108.6.

2103.2.3.4 Furan Mortar and Grout

Chemical-resistant furan mortar and grout that are used to install ceramic tile shall comply with ANSI A118.5. Tile set and grouted with furan shall be installed in accordance with ANSI A108.8.

2103.2.3.5 Modified Epoxy-Emulsion Mortar and Grout

Modified epoxy-emulsion mortar and grout that are used to install ceramic tile shall comply with ANSI A118.8. Tile set and grouted with modified epoxy-emulsion mortar and grout shall be installed in accordance with ANSI A108.9.

2103.2.3.6 Organic Adhesives

Water-resistant organic adhesives used for the installation of ceramic tile shall comply with ANSI A136.1. The shear bond strength after water immersion shall be not less than 40 psi (275 kPa) for Type I adhesive and not less than 20 psi (138 kPa) for Type II adhesive when tested in accordance with ANSI A136.1. Tile set in organic adhesives shall be installed in accordance with ANSI A108.4.

2103.2.3.7 Portland Cement Grouts

Portland cement grouts used for the installation of ceramic tile shall comply with ANSI A118.6. Portland cement grouts for tile work shall be installed in accordance with ANSI A108.10.

2103.2.4 Mortar for Adhered Masonry Veneer

Mortar for use with adhered masonry veneer shall conform to ASTM C270 for Type N or S, or shall comply with ANSI A118.4 for latex-modified Portland cement mortar.

2103.3 Grout

Grout shall comply with Article 2.2 of TMS 602.

2103.4 Metal Reinforcement and Accessories

Metal reinforcement and accessories shall conform to Article 2.4 of TMS 602. Where provided in exterior walls, joint reinforcement shall be a minimum No. 9-gauge ladder-type stainless steel, hot dipped galvanized, or epoxy coated in accordance with TMS 602 Section 2.4E1, 2.4F1b, or 2.4F2a as appropriate. Where unidentified reinforcement is approved for use, not less than three tension and three bending tests shall be made on representative specimens of the reinforcement from each shipment and grade of reinforcing steel proposed for use in the work.

Section 2104 Construction**2104.1 Masonry Construction**

Masonry construction shall comply with the requirements of Sections 2104.1.1 and 2104.1.2 and with the requirements of either TMS 602 or TMS 604.

2104.1.1 Support on Wood

Masonry shall not be supported on wood girders or other forms of wood construction except as permitted in Section 2304.13.

2104.1.2 Molded Cornices

Unless structural support and anchorage are provided to resist the overturning moment, the center of gravity of projecting masonry or molded cornices shall lie within the middle one-third of the supporting wall. Terra cotta and metal cornices shall be provided with a structural frame of *approved* noncombustible material anchored in an *approved* manner.

Section 2105 Quality Assurance**2105.1 General**

A quality assurance program shall be used to ensure that the constructed masonry is in compliance with the *approved construction documents*.

The quality assurance program shall comply with the inspection and testing requirements of TMS 602.

Exception: Unless otherwise specified by the designing architect or engineer, where plan review and inspections are performed by a local building department in accordance with Sections 107 and 110, the quality assurance program of TMS 402 and TMS 602 shall not apply.

Section 2106 Seismic Design**2106.1 Seismic Design Requirements for Masonry**

Reserved.

Section 2107 Allowable Stress Design**2107.1 General**

The design of masonry structures using *allowable stress design* shall comply with Section 2106 and the requirements of Chapters 1 through 8 of TMS 402 except as modified by Sections 2107.2 through 2107.5.

Exception: Where plan review and inspections are performed by a local building department in accordance with Sections 107 and 110, the provisions of TMS 402, Chapter 3 Section 3.1 and TMS 602 Sections 1.5 and 1.6 shall not apply unless specified by the architect or engineer, or the building official.

2107.2 TMS 402, Section 6.1.6.1.1, Lap Splices

As an alternative to Section 6.1.6.1.1, it shall be permitted to design lap splices in accordance with Section 2107.2.1.

2107.2.1 Lap Splices

The minimum length of lap splices for reinforcing bars in tension or compression, l_d , shall be

$$l_d = 0.002d_b f_s \quad (\text{Equation 21-1})$$

For SI: $l_d = 0.29d_b f_s$

but not less than 12 inches (305 mm). In no case shall the length of the lapped splice be less than 40 bar diameters.

where:

d_b = Diameter of reinforcement, inches (mm).

f_s = Computed stress in reinforcement due to design loads, psi (MPa).

In regions of moment where the design tensile stresses in the reinforcement are greater than 80 percent of the allowable steel tension stress, F_s , the lap length of splices shall be increased not less than 50 percent of the minimum required length, but need not be greater than $72 d_b$. Other equivalent means of stress transfer to accomplish the same 50 percent increase shall be permitted. Where epoxy coated bars are used, lap length shall be increased by 50 percent.

2107.3 TMS 402, Section 6.1.6.1, Splices of Reinforcement

Modify Section 6.1.6.1 as follows:

6.1.6.1 — Splices of reinforcement. Lap splices, welded splices or mechanical splices are permitted in accordance with the provisions of this section. All welding shall conform to AWS D1.4. Welded splices shall be of ASTM A706 steel reinforcement. Reinforcement larger than No. 9 (M#29) shall be spliced using mechanical connections in accordance with Section 6.1.6.1.3.

2107.4

Reserved.

2107.5 TMS 402, Section 5.4 Pilasters

Modify Section 5.4 as follows:

5.4 — Pilasters

5.4.3 Where vertical pilaster reinforcement is not provided to resist axial compressive stress, lateral ties are not required.

2107.6 TMS 402, Section 6.1.5.1.1 Development of Bar Reinforcement in Tension or Compression

Modify Section 6.1.5.1.1 as follows:

6.1.5.1.1 The required development length of reinforcing bars shall be determined by Equation (6-1), but shall not be less than 12 inches (305 mm) or $40 d_b$ and need not be greater than $72 d_b$.

Equation 6-1, including the notations from TMS 402, is unchanged. Gamma factors are changed as follows:

γ	=	1.0 for No. 3 (M#10) through No. 5 (M#16) bars
γ	=	1.04 for No. 6 (M#19) through No. 7 (M#22) bars
γ	=	1.2 for No. 8 (M#25) through No. 11 (M#36) bars

Section 2108 Strength Design of Masonry

2108.1 General

The design of masonry structures using strength design shall comply with Section 2106 and the requirements of Chapters 1 through 7 and Chapter 9 of TMS 402, except as modified by Sections 2108.2 through 2108.4.

Exceptions:

1. AAC masonry shall comply with the requirements of Chapters 1 through 7 and Chapter 11 of TMS 402.

2. Where plan review and inspections are performed by a local building department in accordance with Sections 107 and 110, the provisions of TMS 402, Chapter 3, Section 3.1 and TMS 602 Sections 1.5 and 1.6 shall not apply unless specified by the architect or engineer.

2108.2

Reserved.

2108.3

Reserved.

2108.4 TMS 402, Section 6.1.5.1.1 Development of Bar Reinforcement in Tension or Compression

Modify Section 6.1.5.1.1 as follows:

6.1.5.1.1 The required development length of reinforcing bars shall be determined by Equation (6-1), but shall not be less than 12 inches or $40 d_b$ and need not be greater than $72 d_b$.

Equation 6-1, including the notations from TMS 402, is unchanged. Gamma factors are changed as follows:

γ	=	1.0 for No. 3 (M#10) through No. 5 (M#16) bars
γ	=	1.04 for No. 6 (M#19) through No. 7 (M#22) bars
γ	=	1.2 for No. 8 (M#25) through No. 11 (M#36) bars

Section 2109 Dry-Stack Masonry

2109.1 General

The design of dry-stack masonry structures shall comply with the requirements of Chapters 1 through 8 of TMS 402 except as modified by Sections 2109.2 through 2109.5.

2109.2 Limitations

Dry-stack masonry shall be prohibited in Risk Category IV structures.

2109.3 Materials

Concrete masonry units complying with ASTM C90 shall be used.

2109.4 Strength

Dry-stack masonry shall be of adequate strength and proportions to support all superimposed loads without exceeding the allowable stresses listed in Table 2109.4. Allowable stresses not specified in Table 2109.4 shall comply with the requirements of Chapter 8 of TMS 402.

TABLE 2109.4

GROSS CROSS-SECTIONAL AREA ALLOWABLE STRESS FOR DRY-STACK MASONRY

DESCRIPTION	MAXIMUM ALLOWABLE STRESS (psi)
Compression	45
Flexural tension	
Horizontal span	30
Vertical span	18
Shear	10

For SI: 1 pound per square inch = 0.006895 MPa.

2109.5 Construction

Construction of dry-stack masonry shall comply with ASTM C946.

Section 2110 Glass Unit Masonry

2110.1 General

Glass unit masonry construction shall comply with Chapter 13 of TMS 402 and this section.

2110.1.1 Limitations

Solid or hollow *approved* glass block shall not be used in fire walls, party walls, fire barriers, fire partitions or smoke barriers, or for load-bearing construction. Such blocks shall be erected with mortar and reinforcement in metal channel-type frames, structural frames, masonry or concrete recesses, embedded panel anchors as provided for both exterior and interior walls or other *approved* joint materials. Wood strip framing shall not be used in walls required to have a fire-resistance rating by other provisions of this code.

Exceptions:

1. Glass-block assemblies having a fire protection rating of not less than $\frac{3}{4}$ hour shall be permitted as opening protectives in accordance with Section 716 in fire barriers, fire partitions and smoke barriers that have a required fire-resistance rating of 1 hour or less and do not enclose exit stairways and ramps or exit passageways.
2. Glass-block assemblies as permitted in Section 404.6, Exception 2.

Section 2111 Masonry Fireplaces

2111.1 General

The construction of masonry fireplaces, consisting of concrete or masonry, shall be in accordance with this section.

2111.2 Fireplace Drawings

The *construction documents* shall describe in sufficient detail the location, size and construction of masonry fireplaces. The thickness and characteristics of materials and the clearances from walls, partitions and ceilings shall be indicated.

2111.3 Footings and Foundations

Footings for masonry fireplaces and their chimneys shall be constructed of concrete or solid masonry at least 12 inches (305 mm) thick and shall extend at least 6 inches (153 mm) beyond the face of the fireplace or foundation wall on all sides. Footings shall be founded on natural undisturbed earth or engineered fill below frost depth. In areas not subjected to freezing, footings shall be at least 12 inches (305 mm) below finished grade.

2111.3.1 Ash Dump Cleanout

Cleanout openings, located within foundation walls below fireboxes, when provided, shall be equipped with ferrous metal or masonry doors and frames constructed to remain tightly closed, except when in use. Cleanouts shall be accessible and located so that ash removal will not create a hazard to combustible materials.

2111.4 Seismic Reinforcement

Reserved.

2111.4.1 Vertical Reinforcing

Reserved

2111.4.2 Horizontal Reinforcing

Reserved

2111.5 Seismic Anchorage

Reserved

2111.6 Firebox Walls

Masonry fireboxes shall be constructed of solid masonry units, hollow masonry units grouted solid, stone or concrete. When a lining of firebrick at least 2 inches (51 mm) in thickness or other *approved* lining is provided, the minimum thickness of back and sidewalls shall each be 8 inches (203 mm) of solid masonry, including the lining. The width of joints between firebricks shall be not greater than $\frac{1}{4}$ inch (6.4 mm). When no lining is provided, the total minimum thickness of back and sidewalls shall be 10 inches (254 mm) of solid masonry.

Firebrick shall conform to ASTM C27 or ASTM C1261 and shall be laid with medium-duty refractory mortar conforming to ASTM C199.

2111.6.1 Steel Fireplace Units

Steel fireplace units are permitted to be installed with solid masonry to form a masonry fireplace provided they are installed according to either the requirements of their listing or the requirements of this section. Steel fireplace units incorporating a steel firebox lining shall be constructed with steel not less than $\frac{1}{4}$ inch (6.4 mm) in thickness, and an air-circulating chamber which is ducted to the interior of the building. The firebox lining shall be encased with solid masonry to provide a total thickness at the back and sides of not less than 8 inches (203 mm), of which not less than 4 inches (102 mm) shall be of solid masonry or concrete. Circulating air ducts employed with steel fireplace units shall be constructed of metal or masonry.

2111.7 Firebox Dimensions

The firebox of a concrete or masonry fireplace shall have a minimum depth of 20 inches (508 mm). The throat shall be not less than 8 inches (203 mm) above the fireplace opening. The throat opening shall not be less than 4 inches (102 mm) in depth. The cross-sectional area of the passageway above the firebox, including the throat, damper and smoke chamber, shall be not less than the cross-sectional area of the flue.

Exception: Rumford fireplaces shall be permitted provided that the depth of the fireplace is not less than 12 inches (305 mm) and at least one-third of the width of the fireplace opening, and the throat is not less than 12 inches (305 mm) above the lintel, and at least $\frac{1}{20}$ the cross-sectional area of the fireplace opening.

2111.8 Lintel and Throat

Masonry over a fireplace opening shall be supported by a lintel of noncombustible material. The minimum required bearing length on each end of the fireplace opening shall be 4 inches (102 mm). The fireplace throat or damper shall be located not less than 8 inches (203 mm) above the top of the fireplace opening.

2111.8.1 Damper

Masonry fireplaces shall be equipped with a ferrous metal damper located not less than 8 inches (203 mm) above the top of the fireplace opening. Dampers shall be installed in the fireplace or at the top of the flue venting the fireplace, and shall be operable from the room containing the fireplace. Damper controls shall be permitted to be located in the fireplace.

2111.9 Smoke Chamber Walls

Smoke chamber walls shall be constructed of solid masonry units, hollow masonry units grouted solid, stone or concrete. The total minimum thickness of front, back and sidewalls shall be 8 inches (203 mm) of solid masonry. The inside surface shall be parged smooth with refractory mortar conforming to ASTM C199. When a lining of firebrick not less than 2 inches (51 mm) thick, or a lining of vitrified clay not less than $\frac{5}{8}$ inch (15.9 mm) thick, is provided, the total minimum thickness of front, back and sidewalls shall be 6 inches (152 mm) of solid masonry, including the lining. Firebrick shall conform to ASTM C1261 and shall be laid with refractory mortar conforming to ASTM C199. Vitrified clay linings shall conform to ASTM C315.

2111.9.1 Smoke Chamber Dimensions

The inside height of the smoke chamber from the fireplace throat to the beginning of the flue shall be not greater than the inside width of the fireplace opening. The inside surface of the smoke chamber shall not be inclined more than 45 degrees (0.76 rad) from vertical when prefabricated smoke chamber linings are used or when the smoke chamber walls are rolled or sloped rather than corbeled. When the inside surface of the smoke chamber is formed by corbeled masonry, the walls shall not be corbeled more than 30 degrees (0.52 rad) from vertical.

2111.10 Hearth and Hearth Extension

Masonry fireplace hearths and hearth extensions shall be constructed of concrete or masonry, supported by noncombustible materials, and reinforced to carry their own weight and all imposed loads. No combustible material shall remain against the underside of hearths or hearth extensions after construction.

2111.10.1 Hearth Thickness

The minimum thickness of fireplace hearths shall be 4 inches (102 mm).

2111.10.2 Hearth Extension Thickness

The minimum thickness of hearth extensions shall be 2 inches (51 mm).

Exception: When the bottom of the firebox opening is raised not less than 8 inches (203 mm) above the top of the hearth extension, a hearth extension of not less than $\frac{3}{8}$ -inch-thick (9.5 mm) brick, concrete, stone, tile or other *approved* noncombustible material is permitted.

2111.11 Hearth Extension Dimensions

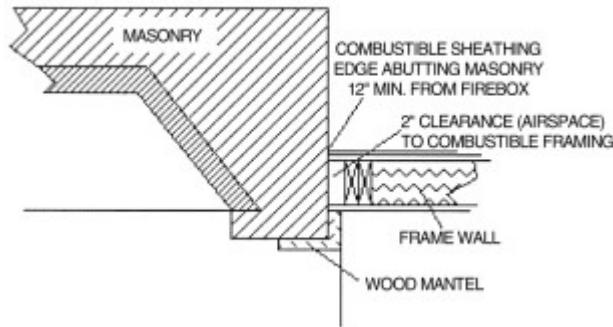
Hearth extensions shall extend not less than 16 inches (406 mm) in front of, and not less than 8 inches (203 mm) beyond, each side of the fireplace opening. Where the fireplace opening is 6 square feet (0.557 m^2) or larger, the hearth extension shall extend not less than 20 inches (508 mm) in front of, and not less than 12 inches (305 mm) beyond, each side of the fireplace opening.

2111.12 Fireplace Clearance

Any portion of a masonry fireplace located in the interior of a building or within the *exterior wall* of a building shall have a clearance to combustibles of not less than 2 inches (51 mm) from the front faces and sides of masonry fireplaces and not less than 4 inches (102 mm) from the back faces of masonry fireplaces. The airspace shall not be filled, except to provide fireblocking in accordance with Section 2111.13.

Exceptions:

1. Masonry fireplaces *listed* and *labeled* for use in contact with combustibles in accordance with UL 127 and installed in accordance with the manufacturer's instructions are permitted to have combustible material in contact with their exterior surfaces.
2. When masonry fireplaces are constructed as part of masonry or concrete walls, combustible materials shall not be in contact with the masonry or concrete walls less than 12 inches (306 mm) from the inside surface of the nearest firebox lining.
3. Exposed combustible *trim* and the edges of sheathing materials, such as wood siding, flooring and drywall, are permitted to abut the masonry fireplace sidewalls and hearth extension, in accordance with Figure 2111.12, provided such combustible *trim* or sheathing is not less than 12 inches (306 mm) from the inside surface of the nearest firebox lining.
4. Exposed combustible mantels or *trim* is permitted to be placed directly on the masonry fireplace front surrounding the fireplace opening, provided such combustible materials shall not be placed within 6 inches (153 mm) of a fireplace opening. Combustible material directly above and within 12 inches (305 mm) of the fireplace opening shall not project more than $\frac{1}{8}$ inch (3.2 mm) for each 1-inch (25 mm) distance from such opening. Combustible materials located along the sides of the fireplace opening that project more than $1\frac{1}{2}$ inches (38 mm) from the face of the fireplace shall have an additional clearance equal to the projection.



For SI: 1 inch = 25.4 mm.

FIGURE 2111.12

ILLUSTRATION OF EXCEPTION TO FIREPLACE CLEARANCE PROVISION

2111.13 Fireplace Fireblocking

All spaces between fireplaces and floors and ceilings through which fireplaces pass shall be fireblocked with noncombustible material securely fastened in place. The fireblocking of spaces between wood joists, beams or headers shall be to a depth of 1 inch (25 mm) and shall only be placed on strips of metal or metal lath laid across the spaces between combustible material and the chimney.

2111.14 Exterior Air

Factory-built or masonry fireplaces covered in this section shall be equipped with an exterior air supply to ensure proper fuel combustion unless the room is mechanically ventilated and controlled so that the indoor pressure is neutral or positive.

2111.14.1 Factory-Built Fireplaces

Exterior combustion air ducts for factory-built fireplaces shall be *listed* components of the fireplace, and installed according to the fireplace manufacturer's instructions.

2111.14.2 Masonry Fireplaces

Listed combustion air ducts for masonry fireplaces shall be installed according to the terms of their listing and manufacturer's instructions.

2111.14.3 Exterior Air Intake

The exterior air intake shall be capable of providing all combustion air from the exterior of the *dwelling*. The exterior air intake shall not be located within a garage, *attic*, basement or crawl space of the *dwelling* nor shall the air intake be located at an elevation higher than the firebox. The exterior air intake shall be covered with a corrosion-resistant screen of $\frac{1}{4}$ -inch (6.4 mm) mesh.

2111.14.4 Clearance

Unlisted combustion air ducts shall be installed with a minimum 1-inch (25 mm) clearance to combustibles for all parts of the duct within 5 feet (1524 mm) of the duct outlet.

2111.14.5 Passageway

The combustion air passageway shall be not less than 6 square inches (3870 mm^2) and not more than 55 square inches (0.035 m^2), except that combustion air systems for *listed* fireplaces or for fireplaces tested for emissions shall be constructed according to the fireplace manufacturer's instructions.

2111.14.6 Outlet

The exterior air outlet is permitted to be located in the back or sides of the firebox chamber or within 24 inches (610 mm) of the firebox opening on or near the floor. The outlet shall be closable and designed to prevent burning material from dropping into concealed combustible spaces.

Section 2112 Masonry Heaters

2112.1 Definition

A masonry heater is a heating appliance constructed of concrete or solid masonry, hereinafter referred to as "masonry," which is designed to absorb and store heat from a solid fuel fire built in the firebox by routing the exhaust gases through internal heat exchange channels in which the flow path downstream of the firebox may include flow in a horizontal or downward direction before entering the chimney and which delivers heat by radiation from the masonry surface of the heater.

2112.2 Installation

Masonry heaters shall be installed in accordance with this section and comply with one of the following:

1. Masonry heaters shall comply with the requirements of ASTM E1602.
2. Masonry heaters shall be *listed* and *labeled* in accordance with UL 1482 or EN 15250 and installed in accordance with the manufacturer's instructions.

2112.3 Footings and Foundation

The firebox floor of a masonry heater shall be a minimum thickness of 4 inches (102 mm) of noncombustible material and be supported on

a noncombustible footing and foundation in accordance with Section 2113.2.

2112.4 Seismic Reinforcing

Reserved

2112.5 Masonry Heater Clearance

Combustible materials shall not be placed within 36 inches (914 mm) or the distance of the allowed reduction method from the outside surface of a masonry heater in accordance with NFPA 211, Section 12.6, and the required space between the heater and combustible material shall be fully vented to permit the free flow of air around all heater surfaces.

Exceptions:

1. Where the masonry heater wall thickness is at least 8 inches (203 mm) of solid masonry and the wall thickness of the heat exchange channels is not less than 5 inches (127 mm) of solid masonry, combustible materials shall not be placed within 4 inches (102 mm) of the outside surface of a masonry heater. A clearance of not less than 8 inches (203 mm) shall be provided between the gas-tight capping slab of the heater and a combustible ceiling.
2. Masonry heaters *listed* and *labeled* in accordance with UL 1482 or EN 15250 and installed in accordance with the manufacturer's instructions.

Section 2113 Masonry Chimneys

2113.1 General

The construction of masonry chimneys consisting of solid masonry units, hollow masonry units grouted solid, stone or concrete shall be in accordance with this section.

2113.2 Footings and Foundations

Footings for masonry chimneys shall be constructed of concrete or solid masonry not less than 12 inches (305 mm) thick and shall extend at least 6 inches (152 mm) beyond the face of the foundation or support wall on all sides. Footings shall be founded on natural undisturbed earth or engineered fill below frost depth. In areas not subjected to freezing, footings shall be not less than 12 inches (305 mm) below finished grade.

2113.3 Seismic Reinforcement

Reserved

2113.3.1 Vertical Reinforcement

Reserved

2113.3.2 Horizontal Reinforcement

Reserved

2113.4 Seismic Anchorage

Reserved

2113.5 Corbeling

Masonry chimneys shall not be corbeled more than half of the chimney's wall thickness from a wall or foundation, nor shall a chimney be corbeled from a wall or foundation that is less than 12 inches (305 mm) in thickness unless it projects equally on each side of the wall, except that on the second story of a two-story dwelling, corbeling of chimneys on the exterior of the enclosing walls is permitted to equal the wall thickness. The projection of a single course shall not exceed one-half the unit height or one-third of the unit bed depth, whichever is less.

2113.6 Changes in Dimension

The chimney wall or chimney flue lining shall not change in size or shape within 6 inches (152 mm) above or below where the chimney

passes through floor components, ceiling components or roof components.

2113.7 Offsets

Where a masonry chimney is constructed with a fireclay flue liner surrounded by one wythe of masonry, the maximum offset shall be such that the centerline of the flue above the offset does not extend beyond the center of the chimney wall below the offset. Where the chimney offset is supported by masonry below the offset in an *approved* manner, the maximum offset limitations shall not apply. Each individual corbeled masonry course of the offset shall not exceed the projection limitations specified in Section 2113.5.

2113.8 Additional Load

Chimneys shall not support loads other than their own weight unless they are designed and constructed to support the additional load. Masonry chimneys are permitted to be constructed as part of the masonry walls or concrete walls of the building.

2113.9 Termination

Chimneys shall extend not less than 2 feet (610 mm) higher than any portion of the building within 10 feet (3048 mm), but shall not be less than 3 feet (914 mm) above the highest point where the chimney passes through the roof.

2113.9.1 Chimney Caps

Masonry chimneys shall have a concrete, metal or stone cap, sloped to shed water, a drip edge and a caulked bond break around any flue liners in accordance with ASTM C1283.

2113.9.2 Spark Arrestors

Where a spark arrestor is installed on a masonry chimney, the spark arrestor shall meet all of the following requirements:

1. The net free area of the arrestor shall be not less than four times the net free area of the outlet of the chimney flue it serves.
2. The arrestor screen shall have heat and corrosion resistance equivalent to 19-gage galvanized steel or 24-gage stainless steel.
3. Openings shall not permit the passage of spheres having a diameter greater than $\frac{1}{2}$ inch (12.7 mm) nor block the passage of spheres having a diameter less than $\frac{3}{8}$ inch (9.5 mm).
4. The spark arrestor shall be accessible for cleaning and the screen or chimney cap shall be removable to allow for cleaning of the chimney flue.

2113.9.3 Rain Caps

Where a masonry or metal rain cap is installed on a masonry chimney, the net free area under the cap shall be not less than four times the net free area of the outlet of the chimney flue it serves.

2113.10 Wall Thickness

Masonry chimney walls shall be constructed of concrete, solid masonry units or hollow masonry units grouted solid with not less than 4 inches (102 mm) nominal thickness.

2113.10.1 Masonry Veneer Chimneys

Where masonry is used as veneer for a framed chimney, through flashing and weep holes shall be provided as required by Chapter 14.

2113.11 Flue Lining (Material)

Masonry chimneys shall be lined. The lining material shall be appropriate for the type of appliance connected, according to the terms of the appliance listing and the manufacturer's instructions.

2113.11.1 Residential-Type Appliances (General)

Flue lining systems shall comply with one of the following:

1. Clay flue lining complying with the requirements of ASTM C315.

2. *Listed* chimney lining systems complying with UL 1777.
3. Factory-built chimneys or chimney units *listed* for installation within masonry chimneys.
4. Other *approved* materials that will resist corrosion, erosion, softening or cracking from flue gases and condensate at temperatures up to 1,800°F (982°C).

2113.11.1.1 Flue Linings for Specific Appliances

Flue linings other than those covered in Section 2113.11.1 intended for use with specific appliances shall comply with Sections 2113.11.1.2 through 2113.11.1.4 and Sections 2113.11.2 and 2113.11.3.

2113.11.1.2 Gas Appliances

Flue lining systems for gas appliances shall be in accordance with the *Florida Building Code, Fuel Gas*.

2113.11.1.3 Pellet Fuel-Burning Appliances

Flue lining and vent systems for use in masonry chimneys with pellet fuel-burning appliances shall be limited to flue lining systems complying with Section 2113.11.1 and pellet vents *listed* for installation within masonry chimneys (see Section 2113.11.1.5 for marking).

2113.11.1.4 Oil-Fired Appliances Approved for Use With L-Vent

Flue lining and vent systems for use in masonry chimneys with oil-fired appliances *approved* for use with Type L vent shall be limited to flue lining systems complying with Section 2113.11.1 and *listed* chimney liners complying with UL 641 (see Section 2113.11.1.5 for marking).

2113.11.1.5 Notice of Usage

When a flue is relined with a material not complying with Section 2113.11.1, the chimney shall be plainly and permanently identified by a *label* attached to a wall, ceiling or other conspicuous location adjacent to where the connector enters the chimney. The *label* shall include the following message or equivalent language: "This chimney is for use only with (type or category of appliance) that burns (type of fuel). Do not connect other types of appliances."

2113.11.2 Concrete and Masonry Chimneys for Medium-Heat Appliances

2113.11.2.1 General

Concrete and masonry chimneys for medium-heat appliances shall comply with Sections 2113.1 through 2113.5.

2113.11.2.2 Construction

Chimneys for medium-heat appliances shall be constructed of solid masonry units or of concrete with walls not less than 8 inches (203 mm) thick, or with stone masonry not less than 12 inches (305 mm) thick.

2113.11.2.3 Lining

Concrete and masonry chimneys shall be lined with an *approved* medium-duty refractory brick not less than 4 $\frac{1}{2}$ inches (114 mm) thick laid on the 4 $\frac{1}{2}$ -inch bed (114 mm) in an *approved* medium-duty refractory mortar. The lining shall start 2 feet (610 mm) or more below the lowest chimney connector entrance. Chimneys terminating 25 feet (7620 mm) or less above a chimney connector entrance shall be lined to the top.

2113.11.2.4 Multiple Passageway

Concrete and masonry chimneys containing more than one passageway shall have the liners separated by a minimum 4-inch-thick (102 mm) concrete or solid masonry wall.

2113.11.2.5 Termination Height

Concrete and masonry chimneys for medium-heat appliances shall extend not less than 10 feet (3048 mm) higher than any portion of any building within 25 feet (7620 mm).

2113.11.2.6 Clearance

A minimum clearance of 4 inches (102 mm) shall be provided between the exterior surfaces of a concrete or masonry chimney for medium-heat appliances and combustible material.

2113.11.3 Concrete and Masonry Chimneys for High-Heat Appliances

2113.11.3.1 General

Concrete and masonry chimneys for high-heat appliances shall comply with Sections 2113.1 through 2113.5.

2113.11.3.2 Construction

Chimneys for high-heat appliances shall be constructed with double walls of solid masonry units or of concrete, each wall to be not less than 8 inches (203 mm) thick with a minimum airspace of 2 inches (51 mm) between the walls.

2113.11.3.3 Lining

The inside of the interior wall shall be lined with an *approved* high-duty refractory brick, not less than 4 $\frac{1}{2}$ inches (114 mm) thick laid on the 4 $\frac{1}{2}$ -inch bed (114 mm) in an *approved* high-duty refractory mortar. The lining shall start at the base of the chimney and extend continuously to the top.

2113.11.3.4 Termination Height

Concrete and masonry chimneys for high-heat appliances shall extend not less than 20 feet (6096 mm) higher than any portion of any building within 50 feet (15 240 mm).

2113.11.3.5 Clearance

Concrete and masonry chimneys for high-heat appliances shall have *approved* clearance from buildings and structures to prevent overheating combustible materials, permit inspection and maintenance operations on the chimney and prevent danger of burns to persons.

2113.12 Clay Flue Lining (Installation)

Clay flue liners shall be installed in accordance with ASTM C1283 and extend from a point not less than 8 inches (203 mm) below the lowest inlet or, in the case of fireplaces, from the top of the smoke chamber to a point above the enclosing walls. The lining shall be carried up vertically, with a maximum slope no greater than 30 degrees (0.52 rad) from the vertical.

Clay flue liners shall be laid in medium-duty nonwater-soluble refractory mortar conforming to ASTM C199 with tight mortar joints left smooth on the inside and installed to maintain an airspace or insulation not to exceed the thickness of the flue liner separating the flue liners from the interior face of the chimney masonry walls. Flue lining shall be supported on all sides. Only enough mortar shall be placed to make the joint and hold the liners in position.

2113.13 Additional Requirements

2113.13.1 Listed Materials

Listed materials used as flue linings shall be installed in accordance with the terms of their listings and the manufacturer's instructions.

2113.13.2 Space Around Lining

The space surrounding a chimney lining system or vent installed within a masonry chimney shall not be used to vent any other appliance.

Exception: This shall not prevent the installation of a separate flue lining in accordance with the manufacturer's instructions.

2113.14 Multiple Flues

When two or more flues are located in the same chimney, masonry wythes shall be built between adjacent flue linings. The masonry wythes shall be at least 4 inches (102 mm) thick and bonded into the walls of the chimney.

Exception: When venting only one appliance, two flues are permitted to adjoin each other in the same chimney with only the flue lining separation between them. The joints of the adjacent flue linings shall be staggered not less than 4 inches (102 mm).

2113.15 Flue Area (Appliance)

Chimney flues shall not be smaller in area than the area of the connector from the appliance. Chimney flues connected to more than one appliance shall be not less than the area of the largest connector plus 50 percent of the areas of additional chimney connectors.

Exceptions:

1. Chimney flues serving oil-fired appliances sized in accordance with NFPA 31.
2. Chimney flues serving gas-fired appliances sized in accordance with the *Florida Building Code, Fuel Gas*.

2113.16 Flue Area (Masonry Fireplace)

Flue sizing for chimneys serving fireplaces shall be in accordance with Section 2113.16.1 or 2113.16.2.

TABLE 2113.16(1)**NET CROSS-SECTIONAL AREA OF ROUND FLUE SIZES^a**

FLUE SIZE, INSIDE DIAMETER (inches)	CROSS-SECTIONAL AREA (square inches)
6	28
7	38
8	50
10	78
10 ³ / ₄	90
12	113
15	176
18	254

For SI: 1 inch = 25.4 mm, 1 square inch = 645.16 mm².

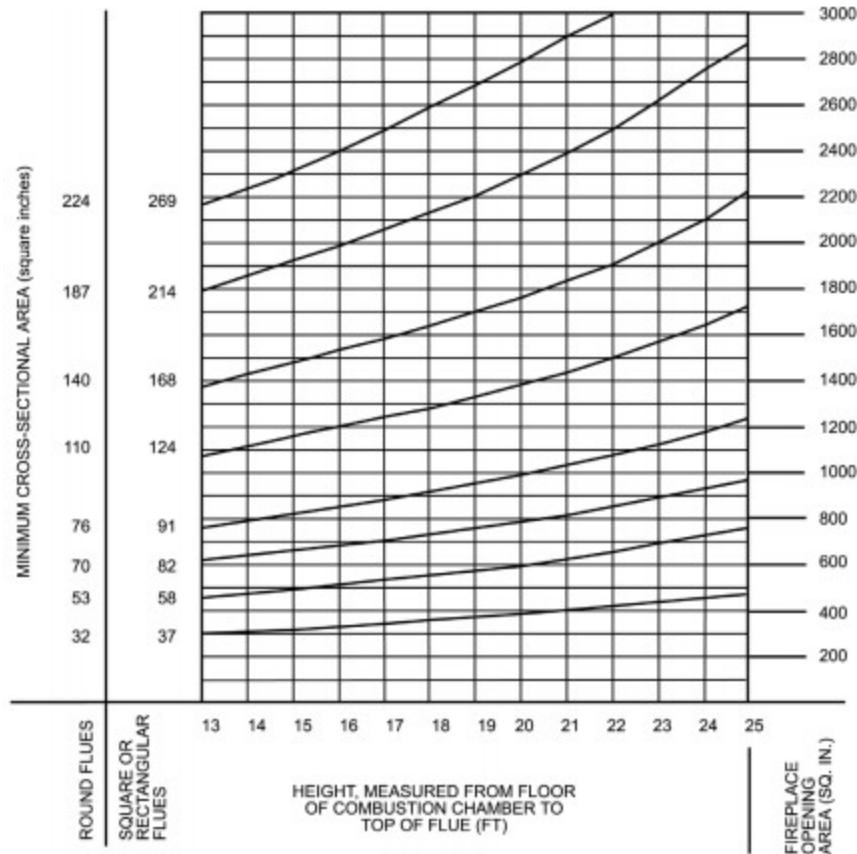
a. Flue sizes are based on ASTM C315.

TABLE 2113.16(2)**NET CROSS-SECTIONAL AREA OF SQUARE AND RECTANGULAR FLUE SIZES**

FLUE SIZE, OUTSIDE NOMINAL DIMENSIONS (inches)	CROSS-SECTIONAL AREA (square inches)
4.5 × 8.5	23
4.5 × 13	34
8 × 8	42
8.5 × 8.5	49
8 × 12	67
8.5 × 13	76
12 × 12	102

8.5 × 18	101
13 × 13	127
12 × 16	131
13 × 18	173
16 × 16	181
16 × 20	222
18 × 18	233
20 × 20	298
20 × 24	335
24 × 24	431

For SI: 1 inch = 25.4 mm, 1 square inch = 645.16 mm².



For SI: 1 inch = 25.4 mm, 1 square inch = 645 mm².

FIGURE 2113.16

FLUE SIZES FOR MASONRY CHIMNEYS

2113.16.1 Minimum Area

Round chimney flues shall have a minimum net cross-sectional area of not less than $\frac{1}{12}$ of the fireplace opening. Square chimney flues shall have a minimum net cross-sectional area of not less than $\frac{1}{10}$ of the fireplace opening. Rectangular chimney flues with an aspect

ratio less than 2 to 1 shall have a minimum net cross-sectional area of not less than $\frac{1}{10}$ of the fireplace opening. Rectangular chimney flues with an aspect ratio of 2 to 1 or more shall have a minimum net cross-sectional area of not less than $\frac{1}{8}$ of the fireplace opening.

2113.16.2 Determination of Minimum Area

The minimum net cross-sectional area of the flue shall be determined in accordance with Figure 2113.16. A flue size providing not less than the equivalent net cross-sectional area shall be used. Cross-sectional areas of clay flue linings are as provided in Tables 2113.16(1) and 2113.16(2) or as provided by the manufacturer or as measured in the field. The height of the chimney shall be measured from the firebox floor to the top of the chimney flue.

2113.17 Inlet

Inlets to masonry chimneys shall enter from the side. Inlets shall have a thimble of fireclay, rigid refractory material or metal that will prevent the connector from pulling out of the inlet or from extending beyond the wall of the liner.

2113.18 Masonry Chimney Cleanout Openings

Cleanout openings shall be provided within 6 inches (152 mm) of the base of each flue within every masonry chimney. The upper edge of the cleanout shall be located not less than 6 inches (152 mm) below the lowest chimney inlet opening. The height of the opening shall be not less than 6 inches (152 mm). The cleanout shall be provided with a noncombustible cover.

Exception: Chimney flues serving masonry fireplaces, where cleaning is possible through the fireplace opening.

2113.19 Chimney Clearances

Any portion of a masonry chimney located in the interior of the building or within the *exterior wall* of the building shall have a minimum airspace clearance to combustibles of 2 inches (51 mm). Chimneys located entirely outside the *exterior walls* of the building, including chimneys that pass through the soffit or cornice, shall have a minimum airspace clearance of 1 inch (25 mm). The airspace shall not be filled, except to provide fireblocking in accordance with Section 2113.20.

Exceptions:

1. Masonry chimneys equipped with a chimney lining system *listed* and *labeled* for use in chimneys in contact with combustibles in accordance with UL 1777, and installed in accordance with the manufacturer's instructions, are permitted to have combustible material in contact with their exterior surfaces.
2. Where masonry chimneys are constructed as part of masonry or concrete walls, combustible materials shall not be in contact with the masonry or concrete wall less than 12 inches (305 mm) from the inside surface of the nearest flue lining.
3. Exposed combustible *trim* and the edges of sheathing materials, such as wood siding, are permitted to abut the masonry chimney sidewalls, in accordance with Figure 2113.19, provided such combustible *trim* or sheathing is not less than 12 inches (305 mm) from the inside surface of the nearest flue lining. Combustible material and *trim* shall not overlap the corners of the chimney by more than 1 inch (25 mm).

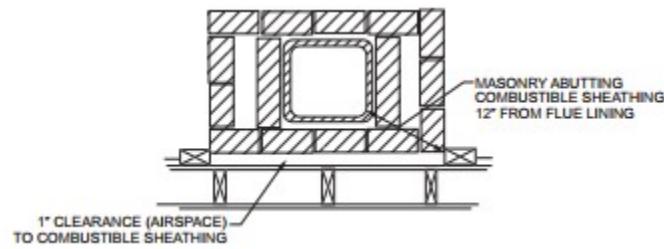


FIGURE 2113.19

ILLUSTRATION OF EXCEPTION THREE CHIMNEY CLEARANCE PROVISION

2113.20 Chimney Fireblocking

All spaces between chimneys and floors and ceilings through which chimneys pass shall be fireblocked with noncombustible material securely fastened in place. The fireblocking of spaces between wood joists, beams or headers shall be self-supporting or be placed on

strips of metal or metal lath laid across the spaces between combustible material and the chimney.

Section 2114 Termite Inspection

2114.1 Cleaning

Cells and cavities in masonry units and air gaps between brick, stone or masonry veneers and the structure shall be cleaned of all nonpreservative treated or nonnaturally durable wood, or other cellulose-containing material prior to concrete placement.

Exception: Inorganic material manufactured for closing cells in foundation concrete masonry unit construction or clean earth fill placed in concrete masonry unit voids below slab level before termite treatment is performed.

2114.2 Concrete Bearing Ledge

Brick, stone or other veneer shall be supported by a concrete bearing ledge at least equal to the total thickness of the brick, stone or other veneer, which is poured integrally with the concrete foundation. No supplemental concrete foundation pours which will create a hidden cold joint shall be used without supplemental treatment in the foundation unless there is an approved physical barrier. An approved physical barrier shall also be installed from below the wall sill plate or first block course horizontally to embed in a mortar joint. If masonry veneer extends below grade, a termite protective treatment must be applied to the cavity created between the veneer and the foundation, in lieu of a physical barrier.

Exception: Veneer supported by a shelf, angle or lintel secured to the foundation sidewall in accordance with TMS 402, provided at least a 6-inch (152 mm) clear inspection space of the foundation sidewall exterior exist between the veneer and the top of any soil, sod, mulch or other organic landscaping component, deck, apron, porch, walk or any other work immediately adjacent to or adjoining the structure.

Section 2115 Special Wind Provisions for Masonry

2115.1 Gable Endwalls

2115.1.1 General

Gable endwalls shall be structurally continuous between points of lateral support.

2115.1.2 Cathedral Endwalls

Gable endwalls adjacent to cathedral ceilings shall be structurally continuous from the uppermost floor to the ceiling diaphragm or to the roof diaphragm.

Section 2116 And 2117

RESERVED

Section 2118 High-Velocity Hurricane Zones—Design

RESERVED

Section 2119 High-Velocity Hurricane Zones—Quality, Tests and Approvals

2119.1 Quality

Reserved.

2119.2 Tests

Reserved.

2119.3 Approvals

2119.3.1

Only such masonry units that bear the approval of the building official and are manufactured or fabricated by plants having a certificate of competency issued by the authority having jurisdiction, shall be considered acceptable for the construction of buildings or other structures.

2119.3.2

Approval of masonry units and manufacturing or fabricating plants shall be for periods not to exceed one year and may be obtained upon application and the submission of certificates of tests in accordance with the provisions of this chapter.

2119.3.3

The provisions for tests for approval of masonry units shall not be construed as in lieu of any tests otherwise required under this chapter.

2119.3.4

Failure of a manufacturer of masonry units to obtain approval or to submit tests as required in this chapter, or such additional tests as the building official may require, shall be cause for rejection of such masonry units.

2119.4 Brick

Reserved.

2119.5 Stone

Reserved.

2119.6 Cast Stone

Reserved.

2119.7 Concrete Blocks

Reserved.

2119.8 Structural Clay Tile

Reserved.

2119.9 Gypsum Tile

Reserved.

2119.10 Plain Concrete

Reserved.

2119.11 Plain Gypsum Concrete

Reserved.

2119.12 Mortar

Reserved.

Section 2120 High-Velocity Hurricane Zones—Allowable Unit Stresses in Unit Masonry

RESERVED

Section 2121 High-Velocity Hurricane Zones—Construction Details**2121.1 General****2121.1.1**

Reserved.

2121.1.2

Reserved.

2121.1.3

Reserved.

2121.1.4

Reserved.

2121.1.5

Reserved.

2121.1.6

Minimum No. 9 gauge truss-type horizontal joint reinforcing at every alternate course [16-inch (406 mm) spacing], shall be provided. This reinforcement shall extend 4 inches (102 mm) into tie columns or be tied to structural columns with approved methods where structural columns replace the tie columns. In addition, horizontal joint reinforcement shall comply with TMS 602 Sections 2.4C through 2.4F and Section 3.4B.7.

2121.2 Exterior Walls**2121.2.1 General****2121.2.1.1**

Exterior walls of unit masonry shall have a minimum thickness of 8 inches (203 mm) except as otherwise set forth in Sections 2121.2.11.

2121.2.1.2

No roof or other members shall be placed to develop direct horizontal thrust on walls unless such walls are specifically designed.

2121.2.1.3

The maximum area of wall panels of 8 inch (203 mm) thick unit masonry, as measured between the concrete members which frame the panel such as the beams and tie columns, shall not exceed 240 square feet (22.3 m^2), except as set forth in Section 2121.2.2.

2121.2.2 Tie Columns**2121.2.2.1**

Concrete tie columns shall be required in exterior walls of unit masonry. Concrete tie columns shall be required at all corners, at intervals not to exceed 16 feet (4.9 m) center-to-center of columns, adjacent to any corner opening exceeding 4 feet (1219 mm) in width, and at the ends of free-standing walls exceeding 2 feet (610 mm) in length. When openings exceed 8 feet (2.4 m) in width, tie columns shall be provided on each side of all such openings. All gable and shed end corners shall have tie columns.

2121.2.2.2

When openings are between 3 and 8 feet (914 mm and 2.4 m) in width, such openings shall have one #5 vertical reinforcing bar at each side. The vertical bars shall be placed in concrete filled cells and shall extend into footings and into tie beams. All such bars shall be continuous from footing to tie beam. All splices, where needed, shall be 30 inches (762 mm) minimum.

2121.2.2.3

Tie columns shall be not less than 12 inches (305 mm) in width. Tie columns having an unbraced height not exceeding 15 feet (4.6 m) shall be not less in thickness than the wall or less than a nominal 8 inches (203 mm), and, where exceeding 15 feet (4.6 m) in unbraced height, shall be not less in thickness than 12 inches (305 mm). The unbraced height shall be taken at the point of positive lateral support in the direction of consideration or the column may be designed to resist applicable lateral loads based on rational analysis.

2121.2.2.4

Tie columns shall be reinforced with not less than four #5 vertical bars for 8 inch by 12 inch (203 mm by 305 mm) columns nor less than four #6 vertical bars for 12 inch by 12 inch (305 mm by 305 mm) columns nor less reinforcing steel than 0.01 of the cross-sectional area for columns of other dimension nor less than may be required to resist axial loads or bending forces. Vertical reinforcing shall be doweled to the footing and splices shall be lapped 30 bar diameters. Columns shall be tied with #2 hoops spaced not more than 12 inches (305 mm) apart.

2121.2.2.5

The concrete tie columns set forth herein are a minimum to limit masonry panel areas and provide an integrated framework for masonry. The spacing of concrete columns for skeleton frame construction, designed as specified in Chapter 19 (High-Velocity

Hurricane Zones), may exceed the spacing herein set forth provided the masonry panels have an area less than 240 square feet (22.3 m^2) and the structural system is designed to transmit horizontal wind loads to the columns.

2121.2.2.6

Concrete tie columns designed to limit masonry panel areas may be offset at tie beams or other horizontal members to avoid openings, but the maximum spacing shall not be exceeded.

2121.2.2.7

Concrete columns in load-bearing walls shall be poured only after masonry units are in place. Where masonry walls of skeleton frame construction are laid up after the frame has been erected, adequate anchorage designed by a professional engineer shall be provided. Where structural steel members are made fire resistive with masonry units, the panel walls shall be bonded to the fire-resistive materials.

2121.2.2.8

Where the minimum spacing of tie columns, as set forth in Section 2121.2.2.1, has been satisfied and structural columns of skeleton frame construction are spaced as specified in Section 2121.2.2.5, provision for resisting the horizontal and vertical loads at the edges of masonry panels abutting door and window openings in masonry walls where openings are not bounded by such reinforced concrete columns shall be considered and, where necessary, transfer the forces through the materials of assembly to the ground.

2121.2.3 Tie Beams

2121.2.3.1

A tie beam of reinforced concrete shall be placed in all walls of unit masonry, at each floor or roof level, and at such intermediate levels as may be required to limit the vertical heights of the masonry units to 16 feet (4.9 m). Well-compacted and confined soil below grade may be considered lateral restraint but only above a point 1 foot (305 mm) below the grade where such restraint begins.

2121.2.3.2

Unless otherwise required by design, all tie beams shall have four #3 ties at 12 inches (305 mm) on center at corners and at each bend and at 48 inches (1219 mm) on center elsewhere. A tie beam shall be not less in dimension or reinforcing than required for the conditions of loading nor less than the following minimums: a tie beam shall have a width of not less than a nominal 8 inches (203 mm), shall have a height of not less than 12 inches (305 mm) and shall be reinforced with not less than four #5 reinforcing bars placed two at the top and two at the bottom of the beam except that a tie beam using "U" type beam block may be used with the following limitations:

1. Limited to one-story Group R3 occupancy.
2. Limited to unsupported spans of 7 feet (2.1 m).
3. Beam block shall be reinforced with one #7 bar in the top and one #7 bar in the bottom of the pour.
4. Beam block shall provide not less than 14 inches (356 mm) vertical dimension or less than $4\frac{1}{2}$ inches (114 mm) horizontal dimension of poured-in-place beam cross-section.
5. Where beam blocks are used, consideration of resistance to uplift caused by wind forces shall be based on only that portion of the dead load above the topmost mortar joint in the wall.

2121.2.3.3

The tie beam shall be continuous. Continuity of the reinforcing in straight runs shall be provided by lapping splices not less than 30 inches (762 mm). Continuity shall be provided at corners by bending two bars from each direction around the corner 30 inches (762 mm) or by adding two #5 bent bars which extend 30 inches (762 mm) each way from the corner. Continuity at columns shall be provided by continuing horizontal reinforcing through columns or by bending horizontal reinforcing in the columns a distance of 18 inches (457 mm).

2121.2.3.4

A tie beam shall not be required where floor or roof systems provide a rigid diaphragm of reinforced concrete with a minimum thickness of 4 inches (102 mm) or where a floor or roof system has an equivalent stiffness factor of not less than 0.5 cubic inches, as determined by the moment of inertia divided by the length. (Per foot of width, measured normal to the plane of the diaphragm and adequately anchored.)

2121.2.3.5

Changes in level of the beams or structural concrete beams (beam) shall be made at tie columns or structural concrete columns and said tie columns or structural concrete columns shall be continuous from beam to beam.

2121.2.3.6

A tie beam may follow the rake of a gable or shed end if the slope does not exceed 3:12 and the requirements of Sections 2121.2.1.2 and 2121.2.1.3 are met.

2121.2.3.7

The concrete in tie beams shall be placed to bond to the masonry units immediately below and shall not be separated therefrom by wood, felt or any other material which may prevent bond. Felt paper no wider than the width of the cells of the block may be used provided that it is depressed a minimum of 2 inches (51 mm) in one cell of each block.

2121.2.3.8

Tie beams subject to uplift and lateral wind forces shall be sized and designed to resist all such forces. Tie beams over openings shall be sized and designed to resist dead and live loads combined with wind loads, whichever governs.

2121.2.4 Gable End and Shed End Walls

All masonry structures with gable end and shed end (half gable) walls shall have such end walls constructed of masonry, only in accordance with this section. A horizontal tie beam shall be provided in line with the lower ends of the gables and sheds, except as permitted in Section 2121.2.3.6 above, and designed in accordance with Sections 2121.2.1.2 and 2121.2.1.3, and load requirements as set forth in Chapter 16 (High-Velocity Hurricane Zones). A concrete coping following the rake of the gable, not less than 64 square inches (0.04 m^2) in area reinforced with two #5 bars shall be provided. Tie columns at gable and shed ends shall be provided. Any intermediate tie columns required within the gable shall extend to the coping beam. Tie beams resting on masonry which are not subject to uplift and lateral wind forces shall be provided according to Section 2121.2.3.2.

2121.2.5 Parapet Walls**2121.2.5.1**

Masonry parapet walls shall be not less than 8 inches (203 mm) thick, shall be reinforced with minimum tie columns and shall be coped with a concrete beam not less than 64 square inches (0.04 m^2) in cross-section, reinforced with two #4 reinforcing bars.

2121.2.5.2

A parapet wall exceeding 5 feet (1524 mm) in height above a tie beam or other point of lateral support shall be specifically designed to resist horizontal wind loads.

2121.2.6 Piers**2121.2.6.1**

In any section of a masonry wall of an enclosed structure where openings are arranged to leave sections of walls less than 16 inches (406 mm), such sections shall be steel or reinforced concrete.

2121.2.6.2

Isolated masonry piers of unenclosed structures shall be so constructed that the height of such piers shall not exceed 10 times the least dimension, that the cells are filled with cement grout and reinforced with not less than two #5 bars anchoring the beam to the foundation.

2121.2.7 Cavity Walls**2121.2.7.1**

Cavity walls consisting of two separate walls with an air space of not less than 2 inches nor more than 6 inches (51 to 152 mm) may be constructed of solid or hollow-unit masonry provided such walls meet the specific requirements for tie columns and beams set forth in this section and are bonded together at intervals not more than 24 inches (610 mm) apart, vertically and horizontally, by masonry ties or by durable, rigid metal ties 0.10 square inch (64.5 mm²) in the cross section.

2121.2.7.2

The minimum thickness of the separate walls of cavity wall construction shall be 4 inches (102 mm), and units shall be laid in full beds of Portland cement mortar with full-end joints.

2121.2.8 Brick and Stone Walls

Walls of brick and stone shall be laterally supported by tie columns and beams, or the equivalent thereof, as provided in this section and shall meet these additional requirements:

1. In all brick walls at least every sixth course on both sides of the wall shall be a header course or there shall be at least one full header in every 72 square inches (0.05 m²) of each wall surface.
2. In walls more than 12 inches (305 mm) thick, the inner joints of header courses shall be covered with another header course that shall break joints with the course below.
3. Solid-unit masonry shall comply with the standard Building Code Requirements for Masonry, ANSI A41.1.
4. Rubble stone walls shall be 4 inches (102 mm) thicker than is required for solid brick or concrete walls of the same respective heights, but in no part less than 16 inches (406 mm).

2121.2.9 Substitutions

2121.2.9.1

Where, for architectural reasons or otherwise, it is desirable to reduce the area of any required tie column or tie beam below the specified requirements, the building official may grant such reduction, provided that the area of concrete omitted shall be replaced by reinforcing or structural steel in the ratio 1:(n-1) where n is defined as the modular ratio of elasticity ($e_{\text{steel}}/e_{\text{concrete}}$).

2121.2.9.2

Where it is desired to substitute for the #5 reinforcing as required by this section, three #4 bars may be substituted to replace two #5 bars.

2121.2.10 Wall Additions

Where new walls are connected to existing walls, such connection shall be by means of a starter column of minimum 8 inches by 8 inches (203 mm by 203 mm) dimension reinforced with two #5 bars.

2121.2.11 Chases, Recesses and Openings

2121.2.11.1

Unit masonry walls required to be a minimum of 8 inches (203 mm) thick, such as exterior walls, fire walls and bearing walls, may be chased or recessed not deeper than one-half the wall thickness for an area not exceeding 8 square feet (0.74 m²), provided the horizontal dimension of the chase or recess does not exceed 4 feet (1219 mm) and provided the chasing shall not reduce the dimension of tie beams and tie columns to less than herein required, except as follows:

Exception: Four-inch (102 mm) deep chases or recesses in 8 inch (703 mm) unit masonry walls may be constructed with 4 inch (102 mm) unit masonry panels provided such 4 inch (102 mm) unit masonry panel does not exceed 5 feet (1524 mm) in width, does not exceed 8 feet (2.4 m) in height, is bonded on one vertical side to 8 inch (203 mm) masonry or a tie column, and is not load bearing. Where such panel exceeds 2 feet (610 mm) in width at locations 20 feet (6.1 m) or more above grade in exterior walls, resistance to wind load shall be considered in the design, and a minimum of 4 inch by 8 inch (102 mm by 203 mm) tie column with two #5 vertical bars shall be provided in the free standing end of such 4 inch (102 mm) wall.

2121.2.11.2

Openings shall have lintels of reinforced concrete. Where such lintel is precast or formed separately from a tie beam, it shall bear not less than nominal 8 inches (203 mm) on the masonry, at each end except as may otherwise be approved for compliance with this code by product approval, or after rational analysis, but not less than 4 inches (102 mm). Where such lintel is formed integrally with the tie beam by deepening the tie beam above the opening, and the tie beam itself is capable of safely supporting all loads, the beam may span up to 6 feet (1.8 m) in length and may be deepened not to exceed 8 inches (203 mm) without additional reinforcing. Where the tie beam is deepened in excess of 8 inches (203 mm) with a span less than 6 feet (1.8 m) in length, and the tie beam itself is capable of supporting all loads, the dropped portion shall contain a #3 horizontal bar at the bottom, bent up at each end and fastened to the upper tie beam steel or two #4 horizontal bars. The dropped portion shall bear at least 4 inches (102 mm) on the masonry at each end. Where the span is in excess of 6 feet (1.8 m), the principal beam reinforcing shall be at the bottom of the beam.

2121.2.12 Glass Unit Masonry

Reserved.

2121.2.13 Grill Block

Reserved.

2121.3 Interior Bearing Walls

Reserved.

2121.4 Fire Walls

Reserved.

2121.5 Panel Walls**2121.5.1**

Panel walls of unit-masonry shall be not less than 8 inches (203 mm) thick and shall be limited in panel dimension as set forth in Section 2121.2.

2121.5.2

Panel walls of reinforced concrete shall be not less than 4 inches (102 mm) thick nor less than required by design as specified in Chapter 19 (High-Velocity Hurricane Zones).

2121.6 Veneered Walls

Reserved.

2121.7 Partitions

Reserved.

2121.8 Fences

Reserved.

2121.9 Other Masonry Walls

Reserved.

Section 2122 High-Velocity Hurricane Zones— Reinforced Unit Masonry**2122.1 Standards**

The provisions of TMS 402 and TMS 602 are hereby adopted as a minimum for the design and construction of reinforced unit masonry. In addition to TMS 402 and TMS 602, reinforced unit masonry structures shall comply with Sections 2122.2 through 2122.10.

Exception: Unless otherwise specified by the designing architect or engineer, where plan review and inspections are performed by a local building department in accordance with Sections 107 and 110, the provisions of TMS 402, Chapter 3, Section 3.1 and TMS 602, Sections 1.5 and 1.6 shall not apply.

2122.2 General**2122.2.1**

Section 2121 shall not apply where design and construction are in accordance with the provisions of this section.

2122.2.2

The design of buildings and structures of reinforced unit masonry shall be by a professional engineer or registered architect.

2122.2.3

Minimum No. 9 gauge ladder-type hot-dipped galvanized, stainless steel, or epoxy coating horizontal joint reinforcing at every alternate course [16-inch (406 mm) spacing], for reinforced masonry shall be provided. This reinforcement shall be tied to structural columns with approved methods. In addition, horizontal joint reinforcement shall comply with TMS 602 Sections 2.4C through 2.4F and Section 3.4B.10.

2122.2.4 Special Inspector

A Florida-registered architect or professional engineer shall furnish inspection of all reinforced unit masonry structures.

2122.3 Concrete Masonry Strength

Concrete masonry strength shall be determined by unit strength method from TMS 602 Section 1.4 or in accordance with ASTM C1314.

2122.4 Reinforcement

Reinforcement shall comply with TMS 402 and TMS 602 except as modified herein Sections 2107 and 2108.

2122.5 Concentrated Loads

Bearing area and concentrated loads shall be in accordance with TMS 402 Sections 4.3.4 and 5.1.3.

2122.6 Reinforced Masonry Bearing Walls

Reinforced masonry bearing walls shall have a nominal thickness of not less than 8 inches (203 mm).

2122.7 Anchorage Requirements

Anchorage shall be in accordance with TMS 402. Loading shall comply with TMS 402 Section 4.1 and the following.

2122.7.1

Reinforced masonry walls shall be securely anchored to adjacent structural members such as roofs, floors, columns, pilasters, buttresses and intersection walls.

2122.7.2

Masonry walls shall be anchored to all floors and roofs that provide lateral support to such walls.

2122.7.3

Such anchorage shall provide a positive direct connection capable of resisting the horizontal forces as required in Chapter 16 (High-Velocity Hurricane Zones), or a minimum force of 200 pounds per lineal foot (2919 N/m) of wall, whichever is greater.

2122.7.4

Required anchors shall be embedded in reinforced grouted cells. Anchor bolts shall be installed in accordance with TMS 602 Section 3.4D.

2122.7.5

Wood framing connected by nails shall not be considered as acceptable anchorage.

2122.8 Mortar and Grout**2122.8.1**

Mortar materials shall comply with TMS 602 Section 2.1. Grout materials shall comply with TMS 602 Section 2.2.

2122.8.2

Vertical alignment of cells to be grouted shall maintain clear, unobstructed, continuous, vertical cores measuring not less than $2\frac{1}{2}$ inches by 3 inches (51 mm by 76 mm) for fine aggregate grout and 3 inches by 3 inches (76 mm by 76 mm) for coarse aggregate grout as defined by ASTM C476. The architect or engineer may specify other grout space sizes which shall be permitted provided they comply with TMS 402 Section 1.203.2.1 and TMS 602 Section 3.5C.

2122.8.3

Placing of mortar and masonry units shall comply with TMS 602 Section 3.3.

2122.8.4 Grout Placement

Grout placement shall be in accordance with TMS 402 and TMS602.

2122.8.5 Confinement

Confine grout to the areas indicated on the project drawings. Use material to confine grout that permits bond between masonry units and mortar.

2122.8.6

Unless otherwise required, mix grout other than self-consolidating grout to a consistency that has a slump between 8 and 11 inches (203 and 279 mm). Self-consolidating grout shall comply with TMS 602.

2122.8.7

Grout shall be placed before any initial set has occurred, but in no case more than $1\frac{1}{2}$ hours after the mix-designed water has been added.

2122.8.8

Grout placement shall comply with Section 3.5 of TMS 602. Grouting shall be a continuous operation with grout pour height in accordance with Section 3.5C of TMS 602 and with grout lift height in accordance with Section 3.5D of TMS 602.

2122.8.9

Grouting shall be consolidated between lifts by puddling, rodding or mechanical vibration.

2122.8.10

Grout keys shall be formed between grout pours. Grout keys shall be formed between grout lifts when the first lift is permitted to set prior to placement of the subsequent lift.

1. Form a grout key by terminating the grout a minimum of $1\frac{1}{2}$ inches (38.1 mm) below a mortar joint.
2. Do not form grout keys within beams.
3. At beams or lintels laid with closed bottom units, terminate the grout pour at the bottom of the beam or lintel without forming a grout key.

2122.9 Bearing

Precast floor and roof units supported on masonry walls shall provide minimum bearing of 3 inches (76 mm) and anchorage in accordance with Section 2122.7.

2122.10 Intersecting Walls

Intersecting walls shall comply with TMS 402 Section 5.1.1.

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Chapter 22 Steel

Section 2201 General

2201.1 Scope

The provisions of this chapter govern the quality, design, fabrication and erection of steel used structurally in buildings or structures.

Exception: Buildings and structures located within the high-velocity hurricane zone shall comply with the provisions of Sections 2204 through 2209 and 2214 through 2224.

Section 2202 Definitions

2202.1 Definitions

The following terms are defined in Chapter 2:

STEEL CONSTRUCTION, COLD-FORMED.

STEEL ELEMENT, STRUCTURAL.

STEEL JOIST.

Section 2203 Identification and Protection of Steel for Structural Purposes

2203.1 Identification

Identification of *structural steel elements* shall be in accordance with AISC 360. Identification of cold-formed steel members shall be in accordance with AISI S100. Identification of cold-formed steel light-frame construction shall also comply with the requirements contained in AISI S240 or AISI S220, as applicable. Other steel furnished for structural load-carrying purposes shall be properly identified for conformity to the ordered grade in accordance with the specified ASTM standard or other specification and the provisions of this chapter. Steel that is not readily identifiable as to grade from marking and test records shall be tested to determine conformity to such standards.

2203.2 Protection

Painting of *structural steel elements* shall be in accordance with AISC 360. Painting of open-web steel joists and joist girders shall be in accordance with SJI 200 and SJI 100. Individual structural members and assembled panels of cold-formed steel construction shall be protected against corrosion in accordance with the requirements contained in AISI S100. Protection of cold-formed steel light-frame construction shall be in accordance with AISI S240 or AISI S220, as applicable.

Section 2204 Connections

2204.1 Welding

The details of design, workmanship and technique for welding and qualification of welding personnel shall be in accordance with the specifications listed in Sections 2205, 2206, 2207, 2208, 2210 and 2211 (see Section 2222 for HVHZ) and 2211 (see Section 2222 for HVHZ).

2204.2 Bolting

The design, installation and inspection of bolts shall be in accordance with the requirements of Sections 2205, 2206, 2207, 2210 and 2211.

2204.3 Anchor Rods

Anchor rods shall be set in accordance with the *approved construction documents*. The protrusion of the threaded ends through the connected material shall fully engage the threads of the nuts but shall not be greater than the length of the threads on the bolts.

Section 2205 Structural Steel

2205.1 General

The design, fabrication and erection of *structural steel elements* in buildings, structures and portions thereof shall be in accordance with AISC 360.

Section 2206 Composite Structural Steel and Concrete Structures

2206.1 General

Systems of *structural steel elements* acting compositely with reinforced concrete shall be designed in accordance with AISC 360 and ACI 318, excluding ACI 318 Chapter 14.

Section 2207 Steel Joists

2207.1 General

The design, manufacture and use of open-web steel joists and joist girders shall be in accordance with either SJI 200 or SJI 100, as applicable.

2207.2 Design

The *registered design professional* shall indicate on the *construction documents* the steel joist and steel joist girder designations from the specifications listed in Section 2207.1; and shall indicate the requirements for joist and joist girder design, layout, end supports, anchorage, bridging design that differs from the SJI specifications listed in Section 2207.1, bridging termination connections and bearing connection design to resist uplift and lateral loads. These documents shall indicate special requirements as follows:

1. Special loads including:

- 1.1. Concentrated loads.
- 1.2. Nonuniform loads.
- 1.3. Net uplift loads.
- 1.4. Axial loads.
- 1.5. End moments.
- 1.6. Connection forces.

2. Special considerations including:

- 2.1. Profiles for joist and joist girder configurations that differ from those defined by the SJI specifications listed in Section 2207.1.
- 2.2. Oversized or other nonstandard web openings.
- 2.3. Extended ends.

3. Live and total load deflection criteria for joists and joist girder configurations that differ from those defined by the SJI specifications listed in Section 2207.1.

2207.3 Calculations

The steel joist and joist girder manufacturer shall design the steel joists and steel joist girders in accordance with the SJI specifications listed in Section 2207.1 to support the load requirements of Section 2207.2. The *registered design professional* shall be permitted to require submission of the steel joist and joist girder calculations as prepared by a *registered design professional* responsible for the product design. Where requested by the *registered design professional*, the steel joist manufacturer shall submit design calculations with a cover letter bearing the seal and signature of the joist manufacturer's *registered design professional*. In addition to the design calculations submitted under seal and signature, the following shall be included:

1. Bridging design that differs from the SJI specifications listed in Section 2207.1, such as cantilevered conditions and net uplift.
2. Connection design for:

- 2.1. Connections that differ from the SJI specifications listed in Section 2207.1, such as flush-framed or framed connections.
- 2.2. Field splices.
- 2.3. Joist headers.

2207.4 Steel Joist Drawings

Steel joist placement plans shall be provided to show the steel joist products as specified on the *approved construction documents* and are to be utilized for field installation in accordance with specific project requirements as stated in Section 2207.2. Steel joist placement plans shall include, at a minimum, the following:

1. Listing of applicable loads as stated in Section 2207.2 and used in the design of the steel joists and joist girders as specified in the *approved construction documents*.
2. Profiles for joist and joist girder configurations that differ from those defined by the SJI specifications listed in Section 2207.1.
3. Connection requirements for:
 - 3.1. Joist supports.
 - 3.2. Joist girder supports.
 - 3.3. Field splices.
 - 3.4. Bridging attachments.
4. Live and total load deflection criteria for joists and joist girder configurations that differ from those defined by the SJI specifications listed in Section 2207.1.
5. Size, location and connections for bridging.
6. Joist headers.

Steel joist placement plans do not require the seal and signature of the joist manufacturer's *registered design professional*.

2207.5 Certification

At completion of manufacture, the steel joist manufacturer shall submit a *certificate of compliance* to the owner or the owner's authorized agent for submittal to the *building official* as specified in Section 1704.5 stating that work was performed in accordance with *approved construction documents* and with SJI specifications listed in Section 2207.1.

Section 2208 Steel Cable Structures

2208.1 General

The design, fabrication and erection including related connections, and protective coatings of steel cables for buildings shall be in accordance with ASCE 19.

Section 2209 Steel Storage Racks

2209.1 Storage Racks

The design, testing and utilization of *storage racks* made of cold-formed or hot-rolled steel structural members shall be in accordance with

2209.2 Cantilevered Steel Storage Racks

The design, testing and utilization of cantilevered storage racks made of cold-formed or hot-rolled steel structural members shall be in accordance with RMI ANSI/MH 16.3.

Section 2210 Cold-Formed Steel**2210.1 General**

The design of cold-formed carbon and low-alloy steel structural members shall be in accordance with AISI S100. The design of cold-formed stainless-steel structural members shall be in accordance with ASCE 8. Cold-formed steel light-frame construction shall also comply with Section 2211.

2210.1.1 Steel Decks

The design and construction of cold-formed steel decks shall be in accordance with this section.

2210.1.1.1 Noncomposite Steel Floor Decks

Noncomposite steel floor decks shall be permitted to be designed and constructed in accordance with ANSI/SDI-NC1.0.

2210.1.1.2 Steel Roof Deck

Steel roof decks shall be permitted to be designed and constructed in accordance with ANSI/SDI-RD1.0.

2210.1.1.3 Composite Slabs on Steel Decks

Composite slabs of concrete and steel deck shall be permitted to be designed and constructed in accordance with SDI-C.

2210.2 Seismic Requirements for Cold-Formed Steel Structures

Reserved.

2210.3 Test Standard for Joist Hangers and Connectors

Allowable loads for joist hangers and connectors shall be in accordance with either AISI S914 or the procedure in ASTM D7147. Allowable loads for hold-downs shall be in accordance with AISI S913.

Section 2211 Cold-Formed Steel Light-Frame Construction**2211.1 Structural Framing**

For cold-formed steel light-frame construction, the design and installation of the following structural framing systems, including their members and connections, shall be in accordance with AISI S240 and Sections 2211.1.1 through 2211.1.3, as applicable:

1. Floor and roof systems,
2. Structural walls,
3. Shear walls, strap braced walls and diaphragms to resist in-plane lateral loads, and
4. Trusses.

2211.1.1 Seismic Requirements for Cold-Formed Steel Structural Systems

Reserved.

2211.1.2 Prescriptive Framing

Detached one- and two-family *dwellings* and *townhouses*, less than or equal to three stories *above grade plane*, shall be permitted to be constructed in accordance with AISI S230 subject to the limitations therein.

2211.1.3 Truss Design

Cold-formed steel trusses shall comply with the provisions of Sections 2211.1.3.1 through 2211.1.3.3.

2211.1.3.1 Truss Design Drawings

The truss design drawings shall conform to the requirements of Section I1 of AISI S202 and shall be provided with the shipment of trusses delivered to the job site. The truss design drawings shall include the details of permanent individual truss member restraint/bracing in accordance with Section I1.6 of AISI S202 where these methods are utilized to provide restraint/bracing.

2211.1.3.2 Trusses Spanning 60 Feet or Greater

The owner or the owner's authorized agent shall contract with a *registered design professional* for the design of the temporary installation restraint/bracing and the permanent individual truss member restraint/bracing for trusses with clear spans 60 feet (1828 mm) or greater.

2211.1.3.3 Truss Quality Assurance

Reserved.

2211.2 Nonstructural Members

For cold-formed steel light-frame construction, the design and installation of nonstructural members and connections shall be in accordance with AISI S220.

Section 2212 Gable End Walls**2212.1 Gable Endwalls**

Gable endwalls shall be structurally continuous between points of lateral support.

2212.1.2 Cathedral Endwalls

Gable endwalls adjacent to cathedral ceilings shall be structurally continuous from the uppermost floor to the ceiling diaphragm or to the roof diaphragm.

Section 2213 Reserved**Section 2214 High-Velocity Hurricane Zones—General—Steel Construction****2214.1 Design**

Steel and iron members shall be designed by methods admitting of rational analysis according to established principles or methods.

2214.2

The design, fabrication and erection of iron and steel for buildings and other structures shall be as set forth in this chapter. The additional requirements set forth in Sections 2215 through 2221 herein, inclusive, apply to structural steel for buildings and other structures located in high-velocity hurricane zones. The additional requirements set forth in Sections 2222 and 2223 herein, inclusive, apply to cold-formed members of sheet or strip steel and cold-formed steel light frame construction located in high-velocity hurricane zones.

2214.3

The following standards, as set forth in Chapter 35 of this code, are hereby adopted.

1. American Institute of Steel Construction, AISC.

a. DG03, Serviceability Design Considerations for Steel Buildings, AISC.

b. DG09, Torsional Analysis of Structural Steel Members, AISC.

c. DG15, Rehabilitation and Retrofit, AISC.

d. AISC Steel Construction Manual, AISC.

2. American Iron and Steel Institute, AISI.

a. AISI S100, North American Specification for the Design of Cold-Formed Steel Structural Members.

b. AISI S230, Standard for Cold-Formed Steel Framing—Prescriptive Method for One and Two Family Dwellings.

c. AISI S240, North American Standard for Cold-Formed Steel Structural Framing.

3. American Society of Civil Engineers, ASCE.

a. ASCE 8, Specification for the Design of Cold-Formed Stainless Steel Structural Members.

4. American National Standards Institute/American Welding Society, ANSI/AWS.

a. Specification for Welding Procedure and Performance Qualification, AWS B2.1.

b. Structural Welding Code—Steel, ANSI/AWS D1.1—D1.1M.

c. Structural Welding Code—Sheet Metal, ANSI/AWS D1.3—D1.3M.

d. Structural Welding Code—Reinforcing Steel, ANSI/AWS D1.4.

e. Sheet Metal Welding Code, AWS D9.1—D9.1M.

5. ASTM International.

a. Standard Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use, ASTM A6.

b. Standard Specification for Sheet Steel, Carbon, Metallic, and Nonmetallic Coated for Cold-formed Steel Framing Members, ASTM A1003-A1003M.

c. Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions, ASTM F3125-F3125M.

6. National Association of Architectural Metal Manufacturers, NAAMM.

a. NAAMM MBG 531, Metal Grating Manual.

7. Research Council on Structural Connections, RCSC.

a. Specification for Structural Joints Using High-Strength Bolts, RCSC.

8. Steel Deck Institute, Inc., SDI.

a. Diaphragm Design Manual, SDI.

b. SDI-C Standard for Composite Steel Floor Deck Slabs.

c. SDI-RD Standard for Steel Roof Deck.

d. SDI-NC Standard for Non-Composite Steel Floor Deck.

9. Steel Joist Institute, SJI.

a. 45th Edition Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders, SJI.

b. "Structural Design of Steel Joist Roofs to Resist Ponding Loads," *Technical Digest No. 3*, SJI.

c. "Vibration of Steel Joist-Concrete Floors," *Technical Digest No. 5*, SJI.

d. "Design of Steel Joist Roofs to Resist Uplift Loads," *Technical Digest No. 6*, SJI.

e. "Welding of Open Web Steel Joist and Joist Girders," *Technical Digest No. 8*, SJI.

f. "Handling and Erection of Steel Joists and Joist Girders," *Technical Digest No. 9*, SJI.

g. 90 Years of Open Web Steel Joist Construction, SJI.

h. "Design of Lateral Load Resisting Frames Using Steel Joists and Joist Girders," *Technical Digest No. 11*, SJI.

10. Steel Tube Institute, STI.

a. HSS Design Manual, Volume 1: Section Properties & Design Information.

b. HSS Design Manual, Volume 2A: Member Design 2016.

c. HSS Design Manual, Volume 2B: Member Design 2016.

d. HSS Design Manual, Volume 3: Connections at HSS Members 2016.

e. HSS Design Manual, Volume 4: Truss & Bracing Connections 2016.

2214.4 Workmanship

Reserved.

2214.5 Statements of the Structural Responsibilities of Architects and Professional Engineers on the Design of Structural Steel Systems

Reserved.

Section 2215 High-Velocity Hurricane Zones—Material

2215.1 Steel

Reserved.

2215.2 High-Strength Steel Bolts

Reserved.

2215.3 Used and Damaged Material

All steel shall be straight and true, and any section damaged to be out of shape shall not be used. Steel previously used or fabricated for use or fabricated in error shall not be used except with the approval of the building official. Filled holes or welds shall not be concealed. Straightened or retempered fire-burned steel shall not be used except with the approval of the building official.

2215.4 Tests

Reserved.

Section 2216 High-Velocity Hurricane Zones— Design Loads

2216.1

Design shall be based on the dead, live, wind and other loads set forth in Chapter 16 (High-Velocity Hurricane Zones) and the additional stress considerations set forth in this chapter.

Section 2217 High-Velocity Hurricane Zones— Minimum Thickness of Material

2217.1

The minimum thickness of material shall not be less than as set forth in the applicable standards listed in Section 2214.3 except as otherwise set forth herein.

Section 2218 High-Velocity Hurricane Zones—Connections

RESERVED

Section 2219 High-Velocity Hurricane Zones—Tubular Columns

2219.1

Tubular columns and other primary compression members, excluding secondary posts and struts not subject to bending and whose design load does not exceed 2,000 pounds (8900 N), shall have a minimum least dimension of $2\frac{1}{2}$ inches (64 mm) and a minimum wall thickness of $\frac{3}{16}$ inch (4.8 mm).

2219.2

Tubular members when filled with concrete shall have $\frac{1}{4}$ -inch diameter (6.4 mm) pressure relief holes drilled through the shell, within 6 inches (152 mm) of the top and bottom of the exposed length of the member and one hole at midheight.

2219.3

Concrete fill in tubular members shall not be assumed to carry any of the load except in compression members having a least dimension of 8 inches (203 mm) or greater and having a 1 inch (25 mm) inspection hole in the plate at each end.

Section 2220 High-Velocity Hurricane Zones—Protection of Metal

RESERVED

Section 2221 High-Velocity Hurricane Zones—General—Open Web Steel Joists

2221.1 Standards

Open web steel joists shall comply with the standards set forth in Section 2214.3.

2221.2

Reserved.

2221.3 Design

Reserved.

2221.4 Connections

Reserved.

2221.5 Bridging

Reserved.

2221.6 End Supports and Anchorage**2221.6.1**

Joists shall not bear directly on unit masonry unless masonry is designed as engineered unit masonry with properly reinforced, grout-filled continuous bond beam.

2221.6.2

The ends of every joist shall be bolted, welded or encased in concrete at each point of bearing to provide not less than 100 percent of the net uplift reaction specified in the structural construction documents.

2221.6.3

The ends of joists shall have a minimum bearing, on reinforced concrete and steel supports as specified in the standard set forth in Section 2214.3(9).

2221.7 Fabrication

Reserved.

2221.8 Shop Standards

Reserved.

Section 2222 High-Velocity Hurricane Zones—Cold-Formed Steel Construction**2222.1**

Cold-formed steel construction shall include individual structural members, structural decks or wall panels, and nonstructural roofing, siding and other construction elements formed from sheet or strip steel and as set forth in Section 2214.3(2) and (3).

2222.2 Standards

Cold-formed steel used in structural applications shall conform to the standards set forth in Section 2214.3(2) and (3).

2222.2.1

Galvanizing as referred to herein is to be zinc coating conforming to the standard set forth in Section 2214.3(5)(b).

2222.3 Individual Structural Members

Design, fabrication and erection of individual cold-formed steel structural members shall be as set forth herein.

2222.3.1

All structural members shall be positively connected to resist the loads set forth in Chapter 16 (High-Velocity Hurricane Zones).

2222.3.2

All connections shall be by welding, riveting, bolting or other approved fastening devices or methods providing positive attachment and resistance to loosening. Fasteners shall be of compatible material.

2222.3.3

Cables and rods shall not be used as lateral bracing in habitable structures. Lateral bracing, when used, shall have a slenderness ratio of 300 or less, unless restricted by any other section of this code.

2222.3.4

All doors shall be anchored as part of the frame in the closed position.

2222.3.5

No increase in strength shall be allowed for the effect of cold work.

2222.4 Structural Sheets

Decks and panels with or without an approved fill material may be designed as diaphragms in accordance with *Diaphragm Design Manual* of the Steel Deck Institute, provided other limitations in this code are complied with.

2222.4.1

Poured fill on roof and floor decks shall not be assumed to have any structural value to support or resist vertical or lateral loads or to provide stability or diaphragm action unless so designed, and poured fill and/or applied materials do not degrade when subjected to moisture.

2222.4.2

Positive attachment of sheets shall be provided to resist uplift forces. Attachment shall be as set forth in Section 2222.3.1 and as required by rational analysis, and/or tests, but not less frequently than the following maximum spacing:

1. One fastener shall be placed near the corner of each sheet or at overlapping corners of sheets.
2. Along each supporting member, the spacing of fasteners shall not exceed 8 inches (203 mm) on centers at ends of sheets or 12 inches (305 mm) on centers.
3. The spacing of edge fasteners between panels, and between panels and supporting members, parallel to the direction of span, where continuous interlock is not otherwise provided shall be not more than 12 inches (305 mm) on centers.
4. Fastening shall be by bolting, welding or other approved fastening device that provides a resistance to lateral movement as required by rational analysis or by test, but not less than 400 pounds per lineal foot (5838 N/m).
5. Poured lightweight concrete fill will be acceptable as continuous interlock.
6. Attachment to the supporting structure shall be provided at all perimeters and discontinuities by fasteners spaced at no more than 8 inches (203 mm) on center.
7. Wall panels shall be attached as set forth in Section 2222.4.2(1), (2) and (3).

2222.4.3

Metal siding and roof panels shall be not less than 24 gauge.

Exception: Roof panels having an approved fill material designed to act as a diaphragm may use a lighter deck gauge provided that the product approval for the fill material allows its use over the same deck gauge, but in no case shall the deck be less than 26 gauge. The permit applicant shall provide the building official with signed and sealed structural calculations for the diaphragm design prepared by a licensed architect or engineer proficient in structural design. The diaphragm design shall comply with the applicable requirements of Chapter 16 and Chapter 22 (High-Velocity Hurricane Zones).

2222.4.4 Deflection

2222.4.4.1

Deflection of structural metal siding shall not exceed L/240.

2222.4.4.2

Deflection of structural metal roof panels shall not exceed L/180.

2222.4.5

The bending stress of metal siding and roof panels shall be designed using a safety factor of not less than 2.5.

2222.4.6

Minimum roof decking uplift loads shall comply with the design requirements of Chapter 16 (High-Velocity Hurricane Zones) utilizing rational analysis, but not less than UL 580 Class 90.

2222.4.7

Reserved.

2222.4.8

Metal siding and roof panels shall be designed, where possible, to be continuous over two or more spans.

2222.5 Nonstructural Sheets

Steel sheet sections not suitable by rational analysis for self-supporting structural sheets shall be termed roofing and siding. Roofing and siding shall be used only over solid wood sheathing or equivalent backing.

2222.5.1

Attachment of sheets shall be as set forth in Section 2222.4.2.

2222.6 Protection of Metal

All members shall be treated with protective paint coatings or equivalent protection except as permitted in Sections 2222.6.1 or 2222.6.2.

2222.6.1

All steel sheets having a thickness of less than 20 gauge, i.e., materials of higher gauge, shall be galvanized in accordance with the standards of Section 2214.3(5)(b) herein to provide a minimum coating designation of G90.

2222.6.2

Abrasions or damages to the protective coating shall be spot-treated with a material and in a manner compatible to the shop protective coating.

2222.7

Welding shall conform to the requirements of Sections 2214.3.

Section 2223 High-Velocity Hurricane Zones—Preengineered, Prefabricated Metal Building Systems and Components (Preengineered Structures)**2223.1 Scope**

Metal buildings (preengineered structures) shall include, but not be limited to, tapered or straight web structural steel frames and predominantly cold-formed steel secondary components, including, but not limited to, girts, purlins, roof sheets, wall sheets, etc.

2223.2 Standards

Frames and components shall comply with the standards set forth in Section 2214.3.

2223.3

Structural construction documents for preengineered structures shall indicate the necessary measures for adapting the structures to the specific site. The structural construction documents shall indicate all openings, concentrated loads and other special requirements.

Foundation conditions assumed in the design shall be indicated as well as the location and magnitude of building reactions on that foundation under all design conditions.

2223.4 Structural Submittals

Reserved.

2223.5 Design

A building or component system in this section shall have a structural engineer of record and/or architect of record responsible for the overall design and performance of the entire building including the foundation and the anchorage of the preengineered metal systems buildings thereto. The structural engineer of record and/or the architect of record shall provide the structural construction documents necessary for permitting.

2223.5.1

Calculations for drift and deflection of the metal system building shall be by the specialty engineer.

2223.5.2

Calculations for deflection shall be done using only the bare frame method. Reductions based on engineering judgment using the assumed composite stiffness of the building envelope shall not be allowed. Drift shall follow AISC serviceability design considerations for low-rise buildings. The use of composite stiffness for deflection calculations shall be permitted only when actual calculations for the stiffness are included with the design for the specific project. When maximum deflections are specified by the structural construction documents, calculations shall be included in the design data.

2223.5.3

The manufacturer shall design the metal system building and/or component system in accordance with the provisions of Chapter 16 (High-Velocity Hurricane Zones), and the design shall be signed, dated and sealed by the specialty engineer and reviewed by the structural engineer of record and/or the architect of record. The manufacturer of the metal system building and or component system shall be responsible to provide all reactions to the structural engineer of record and/or the architect of record.

2223.5.4

Fastenings shall be by bolting, welding or other approved fastening device that provides a resistance to lateral movement as required by rational analysis or by test, but not less than 400 pounds per lineal foot (5838 N/m).

2223.6 Permitting

Reserved.

2223.7 Fabrication and Erection

2223.7.1

Reserved.

2223.7.2

Temporary bracing shall be provided during erection and shall remain in place until all structural frames, purlins, girts, flange braces, cable or rod bracing and sheets used as diaphragms have been installed.

2223.8 Roof Sheets, Wall Sheets, Roof Panels and Wall Panels

2223.8.1

Reserved.

2223.8.2

The fusion welding of structural members and structural sheets defined in Section 2222.4 and less than 22 gauge (0.0299 inch nominal) in thickness shall have minimum of $\frac{5}{8}$ inch (17 mm) diameter welds through weld washers not less than 14-gauge in thickness and 1 inch (25 mm) in diameter, contoured if necessary to provide continuous contact, or an equivalent device.

2223.8.3

Clip-mounted standing-seam roof sheets shall not be used as diaphragms nor shall they be considered as adequate lateral bracing of the flange of the secondary member to which they are attached unless one or both of these features are designed into the sheathing system and the manufacturer can certify by testing and/or analysis that such capabilities exist and are appropriately defined.

2223.8.4

Structural standing-seam roof sheets shall be a minimum of 24 gauge [0.0239 inch (0.6 mm) nominal] in thickness.

2223.8.5

Direct screw attached roof and wall sheets may be used as diaphragms provided the sheets are a minimum of 24 gauge [0.0239 inch (0.6 mm) nominal] in thickness. Additionally, these sheets shall be considered to laterally brace the flange of the secondary member to which they are attached.

2223.8.6

See Section 2222 for additional requirements for roof sheets, wall sheets, roof panels and wall panels.

2223.9 Roof Purlins and Wall Girts**2223.9.1**

Adequate bracing shall be provided to the compression flanges of secondary members with special attention to those members subject to uplift or outward pressures where no roof or wall sheets are attached to provide such bracing. Sag rods shall not be considered bracing when located in the neutral axis of the web of the secondary members.

2223.9.2

Roof purlins and wall girts shall be laterally braced in addition to relying on deck and panel diaphragm action.

2223.9.3

The ends and bearing points of secondary members shall be designed to carry 100 percent of dead, live and collateral loads superimposed on them by wind.

2223.9.4

Upward or outward forces of wind are to be calculated without live and collateral loads. When downward or inward forces caused by wind are involved, the dead forces plus collateral load forces must be combined but the roof live load may be omitted.

2223.10 Individual Structural Members**2223.10.1**

Cables and rods shall not be used as lateral bracing in habitable structures. Lateral bracing, when used, shall have a slenderness ratio of 300 or less, unless restricted by any other section of this code.

2223.10.2

Reserved.

2223.10.3

All doors shall be anchored as part of the frame in the closed position.

2223.10.4

See Section 2222 for additional requirements for metal building systems and components.

2223.11 Inspection

Reserved.

Section 2224 High-Velocity Hurricane Zones—Chain Link Fences**TABLE 2224****CHAIN LINK FENCE MINIMUM REQUIREMENTS**

Fence Height (ft)	Terminal Post Dimensions (o.d. x wall thickness) (in inches)	Line Post Dimensions (o.d. x wall thickness) (in inches)	Terminal Post Concrete Foundation Size (diameter x depth) (in inches)	Line Post Concrete Foundation Size (diameter x depth) (in inches)
Up to 4	$2\frac{3}{8} \times 0.042$	$1\frac{5}{8} \times 0.047$	10×24	8×24
Over 4 to 5	$2\frac{3}{8} \times 0.042$	$1\frac{7}{8} \times 0.055$	10×24	8×24
Over 5 to 6	$2\frac{3}{8} \times 0.042$	$1\frac{7}{8} \times 0.065$	10×24	8×24
Over 6 to 8	$2\frac{3}{8} \times 0.110$	$2\frac{3}{8} \times 0.095$	10×36	10×36
Over 8 to 10	$2\frac{7}{8} \times 0.110$	$2\frac{3}{8} \times 0.130$	12×40	10×40
Over 10 to 12	$2\frac{7}{8} \times 0.160$	$2\frac{7}{8} \times 0.120$	12×42	12×42

For SI: 1 inch = 25.4 mm.

NOTES:

1. This table is applicable only to fences with unrestricted airflow.
2. Fabric: $12\frac{1}{2}$ gauge minimum.
3. Tension bands: Use one less than the height of the fence in feet evenly spaced.
4. Fabric ties: Must be minimum the same gauge of the fabric.
5. Fabric tie spacing on the top rail: Five ties between posts, evenly spaced.
6. Fabric tie spacing on line posts: One less than height of the fence in feet, evenly spaced.
7. Either top rail or top tension wire shall be used.
8. Braces must be used at terminal posts if top tension wire is used instead of top rail.
9. Post spacing: 10 foot (3 m) on center maximum.
10. Posts shall be embedded to within 6 inches (152 mm) from the bottom of the foundation.
11. In order to follow the contour of the land, the bottom of the fence may clear the contour of the ground by up to 5 inches (127 mm) without increasing table values to the next higher limit.

2224.1

Chain link fences in excess of 12 feet (3.7 m) in height shall be designed according to the loads specified in Chapter 16 (High-Velocity Hurricane Zones).

2224.2

Chain link fences less than 12 feet (3.7 m) in height shall be designed according to the loads specified in Chapter 16 (High-Velocity Hurricane Zones) or may be constructed to meet the minimum requirements specified in Table 2224.

2023 FBC - Building, 8th edition**Chapter 23 Wood****Section 2301 General****2301.1 Scope**

The provisions of this chapter shall govern the materials, design, construction and quality of wood members and their fasteners.

Exception: Buildings and structures located within the high-velocity hurricane zone shall comply with the provisions of Sections 2302, 2303.1 through 2303.1.4, 2303.1.8, 2303.2, 2303.5, 2303.5.1, 2303.5.2, 2304.12, 2304.12.3 and Sections 2314 through 2330.

2301.2 General Design Requirements

The design of structural elements or systems, constructed partially or wholly of wood or wood-based products, shall be in accordance with one of the following methods:

1. *Allowable stress design* in accordance with Sections 2304, 2305 and 2306.
2. *Load and resistance factor design* in accordance with Sections 2304, 2305 and 2307.
3. *Conventional light-frame construction* in accordance with Section 2304.
4. AWC WFCM in accordance with Section 2309.
5. The design and construction of log structures in accordance with the provisions of ICC 400.

2301.3 Nominal Sizes

For the purposes of this chapter, where dimensions of lumber are specified, they shall be deemed to be nominal dimensions unless specifically designated as actual dimensions (see Section 2304.2).

Section 2302 Definitions**2302.1 Definitions**

The following terms are defined in Chapter 2:

ACCREDITATION BODY.

BRACED WALL LINE.

BRACED WALL PANEL.

COLLECTOR.

CONVENTIONAL LIGHT-FRAME CONSTRUCTION.

CRIPPLE WALL.

CROSS-LAMINATED TIMBER.

DIAPHRAGM, UNBLOCKED.

DRAG STRUT.

ENGINEERED WOOD RIM BOARD.

FIBERBOARD.

GABLE.

GRADE (LUMBER).

HARDBOARD.

NAILING, BOUNDARY.

NAILING, EDGE.

NAILING, FIELD.

NOMINAL SIZE (LUMBER).

PARTICLEBOARD.

PERFORMANCE CATEGORY.

PREFABRICATED WOOD I-JOIST.

SHEAR WALL.

Shear wall, perforated.

Shear wall segment, perforated.

STRUCTURAL COMPOSITE LUMBER.

Laminated strand lumber (LSL).

Laminated veneer lumber (LVL).

Oriented strand lumber (OSL).

Parallel strand lumber (PSL).

STRUCTURAL GLUED-LAMINATED TIMBER.**TIE-DOWN (HOLD-DOWN).****TREATED WOOD.**

Fire-retardant-treated wood.

Preservative-treated wood.

WOOD SHEAR PANEL.**WOOD STRUCTURAL PANEL.**

Composite panels.

Oriented strand board (OSB).

Plywood.

Section 2303 Minimum Standards and Quality**2303.1 General**

Structural sawn lumber; end-jointed lumber; prefabricated wood I-joists; structural glued-laminated timber; wood structural panels; fiberboard sheathing (when used structurally); hardboard siding (when used structurally); particleboard; *preservative-treated wood*; structural log members; structural composite lumber; round timber poles and piles; *fire-retardant-treated wood*; hardwood plywood; wood trusses; joist hangers; nails; and staples shall conform to the applicable provisions of this section.

2303.1.1 Sawn Lumber

Sawn lumber used for load-supporting purposes, including end-jointed or edge-glued lumber, machine stress-rated or machine-evaluated lumber, shall be identified by the grade *mark* of a lumber grading or inspection agency that has been approved by an accreditation body that complies with DOC PS 20 or equivalent. Grading practices and identification shall comply with rules published by an agency approved in accordance with the procedures of DOC PS 20 or equivalent procedures.

2303.1.1.1 Certificate of Inspection

In lieu of a grade *mark* on the material, a certificate of inspection as to species and grade issued by a lumber grading or inspection agency meeting the requirements of this section is permitted to be accepted for precut, remanufactured or rough-sawn lumber and for sizes larger than 3 inches (76 mm) nominal thickness.

2303.1.1.2 End-Jointed Lumber

Approved end-jointed lumber is permitted to be used interchangeably with solid-sawn members of the same species and grade. End-jointed lumber used in an assembly required to have a fire-resistance rating shall have the designation "Heat Resistant Adhesive" or "HRA" included in its grade mark.

2303.1.2 Prefabricated Wood I-Joists

Structural capacities and design provisions for prefabricated wood I-joists shall be established and monitored in accordance with ASTM D5055.

2303.1.3 Structural Glued-Laminated Timber

Glued-laminated timbers shall be manufactured and identified as required in ANSI/AITC A190.1 and ASTM D3737.

2303.1.4 Structural Glued Cross-Laminated Timber

Cross-laminated timbers shall be manufactured and identified in accordance with ANSI/APA PRG 320.

2303.1.5 Wood Structural Panels

Wood structural panels, when used structurally (including those used for siding, roof and wall sheathing, subflooring, diaphragms and built-up members), shall conform to the requirements for their type in DOC PS 1, DOC PS 2 or ANSI/APA PRP 210. Each panel or member shall be identified for grade, bond classification, and Performance Category by the trademarks of an *approved* testing and grading agency. The Performance Category value shall be used as the "nominal panel thickness" or "panel thickness" whenever referenced in this code. Wood structural panel components shall be designed and fabricated in accordance with the applicable standards listed in Section 2306.1 and identified by the trademarks of an *approved* testing and inspection agency indicating conformance to the applicable standard. In addition, wood structural panels when permanently exposed in outdoor applications shall be of Exterior type, except that wood structural panel roof sheathing exposed to the outdoors on the underside is permitted to be Exposure 1 type.

2303.1.6 Fiberboard

Fiberboard for its various uses shall conform to ASTM C208. Fiberboard sheathing, when used structurally, shall be identified by an *approved* agency as conforming to ASTM

2303.1.6.1 Jointing

To ensure tight-fitting assemblies, edges shall be manufactured with square, shiplapped, beveled, tongue-and-groove or U-shaped joints.

2303.1.6.2 Roof Insulation

Where used as roof insulation in all types of construction, fiberboard shall be protected with an *approved* roof covering.

2303.1.6.3 Wall Insulation

Where installed and fire-blocked to comply with Chapter 7, fiberboards are permitted as wall insulation in all types of construction. In fire walls and fire barriers, unless treated to comply with Section 803.1 for Class A materials, the boards shall be cemented directly to the concrete, masonry or other noncombustible base and shall be protected with an *approved* noncombustible veneer anchored to the base without intervening airspaces.

2303.1.6.3.1 Protection

Fiberboard wall insulation applied on the exterior of foundation walls shall be protected below ground level with a bituminous coating.

2303.1.7 Hardboard

Hardboard siding shall conform to the requirements of ANSI A135.6 and, where used structurally, shall be identified by the label of an *approved agency*. Hardboard underlayment shall meet the strength requirements of $\frac{7}{32}$ -inch (5.6 mm) or $\frac{1}{4}$ -inch (6.4 mm) service class hardboard planed or sanded on one side to a uniform thickness of not less than 0.200 inch (5.1 mm). Prefinished hardboard paneling shall meet the requirements of ANSI A135.5. Other basic hardboard products shall meet the requirements of ANSI A135.4. Hardboard products shall be installed in accordance with manufacturer's recommendations.

2303.1.8 Particleboard

Particleboard shall conform to ANSI A208.1. Particleboard shall be identified by the grade *mark* or certificate of inspection issued by an *approved agency*. Particleboard shall not be utilized for applications other than indicated in this section unless the particleboard complies with the provisions of Section 2306.3.

2303.1.8.1 Floor Underlayment

Particleboard floor underlayment shall conform to Type PBU of ANSI A208.1. Type PBU underlayment shall not be less than $\frac{1}{4}$ -inch (6.4 mm) thick and shall be installed in accordance with the instructions of the Composite Panel Association.

2303.1.9 Preservative-Treated Wood

Lumber, timber, plywood, piles and poles supporting permanent structures required by Section 2304.12 to be preservative treated shall conform to AWPA U1 and M4. Lumber and plywood used in permanent wood foundation systems shall conform to Chapter 18.

2303.1.9.1 Identification

Wood required by Section 2304.12 to be preservative treated shall bear the quality *mark* of an inspection agency that maintains continuing supervision, testing and inspection over the quality of the *preservative-treated wood*. Inspection agencies for *preservative-treated wood* shall be *listed* by an accreditation body that complies with the requirements of the American Lumber Standards Treated Wood Program, or equivalent. The quality *mark* shall be on a stamp or *label* affixed to the *preservative-treated wood*, and shall include the following information:

1. Identification of treating manufacturer.
2. Type of preservative used.
3. Minimum preservative retention (pcf).
4. End use for which the product is treated.
5. AWPA standard to which the product was treated.
6. Identity of the accredited inspection agency.

2303.1.9.2 Moisture Content

Where *preservative-treated wood* is used in enclosed locations where drying in service cannot readily occur, such wood shall be at a moisture content of 19 percent or less before being covered with insulation, interior wall finish, floor covering or other materials.

2303.1.10 Structural Composite Lumber

Structural capacities for structural composite lumber shall be established and monitored in accordance with ASTM D5456.

2303.1.11 Structural Log Members

Stress grading of structural log members of nonrectangular shape, as typically used in log buildings, shall be in accordance with ASTM D3957. Such structural log members shall be identified by the grade *mark* of an *approved* lumber grading or inspection agency. In lieu of a grade *mark* on the material, a certificate of inspection as to species and grade issued by a lumber grading or inspection agency meeting the requirements of this section shall be permitted.

2303.1.12 Round Timber Poles and Piles

Round timber poles and piles shall comply with ASTM D3200 and ASTM D25, respectively.

2303.1.13 Engineered Wood Rim Board

Engineered wood rim boards shall conform to ANSI/APA PRR 410 or shall be evaluated in accordance with ASTM D7672. Structural capacities shall be in accordance with ANSI/APA PRR 410 or established in accordance with ASTM D7672. Rim boards conforming to ANSI/APA PRR 410 shall be marked in accordance with that standard.

2303.2 Fire-Retardant-Treated Wood

Fire-retardant-treated wood is any wood product that, when impregnated with chemicals by a pressure process or other means during manufacture, shall have, when tested in accordance with ASTM E84 or UL 723, a *listed* flame spread index of 25 or less. Additionally, the ASTM E84 or UL 723 test shall be continued for an additional 20-minute period and the flame front shall not progress more than 10 $\frac{1}{2}$ feet (3200 mm) beyond the centerline of the burners at any time during the test.

2303.2.1 Pressure Process

For wood products impregnated with chemicals by a pressure process, the process shall be performed in closed vessels under pressures not less than 50 pounds per square inch gauge (psig) (345 kPa).

2303.2.2 Other Means During Manufacture

For wood products impregnated with chemicals by other means during manufacture, the treatment shall be an integral part of the manufacturing process of the wood product. The treatment shall provide permanent protection to all surfaces of the wood product. The use of paints, coating, stains or other surface treatments is not an approved method of protection as required in this section.

2303.2.3 Fire Testing of Wood Structural Panels

Wood structural panels shall be tested with a ripped or cut longitudinal gap of $\frac{1}{8}$ inch (3.2 mm).

2303.2.4 Labeling

In addition to the labels required in Section 2303.1.1 for sawn lumber and Section 2303.1.5 for wood structural panels, each piece of fire-retardant-treated lumber and wood structural panels shall be labeled. The *label* shall contain the following items:

1. The identification *mark* of an *approved agency* in accordance with Section 1703.5.
2. Identification of the treating manufacturer.
3. The name of the fire-retardant treatment.
4. The species of wood treated.
5. Flame spread and smoke-developed index.
6. Method of drying after treatment.
7. Conformance with appropriate standards in accordance with Sections 2303.2.5 through 2303.2.8.
8. For *fire-retardant-treated wood* exposed to weather, damp or wet locations, include the words "No increase in the *listed* classification when subjected to the Standard Rain Test" (ASTM D2898).

2303.2.5 Strength Adjustments

Design values for untreated lumber and wood structural panels, as specified in Section 2303.1, shall be adjusted for *fire-retardant-treated wood*. Adjustments to design values shall be based on an *approved* method of investigation that takes into consideration the effects of the anticipated temperature and humidity to which the *fire-retardant-treated wood* will be subjected, the type of treatment and redrying procedures.

2303.2.5.1 Wood Structural Panels

The effect of treatment and the method of redrying after treatment, and exposure to high temperatures and high humidities on the flexure properties of fire-retardant-treated softwood plywood shall be determined in accordance with ASTM D5516. The test data developed by ASTM D5516 shall be used to develop adjustment factors, maximum loads and spans, or both, for untreated plywood design values in accordance with ASTM D6305. Each manufacturer shall publish the allowable maximum loads and spans for service as floor and roof sheathing for its treatment.

2303.2.5.2 Lumber

For each species of wood that is treated, the effects of the treatment, the method of redrying after treatment and exposure to high temperatures and high humidities on the allowable design properties of fire-retardant-treated lumber shall be determined in accordance with ASTM D5664. The test data developed by ASTM D5664 shall be used to develop modification factors for use at or near room temperature and at elevated temperatures and humidity in accordance with ASTM D6841. Each manufacturer shall publish the modification factors for service at temperatures of not less than 80°F (27°C) and for roof framing. The roof framing modification factors shall take into consideration the climatological location.

2303.2.6 Exposure to Weather, Damp or Wet Locations

Where *fire-retardant-treated wood* is exposed to weather, or damp or wet locations, it shall be identified as "Exterior" to indicate there is no increase in the *listed* flame spread index as defined in Section 2303.2 when subjected to ASTM D2898.

2303.2.7 Interior Applications

Interior *fire-retardant-treated wood* shall have moisture content of not over 28 percent when tested in accordance with ASTM D3201 procedures at 92-percent relative humidity. Interior *fire-retardant-treated wood* shall be tested in accordance with Section 2303.2.5.1 or 2303.2.5.2. Interior *fire-retardant-treated wood* designated as Type A shall be tested in accordance with the provisions of this section.

2303.2.8 Moisture Content

Fire-retardant-treated wood shall be dried to a moisture content of 19 percent or less for lumber and 15 percent or less for wood structural panels before use. For wood kiln-dried after treatment (KDAT), the kiln temperatures shall not exceed those used in kiln drying the lumber and plywood submitted for the tests described in Section 2303.2.5.1 for plywood and 2303.2.5.2 for lumber.

2303.2.9 Type I and II Construction Applications

See Section 603.1 for limitations on the use of *fire-retardant-treated wood* in buildings of Type I or II construction.

2303.3 Hardwood and Plywood

Hardwood and decorative plywood shall be manufactured and identified as required in HPVA HP-1.

2303.4 Trusses

Wood trusses shall comply with Sections 2303.4.1 through 2303.4.7.

2303.4.1 Design

Wood trusses shall be designed in accordance with the provisions of this code and accepted engineering practice. Members are permitted to be joined by nails, glue, bolts, timber connectors, metal connector plates or other *approved* framing devices.

2303.4.1.1 Truss Design Drawings

The written, graphic and pictorial depiction of each individual truss shall be provided to the *building official* for approval prior to installation. Truss design drawings shall also be provided with the shipment of trusses delivered to the job site. Truss design drawings shall include, at a minimum, the information specified below:

1. Slope or depth, span and spacing.
2. Location of all joints and support locations.
3. Number of plies if greater than one.
4. Required bearing widths.
5. Design loads as applicable, including:
 - 5.1. Top chord live load.
 - 5.2. Top chord dead load.
 - 5.3. Bottom chord live load.
 - 5.4. Bottom chord dead load.
 - 5.5. Additional loads and locations.
 - 5.6. Environmental design criteria and loads (wind, rain, etc.).
6. Other lateral loads, including drag strut loads.
7. Adjustments to wood member and metal connector plate design value for conditions of use.
8. Maximum reaction force and direction, including maximum uplift reaction forces where applicable.
9. Metal-connector-plate type, size and thickness or gage, and the dimensioned location of each metal connector plate except where symmetrically located relative to the joint interface.
10. Size, species and grade for each wood member.
11. Truss-to-truss connections and truss field assembly requirements.
12. Calculated span-to-deflection ratio and maximum vertical and horizontal deflection for live and total load as applicable.
13. Maximum axial tension and compression forces in the truss members.
14. Required permanent individual truss member restraint location and the method and details of restraint and diagonal bracing to be used in accordance with Section 2303.4.1.2.

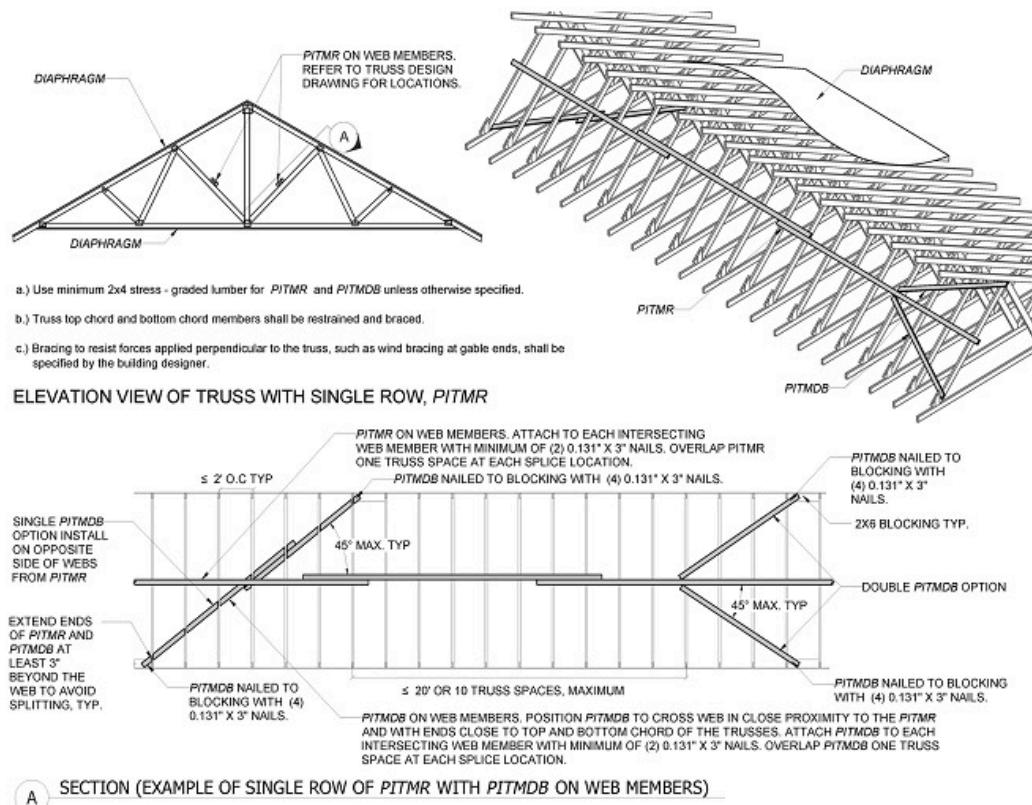
2303.4.1.2 Permanent Individual Truss Member Restraint (PITMR) and Permanent Individual Truss Member Diagonal Bracing (PITMDB)

Where the truss design drawings designate the need for *permanent individual truss member restraint*, it shall be accomplished by one of the following methods:

1. *PITMR* and *PITMDB* installed using standard industry lateral restraint and diagonal bracing details in accordance with TPI 1, Section 2.3.3.1.1, accepted engineering practice, or Figures 2303.4.1.2(1a), (2a) and (3).

2. Individual truss member reinforcement in place of the specified lateral restraints (i.e., buckling reinforcement such as T-reinforcement, L-reinforcement, proprietary reinforcement, etc.) such that the buckling of any individual truss member is resisted internally by the individual truss. The buckling reinforcement of individual *truss members* shall be installed as shown on the truss design drawing or on supplemental truss member buckling reinforcement details provided by the truss designer or in accordance with Figures 2303.4.1.2(1b) and (2b).

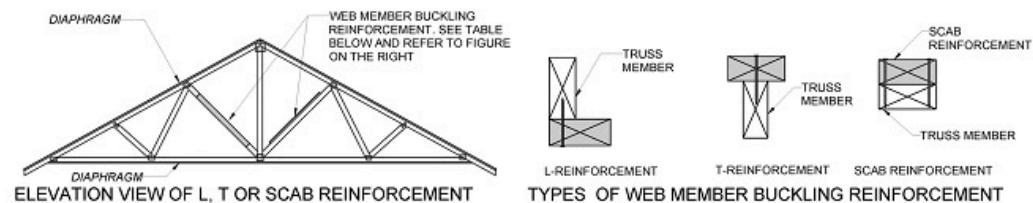
3. A project-specific *PITMR* and *PITMDB* design provided by any registered design professional.



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

FIGURE 2303.4.1.2(1a)

PITMR AND PITMDB FOR TRUSS WEB MEMBERS REQUIRING ONE ROW OF PITMR



- a.) Truss top chord and bottom chord members shall be restrained and braced.
b.) Bracing to resist forces applied perpendicular to the truss, such as wind bracing at gable ends, shall be specified by the building designer.
c.) Use the table below unless project specific web member reinforcement is provided on the truss design drawing or supplemental truss buckling reinforcement details are provided by the truss designer.

NUMBER OF ROWS OF PITMR SPECIFIED ON WEB MEMBER	SIZE OF TRUSS WEB	TYPE AND SIZE OF WEB REINFORCEMENT ¹ FOR T, L OR SCAB ²	GRADE OF WEB REINFORCEMENT	MINIMUM LENGTH OF WEB REINFORCEMENT	MINIMUM CONNECTION OF WEB REINFORCEMENT TO WEB
ONE	2x4	2x4	Same species and grade or better than web member	90% of web or extend to within 6' of end of web member, whichever is greater	(0.131" x 3") nails at 6" on-center ²
	2x6	2x6			
	2x8	2x8			

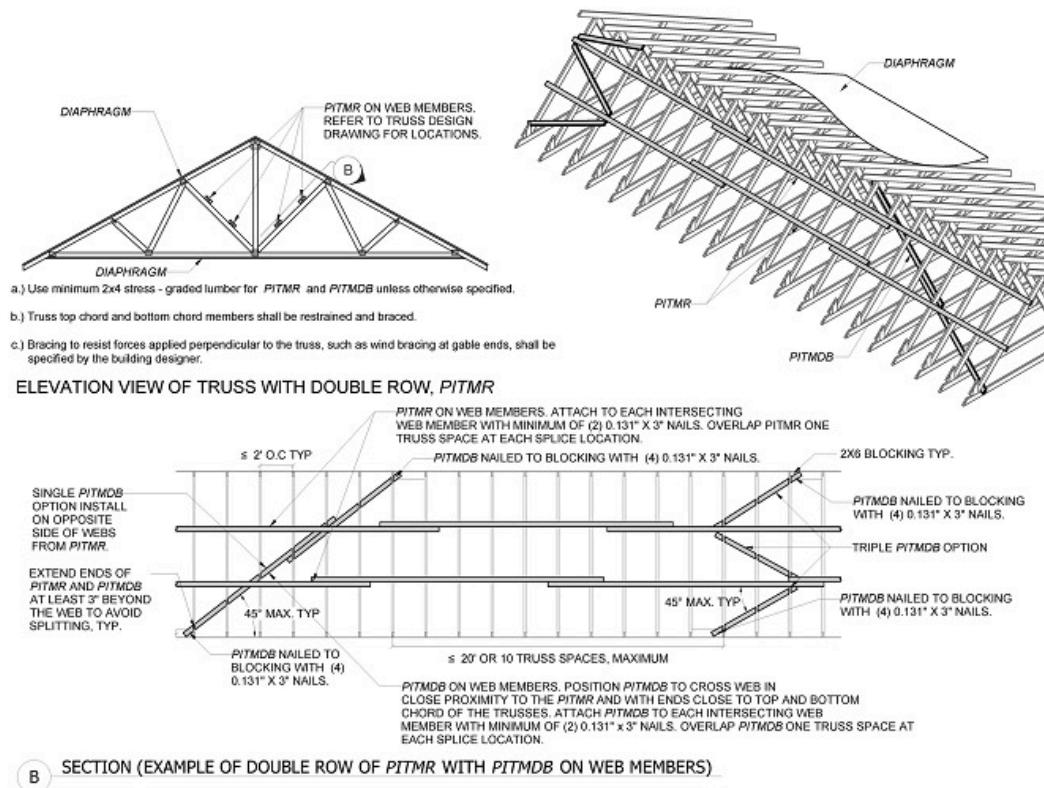
¹Maximum allowable web length is 14'

²Attach Scab reinforcement to web with two rows of minimum 0.131" x 3" nails at 6" on-center

For SI: 1 inch - 25.4 mm, 1 foot = 304.8 mm.

FIGURE 2303.4.1.2(1b)

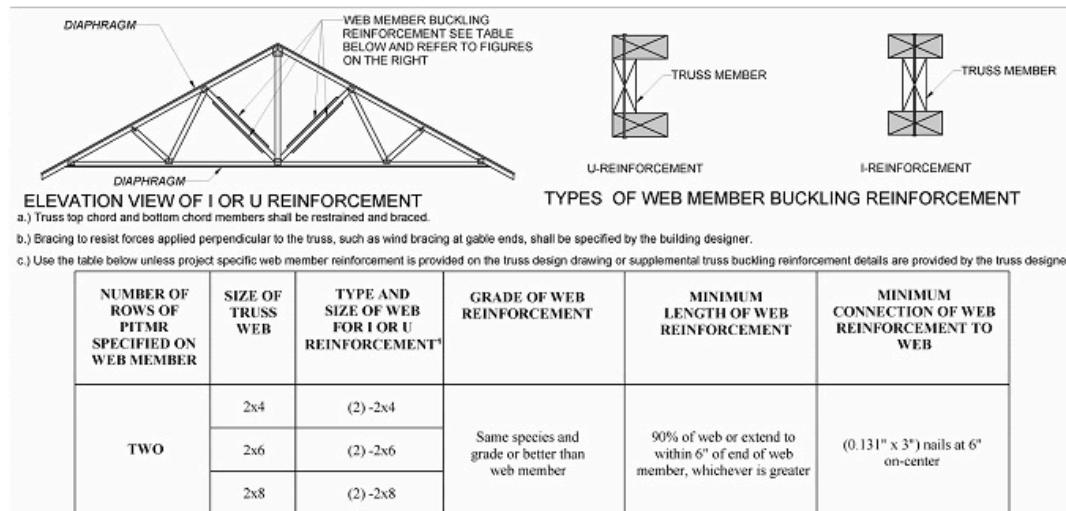
ALTERNATIVE INSTALLATION USING BUCKLING REINFORCEMENT FOR TRUSS WEB MEMBERS IN LIEU OF ONE ROW OF PITMR



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

FIGURE 2303.4.1.2(2a)

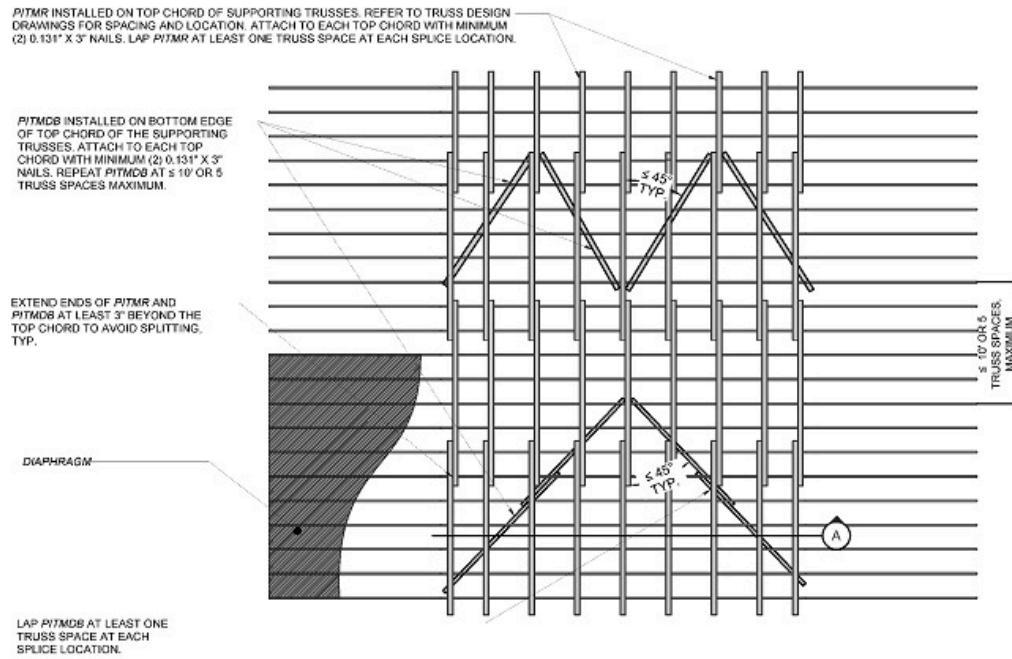
PITMR AND PITMDB FOR TRUSS WEB MEMBERS REQUIRING TWO ROWS OF PITMR



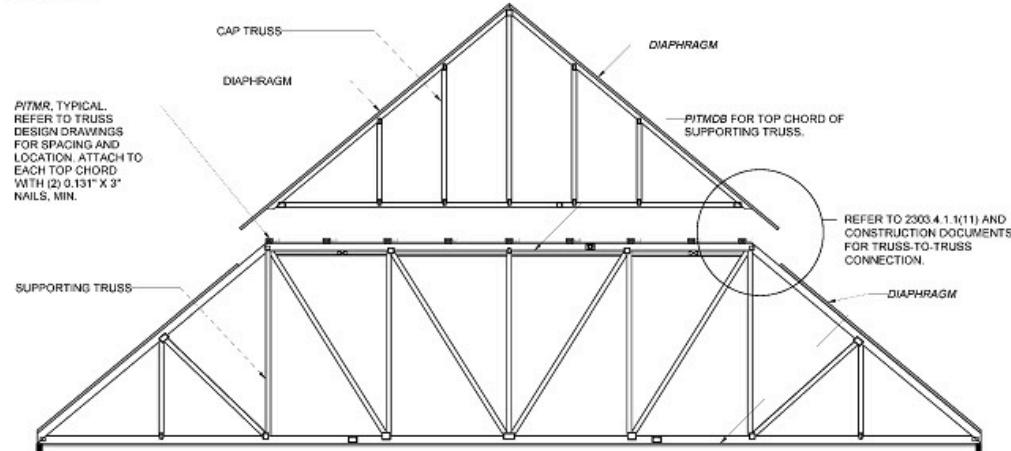
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

FIGURE 2303.4.1.2(2b)

ALTERNATIVE INSTALLATION USING BUCKLING REINFORCEMENT FOR TRUSS WEB MEMBERS IN LIEU OF TWO ROWS OF PITMR



PLAN VIEW



- a.) Use minimum 2x6 stress - graded lumber for PITMR and PITMDB unless otherwise specified.
- b.) Web PITMR and PITMDB not shown for clarity.
- c.) Truss top chord and bottom chord members shall be restrained and braced.
- d.) Bracing to resist forces applied perpendicular to the truss, such as wind bracing at gable ends, shall be specified by the building designer.

SECTION AT A

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

FIGURE 2303.4.1.2(3)**PITMR AND PITMDB FOR FLAT PORTION OF TOP CHORD IN A PIGGYBACK ASSEMBLY****2303.4.1.2.1 Trusses Installed Without a Diaphragm**

Trusses installed without a diaphragm on the top or bottom chord shall require a project specific PITMR and PITMDB design prepared by a registered design professional.

Exception: Group U occupancies.

2303.4.1.3 Trusses Spanning 60 Feet or Greater

The owner or the owner's authorized agent shall contract with any qualified *registered design professional* for the design of the temporary installation restraint and diagonal bracing and the PITMR and PITMDB for all trusses with clear spans 60 feet (18 288 mm) or greater.

2303.4.1.4 Truss Designer

The individual or organization responsible for the design of trusses.

2303.4.1.4.1 Truss Design Drawings

Where required by the *registered design professional*, the *building official* or the statutes of the jurisdiction in which the project is to be constructed, each individual truss design drawing shall bear the seal and signature of the truss designer.

Exceptions:

1. Where a cover sheet and truss index sheet are combined into a single sheet and attached to the set of truss design drawings, the single cover/truss index sheet is the only document required to be signed and sealed by the truss designer.

2. When a cover sheet and a truss index sheet are separately provided and attached to the set of truss design drawings, the cover sheet and the truss index sheet are the only documents required to be signed and sealed by the truss designer.

2303.4.2 Truss Placement Diagram

The truss manufacturer shall provide a truss placement diagram that identifies the proposed location for each individually designated truss and references the corresponding truss design drawing. The truss placement diagram shall be provided as part of the truss submittal package, and with the shipment of trusses delivered to the job site. Truss placement diagrams that serve only as a guide for installation and do not deviate from the *permit* submittal drawings shall not be required to bear the seal or signature of the truss designer.

2303.4.3 Truss Submittal Package

The truss submittal package provided by the truss manufacturer shall consist of each individual truss design drawing, the truss placement diagram, the permanent individual truss member restraint/bracing method and details and any other structural details germane to the trusses; and, as applicable, the cover/truss index sheet.

2303.4.4 Anchorage

The design for the transfer of loads and anchorage of each truss to the supporting structure is the responsibility of the *registered design professional*.

2303.4.5 Alterations to Trusses

Truss members and components shall not be cut, notched, drilled, spliced or otherwise altered in any way without written concurrence and approval of a *registered design professional*. Alterations resulting in the addition of loads to any member (e.g., HVAC equipment, piping, additional roofing or insulation, etc.) shall not be permitted without verification that the truss is capable of supporting such additional loading.

2303.4.6 TPI 1 Specifications

In addition to Sections 2303.4.1 through 2303.4.5, the design, manufacture and quality assurance of metal-plate-connected wood trusses shall be in accordance with TPI 1. Job-site inspections shall be in compliance with Section 110.4, as applicable.

2303.4.7 Truss Quality Assurance

Trusses not part of a manufacturing process in accordance with either Section 2303.4.6 or a referenced standard, which provides requirements for quality control done under the supervision of a third-party quality control agency, shall be manufactured in compliance with Sections 1704.2.5 and 1705.5, as applicable.

2303.5 Test Standard for Joist Hangers and Connectors

2303.5.1

Allowable loads for joist hangers shall be in accordance with ASTM D7147.

2303.5.2

Allowable loads for other premanufactured connectors shall be established using the procedure in ASTM D7147. A maximum of two connectors shall be tested simultaneously when establishing loads for one connector.

Exception: Allowable loads for connectors that are flat and are not loaded eccentrically, such as straps, are permitted to be determined by calculations in accordance with the standards listed in this code.

2303.6 Nails and Staples

Nails and staples shall conform to requirements of ASTM F1667. Nails used for framing and sheathing connections shall have minimum average bending yield strengths as follows: 80 kips per square inch (ksi) (551 MPa) for shank diameters larger than 0.177 inch (4.50 mm) but not larger than 0.254 inch (6.45 mm), 90 ksi (620 MPa) for shank diameters larger than 0.142 inch (3.61 mm) but not larger than 0.177 inch (4.50 mm) and 100 ksi (689 MPa) for shank diameters of at least 0.099 inch (2.51 mm) but not larger than 0.142 inch (3.61 mm).

2303.7 Shrinkage

Consideration shall be given in design for the effects of wood cross-grain dimensional changes that occur as a result of changes in the wood moisture content after installation.

Section 2304 General Construction Requirements

2304.1 General

The provisions of this section apply to design methods specified in Section 2301.2.

2304.2 Size of Structural Members

Computations to determine the required sizes of members shall be based on the net dimensions (actual sizes) and not nominal sizes.

2304.3 Wall Framing

The framing of exterior and interior walls shall be in accordance with the provisions specified in Section 2301.2 unless a specific design is furnished.

2304.3.1 Bottom Plates

Studs shall have full bearing on a 2-inch-thick (actual 1 1/2-inch, 38 mm) or larger plate or sill having a width at least equal to the width of the studs.

2304.3.2 Framing Over Openings

Headers, double joists, trusses or other *approved* assemblies that are of adequate size to transfer loads to the vertical members shall be provided over window and door openings in load-bearing walls and partitions.

2304.3.3 Shrinkage

Wood walls and bearing partitions shall not support more than two floors and a roof unless an analysis satisfactory to the *building official* shows that shrinkage of the wood framing will not have adverse effects on the structure or any plumbing, electrical or mechanical systems or other equipment installed therein due to excessive shrinkage or differential movements caused by shrinkage. The analysis shall also show that the roof drainage system and the foregoing systems or equipment will not be adversely affected or, as an alternate, such systems shall be designed to accommodate the differential shrinkage or movements.

2304.3.4 Gable Endwalls

2304.3.4.1 General

Gable endwalls shall be structurally continuous between points of lateral support.

2304.3.4.2 Cathedral Endwalls

Gable endwalls adjacent to cathedral ceilings shall be structurally continuous from the uppermost floor to the ceiling diaphragm or to the roof diaphragm.

2304.3.4.3 Full Height Studs

Full height studs may be sized using the bracing at a ceiling diaphragm for determining stud length requirements.

2304.4 Floor and Roof Framing

The framing of wood-joisted floors and wood-framed roofs shall be in accordance with the provisions specified in Section 2301.2 unless a specific design is furnished.

2304.5 Framing Around Flues and Chimneys

Combustible framing shall be a minimum of 2 inches (51 mm), but shall not be less than the distance specified in Sections 2111 and 2113 and the *Florida Building Code, Mechanical*, from flues, chimneys and fireplaces, and 6 inches (152 mm) away from flue openings.

2304.6 Exterior Wall Sheathing

Wall sheathing on the outside of exterior walls, including gables, and the connection of the sheathing to framing shall be designed in accordance with the general provisions of this code and shall be capable of resisting wind pressures in accordance with Section 1609.

2304.6.1 Wood Structural Panel Sheathing

Where wood structural panel sheathing is used as the exposed finish on the outside of exterior walls, it shall have an exterior exposure durability classification. Where wood structural panel sheathing is used elsewhere, but not as the exposed finish, it shall be of a type manufactured with exterior glue (Exposure 1 or Exterior). Wood structural panel sheathing, connections and framing spacing shall be in accordance with Table 2304.6.1 for the applicable wind speed and exposure category where used in enclosed buildings with a mean roof height not greater than 30 feet (9144 mm) and a topographic factor ($K_{z,t}$) of 1.0.

TABLE 2304.6.1

MAXIMUM NOMINAL DESIGN WIND SPEED, V_{asd} , PERMITTED FOR WOOD STRUCTURAL PANEL WALL SHEATHING USED TO RESIST WIND PRESSURES^{a, b, c}

MINIMUM NAIL		MINIMUM WOOD STRUCTURAL PANEL SPAN RATING	MINIMUM NOMINAL PANEL THICKNESS (inches)	MAXIMUM WALL STUD SPACING (inches)	PANEL NAIL SPACING		MAXIMUM NOMINAL DESIGN WIND SPEED, V_{asd} , ^d (MPH)					
Size	Penetration (inches)				Edges (inches o.c.)	Field (inches o.c.)	Wind exposure category					
					B	C	D					
6d common (2.0" x 0.113")	1.5	24/0	3/8	16	6	12	110	90	85			
		24/16	7/16	16	6	12	110	100	90			
						6	150	125	110			
	1.75	24/16	7/16	16	6	12	130	110	105			
						6	150	125	110			
				24	6	12	110	90	85			
						6	110	90	85			

For SI: 1 inch = 25.4 mm, 1 mile per hour = 0.447 m/s.

a. Panel strength axis shall be parallel or perpendicular to supports. Three-ply plywood sheathing with studs spaced more than 16 inches on center shall be applied with panel strength axis perpendicular to supports.

b. The table is based on wind pressures acting toward and away from building surfaces in accordance with Section 30.7 of ASCE 7. Lateral requirements shall be in accordance with Section 2305 or Section 2301.2.

c. Wood structural panels with span ratings of wall-16 or wall-24 shall be permitted as an alternative to panels with a 24/0 span rating. Plywood siding rated 16 on center or 24 on center shall be permitted as an alternative to panels with a 24/16 span rating. Wall-16 and plywood siding 16 on center shall be used with studs spaced a maximum of 16 inches on center.

d. V_{asd} shall be determined in accordance with Section 1609.3.1.

2304.7 Interior Paneling

Softwood wood structural panels used for interior paneling shall conform to the provisions of Chapter 8 and shall be installed in accordance with Table 2304.10.1. Panels shall comply with DOC PS 1, DOC PS 2 or ANSI/APA PRP 210. Prefinished hardboard paneling shall meet the requirements of CPA/ANSI A135.5. Hardwood plywood shall conform to HPVA HP-1.

2304.8 Floor and Roof Sheathing

Structural floor sheathing and structural roof sheathing shall comply with Sections 2304.8.1 and 2304.8.2, respectively.

TABLE 2304.8(1)

ALLOWABLE SPANS FOR LUMBER FLOOR AND ROOF SHEATHING^a

SPAN (inches)	MINIMUM NET THICKNESS (inches) OF LUMBER PLACED			
	Perpendicular to supports		Diagonally to supports	
	Surfaced dry ^a	Surfaced unseasoned	Surfaced dry ^a	Surfaced unseasoned
Floors				
24	3/4	25/32	3/4	25/32
16	5/8	11/16	5/8	11/16
Roofs				
24	5/8	11/16	3/4	25/32

For SI: 1 inch = 25.4 mm.

a. Maximum 19-percent moisture content.

TABLE 2304.8(2)

SHEATHING LUMBER, MINIMUM GRADE REQUIREMENTS: BOARD GRADE

SOLID FLOOR OR ROOF SHEATHING	SPACED ROOF SHEATHING	GRADING RULES
Utility	Standard	NLGA, WCLIB, WWPA
4 common or utility	3 common or standard	NLGA, WCLIB, WWPA, NSLB or NELMA
No. 3	No. 2	SPIB
Merchantable	Construction common	RIS

TABLE 2304.8(3)

ALLOWABLE SPANS AND LOADS FOR WOOD STRUCTURAL PANEL SHEATHING AND SINGLE-FLOOR GRADES CONTINUOUS OVER TWO OR MORE SPANS WITH STRENGTH AXIS PERPENDICULAR TO SUPPORTS^a

SHEATHING GRADES		ROOF ^b				FLOOR ^c
Panel span rating roof/ floor span	Panel thickness (inches)	Maximum span (inches)		Load ^d (psf)		Maximum span (inches)
		With edge support ^e	Without edge support	Total load	Live load	
16/0	3/8	16	16	40	30	0
20/0	3/8	20	20	40	30	0
24/0	3/8, 7/16, 1/2	24	20 ^f	40	30	0
24/16	7/16, 1/2	24	24	50	40	16
32/16	15/32, 1/2, 5/8	32	28	40	30	16 ^g
40/20	19/32, 5/8, 3/4, 7/8	40	32	40	30	20 ^{g, h}
48/24	23/32, 3/4, 7/8	48	36	45	35	24
54/32	7/8, 1	54	40	45	35	32

60/32	$\frac{7}{8}, 1\frac{1}{8}$	60	48	45	35	32
SINGLE FLOOR GRADES		ROOF^c				FLOOR^c
Panel span rating	Panel thickness (inches)	Maximum span (inches)		Load^d (psf)		Maximum span (inches)
		With edge support^e	Without edge support	Total load	Live load	
16 o.c.	$\frac{1}{2}, \frac{19}{32}, \frac{5}{8}$	24	24	50	40	16 ^g
20 o.c.	$\frac{19}{32}, \frac{5}{8}, \frac{3}{4}$	32	32	40	30	20 ^{g, h}
24 o.c.	$\frac{23}{32}, \frac{3}{4}$	48	36	35	25	24
32 o.c.	$\frac{7}{8}, 1$	48	40	50	40	32
48 o.c.	$1\frac{3}{32}, 1\frac{1}{8}$	60	48	50	40	48

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kN/m².

a. Applies to panels 24 inches or wider.

b. Uniform load deflection limitations $1/180$ of span under live load plus dead load, $1/240$ under live load only.

c. Panel edges shall have approved tongue-and-groove joints or shall be supported with blocking unless $1/4$ -inch minimum thickness underlayment or $1\frac{1}{2}$ inches of approved cellular or lightweight concrete is placed over the subfloor, or finish floor is $3/4$ -inch wood strip. Allowable uniform load based on deflection of $1/360$ of span is 100 pounds per square foot except the span rating of 48 inches on center is based on a total load of 65 pounds per square foot.

d. Allowable load at maximum span.

e. Tongue-and-groove edges, panel edge clips (one midway between each support, except two equally spaced between supports 48 inches on center), lumber blocking or other. Only lumber blocking shall satisfy blocked diaphragm requirements.

f. For $1/2$ -inch panel, maximum span shall be 24 inches.

g. Span is permitted to be 24 inches on center where $3/4$ -inch wood strip flooring is installed at right angles to joist.

h. Span is permitted to be 24 inches on center for floors where $1\frac{1}{2}$ inches of cellular or lightweight concrete is applied over the panels.

TABLE 2304.8(4)

ALLOWABLE SPAN FOR WOOD STRUCTURAL PANEL COMBINATION SUBFLOOR-UNDERLayment (SINGLE FLOOR)^a

(Panels Continuous Over Two or More Spans and Strength Axis Perpendicular to Supports)

IDENTIFICATION	MAXIMUM SPACING OF JOISTS (inches)				
	16	20	24	32	48
Species group^b	Thickness (inches)				
1	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	—	—
2, 3	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	—	—
4	$\frac{3}{4}$	$\frac{7}{8}$	1	—	—
Single floor span rating ^c	16 o.c.	20 o.c.	24 o.c.	32 o.c.	48 o.c.

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kN/m².

a. Spans limited to value shown because of possible effects of concentrated loads. Allowable uniform loads based on deflection of $1/360$ of span is 100 pounds per square foot except allowable total uniform load for $1\frac{1}{8}$ -inch wood structural panels over joists spaced 48 inches on center is 65 pounds per square foot. Panel edges shall have approved tongue-and-groove joints or shall be supported with blocking, unless $1/4$ -inch minimum thickness underlayment or $1\frac{1}{2}$ inches of approved cellular or lightweight concrete is placed over the subfloor, or finish floor is $3/4$ -inch wood strip.

b. Applicable to all grades of sanded exterior-type plywood. See DOC PS 1 for plywood species groups.

c. Applicable to Underlayment grade, C-C (Plugged) plywood, and Single Floor grade wood structural panels.

TABLE 2304.8(5)

ALLOWABLE LOAD (PSF) FOR WOOD STRUCTURAL PANEL ROOF SHEATHING CONTINUOUS OVER TWO OR MORE SPANS AND STRENGTH AXIS PARALLEL TO SUPPORTS(Plywood Structural Panels Are Five-Ply, Five-Layer Unless Otherwise Noted)^{a, b}

PANEL GRADE	THICKNESS (inch)	MAXIMUM SPAN (inches)	LOAD AT MAXIMUM SPAN (psf)	
			Live	Total
Structural I sheathing	$\frac{7}{16}$	24	20	30
	$\frac{15}{32}$	24	35 ^b	45 ^b
	$\frac{1}{2}$	24	40 ^b	50 ^b
	$\frac{19}{32}, \frac{5}{8}$	24	70	80
	$\frac{23}{32}, \frac{3}{4}$	24	90	100
Sheathing, other grades covered in DOC PS 1 or DOC PS 2	$\frac{7}{16}$	16	40	50
	$\frac{15}{32}$	24	20	25
	$\frac{1}{2}$	24	25	30
	$\frac{19}{32}$	24	40 ^b	50 ^b
	$\frac{5}{8}$	24	45 ^b	55 ^b
	$\frac{23}{32}, \frac{3}{4}$	24	60 ^b	65 ^b

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kN/m².

a. Uniform load deflection limitations $1/180$ of span under live load plus dead load, $1/240$ under live load only. Edges shall be blocked with lumber or other approved type of edge supports.

b. For composite and four-ply plywood structural panel, load shall be reduced by 15 pounds per square foot.

2304.8.1 Structural Floor Sheathing

Structural floor sheathing shall be designed in accordance with the general provisions of this code.

Floor sheathing conforming to the provisions of Table 2304.8(1), 2304.8(2), 2304.8(3) or 2304.8(4) shall be deemed to meet the requirements of this section.

2304.8.2 Structural Roof Sheathing

Structural roof sheathing shall be designed in accordance with the general provisions of this code and the special provisions in this section.

Roof sheathing conforming to the provisions of Table 2304.8(1), 2304.8(2), 2304.8(3) or 2304.8(5) shall be deemed to meet the requirements of this section. Wood structural panel roof sheathing shall be of a type manufactured with exterior glue (Exposure 1 or Exterior).

2304.9 Lumber Decking

Lumber decking shall be designed and installed in accordance with the general provisions of this code and Sections 2304.9.1 through 2304.9.5.3. Other lumber decking patterns and connection designs shall be substantiated through engineering analysis.

2304.9.1 General

Each piece of lumber decking shall be square-end trimmed. When random lengths are furnished, each piece shall be square end trimmed across the face so that at least 90 percent of the pieces are within 0.5 degrees (0.00873 rad) of square. The ends of the pieces shall be permitted to be beveled up to 2 degrees (0.0349 rad) from the vertical with the exposed face of the piece slightly longer than the opposite face of the piece. Tongue-and-groove decking shall be installed with the tongues up on sloped or pitched roofs with pattern faces down.

2304.9.2 Layup Patterns

Lumber decking is permitted to be laid up following one of five standard patterns as defined in Sections 2304.9.2.1 through 2304.9.2.5.

2304.9.2.1 Simple Span Pattern

All pieces shall be supported on their ends (i.e., by two supports).

2304.9.2.2 Two-Span Continuous Pattern

All pieces shall be supported by three supports, and all end joints shall occur in line on alternating supports. Supporting members shall be designed to accommodate the load redistribution caused by this pattern.

2304.9.2.3 Combination Simple and Two-Span Continuous Pattern

Courses in end spans shall be alternating simple-span pattern and two-span continuous pattern. End joints shall be staggered in adjacent courses and shall bear on supports.

2304.9.2.4 Cantilevered Pieces Intermixed Pattern

The decking shall extend across a minimum of three spans. Pieces in each starter course and every third course shall be simple span pattern. Pieces in other courses shall be cantilevered over the supports with end joints at alternating quarter or third points of the spans. Each piece shall bear on at least one support.

2304.9.2.5 Controlled Random Pattern

The decking shall extend across a minimum of three spans. End joints of pieces within 6 inches (152 mm) of the end joints of the adjacent pieces in either direction shall be separated by at least two intervening courses. In the end bays, each piece shall bear on at least one support. Where an end joint occurs in an end bay, the next piece in the same course shall continue over the first inner support for at least 24 inches (610 mm). The details of the controlled random pattern shall be as specified for each decking material in Section 2304.9.3.3, 2304.9.4.3 or 2304.9.5.3.

Decking that cantilevers beyond a support for a horizontal distance greater than 18 inches (457 mm), 24 inches (610 mm) or 36 inches (914 mm) for 2-inch (51 mm), 3-inch (76 mm) and 4-inch (102 mm) nominal thickness decking, respectively, shall comply with the following:

1. The maximum cantilevered length shall be 30 percent of the length of the first adjacent interior span.
2. A structural fascia shall be fastened to each decking piece to maintain a continuous, straight line.
3. There shall be no end joints in the decking between the cantilevered end of the decking and the centerline of the first adjacent interior span.

2304.9.3 Mechanically Laminated Decking

Mechanically laminated decking shall comply with Sections 2304.9.3.1 through 2304.9.3.3.

2304.9.3.1 General

Mechanically laminated decking consists of square-edged dimension lumber laminations set on edge and nailed to the adjacent pieces and to the supports.

2304.9.3.2 Nailing

The length of nails connecting laminations shall be not less than two and one-half times the net thickness of each lamination. Where decking supports are 48 inches (1219 mm) on center or less, side nails shall be installed not more than 30 inches (762 mm) on center alternating between top and bottom edges, and staggered one-third of the spacing in adjacent laminations. Where supports are spaced more than 48 inches (1219 mm) on center, side nails shall be installed not more than 18 inches (457 mm) on center alternating between top and bottom edges and staggered one-third of the spacing in adjacent laminations. For mechanically laminated decking constructed with laminations of 2-inch (51 mm) nominal thickness, nailing in accordance with Table 2304.9.3.2 shall be permitted. Two side nails shall be installed at each end of butt-jointed pieces.

Laminations shall be toenailed to supports with 20d or larger common nails. Where the supports are 48 inches (1219 mm) on center or less, alternate laminations shall be toenailed to alternate supports; where supports are spaced more than 48 inches (1219 mm) on center, alternate laminations shall be toenailed to every support. For mechanically laminated decking constructed with laminations of 2-inch (51 mm) nominal thickness, toenailing at supports in accordance with Table 2304.9.3.2 shall be permitted.

TABLE 2304.9.3.2

FASTENING SCHEDULE FOR MECHANICALLY LAMINATED DECKING USING LAMINATIONS OF 2-INCH NOMINAL THICKNESS

MINIMUM NAIL SIZE (Length × diameter)	MAXIMUM SPACING BETWEEN FACE NAILS ^{a, b} (inches)		NUMBER OF TOENAILS INTO SUPPORTS ^c
	Decking supports ≤ 48 inches o.c.	Decking supports > 48 inches o.c.	
4" × 0.192"	30	18	1
4" × 0.162"	24	14	2
4" × 0.148"	22	13	2
3½" × 0.162"	20	12	2
3½" × 0.148"	19	11	2
3½" × 0.135"	17	10	2
3" × 0.148"	11	7	2
3" × 0.128"	9	5	2
2¾" × 0.148"	10	6	2
2¾" × 0.131"	9	6	3
2¾" × 0.120"	8	5	3

For SI: 1 inch = 25.4 mm.

a. Nails shall be driven perpendicular to the lamination face, alternating between top and bottom edges.

- b. Where nails penetrate through two laminations and into the third, they shall be staggered one-third of the spacing in adjacent laminations. Otherwise, nails shall be staggered one-half of the spacing in adjacent laminations.
- c. Where supports are 48 inches (1219 mm) on center or less, alternate laminations shall be toenailed to alternate supports; where supports are spaced more than 48 inches (1219 mm) on center, alternate laminations shall be toenailed to every support.

2304.9.3.3 Controlled Random Pattern

There shall be a minimum distance of 24 inches (610 mm) between end joints in adjacent courses. The pieces in the first and second courses shall bear on at least two supports with end joints in these two courses occurring on alternate supports. A maximum of seven intervening courses shall be permitted before this pattern is repeated.

2304.9.4 Two-Inch Sawn Tongue-and-Groove Decking

Two-inch (51 mm) sawn tongue-and-groove decking shall comply with Sections 2304.9.4.1 through 2304.9.4.3.

2304.9.4.1 General

Two-inch (51 mm) decking shall have a maximum moisture content of 15 percent. Decking shall be machined with a single tongue-and-groove pattern. Each decking piece shall be nailed to each support.

2304.9.4.2 Nailing

Each piece of decking shall be toe-nailed at each support with one 16d common nail through the tongue and face-nailed with one 16d common nail.

2304.9.4.3 Controlled Random Pattern

There shall be a minimum distance of 24 inches (610 mm) between end joints in adjacent courses. The pieces in the first and second courses shall bear on at least two supports with end joints in these two courses occurring on alternate supports. A maximum of seven intervening courses shall be permitted before this pattern is repeated.

2304.9.5 Three- And Four-Inch Sawn Tongue-and-Groove Decking

Three- and four-inch (76 mm and 102 mm) sawn tongue-and-groove decking shall comply with Sections 2304.9.5.1 through 2304.9.5.3.

2304.9.5.1 General

Three-inch (76 mm) and four-inch (102 mm) decking shall have a maximum moisture content of 19 percent. Decking shall be machined with a double tongue-and-groove pattern. Decking pieces shall be interconnected and nailed to the supports.

2304.9.5.2 Nailing

Each piece shall be toenailed at each support with one 40d common nail and face-nailed with one 60d common nail. Courses shall be spiked to each other with 8-inch (203 mm) spikes at maximum intervals of 30 inches (762 mm) through predrilled edge holes penetrating to a depth of approximately 4 inches (102 mm). One spike shall be installed at a distance not exceeding 10 inches (254 mm) from the end of each piece.

2304.9.5.3 Controlled Random Pattern

There shall be a minimum distance of 48 inches (1219 mm) between end joints in adjacent courses. Pieces not bearing on a support are permitted to be located in interior bays provided the adjacent pieces in the same course continue over the support for at least 24 inches (610 mm). This condition shall not occur more than once in every six courses in each interior bay.

2304.10 Connectors and Fasteners

Connectors and fasteners shall comply with the applicable provisions of Sections 2304.10.1 through 2304.10.7.

2304.10.1 Fastener Requirements

Connections for wood members shall be designed in accordance with the appropriate methodology in Section 2301.2. The number and size of fasteners connecting wood members shall not be less than that set forth in Table 2304.10.1.

TABLE 2304.10.1

FASTENING SCHEDULE

DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER	SPACING AND LOCATION
Roof		
1. Blocking between ceiling joists, rafters or trusses to top plate or other framing below	4-8d box ($2\frac{1}{2}'' \times 0.113''$); or 3-8d common ($2\frac{1}{2}'' \times 0.131''$); or 3-10d box ($3'' \times 0.128''$); or 3-3" x 0.131" nails; or 3-3" 14 gage staples, $\frac{7}{16}''$ crown	Each end, toenail
Blocking between rafters or truss not at the wall top plate, to rafter or truss	2-8d common ($2\frac{1}{2}'' \times 0.131''$) 2-3" x 0.131" nails 2-3" 14 gage staples	Each end, toenail
	2-16d common ($3\frac{1}{2}'' \times 0.162''$) 3-3" x 0.131" nails 3-3" 14 gage staples	End nail
Flat blocking to truss and web filler	16d common ($3\frac{1}{2}'' \times 0.162''$) @ 6" o.c. 3" x 0.131" nails @ 6" o.c.	Face nail

	3" x 14 gage staples @ 6" o.c	
2. Ceiling joists to top plate	4-8d box (2 ¹ / ₂ " x 0.113"); or 3-8d common (2 ¹ / ₂ " x 0.131"); or 3-10d box (3" x 0.128"); or 3-3" x 0.131" nails; or 3-3" 14 gage staples, 7/ ₁₆ " crown	Each joist, toenail
3. Ceiling joist not attached to parallel rafter, laps over partitions (no thrust) (see Section 2301.2)	3-16d common (3 ¹ / ₂ " x 0.162"); or 4-10d box (3" x 0.128"); or 4-3" x 0.131" nails; or 4-3" 14 gage staples, 7/ ₁₆ " crown	Face nail
4. Ceiling joist attached to parallel rafter (heel joint) (see Section 2301.2)	Per Section 2301.2	Face nail
5. Collar tie to rafter	3-10d common (3" x 0.148"); or 4-10d box (3" x 0.128"); or 4-3" x 0.131" nails; or 4-3" 14 gage staples, 7/ ₁₆ " crown	Face nail
6. Rafter or roof truss to top plate (See Section 2301.2)	3-10 common (3" x 0.148"); or 3-16d box (3 ¹ / ₂ " x 0.135"); or 4-10d box (3" x 0.128"); or 4-3" x 0.131" nails; or 4-3" 14 gage staples, 7/ ₁₆ " crown	2 toenails on one side and 1 toenail on opposite side of rafter or truss ^c
7. Roof rafters to ridge valley or hip rafters; or roof rafter to 2-inch ridge beam	2-16d common (3 ¹ / ₂ " x 0.162"); or 3-16d box (3 ¹ / ₂ " x 0.135"); or 3-10d box (3" x 0.128"); or 3-3" x 0.131" nails; or 3-3" 14 gage staples, 7/ ₁₆ " crown; or	End nail
	3-10d common (3" x 0.148"); or 4-16d box (3 ¹ / ₂ " x 0.135"); or 4-10d box (3" x 0.128"); or 4-3" x 0.131" nails; or 4-3" 14 gage staples, 7/ ₁₆ " crown	Toenail
Wall		
8. Stud to stud (not at braced wall panels)	16d common (3 ¹ / ₂ " x 0.162")	24" o.c. face nail
	10d box (3" x 0.128"); or 3" x 0.131" nails; or 3-3" 14 gage staples, 7/ ₁₆ " crown	16" o.c. face nail
9. Stud to stud and abutting studs at intersecting wall corners (at braced wall panels)	16d common (3 ¹ / ₂ " x 0.162")	16" o.c. face nail
	16d box (3 ¹ / ₂ " x 0.135"); or 3" x 0.131" nails; or 3-3" 14 gage staples, 7/ ₁₆ " crown	12" o.c. face nail
10. Built-up header (2" to 2" header)	16d common (3 ¹ / ₂ " x 0.162")	16" o.c. each edge, face nail
	16d box (3 ¹ / ₂ " x 0.135")	12" o.c. each edge, face nail
11. Continuous header to stud	4-8d common (2 ¹ / ₂ " x 0.131"); or 4-10d box (3" x 0.128"); or 5-8d box (2 ¹ / ₂ " x 0.113")	Toenail
12. Top plate to top plate	16d common (3 ¹ / ₂ " x 0.162")	16" o.c. face nail
	10d box (3" x 0.128"); 3" x 0.131" nails; or 3" 14 gage staples, 7/ ₁₆ " crown	12" o.c. face nail
13. Top plate to top plate, at end joints	8-16d common (3 ¹ / ₂ " x 0.162"); or 12-16d box (3 ¹ / ₂ " x 0.135"); or 12-10d box (3" x 0.128"); or 12-3" x 0.131" nails; or 12-3" 14 gage staples, 7/ ₁₆ " crown	Each side of end joint, face nail (minimum 24" lap splice length each side of end joint)
14. Bottom plate to joist, rim joist, band joist or blocking (not at braced wall panels)	16d common (3 ¹ / ₂ " x 0.162")	16" o.c. face nail
	16d box (3 ¹ / ₂ " x 0.135"); 3" x 0.131" nails; or 3" 14 gage staples, 7/ ₁₆ " crown	12" o.c. face nail

15. Bottom plate to joist, rim joist, band joist or blocking at braced wall panels	2-16d common ($3\frac{1}{2}'' \times 0.162''$); or 3-16d box ($3\frac{1}{2}'' \times 0.135''$); or 4-3" \times 0.131" nails; or 4-3" 14 gage staples, $7/16''$ crown	16" o.c. face nail
16. Stud to top or bottom plate	3-16d box ($3\frac{1}{2}'' \times 0.135''$); or 4-8d common ($2\frac{1}{2}'' \times 0.131''$); or 4-10d box ($3'' \times 0.128''$); or 4-3" \times 0.131" nails; or 4-8d box ($2\frac{1}{2}'' \times 0.113''$); or 4-3" 14 gage staples, $7/16''$ crown	Toenail
	2-16d common ($3\frac{1}{2}'' \times 0.162''$); or 3-16d box ($3\frac{1}{2}'' \times 0.135''$); or 3-10d box ($3'' \times 0.128''$); or 3-3" \times 0.131" nails; or 3-3" 14 gage staples, $7/16''$ crown	End nail
17. Reserved		
18. Top plates, laps at corners and intersections	2-16d common ($3\frac{1}{2}'' \times 0.162''$); or 3-10d box ($3'' \times 0.128''$); or 3-3" \times 0.131" nails; or 3-3" 14 gage staples, $7/16''$ crown	Face nail
19. 1" brace to each stud and plate	3-8d box ($2\frac{1}{2}'' \times 0.113''$); or 2-8d common ($2\frac{1}{2}'' \times 0.131''$); or 2-10d box ($3'' \times 0.128''$); or 2-3" \times 0.131" nails; or 2-3" 14 gage staples, $7/16''$ crown	Face nail
20. 1" \times 6" sheathing to each bearing	3-8d box ($2\frac{1}{2}'' \times 0.113''$); or 2-8d common ($2\frac{1}{2}'' \times 0.131''$); or 2-10d box ($3'' \times 0.128''$); or 2-1 $\frac{3}{4}$ " 16 gage staples, 1" crown	Face nail
21. 1" \times 8" and wider sheathing to each bearing	3-8d common ($2\frac{1}{2}'' \times 0.131''$); or 3-8d box ($2\frac{1}{2}'' \times 0.113''$); or 2-10d box ($3'' \times 0.128''$); or 3-1 $\frac{3}{4}$ " 16 gage staples, 1" crown	Face nail
	3-8d common ($2\frac{1}{2}'' \times 0.131''$); or 4-8d box ($2\frac{1}{2}'' \times 0.113''$); or 3-10d box ($3'' \times 0.128''$); or 3-1 $\frac{3}{4}$ " 16 gage staples, 1" crown	
	Wider than 1" \times 8"; 3-8d common ($2\frac{1}{2}'' \times 0.131''$); or 4-8d box ($2\frac{1}{2}'' \times 0.113''$); or 3-10d box ($3'' \times 0.128''$); or 4-1 $\frac{3}{4}$ " 16 gage staples, 1" crown	
Floor		
22. Joist to sill, top plate, or girder	4-8d box ($2\frac{1}{2}'' \times 0.113''$); or 3-8d common ($2\frac{1}{2}'' \times 0.131''$); or floor 3-10d box ($3'' \times 0.128''$); or 3-3" \times 0.131" nails; or 3-3" 14 gage staples, $7/16''$ crown	Toenail
23. Rim joist, band joist, or blocking to top plate, sill or other framing below	4-8d box ($2\frac{1}{2}'' \times 0.113''$)	4" o.c., toenail
	8d common ($2\frac{1}{2}'' \times 0.131''$); or 10d box ($3'' \times 0.128''$); or 3" \times 0.131" nails; or 3" 14 gage staples, $7/16''$ crown	6" o.c., toenail
24. 1" \times 6" subfloor or less to each joist	3-8d box ($2\frac{1}{2}'' \times 0.113''$); or 2-8d common ($2\frac{1}{2}'' \times 0.131''$); or 3-10d box ($3'' \times 0.128''$); or 2-1 $\frac{3}{4}$ " 16 gage staples 1" crown	Face nail
25. 2" subfloor to joist or girder	3-16d box ($3\frac{1}{2}'' \times 0.135''$); or 2-16d common ($3\frac{1}{2}'' \times 0.162''$)	Blind and face nail
26. 2" planks (plank & beam — floor & roof)	3-16d box ($3\frac{1}{2}'' \times 0.135''$); or 2-16d common ($3\frac{1}{2}'' \times 0.162''$)	Each bearing, face nail

27. Built-up girders and beams, 2" lumber layers	20d common (4" × 0.192")	32" o.c., face nail at top and bottom staggered on opposite sides
	10d box (3" × 0.128"); or 3" × 0.131" nails; or 3" 14 gage staples, 7/16" crown	24" o.c., face nail at top and bottom staggered on opposite sides
	And: 2-20d common (4" × 0.192"); or 3-10d box (3" × 0.128"); or 3-3" × 0.131" nails; or 3-3" 14 gage staples, 7/16" crown	Ends and at each splice, face nail
28. Ledger strip supporting joists or rafters	3-16d common (3 1/2" × 0.162"); or 4-16d box (3 1/2" × 0.135"); or 4-10d box (3" × 0.128"); or 4-3" × 0.131" nails; or 4-3" 14 gage staples, 7/16" crown	Each joist or rafter, face nail
29. Joist to band joist or rim joist	3-16d common (3 1/2" × 0.162"); or 4-10d box (3" × 0.128"); or 4-3" × 0.131" nails; or 4-3" 14 gage staples, 7/16" crown	End nail
30. Bridging or blocking to joist, rafter or truss	2-8d common (2 1/2" × 0.131"); or 2-10d box (3" × 0.128"); or 2-3" × 0.131" nails; or 2-3" 14 gage staples, 7/16" crown	Each end, toenail

Wood structural panels (WSP), subfloor, roof and interior wall sheathing to framing and particleboard wall sheathing to framing^a

		Edges (inches)	Intermediate supports (inches)
31. 3/8" — 1/2"	6d common or deformed (2" × 0.113"); or 2 3/8" × 0.113" (subfloor and wall)	6	12
	8d common or deformed (2 1/2" × 0.131" × 0.281" head) (roof); or RSRS-01 (2 3/8" × 0.113") nail (roof) ^d	6 ^e	6 ^e
	1 3/4" 16 gage staple, 7/16" crown (subfloor and wall)	4	8
	2 3/8" × 0.113" × 0.266" head nail (roof)	3 ^f	3 ^f
	1 3/4" 16 gage staple, 7/16" crown (roof)	3 ^f	3 ^f
32. 19/32" — 3/4"	8d common (2 1/2" × 0.131"); or deformed (2" × 0.113") (subfloor and wall)	6	12
	8d common or deformed (2 1/2" × 0.131" × 0.281" head) (roof); or RSRS-01 (2 3/8" × 0.113") nail (roof) ^d	6 ^e	6 ^e
	2 3/8" × 0.113" × 0.266" head nail; or 2" 16 gage staple, 7/16" crown	4	8
33. 7/8" — 1 1/4"	10d common (3" × 0.148"); or deformed (2 1/2" × 0.131" × 0.281" head)	6	12

Other exterior wall sheathing

34. 1/2" fiberboard sheathing ^b	1 1/2" × 0.120", galvanized roofing nail (7/16" diameter head); or 1 1/4" 16 gage staple with 7/16" or 1" crown	3	6
35. 25/32" fiberboard sheathing ^b	1 3/4" × 0.120" galvanized roofing nail (7/16" diameter head); or 1 1/2" 16 gage staple with 7/16" or 1" crown	3	6

Wood structural panels, combination subfloor underlayment to framing

36. 3/4" and less	8d common (2 1/2" × 0.131"); or deformed (2" × 0.113"); or deformed 2" × 0.120"	6	12
37. 7/8" — 1"	8d common (2 1/2" × 0.131"); or deformed (2 1/2" × 0.131"); or deformed 2 1/2" × 0.120"	6	12
38. 1 1/8" — 1 1/4"	10d common (3" × 0.148"); or deformed (2 1/2" × 0.131"); or deformed 2 1/2" × 0.120"	6	12

Panel siding to framing			
39. $\frac{1}{2}$ " or less	6d corrosion-resistant siding ($1\frac{7}{8}$ " x 0.106"); or 6d corrosion-resistant casing (2" x 0.099")	6	12
40. $\frac{5}{8}$ "	8d corrosion-resistant siding ($2\frac{3}{8}$ " x 0.128"); or 8d corrosion-resistant casing (2 $\frac{1}{2}$ " x 0.113")	6	12
Interior paneling			
41. $\frac{1}{4}$ "	4d casing (1 $\frac{1}{2}$ " x 0.080"); or 4d finish (1 $\frac{1}{2}$ " x 0.072")	6	12
42. $\frac{3}{8}$ "	6d casing (2" x 0.099"); or 6d finish (2" x 0.092") (Panel supports at 24 inches)	6	12

For SI: 1 inch = 25.4 mm.

- a. Nails spaced at 6 inches at intermediate supports where spans are 48 inches or more. For nailing of wood structural panel and particleboard diaphragms and shear walls, refer to Section 2305. Nails for wall sheathing are permitted to be common, box or casing.
- b. Spacing shall be 6 inches on center on the edges and 12 inches on center at intermediate supports for nonstructural applications. Panel supports at 16 inches (20 inches if strength axis in the long direction of the panel, unless otherwise marked).
- c. Where a rafter is fastened to an adjacent parallel ceiling joist in accordance with this schedule and the ceiling joist is fastened to the top plate in accordance with this schedule, the number of toenails in the rafter shall be permitted to be reduced by one nail.
- d. RSRS-01 is a Roof Sheathing Ring Shank nail meeting the specifications in ASTM F1667.
- e. Tabulated fastener requirements apply where the ultimate design wind speed is less than 140 mph. For wood structural panel roof sheathing attached to gable end roof framing and to intermediate supports within 48 inches of roof edges and ridges, nails shall be spaced at 4 inches on center where the ultimate design wind speed is greater than 130 mph in Exposure B or greater than 110 mph in Exposure C. Spacing exceeding 6 inches on center at intermediate supports shall be permitted where the fastening is designed per the AWC NDS.
- f. Fastening is only permitted where the ultimate design wind speed is less than or equal to 110 mph.
- g. Nails and staples are carbon steel meeting the specifications of ASTM F1667. Connections using nails and staples of other materials, such as stainless steel, shall be designed by acceptable engineering practice or approved under Section 104.11.

2304.10.2 Sheathing Fasteners

Sheathing nails or other *approved* sheathing connectors shall be driven so that their head or crown is flush with the surface of the sheathing.

2304.10.3 Joist Hangers and Framing Anchors

Connections depending on joist hangers or framing anchors, ties and other mechanical fastenings not otherwise covered are permitted where *approved*. The vertical load-bearing capacity, torsional moment capacity and deflection characteristics of joist hangers shall be determined in accordance with ASTM D7147.

2304.10.4 Other Fasteners

Clips, staples, glues and other *approved* methods of fastening are permitted where *approved*.

2304.10.5 Fasteners and Connectors in Contact With Preservative-Treated and Fire-Retardant-Treated Wood

Fasteners, including nuts and washers, and connectors in contact with *preservative-treated* and *fire-retardant-treated* wood shall be in accordance with Sections 2304.10.5.1 through 2304.10.5.4. The coating weights for zinc-coated fasteners shall be in accordance with ASTM A153. Stainless steel driven fasteners shall be in accordance with the material requirements of ASTM F1667.

2304.10.5.1 Fasteners and Connectors for Preservative-Treated Wood

Fasteners, including nuts and washers, in contact with *preservative-treated* wood shall be of hot-dipped zinc-coated galvanized steel, stainless steel, silicon bronze or copper. Staples shall be of stainless steel. Fasteners other than nails, staples, timber rivets, wood screws and lag screws shall be permitted to be of mechanically deposited zinc-coated steel with coating weights in accordance with ASTM B695, Class 55 minimum. Connectors that are used in exterior applications and in contact with *preservative-treated* wood shall have coating types and weights in accordance with the treated wood or connector manufacturer's recommendations. In the absence of manufacturer's recommendations, a minimum of ASTM A653, Type G185 zinc-coated galvanized steel, or equivalent, shall be used.

Exception: Plain carbon steel fasteners, including nuts and washers, in SBX/DOT and zinc borate *preservative-treated* wood in an interior, dry environment shall be permitted.

2304.10.5.2 Fastenings for Wood Foundations

Fastenings, including nuts and washers, for wood foundations shall be as required in AWC PWF.

2304.10.5.3 Fasteners for Fire-Retardant-Treated Wood Used in Exterior Applications or Wet or Damp Locations

Fasteners, including nuts and washers, for *fire-retardant-treated wood* used in exterior applications or wet or damp locations shall be of hot-dipped zinc-coated galvanized steel, stainless steel, silicon bronze or copper. Staples shall be of stainless steel. Fasteners other than nails, staples, timber rivets, wood screws and lag screws shall be permitted to be of mechanically deposited zinc-coated steel with coating weights in accordance with ASTM B695, Class 55 minimum.

2304.10.5.4 Fasteners for Fire-Retardant-Treated Wood Used in Interior Applications

Fasteners, including nuts and washers, for *fire-retardant-treated wood* used in interior locations shall be in accordance with the manufacturer's recommendations. In the absence of manufacturer's recommendations, Section 2304.10.5.3 shall apply.

2304.10.6 Load Path

Where wall framing members are not continuous from the foundation sill to the roof, the members shall be secured to ensure a continuous load path. Where required, sheet metal clamps, ties or clips shall be formed of galvanized steel or other *approved* corrosion-resistant material not less than 0.0329-inch (0.836 mm) base metal thickness.

2304.10.7 Framing Requirements

Wood columns and posts shall be framed to provide full end bearing. Alternatively, column-and-post end connections shall be designed to resist the full compressive loads, neglecting end-bearing capacity. Column-and-post end connections shall be fastened to resist lateral and net induced uplift forces.

2304.11 Heavy Timber Construction

Where a structure, portion thereof or individual structural elements are required to be of heavy timber by provisions of this code, the building elements therein shall comply with the applicable provisions of Sections 2304.11.1 through 2304.11.4. Minimum dimensions of heavy timber shall comply as applicable in Table 2304.11 based on roofs or floors supported and the configuration of each structural element, or as applicable in Sections 2304.11.2 through 2304.11.4. Lumber decking shall also be in accordance with Section 2304.9.

TABLE 2304.11

MINIMUM DIMENSIONS OF HEAVY TIMBER STRUCTURAL MEMBERS

		MINIMUM NOMINAL SOLID SAWN SIZE		MINIMUM GLUED-LAMINATED NET SIZE		MINIMUM STRUCTURAL COMPOSITE LUMBER NET SIZE	
SUPPORTING	HEAVY TIMBER STRUCTURAL ELEMENTS	Width (inches)	Depth (inches)	Width (inches)	Depth (inches)	Width (inches)	Depth (inches)
Floor loads only or combined floor and roof loads	Columns; Framed sawn or glued-laminated timber arches that spring from the floor line; Framed timber trusses	8	8	6 ³ / ₄	8 ¹ / ₄	7	7 ¹ / ₂
	Wood beams and girders	6	10	5	10 ¹ / ₂	5 ¹ / ₄	9 ¹ / ₂
Roof loads only	Columns (roof and ceiling loads); Lower half of: wood-frame or glued-laminated arches that spring from the floor line or from grade	6	8	5	8 ¹ / ₄	5 ¹ / ₄	7 ¹ / ₂
	Upper half of: wood-frame or glued-laminated arches that spring from the floor line or from grade	6	6	5	6	5 ¹ / ₄	5 ¹ / ₂
	Framed timber trusses and other roof framing; ^a Framed or glued-laminated arches that spring from the top of walls or wall abutments	4 ^b	6	3 ^b	6 ⁷ / ₈	3 ¹ / ₂ ^b	5 ¹ / ₂

For SI: 1 inch = 25.4 mm.

- a. Spaced members shall be permitted to be composed of two or more pieces not less than 3 inches (76 mm) nominal in thickness where blocked solidly throughout their intervening spaces or where spaces are tightly closed by a continuous wood cover plate of not less than 2 inches (51 mm) nominal in thickness secured to the underside of the members. Splice plates shall be not less than 3 inches (76 mm) nominal in thickness.
- b. Where protected by approved automatic sprinklers under the roof deck, framing members shall be not less than 3 inches (76 mm) nominal in width.

2304.11.1 Details of Heavy Timber Structural Members

Heavy timber structural members shall be detailed and constructed in accordance with Sections 2304.11.1.1 through 2304.11.1.3.

2304.11.1.1 Columns

Minimum dimensions of columns shall be in accordance with Table 2304.11. Columns shall be continuous or superimposed throughout all stories and connected in an approved manner. Girders and beams at column connections shall be closely fitted around columns and adjoining ends shall be cross tied to each other, or intertied by caps or ties, to transfer horizontal loads across joints. Wood bolsters shall not be placed on tops of columns unless the columns support roof loads only. Where traditional

heavy timber detailing is used, connections shall be permitted to be by means of reinforced concrete or metal caps with brackets, or shall be connected by properly designed steel or iron caps, with pintles and base plates, or by timber splice plates affixed to the columns by metal connectors housed within the contact faces, or by other approved methods.

2304.11.1.2 Floor Framing

Minimum dimensions of floor framing shall be in accordance with Table 2304.11. Approved wall plate boxes or hangers shall be provided where wood beams, girders or trusses rest on masonry or concrete walls. Where intermediate beams are used to support a floor, they shall rest on top of girders, or shall be supported by an approved metal hanger into which the ends of the beams shall be closely fitted. Where traditional heavy timber detailing is used, these connections shall be permitted to be supported by ledgers or blocks securely fastened to the sides of the girders.

2304.11.1.3 Roof Framing

Minimum dimensions of roof framing shall be in accordance with Table 2304.11. Every roof girder and at least every alternate roof beam shall be anchored to its supporting member; forces shall be as required in Chapter 16.

2304.11.2 Partitions and Walls

Partitions and walls shall comply with Section 2304.11.2.1 or 2304.11.2.2.

2304.11.2.1 Exterior Walls

Exterior walls shall be permitted to be *cross-laminated timber* meeting the requirements of Section 2303.1.4.

2304.11.2.2 Interior Walls and Partitions

Interior walls and partitions shall be of solid wood construction formed by not less than two layers of 1-inch (25 mm) matched boards or laminated construction 4 inches (102 mm) thick, or of 1-hour fire-resistance-rated construction.

2304.11.3 Floors

Floors shall be without concealed spaces. Wood floors shall be constructed in accordance with Section 2304.11.3.1 or 2304.11.3.2.

2304.11.3.1 Cross-Laminated Timber Floors

Cross-laminated timber shall be not less than 4 inches (102 mm) in actual thickness. *Cross-laminated timber* shall be continuous from support to support and mechanically fastened to one another. *Cross-laminated timber* shall be permitted to be connected to walls without a shrinkage gap providing swelling or shrinking is considered in the design. Corbelling of masonry walls under the floor shall be permitted to be used.

2304.11.3.2 Sawn or Glued-Laminated Plank Floors

Sawn or glued-laminated plank floors shall be one of the following:

1. Sawn or glued-laminated planks, splined or tongue-and-groove, of not less than 3 inches (76 mm) nominal in thickness covered with 1-inch (25 mm) nominal dimension tongue-and-groove flooring, laid crosswise or diagonally, $\frac{15}{32}$ -inch (12 mm) wood structural panel or $\frac{1}{2}$ -inch (12.7 mm) particleboard.
2. Planks not less than 4 inches (102 mm) nominal in width set on edge close together and well spiked and covered with 1-inch (25 mm) nominal dimension flooring or $\frac{15}{32}$ -inch (12 mm) wood structural panel or $\frac{1}{2}$ -inch (12.7 mm) particleboard.

The lumber shall be laid so that no continuous line of joints will occur except at points of support. Floors shall not extend closer than $\frac{1}{2}$ inch (12.7 mm) to walls. Such $\frac{1}{2}$ -inch (12.7 mm) space shall be covered by a molding fastened to the wall and so arranged that it will not obstruct the swelling or shrinkage movements of the floor. Corbelling of masonry walls under the floor shall be permitted to be used in place of molding.

2304.11.4 Roof Decks

Roofs shall be without concealed spaces and roof decks shall be constructed in accordance with Section 2304.11.4.1 or 2304.11.4.2. Other types of decking shall be permitted to be used where equivalent fire resistance and structural properties are being provided. Where supported by a wall, roof decks shall be anchored to walls to resist forces determined in accordance with Chapter 16. Such anchors shall consist of steel bolts, lags, screws or approved hardware of sufficient strength to resist prescribed forces.

2304.11.4.1 Cross-Laminated Timber Roofs

Cross-laminated timber roofs shall be not less than 3 inches (76 mm) in actual thickness and shall be continuous from support to support and mechanically fastened to one another.

2304.11.4.2 Sawn, Wood Structural Panel or Glued-Laminated Plank Roofs

Sawn, wood structural panel or glued-laminated plank roofs shall be one of the following:

1. Sawn or glued laminated, splined or tongue-and-groove plank, not less than 2 inches (51 mm) nominal in thickness.
2. $\frac{1}{8}$ -inch-thick (29 mm) wood structural panel (exterior glue).
3. Planks not less than 3 inches (76 mm) nominal in width, set on edge close together and laid as required for floors.

2304.12 Protection Against Decay and Termites

Wood shall be protected from decay and termites in accordance with the applicable provisions of Sections 2304.12.1 through 2304.12.6.

2304.12.1 Locations Requiring Water-Borne Preservatives or Naturally Durable Wood

Wood used above ground in the locations specified in Sections 2304.12.1.1 through 2304.12.1.5 shall be naturally durable wood or *preservative-treated wood* using water-borne preservatives, in accordance with AWPA U1 for above-ground use.

2304.12.1.1 Joists, Girders and Subfloor

Wood joists or wood structural floors that are closer than 18 inches (457 mm) or wood girders that are closer than 12 inches (305 mm) to the exposed ground in crawl spaces or unexcavated areas located within the perimeter of the building foundation shall be of naturally durable or *preservative-treated wood*.

2304.12.1.2 Wood Supported by Exterior Foundation Walls

Wood framing members, including wood sheathing, that are in contact with exterior foundation walls and are less than 8 inches (203 mm) from exposed earth shall be of naturally durable or *preservative-treated wood*.

2304.12.1.3 Exterior Walls Below Grade

Wood framing members and furring strips in direct contact with the interior of exterior masonry or concrete walls below grade shall be of naturally durable or *preservative-treated wood*.

2304.12.1.4 Sleepers and Sills

Sleepers and sills on a concrete or masonry slab that is in direct contact with earth shall be of naturally durable or *preservative-treated wood*.

2304.12.1.5 Wood Siding

Clearance between wood siding and earth on the exterior of a building shall not be less than 6 inches (152 mm) or less than 2 inches (51 mm) vertical from concrete steps, porch slabs, patio slabs and similar horizontal surfaces exposed to the weather except where siding, sheathing and wall framing are of naturally durable or *preservative-treated wood*.

2304.12.2 Other Locations

Wood used in the locations specified in Sections 2304.12.2.1 through 2304.12.2.9 shall be naturally durable wood or *preservative-treated wood* in accordance with AWPA U1. *Preservative-treated wood* used in interior locations shall be protected with two coats of urethane, shellac, latex epoxy or varnish unless water-borne preservatives are used. Prior to application of the protective finish, the wood shall be dried in accordance with the manufacturer's recommendations.

2304.12.2.1 Girder Ends

The ends of wood girders entering exterior masonry or concrete walls shall be provided with a 1/2-inch (12.7 mm) airspace on top, sides and end, unless naturally durable or *preservative-treated wood* is used.

2304.12.2.2 Posts or Columns

Posts or columns supporting permanent structures and supported by a concrete or masonry slab or footing that is in direct contact with the earth shall be of naturally durable or *preservative-treated wood*.

Exception: Posts or columns that meet all of the following:

1. Are not exposed to the weather, or are protected by a roof, eave, overhang or other covering if exposed to the weather.
2. Are supported by concrete piers or metal pedestals projecting at least 1 inch (25 mm) above the slab or deck and are separated from the concrete pier by an impervious moisture barrier.
3. Are located at least 8 inches (203 mm) above exposed earth.

2304.12.2.3 Supporting Member for Permanent Appurtenances

Naturally durable or *preservative-treated wood* shall be utilized for those portions of wood members that form the structural supports of buildings, balconies, porches or similar permanent building appurtenances where such members are exposed to the weather without adequate protection from a roof, eave, overhang or other covering to prevent moisture or water accumulation on the surface or at joints between members.

Exception: When a building is located in a geo-graphical region where experience has demonstrated that climatic conditions preclude the need to use durable materials where the structure is exposed to the weather.

2304.12.2.4 Laminated Timbers

The portions of glued-laminated timbers that form the structural supports of a building or other structure and are exposed to weather and not fully protected from moisture by a roof, eave or similar covering shall be pressure treated with preservative or be manufactured from naturally durable or *preservative-treated wood*.

2304.12.2.5 Supporting Members for Permeable Floors and Roofs

Wood structural members that support moisture-permeable floors or roofs that are exposed to the weather, such as concrete or masonry slabs, shall be of naturally durable or *preservative-treated wood* unless separated from such floors or roofs by an impervious moisture barrier. The impervious moisture barrier system protecting the structure-supporting floors shall provide positive drainage of water that infiltrates the moisture-permeable floor topping.

2304.12.2.6 Ventilation Required Beneath Balcony or Elevated Walking Surfaces

In new construction, enclosed framing in exterior balconies and elevated walking surfaces that have *weather-exposed surfaces* shall be provided with openings that provide a net free cross ventilation area not less than 1/150 of the area of each separate space.

2304.12.2.7 Wood in Contact With the Ground or Fresh Water

Wood used in contact with exposed earth shall be naturally durable for both decay and termite resistance or preservative treated in accordance with AWPA U1 for soil or fresh water use.

Exception: Untreated wood is permitted where such wood is continuously and entirely below the ground-water level or submerged in fresh water.

2304.12.2.7.1 Posts or Columns

Posts and columns that are supporting permanent structures and embedded in concrete that is exposed to the weather or in direct contact with the earth shall be of *preservative-treated wood*.

2304.12.2.7.2 Decks, Fences, Patios, Planters, or Other Wooden Building Components

Decks, fences, patios, planters, or other wooden building components that directly abut the sidewall of the foundation or structure shall be constructed so as to provide:

1. Eighteen-inch (457 mm) clearance beneath or,
2. Six-inch (152 mm) clearance between the top of the component and the exterior wall covering or,
3. Have components that are easily removable by screws or hinges to allow access for inspection of the foundation sidewall and treatment for termites.

2304.12.2.8 Termite Protection

Wood floor framing in the locations specified in Section 2304.12 and exposed framing of exterior decks or balconies shall be of naturally durable species (termite resistant) or preservative treated in accordance with AWPA U1 for the species, product preservative and end use or provided with *approved* methods of termite protection.

2304.12.2.9 Wood Used in Retaining Walls and Cribs

Wood installed in retaining or crib walls shall be preservative treated in accordance with AWPA U1 for soil and fresh water use.

2304.12.3 Attic Ventilation

For *attic* ventilation, see Section 1203.2.

2304.12.4 Under-Floor Ventilation (Crawl Space)

For under-floor ventilation (crawl space), see Section 1203.4.

2304.12.5 Foam-Plastic Insulation

2304.12.5.1

The provisions of Section 2603.8 shall apply to the installation of foam plastic insulation in close proximity to the ground.

Exception: Materials which are of naturally durable wood or are pressure treated for ground contact, and which are installed with at least 6 inches (152 mm) clear space from the structure to allow for inspection and treatment for termites.

In order to reduce chances of termite infestation, no wood, vegetation, stumps, dead roots, cardboard, trash, or other cellulose-containing material shall be buried on the building lot within 15 feet (4.6 m) of any building or the position of any building proposed to be built.

2304.12.6 Preparation of Building Site and Removal of Debris

2304.12.6.1

All building sites shall be graded to provide drainage under all portions of the building not occupied by basements.

2304.12.6.2

The foundation and the area encompassed within 1 foot (305 mm) therein shall have all vegetation, stumps, dead roots, cardboard, trash, and foreign material removed and the fill material shall be free of vegetation and foreign material. The fill shall be compacted to assure adequate support of the foundation.

2304.12.6.3

After all work is completed, loose wood and debris shall be completely removed from under the building and within 1 foot (305 mm) thereof. All wood forms and supports shall be completely removed. This includes, but is not limited to: wooden grade stakes, forms, contraction spacers, tub trap boxes, plumbing supports, bracing, shoring, forms, or other cellulose-containing material placed in any location where such materials are not clearly visible and readily removable prior to completion of the work. Wood shall not be stored in contact with the ground under any building.

2304.13 Long-Term Loading

Wood members supporting concrete, masonry or similar materials shall be checked for the effects of long-term loading using the provisions of the ANSI/AWC NDS. The total deflection, including the effects of long-term loading, shall be limited in accordance with Section 1604.3.1 for these supported materials.

Exception: Horizontal wood members supporting masonry or concrete nonstructural floor or roof surfacing not more than 4 inches (102 mm) thick need not be checked for long-term loading.

Section 2305 General Design Requirements for Lateral Force-Resisting Systems

2305.1 General

Structures using wood-frame shear walls or wood-frame diaphragms to resist wind or other lateral loads shall be designed and constructed in accordance with AWC SDPWS and the applicable provisions of Sections 2305, 2306 and 2307.

2305.1.1 Openings in Shear Panels

Openings in shear panels that materially affect their strength shall be detailed on the plans and shall have their edges adequately reinforced to transfer all shearing stresses.

2305.2 Diaphragm Deflection

The deflection of wood-frame diaphragms shall be determined in accordance with AWC SDPWS. The deflection (Δ_{dia}) of a blocked wood structural panel diaphragm uniformly fastened throughout with staples is permitted to be calculated in accordance with Equation 23-1.

1. If not uniformly fastened, the constant 0.188 (For SI: 1/1627) in the third term shall be modified by an approved method.

$$\Delta_{dia} = \frac{5vL^3}{8EAW} + \frac{vL}{4Gt} + 0.188Le_n + \frac{\Sigma(\Delta_c X)}{2W} \quad (\text{Equation 23-1})$$

$$\text{For SI: } \Delta_{dia} = \frac{0.052vL^3}{EAW} + \frac{vL}{4Gt} + \frac{Le_n}{1627} + \frac{\Sigma(\Delta_c X)}{2W}$$

where:

- A = Area of chord cross section, in square inches (mm^2).
- E = Modulus of elasticity of diaphragm chords, in pounds per square inch (N/mm^2).
- e_n = Staple slip, in inches (mm) [see Table 2305.2(1)].
- Gt = Panel rigidity through the thickness, in pounds per inch (N/mm) of panel width or depth [see Table 2305.2(2)].
- L = Diaphragm length (dimension perpendicular to the direction of the applied load), in feet (mm).
- v = Maximum induced unit shear, in pounds per linear foot (plf) (N/mm).
- W = Diaphragm width (in the direction of applied force), in feet (mm).
- Δ_{dia} = The calculated maximum midspan diaphragm deflection determined by elastic analysis, in inches (mm).
- X = Distance from chord splice to nearest support, in feet (mm)
- Δ_c = Diaphragm chord splice slip at the induced unit shear, in inches (mm)

TABLE 2305.2(1)

e_n VALUES (inches) FOR USE IN CALCULATING DIAPHRAGM AND SHEAR WALL DEFLECTION DUE TO FASTENER SLIP (Structural I)^{a, c}

LOAD PER FASTENER ^b (pounds)	FASTENER DESIGNATIONS	
	14-Ga staple × 2 inches long	
60	0.011	
80	0.018	
100	0.028	
120	0.04	
140	0.053	
160	0.068	

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound = 4.448 N.

a. Increase e_n values 20 percent for plywood grades other than Structural I.

b. Load per fastener = maximum shear per foot divided by the number of fasteners per foot at interior panel edges.

c. Decrease e_n values 50 percent for seasoned lumber (moisture content < 19 percent).

TABLE 2305.2(2)

VALUES OF Gt FOR USE IN CALCULATING DEFLECTION OF WOOD STRUCTURAL PANEL SHEAR WALLS AND DIAPHRAGMS

PANEL TYPE	SPAN RATING	VALUES OF Gt (lb/in. panel depth or width)							
		Structural Sheathing				Structural I			
		Plywood				Plywood			
		3-ply	4-ply	5-ply ^a	OSB	3-ply	4-ply	5-ply ^a	OSB
Sheathing	24/0	25,000	32,500	37,500	77,500	32,500	42,500	41,500	77,500

	24/16	27,000	35,000	40,500	83,500	35,000	45,500	44,500	83,500
	32/16	27,000	35,000	40,500	83,500	35,000	45,500	44,500	83,500
	40/20	28,500	37,000	43,000	88,500	37,000	48,000	47,500	88,500
	48/24	31,000	40,500	46,500	96,000	40,500	52,500	51,000	96,000
Single Floor	16 o.c.	27,000	35,000	40,500	83,500	35,000	45,500	44,500	83,500
	20 o.c.	28,000	36,500	42,000	87,000	36,500	47,500	46,000	87,000
	24 o.c.	30,000	39,000	45,000	93,000	39,000	50,500	49,500	93,000
	32 o.c.	36,000	47,000	54,000	110,000	47,000	61,000	59,500	110,000
	48 o.c.	50,500	65,500	76,000	155,000	65,500	85,000	83,500	155,000

	Thickness (in.)	Structural Sheathing			Structural I		
		A-A, A-C	Marine	All Other Grades	A-A, A-C	Marine	All Other Grades
Sanded Plywood	1/4	24,000	31,000	24,000	31,000	31,000	31,000
	11/32	25,500	33,000	25,500	33,000	33,000	33,000
	3/8	26,000	34,000	26,000	34,000	34,000	34,000
	15/32	38,000	49,500	38,000	49,500	49,500	49,500
	1/2	38,500	50,000	38,500	50,000	50,000	50,000
	19/32	49,000	63,500	49,000	63,500	63,500	63,500
	5/8	49,500	64,500	49,500	64,500	64,500	64,500
	23/32	50,500	65,500	50,500	65,500	65,500	65,500
	3/4	51,000	66,500	51,000	66,500	66,500	66,500
	7/8	52,500	68,500	52,500	68,500	68,500	68,500

For SI: 1 inch = 25.4 mm, 1 pound/inch = 0.1751 N/mm.

a. 5-ply applies to plywood with five or more layers. For 5-ply plywood with three layers, use values for 4-ply panels.

2305.3 Shear Wall Deflection

The deflection of wood-frame shear walls shall be determined in accordance with AWC SDPWS. The deflection (Δ_{sw}) of a blocked wood structural panel shear wall uniformly fastened throughout with staples is permitted to be calculated in accordance with Equation 23-2.

$$\Delta_{sw} = \frac{8vh^3}{EAb} + \frac{vh}{Gt} + 0.75he_n + d_{ab} \quad (\text{Equation 23-2})$$

$$\text{For SI: } \Delta_{sw} = \frac{vh^3}{3EAb} + \frac{vh}{Gt} + \frac{he_n}{407.6} + d_{ab}$$

where:

A = Area of end post cross section in square inches (mm^2).

b = Shear wall length, in feet (mm).

d_a = Total vertical elongation of wall anchorage system (including fastener slip, device elongation, rod elongation, etc.) at the induced unit shear in the shear wall (v).

E = Modulus of elasticity of end posts, in pounds per square inch (N/mm^2).

e_n = Staple slip, in inches (mm) [see Table 2305.2(1)].

G_t = Panel rigidity through the thickness, in pounds per inch (N/mm) of panel width or depth [see Table 2305.2(2)].

h = Shear wall height, in feet (mm).

v = Induced unit shear, in pounds per linear foot (N/mm).

Δ_{sw} = Maximum shear wall deflection determined by elastic analysis, in inches (mm).

Section 2306 Allowable Stress Design

2306.1 Allowable Stress Design

The design and construction of wood elements in structures using *allowable stress design* shall be in accordance with the following applicable standards:

American Wood Council.	
NDS	National Design Specification for Wood Construction
SDPWS	Special Design Provisions for Wind and Seismic
American Institute of Timber Construction.	
AITC 104	Typical Construction Details
AITC 110	Standard Appearance Grades for Structural Glued Laminated Timber
AITC 113	Standard for Dimensions of Structural Glued Laminated Timber
AITC 119	Standard Specifications for Structural Glued Laminated Timber of Hardwood Species
AITC 200	Inspection Manual
American Society of Agricultural and Biological Engineers.	
ASABE EP 484.2	Diaphragm Design of Metal-clad, Post-Frame Rectangular Buildings
ASABE EP 486.2	Shallow Post Foundation Design
ASABE 559.1	Design Requirements and Bending Properties for Mechanically Laminated Columns
APA—The Engineered Wood Association.	
ANSI 117	Glued Laminated Timber of Softwood Species
ANSI A190.1	Structural Glued Laminated Timber
Panel Design Specification	
Plywood Design Specification Supplement 1—Design & Fabrication of Plywood Curved Panel	
Plywood Design Specification Supplement 2—Design & Fabrication of Glued Plywood-lumber Beams	
Plywood Design Specification Supplement 3—Design & Fabrication of Plywood Stressed-skin Panels	
Plywood Design Specification Supplement 4—Design & Fabrication of Plywood Sandwich Panels	
Plywood Design Specification Supplement 5—Design & Fabrication of All-plywood Beams	
EWS APA T300	Glulam Connection Details
EWS APA S560	Field Notching and Drilling of Glued Laminated Timber Beams
EWS APA S475	Glued Laminated Beam Design Tables
EWS APA X450	Glulam in Residential Building Construction Guide
EWS APA X440	Product and Application Guide: Glulam
EWS APA R540	Builders Tips: Proper Storage and Handling of Glulam Beams
Truss Plate Institute, Inc.	
TPI 1	National Design Standard for Metal Plate Connected Wood Truss Construction

2306.1.1 Joists and Rafters

The design of rafter spans is permitted to be in accordance with the AWC STJR.

2306.1.2 Plank and Beam Flooring

The design of plank and beam flooring is permitted to be in accordance with the AWC *Wood Construction Data No. 4*.

2306.1.3 Treated Wood Stress Adjustments

The allowable unit stresses for *preservative-treated wood* need no adjustment for treatment, but are subject to other adjustments.

The allowable unit stresses for *fire-retardant-treated wood*, including fastener values, shall be developed from an *approved* method of investigation that considers the effects of anticipated temperature and humidity to which the *fire-retardant-treated wood* will be subjected, the type of treatment and the redrying process. Other adjustments are applicable except that the impact load duration shall not apply.

2306.1.4 Lumber Decking

The capacity of lumber decking arranged according to the patterns described in Section 2304.9.2 shall be the lesser of the capacities determined for moment and deflection according to the formulas in Table 2306.1.4.

TABLE 2306.1.4

ALLOWABLE LOADS FOR LUMBER DECKING

PATTERN	ALLOWABLE AREA LOAD ^a	
	Moment	Deflection
Simple span	$w_b = \frac{8F'_b d^2}{l^2 6}$	$w_\Delta = \frac{384\Delta E' d^3}{5l^4 12}$
Two-span continuous	$w_b = \frac{8F'_b d^2}{l^2 6}$	$w_\Delta = \frac{185\Delta E' d^3}{l^4 12}$
Combination simple- and two-span continuous	$w_b = \frac{8F'_b d^2}{l^2 6}$	$w_\Delta = \frac{131\Delta E' d^3}{l^4 12}$
Cantilevered pieces intermixed	$w_b = \frac{20F'_b d^2}{3l^2 6}$	$w_\Delta = \frac{105\Delta E' d^3}{l^4 12}$
Controlled random layup		
Mechanically laminated decking	$w_b = \frac{20F'_b d^2}{3l^2 6}$	$w_\Delta = \frac{100\Delta E' d^3}{l^4 12}$
2-inch decking	$w_b = \frac{20F'_b d^2}{3l^2 6}$	$w_\Delta = \frac{100\Delta E' d^3}{l^4 12}$
3-inch and 4-inch decking	$w_b = \frac{8F'_b d^2}{l^2 6}$	$w_\Delta = \frac{116\Delta E' d^3}{l^4 12}$

For SI: 1 inch = 25.4 mm.

a. w_b = Allowable total uniform load limited by moment.

w_Δ = Allowable total uniform load limited by deflection.

d = Actual decking thickness.

l = Span of decking.

F'_b = Allowable bending stress adjusted by applicable factors.

E' = Modulus of elasticity adjusted by applicable factors.

2306.2 Wood-Frame Diaphragms

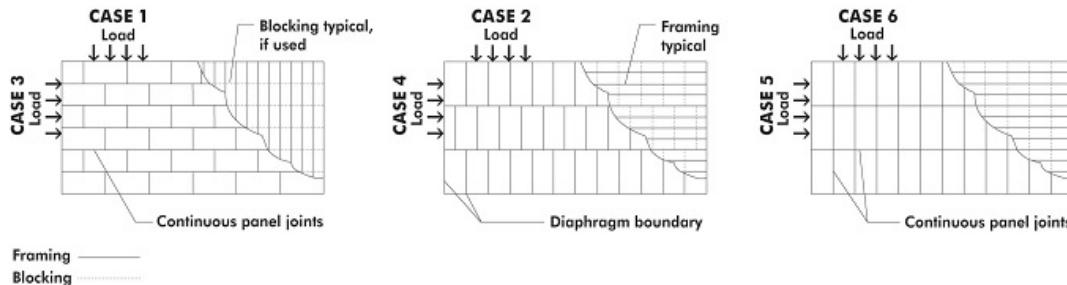
Wood-frame diaphragms shall be designed and constructed in accordance with AWC SDPWS. Where panels are fastened to framing members with staples, requirements and limitations of AWC SDPWS shall be met and the allowable shear values set forth in Table 2306.2(1) or 2306.2(2) shall be permitted. The allowable shear values in Tables 2306.2(1) and 2306.2(2) are permitted to be increased 40 percent for wind design.

TABLE 2306.2(1)

ALLOWABLE SHEAR VALUES (POUNDS PER FOOT) FOR WOOD STRUCTURAL PANEL DIAPHRAGMS UTILIZING STAPLES WITH FRAMING OF DOUGLAS FIR-LARCH, OR SOUTHERN PINE^a FOR WIND LOADING^f

PANEL GRADE	STAPLE LENGTH AND GAGE ^d	MINIMUM FASTENER PENETRATION IN FRAMING (inches)	MINIMUM NOMINAL PANEL THICKNESS (inch)	MINIMUM NOMINAL WIDTH OF FRAMING MEMBERS AT	BLOCKED DIAPHRAGMS	UNBLOCKED DIAPHRAGMS
					Fastener spacing (inches) at	Fasteners spaced 6 max. at supported edges ^b

ADJOINING PANEL EDGES AND BOUNDARIES ^e (inches)	diaphragm boundaries (all cases) at continuous panel edges parallel to load (Cases 3, 4), and at all panel edges (Cases 5, 6) ^b				Case 1 (No unblocked edges or continuous joints parallel to load)	All other configurations (Cases 2, 3, 4, 5 and 6)				
	6	4	2 ^{1/2} ^c	2 ^c						
	Fastener spacing (inches) at other panel edges (Cases 1, 2, 3 and 4) ^b									
	6	6	4	3						
Structural I grades	1 ^{1/2} 16 gage	1	3/8	2	175	235	350	400	155	115
			3/8	3	200	265	395	450	175	130
			15/32	2	175	235	350	400	155	120
			15/32	3	200	265	395	450	175	130
Sheathing, single floor and other grades covered in DOC PS 1 and PS 2	1 ^{1/2} 16 gage	1	3/8	2	160	210	315	360	140	105
			3/8	3	180	235	355	400	160	120
			7/16	2	165	225	335	380	150	110
			7/16	3	190	250	375	425	165	125
			15/32	2	160	210	315	360	140	105
			15/32	3	180	235	355	405	160	120
			19/32	2	175	235	350	400	155	115
			19/32	3	200	265	395	450	175	130



For SI: 1 inch = 25.4 mm, 1 pound per foot = 14.5939 N/m.

- a. For framing of other species: (1) Find specific gravity for species of lumber in ANSI/AWC NDS. (2) For staples find shear value from table above for Structural I panels (regardless of actual grade) and multiply value by 0.82 for species with specific gravity of 0.42 or greater, or 0.65 for all other species.
- b. Space fasteners maximum 12 inches on center along intermediate framing members (6 inches on center where supports are spaced 48 inches on center).
- c. Framing at adjoining panel edges shall be 3 inches nominal or wider.
- d. Staples shall have a minimum crown width of 7/16 inch and shall be installed with their crowns parallel to the long dimension of the framing members.
- e. The minimum nominal width of framing members not located at boundaries or adjoining panel edges shall be 2 inches.
- f. For shear loads of normal or permanent load duration as defined by the ANSI/AWC NDS, the values in the table above shall be multiplied by 0.63 or 0.56, respectively.

TABLE 2306.2(2)

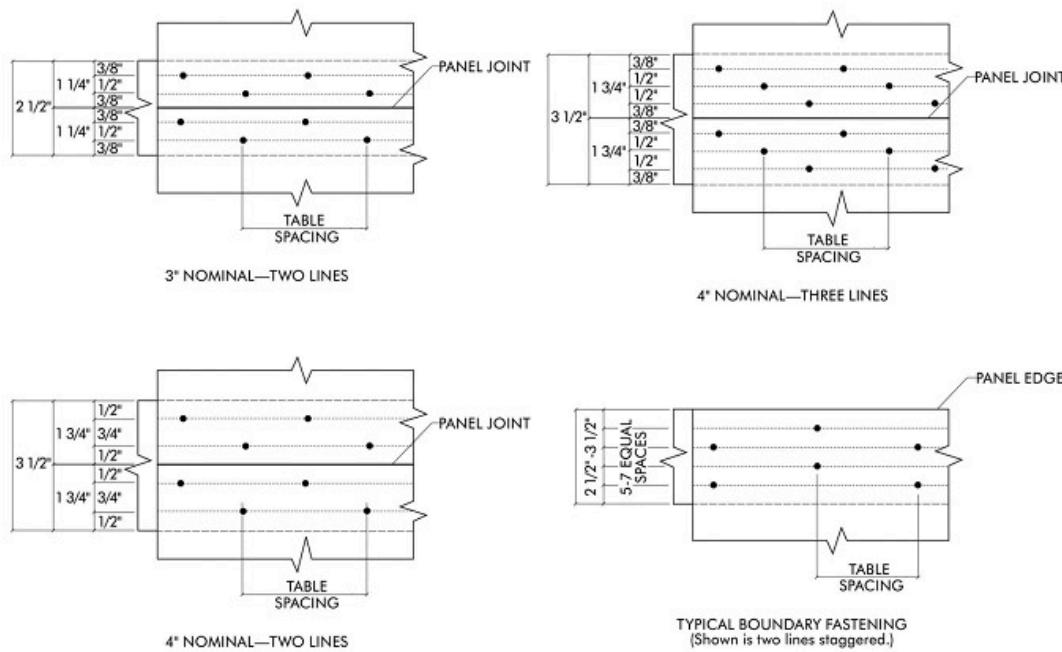
ALLOWABLE SHEAR VALUES (POUNDS PER FOOT) FOR WOOD STRUCTURAL PANEL BLOCKED DIAPHRAGMS UTILIZING MULTIPLE ROWS OF STAPLES (HIGH-LOAD DIAPHRAGMS) WITH FRAMING OF DOUGLAS FIR-LARCH OR SOUTHERN PINE^a FOR WIND LOADING^{b, h}

PANEL GRADE ^c	STAPLE GAGE ^f	MINIMUM FASTENER PENETRATION	MINIMUM NOMINAL PANEL	MINIMUM NOMINAL WIDTH OF FRAMING MEMBER AT	LINES OF FASTENERS	BLOCKED DIAPHRAGMS	
						Cases 1 and 2 ^d	

	IN FRAMING (inches)	THICKNESS (inch)	ADJOINING PANEL EDGES AND BOUNDARIES ^e	Fastener Spacing Per Line at Boundaries (inches)							
				4		2 ^{1/2}		2			
				Fastener Spacing Per Line at Other Panel Edges (inches)							
				6	4	4	3	3	3	2	
Structural I grades	14 gage staples	2	$\frac{15}{32}$	3	2	600	600	860	960	1,060	1,200
				4	3	860	900	1,160	1,295	1,295	1,400
			$\frac{19}{32}$	3	2	600	600	875	960	1,075	1,200
				4	3	875	900	1,175	1,440	1,475	1,795
Sheathing single floor and other grades covered in DOC PS 1 and PS 2	14 gage staples	2	$\frac{15}{32}$	3	2	540	540	735	865	915	1,080
				4	3	735	810	1,005	1,105	1,105	1,195
			$\frac{19}{32}$	3	2	600	600	865	960	1,065	1,200
				4	3	865	900	1,130	1,430	1,370	1,485
			$\frac{23}{32}$	4	3	865	900	1,130	1,490	1,430	1,545

For SI: 1 inch = 25.4 mm, 1 pound per foot = 14.5939 N/m.

- a. For framing of other species: (1) Find specific gravity for species of framing lumber in ANSI/AWC NDS. (2) For staples, find shear value from table above for Structural I panels (regardless of actual grade) and multiply value by 0.82 for species with specific gravity of 0.42 or greater, or 0.65 for all other species.
- b. Fastening along intermediate framing members: Space fasteners a maximum of 12 inches on center, except 6 inches on center for spans greater than 32 inches.
- c. Panels conforming to PS 1 or PS 2.
- d. This table gives shear values for Cases 1 and 2 as shown in Table 2306.2(1). The values shown are applicable to Cases 3, 4, 5 and 6 as shown in Table 2306.2(1), providing fasteners at all continuous panel edges are spaced in accordance with the boundary fastener spacing.
- e. The minimum nominal depth of framing members shall be 3 inches nominal. The minimum nominal width of framing members not located at boundaries or adjoining panel edges shall be 2 inches.
- f. Staples shall have a minimum crown width of $\frac{7}{16}$ inch, and shall be installed with their crowns parallel to the long dimension of the framing members.
- g. Reserved.
- h. For shear loads of normal or permanent load duration as defined by the ANSI/AWC NDS, the values in the table above shall be multiplied by 0.63 or 0.56, respectively.



NOTE: SPACE PANEL END AND EDGE JOINT 1/8 INCH. REDUCE SPACING BETWEEN LINES OF NAILS AS NECESSARY TO MAINTAIN MINIMUM 3/8 INCH FASTENER EDGE MARGINS, MINIMUM SPACING BETWEEN LINES IS 3/8 INCH

2306.2.1 Gypsum Board Diaphragm Ceilings

Gypsum board diaphragm ceilings shall be in accordance with Section 2508.6.

2306.3 Wood-Frame Shear Walls

Wood-frame shear walls shall be designed and constructed in accordance with AWC SDPWS. Where panels are fastened to framing members with staples, requirements and limitations of AWC SDPWS shall be met and the allowable shear values set forth in Table 2306.3(1), 2306.3(2) or 2306.3(3) shall be permitted. The allowable shear values in Tables 2306.3(1) and 2306.3(2) are permitted to be increased 40 percent for wind design. Panels complying with ANSI/APA PRP-210 shall be permitted to use design values for Plywood Siding in the AWC SDPWS.

TABLE 2306.3(1)

ALLOWABLE SHEAR VALUES (POUNDS PER FOOT) FOR WOOD STRUCTURAL PANEL SHEAR WALLS UTILIZING STAPLES WITH FRAMING OF DOUGLAS FIR-LARCH OR SOUTHERN PINE^a FOR WIND LOADING^{b, f, i}

PANEL GRADE	MINIMUM NOMINAL PANEL THICKNESS (inch)	MINIMUM FASTENER PENETRATION IN FRAMING (inches)	PANELS APPLIED DIRECT TO FRAMING				PANELS APPLIED OVER 1/2" OR 5/8" GYPSUM SHEATHING			
			Staple size ^h	Fastener spacing at panel edges (inches)			Staple size ^h	Fastener spacing at panel edges (inches)		
				6	4	3		6	4	3
Structural I sheathing	3/8	1	1 1/2 16 Gage	155	235	315	2 16 Gage	155	235	310
	7/16			170	260	345		155	235	310
	15/32			185	280	375		155	235	300
Sheathing, plywood siding ^e except Group 5 Species, ANSI/APA PRP 210 siding	5/16 ^c or 1/4 ^c	1	1 1/2 16 Gage	145	220	295	2 16 Gage	110	165	220
	3/8			140	210	280		140	210	280
	7/16			155	230	310		140	210	280
	15/32			170	255	335		140	210	280
	19/32		1 3/4 16 Gage	185	280	375	—	—	—	—

For SI: 1 inch = 25.4 mm, 1 pound per foot = 14.5939 N/m.

- a. For framing of other species: (1) Find specific gravity for species of lumber in ANSI/AWC NDS. (2) For staples find shear value from table above for Structural I panels (regardless of actual grade) and multiply value by 0.82 for species with specific gravity of 0.42 or greater, or 0.65 for all other species.

- b. Panel edges backed with 2-inch nominal or wider framing. Install panels either horizontally or vertically. Space fasteners maximum 6 inches on center along intermediate framing members for $\frac{3}{8}$ -inch and $\frac{7}{16}$ -inch panels installed on studs spaced 24 inches on center. For other conditions and panel thickness, space fasteners maximum 12 inches on center on intermediate supports.
- c. $\frac{3}{8}$ -inch panel thickness or siding with a span rating of 16 inches on center is the minimum recommended where applied directly to framing as exterior siding. For grooved panel siding, the nominal panel thickness is the thickness of the panel measured at the point of fastening.
- d. Framing at adjoining panel edges shall be 3 inches nominal or wider.
- e. Values apply to all-veneer plywood. Thickness at point of fastening on panel edges governs shear values.
- f. Where panels are applied on both faces of a wall and fastener spacing is less than 6 inches on center on either side, panel joints shall be offset to fall on different framing members, or framing shall be 3 inches nominal or thicker at adjoining panel edges.
- g. Reserved.
- h. Staples shall have a minimum crown width of $\frac{7}{16}$ inch and shall be installed with their crowns parallel to the long dimension of the framing members.
- i. For shear loads of normal or permanent load duration as defined by the ANSI/AWC NDS, the values in the table above shall be multiplied by 0.63 or 0.56, respectively.

TABLE 2306.3(2)

ALLOWABLE SHEAR VALUES (plf) FOR WIND LOADING ON SHEAR WALLS OF FIBERBOARD SHEATHING BOARD CONSTRUCTION UTILIZING STAPLES FOR TYPE V CONSTRUCTION ONLY^{a, b, c, d}

THICKNESS AND GRADE	FASTENER SIZE	ALLOWABLE SHEAR VALUE (pounds per linear foot) STAPLE SPACING AT PANEL EDGES (inches) ^a		
		4	3	2
$\frac{1}{2}$ " or $\frac{25}{32}$ " Structural	16 gage galvanized staple, $\frac{7}{16}$ " crown, $1\frac{3}{4}$ inch long	150	200	225
	16 gage galvanized staple, 1" crown, $1\frac{3}{4}$ inch long	220	290	325

For SI: 1 inch = 25.4 mm, 1 pound per foot = 14.5939 N/m.

- a. Fiberboard sheathing shall not be used to brace concrete or masonry walls.
- b. Panel edges shall be backed with 2-inch or wider framing of Douglas Fir-Larch or Southern Pine. For framing of other species: (1) Find specific gravity for species of framing lumber in ANSI/AWC NDS. (2) For staples, multiply the shear value from the table above by 0.82 for species with specific gravity of 0.42 or greater, or 0.65 for all other species.
- c. Values shown are for fiberboard sheathing on one side only with long panel dimension either parallel or perpendicular to studs.
- d. Fastener shall be spaced 6 inches on center along intermediate framing members.
- e. Reserved.

TABLE 2306.3(3)

ALLOWABLE SHEAR VALUES FOR WIND FORCES FOR SHEAR WALLS OF LATH AND PLASTER OR GYPSUM BOARD WOOD FRAMED WALL ASSEMBLIES UTILIZING STAPLES

TYPE OF MATERIAL	THICKNESS OF MATERIAL	WALL CONSTRUCTION	STAPLE SPACING ^b MAXIMUM (inches)	SHEAR VALUE ^{a, c} (plf)	MINIMUM STAPLE SIZE ^{f, g}
1. Expanded metal or woven wire lath and Portland cement plaster	$\frac{7}{8}$ "	Unblocked	6	180	No. 16 gage galv. staple, $\frac{7}{8}$ " legs
2. Gypsum lath, plain or perforated	$\frac{3}{8}$ " lath and $\frac{1}{2}$ " plaster	Unblocked	5	100	No. 16 gage galv. staple, $1\frac{1}{8}$ " long
3. Gypsum sheathing	$\frac{1}{2}$ " \times 2' \times 8'	Unblocked	4	75	No. 16 gage galv. staple, $1\frac{3}{4}$ " long
	$\frac{1}{2}$ " \times 4'	Blocked ^d Unblocked	4 7	175 100	

4. Gypsum board, gypsum veneer base or water-resistant gypsum backing board	$\frac{1}{2}$ "	Unblocked ^d	7	75	No. 16 gage galv. staple, $1\frac{1}{2}$ " long
		Unblocked ^d	4	110	
		Unblocked	7	100	
		Unblocked	4	125	
		Blocked ^e	7	125	
		Blocked ^e	4	150	
	$\frac{5}{8}$ "	Unblocked ^d	7	115	No. 16 gage galv. staple, $1\frac{5}{8}$ " long
			4	145	
		Blocked ^e	7	145	
			4	175	
		Blocked ^e Two-ply	Base ply: 9 Face ply: 7	250	No. 16 gage galv. staple $1\frac{5}{8}$ " long No. 15 gage galv. staple, $2\frac{1}{4}$ " long

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per foot = 14.5939 N/m.

- a. These shear walls shall not be used to resist loads imposed by masonry or concrete walls (see AWC SDPWS). Values shown are for short-term loading due to wind loading. Values shown shall be reduced 25 percent for normal loading.
- b. Applies to fastening at studs, top and bottom plates and blocking.
- c. Except as noted, shear values are based on a maximum framing spacing of 16 inches on center.
- d. Maximum framing spacing of 24 inches on center.
- e. All edges are blocked, and edge fastening is provided at all supports and all panel edges.
- f. Staples shall have a minimum crown width of $\frac{7}{16}$ inch, measured outside the legs, and shall be installed with their crowns parallel to the long dimension of the framing members.
- g. Staples for the attachment of gypsum lath and woven-wire lath shall have a minimum crown width of $\frac{3}{4}$ inch, measured outside the legs.

Section 2307 Load and Resistance Factor Design

2307.1 Load and Resistance Factor Design

The design and construction of wood elements and structures using *load and resistance factor design* shall be in accordance with ANSI/AWC NDS and AWC SDPWS.

Section 2308 Conventional Light-Frame Construction

RESERVED

Section 2309 Wood Frame Construction Manual

2309.1 Wood Frame Construction Manual

Structural design in accordance with the AWC WFCM shall be permitted for buildings assigned to Risk Category I or II subject to the limitations of Section 1.1.3 of the AWC WFCM and the load assumptions contained therein. Structural elements beyond these limitations shall be designed in accordance with accepted engineering practice.

Section 2310 Through 2313

RESERVED

Section 2314 High-Velocity Hurricane Zones

2314.1 Design

Wood members and their fastenings shall be designed to comply with ASCE 7 by methods based on rational analysis or approved laboratory testing procedures, both performed in accordance with fundamental principles of theoretical and applied mechanics.

2314.2 Workmanship

Wood members shall be framed, anchored, tied and braced to develop the strength and rigidity necessary for the purposes for which they are used and to resist the loads imposed as set forth in this code. Wood construction shall be in conformance with the tolerances, quality and methods of construction as prescribed by the standards in Chapter 35 of this code.

2314.3 Fabrication

2314.3.1

Preparation, fabrication and installation of wood members and the glues, connectors and mechanical devices for fastening shall conform to good engineering practice.

2314.3.2

Any person desiring to manufacture or fabricate wood truss assemblies shall obtain a certificate of competency from the authority having jurisdiction.

2314.4

The following standards, as set forth in Chapter 35 of this code, are hereby adopted for the design and quality of wood members and their fastenings:

2314.4.1

American Hardboard Products Association, 887-B Wilmette Road, Palatine, IL 60067 AHA.

1. Basic Hardboard ANSI/AHA A135.4—1982.
2. Prefinished Hardboard Paneling ANSI/AHA A135.5—1982.
3. Hardboard Siding ANSI/AHA A135.6—1990.
4. Cellulosic Fiberboard ANSI/AHA A194.1—1985.
5. Recommended Product and Application Specification—Structural Insulating Roof Deck, I.B. Spec. No. 1.
6. Recommended Product and Application Specification— $\frac{1}{2}$ -inch Fiberboard Nail-Base-Sheathing I.B. Spec. No. 2.
7. Recommended Product and Application Specification— $\frac{1}{2}$ -inch Intermediate Fiberboard Sheathing I.B. Spec. No. 3.

2314.4.2

American Institute of Timber Construction, 333 West Hampden Avenue, Englewood, CO 80110 AITC.

1. Typical Construction Details, AITC 104.
2. Code of Suggested Practices, AITC 106.
3. Standard for Heavy Timber Construction, AITC 108.
4. Standard for Preservative Treatment for Structural Glued Laminated Timber, AITC 109.
5. Standard Appearance Grades for Structural Glued Laminated Timber, AITC 110.
6. Standard for Tongue and Groove Heavy Timber Roof Decking, AITC 112.
7. Standard for Dimensions of Glued Laminated Structural Members, AITC 113.
8. Standard Specifications for Hardwood Glued Laminated Timber, AITC 119.
9. Technical Report No. 7, Calculation of Fire Resistance of Glued Laminated Timber.

2314.4.3

APA The Engineered Wood Association (formerly APA American Plywood Association), 7011 South 19th Street, Tacoma, WA 98466.

1. APA Design Construction Guide, E30.
2. Plywood Design Specification Y510J.
3. Plywood Design Specification—Design and Fabrication of Plywood Beams, Supplement No. 1 S811.
4. Plywood Design Specification—Design and Fabrication of Plywood Beams, Supplement No. 2 S812.
5. Plywood Design Specification—Design and Fabrication of Plywood Stressed—Skin Panels, Supplement No. 3 U813.
6. Plywood Design Specifications—Design and Fabrication of Plywood Sandwich Panels Supplement No. 4 U814.
7. Plywood Design Specifications—Design and Fabrication of All-Plywood Beams, Supplement No. 5 H815.

8. Plywood Folded Plate, Laboratory Report 21 V910.
9. APA Design/Construction Guide Diaphragms L350.
10. Performance Standards and Policies for Structural-Use Panels PRP-108.
11. 303 Siding Manufacturing Specifications B840.
12. Standard Specifications for Structural Glued Laminated Timber of Softwood Species, ANSI 117.
13. Structural Glued Laminated Timber, ANSI A190.1.

2314.4.4

ASTM International, 1916 Race Street, Philadelphia, PA 19103-1187 ASTM.

1. Standard Test Methods for Mechanical Fasteners in Wood, ASTM D1761.
2. Accelerated Weathering on Fire-Retardant Treated Wood for Fire Testing, ASTM D2898.
3. Surface Burning Characteristics of Building Materials, ASTM E84.
4. Hygroscopic Properties of Fire-Retardant Wood and Wood-Base Products, ASTM D3201.
5. Standard Specifications for Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems, ASTM D3498.

2314.4.5

American Wood Preservers Association, P.O. Box 361784, Birmingham, AL 35236-1784.

1. AWPA Use Category Systems Standard U1.
2. AWPA Standard M4 Care of Pressure Treated Wood Products.

2314.4.6

National Institute for Standards and Technology Standard Development Services Section, Standards Application and Analysis Division, Washington, D.C. 20234 NIST.

1. Mat-Formed Particleboard CS236.
2. Structural Plywood PS1.
3. American Softwood Lumber Standard PS20.
4. Performance Standard for Wood Structural Panels PS2{*}.

{*} All wood structural panels except oriented strand boards used as floor sheathing in interior applications or plywood shall have product approval and shall be tested in accordance with High-Velocity Hurricane Zone Testing Protocols.

2314.4.7

American Wood Council, 222 Catoctin Circle SE, Suite 201, Leesburg, VA 20175.

1. ANSI/AWC NDS—2018: National Design Specification for Wood Construction with 2018 NDS Supplement.
2. AWC Wood Structural Design Data.
3. AWC ST JR—2015: Span Tables for Joists and Rafters.
4. AWC 2015 Design Values for Joists and Rafters.
5. AWC WCD No. 1—Wood Construction Data No. 1, Details for Conventional Wood Frame Construction.
6. AWC WCD No. 4—Wood Construction Data No. 4, Plank-and-Beam Framing for Residential Building.

7. AWC WCD No. 5—Wood Construction Data No. 5, Heavy Timber Construction.

8. AWC WCD No. 6—Wood Construction Data No. 6, Design of Wood Frame Structures for Permanence.

9. ANSI/AWC PWF—2015: Permanent Wood Foundation (PWF) Design Specification.

10. ANSI/AWC WFCM—2018: Wood Frame Construction Manual for One- and Two-Family Dwellings.

11. ANSI/AWC SDPWS-2015: Special Design Provisions for Wind and Seismic.

2314.4.8

Timber Company, Inc., 2402 Daniels Street, Madison, WI 53704.

TECO Performance Standards and Policies for Structural use Panels. PRP-133.

2314.4.9

Truss Plate Institute, 218 N. Lee Street, Suite 312, Alexandria, VA 22314.

1. National Design Standard for Metal Plate Connected Wood Truss Construction (excluding Chapter 2).

2. Building Component Safety Information (BCSI 1) Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses. [A joint publication with the Wood Truss Council of America (WTCA).]

2314.4.10

Reserved.

Section 2315 High-Velocity Hurricane Zones—Quality

2315.1 Identification

Reserved.

2315.1.1

Reserved.

2315.1.2

Reserved.

2315.1.3

Wood shingles and/or shakes shall be identified by the trademark of an approved grading or inspection bureau or agency.

2315.1.4

Reserved.

2315.1.5

Reserved.

2315.1.6

Reserved.

2315.1.7

Reserved.

2315.1.8

Reserved.

2315.1.9

Reserved.

2315.1.10

Reserved.

2315.1.11

All wood-based structural panels, including those made of fiberboard, hardboard and particleboard shall have product approval. Product approval shall be given upon certification by an approved independent testing laboratory that the product:

1. Complies with the applicable standards set forth above.

2. Complies with the manufacturer's published design properties before and after a wet-dry, wet-dry cycle.

3. When tested dry, maintains a safety factor of 2:1 and when tested after the cycles specified in Section 2315.1.11(2) above maintains a safety factor of 1.5:1. Testing shall be as specified in the testing protocol.

2315.2

When wood structural panels are used as floor sheathing in interior applications, the panel sheathing shall be rated for Exposure 1 or Exterior in accordance with PS 1 or PS 2.

2315.3

All lumber 2 inches (51 mm) or less in thickness shall contain not more than 19-percent moisture at the time of permanent incorporation in a building or structure and/or at the time of treatment with a wood preservative.

2315.4 Grade and Species

2315.4.1

All structural wood members not limited by other sections of this chapter shall be of sufficient size and capacity to carry all loads as required by the high-velocity hurricane provisions of Chapter 16 without exceeding the allowable design stresses specified in the *National Design Specification for Wood Construction* and in compliance with Section 2317.

2315.4.2

Reserved.

Section 2316 High-Velocity Hurricane Zones—Sizes

RESERVED

Section 2317 High-Velocity Hurricane Zones—Unit Stresses

2317.1 General

2317.1.1

Lumber used for joists, rafters, trusses, columns, beams and/or other structural members shall be of no less strength than No. 2 grade of Southern Pine, Douglas Fir-Larch, Hem-Fir or Spruce-Pine-Fir. Joists and rafters shall be sized according to AF&PA Span Tables for Joists and Rafters adopted in Section 2314.4.

2317.1.2

Lumber used for studs in exterior walls and interior bearing walls shall be of no less strength than stud grade of Southern Pine, Douglas Fir-Larch, Hem-Fir or Spruce-Pine-Fir and capable of resisting all loads determined in accordance with Chapter 16 (High-Velocity Hurricane Zones). The unbraced height of the wall shall be no more than 8 feet 6 inches (2.6 m) (including top and bottom plates). Heights may be increased where justified by rational analysis prepared by a registered professional engineer or registered architect proficient in structural design.

2317.1.3

Reserved.

2317.1.4

The designer shall specify on the design drawings the size, spacing, species and grade of all load supporting members.

2317.2

Allowable stress design value may be modified for repetitive, duration, etc., factors where design is by a registered professional engineer or registered architect proficient in structural design or where such modified values are reflected in the tables of the standards in Section 2314.4.

Section 2318 High-Velocity Hurricane Zones—Vertical Framing

2318.1 Studs in Bearing and Exterior Walls

Studs in walls framing over 8 feet 6 inches (2.6 m) (including top and bottom plates) or supporting floor and roof loads shall be designed by rational analysis prepared by a registered professional engineer or registered architect proficient in structural design.

2318.1.1 Minimum Size

Studs shall be not less than nominal 2 × 6 for exterior walls or 2 × 4 for interior bearing or load resisting walls unless designed by rational analysis by a registered professional engineer or registered architect proficient in structural design.

2318.1.2 Spacing

Studs shall be spaced not more than 16 inches (406 mm) on center unless designed by rational analysis as a system of columns and beams by a registered professional engineer or registered architect proficient in structural design.

2318.1.3 Placing

2318.1.3.1

Studs in exterior and bearing walls shall be placed with the longer dimension perpendicular to the wall.

2318.1.3.2

Studs in exterior walls and in bearing walls shall be supported by foundation plates, sills, or girders or floor framing directly over supporting walls or girders. Stud bearing walls when perpendicular to supporting joists may be offset from supporting walls or girders not more than the depth of the joists unless such joists are designed for the extra loading conditions.

2318.1.3.3

Stud walls framing into base plates of exterior walls and interior bearing walls resting on masonry or concrete shall be anchored past the plate to the masonry or concrete, or shall be anchored to a sill plate which is anchored in accordance with Section 2318.1.4.1 when the net wind uplift is up to 500 pounds per foot (7297 N/m).

2318.1.4 Sills and/or Base Plates

2318.1.4.1

Sills and/or base plates, where provided in contact with masonry or concrete, shall be of an approved durable species or be treated with an approved preservative and shall be attached to the masonry or concrete with $\frac{1}{2}$ -inch (13 mm) diameter bolts with oversized washer spaced not over 2 feet (610 mm) apart and embedded not less than 7 inches (178 mm) into a grout filled cell of masonry or into concrete. Base plates shall be placed in a recess $\frac{3}{4}$ inch (19 mm) deep and the width of the base plate at the edge of a concrete slab, beam/slab or any other type of construction which uses a masonry surface or concrete slab, or be provided with an alternate waterstop method as approved by the building official. Alternate methods of anchorage may be designed by rational analysis by a registered professional engineer or a registered architect proficient in structural design.

2318.1.4.2

Where the base plate of a bearing wall is supported on joists or trusses running perpendicular to the wall and the studs from the wall above do not fall directly over a joist or truss, a double base plate or a single base plate supported by a minimum 2×4 inset ribbon shall be used to support the upper stud wall.

2318.1.5 Top Plates

2318.1.5.1

The top plate of stud bearing walls shall be doubled and lapped at each intersection of walls and partitions.

2318.1.5.2

Joints shall be lapped not less than 4 feet (1219 mm).

2318.1.6 Corners

Corners of stud walls and partitions shall be framed solid by not less than three studs.

2318.1.7 Splicing

Studs, other than end-jointed lumber, shall be spliced only at points where lateral support is provided.

2318.1.8 Framing Types

2318.1.8.1

Wood framing may be any one, or a combination, of the following types: platform, balloon, plank and beam or pole type.

2318.1.8.2

Exterior stud walls of two-story buildings shall be balloon-framed with studs continuous from foundation to second floor ceiling and with second floor joists supported as indicated in Section 2319.3.3. Gable endwalls in wood frame buildings shall be balloon framed with studs continuous from foundation to roof.

Exception: Platform framing is allowed in buildings over one story in height provided an additional mandatory inspection for floor level connectors is made before the framing/firestopping inspection. Gable endwalls shall be balloon framed with studs continuous from top floor to roof.

2318.1.9 Notching

2318.1.9.1

Studs that carry loads in excess of 75 percent of their capacity shall not be notched or cut.

2318.1.9.2

Studs that carry loads 75 percent or less of their capacity may be notched to one-third of the depth without limit of the number of consecutive studs.

2318.1.10 Pipes in Walls

2318.1.10.1

Stud walls and partitions containing pipes shall be framed to give proper clearance for the piping.

2318.1.10.2

Where walls and partitions containing piping are parallel to floor joists, the joists shall be doubled and may be spaced to allow vertical passage of pipes.

2318.1.10.3

Where vertical pipe positions necessitate the cutting of plates, a metal tie not less than 1 inch by $\frac{1}{8}$ inch (25 mm by 3 mm) shall be placed on each side of the plate across the opening and nailed with not less than two 16d or three 8d nails at each end.

2318.1.11 Headers

2318.1.11.1

All headers in bearing walls shall be designed by rational analysis.

2318.1.11.2

Headers or lintels over stud wall openings shall have not less than nominal 2-inch (51 mm) bearings.

2318.1.12 Studs Joining Masonry or Reinforced Concrete Walls

Where stud walls or partitions join masonry or concrete walls, such studs shall be secured against lateral movement by bolting to the masonry or concrete with $\frac{1}{2}$ -inch (13 mm) diameter anchor bolts with oversized washers spaced not more than 4 feet (1219 mm) apart and embedded not less than 5 inches (127 mm) into a grout filled cell or into concrete or as designed by a registered professional engineer or registered architect proficient in structural design using rational analysis.

2318.1.13 Wind Bracing

Exterior stud walls shall be effectively wind-braced in accordance with Section 2322.3. Such bracing shall be designed by a registered professional engineer or registered architect proficient in structural design.

2318.1.14

The intermixing of wall framing described in this chapter with other types of structural wall systems as provided in this code shall not be permitted unless such wall framing and connections are designed by a registered professional engineer or registered architect proficient in structural design.

2318.1.15

Reserved.

2318.2 Interior Nonbearing Partitions

Reserved.

2318.3 Columns and Posts**2318.3.1**

Columns and posts shall be framed to true end bearing, shall be securely anchored against lateral and vertical forces, and shall be designed by a registered professional engineer or registered architect proficient in structural design.

2318.3.2

Reserved.

2318.3.3

Columns and posts shall be spliced only in regions where lateral support is adequately provided about both axes and is designed by rational analysis. Such design shall be prepared, signed and sealed by a registered professional engineer or registered architect proficient in structural design.

2318.3.4

Design dimensions of columns and posts shall not be reduced by notching, cutting or boring.

Section 2319 High-Velocity Hurricane Zones—Horizontal Framing**2319.1 Size****2319.1.1**

The minimum size of joists and rafters shall be as set forth in Section 2317.

2319.1.2

The design of horizontal framing other than joists and rafters shall be as set forth in Section 2317.1.1.

2319.1.3

Reserved.

2319.2 Spacing

Reserved.

2319.3 Bearing**2319.3.1**

Joists and rafters shall have not less than 3 inches of bearing, on wood, metal, grout-filled masonry or concrete, except as provided in Sections 2319.3.2, 2319.3.3 and 2319.3.4.

2319.3.2 Masonry and Concrete**2319.3.2.1**

Joists and rafters may bear on and be anchored by steel strap anchor embedded into a grout-filled cell of the masonry or reinforced concrete, as described in Section 2321.5.1, to a wood plate provided such wood plate is of an approved durable species or pressure treated with an approved preservative and such plate shall be not less than 2 inch by 4 inch (51 mm by 102 mm) and attached in accordance with Section 2318.1.4.1. The net uplift on the plate shall be limited to 300 pounds per foot (4378 N/m).

2319.3.2.2

Joists and rafters may bear on a product approved channel-shaped metal saddle and fastened to the masonry by a steel strap anchor embedded into a grout-filled cell of the masonry or concrete.

2319.3.2.3

Joists and rafters may bear on masonry, provided that each joist or rafter in contact with masonry is of an approved durable species or pressure treated with an approved preservative and anchored as in Section 2319.3.2.2 above.

2319.3.3

Floor joists may butt into a header beam if effectively toenailed and if an approved metal hanger providing not less than 3 inches (76 mm) of bearing transmits the vertical load to the top of the header, provided, however, that approved devices or other approved means of support may be used in lieu of such bearing. All hangers and devices shall have product approval.

2319.3.4

Ceiling joists may butt into a header beam, as set forth for floor joists, or approved devices or other approved means of support may be used in lieu of such bearing. All devices shall have product approval.

2319.3.5

In lieu of the above, bearing and anchorage may be designed by rational analysis by a registered professional engineer or registered architect proficient in structural design.

2319.4 Splicing

Horizontal members shall not be spliced between supports except that properly designed splices or approved end-jointed lumber may be used.

2319.5 Notching and Boring**2319.5.1**

Unless local unit stresses are calculated on the basis of reduced size, wood members in bending shall not be cut, notched or bored except as provided in Sections 2319.5.1.1 and 2319.5.1.2.

2319.5.1.1

Notches may be cut in the top or bottom not deeper than one-sixth of the depth not longer than one-third of the depth of the member and shall not be located in the middle one-third of the span. Where members are notched at the ends, over bearing points, the notch depth shall not exceed one-fourth the member depth.

2319.5.1.2

Holes may be bored in the middle one-third of the depth and length and not larger than one-sixth of the depth. Space between any two holes in the same joist shall be not less than the depth of the joist.

2319.5.2

Where necessary to run service pipes in the space between the ceiling and floor larger than can be accommodated by the above provision, such ceilings shall be furred or provision made for headers or beams and/or for changing direction of the joists where the design permits.

2319.6 Openings**2319.6.1**

Joists shall be doubled adjacent to openings where more than one joist is cut out or shall be so increased in size or number as may be needed to meet the stress requirements.

2319.6.2

Headers shall be of the same size as the joists and where supporting more than one joist shall be double members.

2319.6.3

Headers shall be supported by approved metal hangers or ledgers or other approved members.

2319.7 Wood Entering Masonry or Reinforced Concrete**2319.7.1**

Wood joists, beams or girders which frame into masonry or reinforced concrete shall have a minimum of $\frac{1}{2}$ -inch (12.7 mm) air space at the top, end and sides or shall be preservative pressure treated or of an approved durable species.

2319.7.2

Where masonry extends above such wood members, joists shall be fire-cut so the top edge does not enter the masonry more than 1 inch (25 mm) or shall be provided with wall plate boxes of self-releasing type or approved hangers.

2319.7.3

Reserved.

2319.8 Floor Joists

Reserved.

2319.9 Ceiling Joists**2319.9.1**

In buildings with pitched roofs the ceiling joists, where practicable, shall be nailed to the rafters and shall be designed to carry all imposed loads including but not limited to lateral thrust.

2319.9.2

Ceiling joists spanning more than 10 feet (3 m) shall be laterally supported at midspan.

2319.9.3

Ceiling joists shall not be used to support rafter loads unless the joists and connections are properly designed for the total load being imposed.

2319.10 Roof Framing

The permit documents shall include roof framing plans showing spacing and spans of all roof members indicating any fabricated elements to be designed and furnished by others and shall include the details for support and bearing of the roof structural system, for the permanent cross/lateral/diagonal bracing and anchorage required to resist dead, live and wind loads as set forth in Chapter 16 (High-Velocity Hurricane Zones). The framing plans shall also indicate the uplift forces applied on the roof, sheathing type, thickness and nailing requirements for the sheathing. The roof framing plans shall be prepared by, and bear the sign and seal of, a registered professional engineer or registered architect of record proficient in structural design.

2319.11 Roof Joists

Roof joists may cantilever over exterior walls as limited by the allowable stress, but the length of such cantilever shall not exceed one-half the length of the portion of the joist inside the building; and where the cantilever of tail joists exceeds 3 feet (914 mm), the roof joist acting as a header shall be doubled.

2319.12 Roof Rafters

2319.12.1

Hip rafters, valley rafters and ridge boards shall be provided and shall be not less in size than the largest rafter framing thereto nor less than required to support the loads.

2319.12.2 Collar Ties

2319.12.2.1

Collar ties and their connections shall be provided to resist the thrust of rafters and shall be designed by a registered engineer or registered architect proficient in structural design.

2319.12.2.2

Collar ties shall not be required if the ridge is designed as a supporting beam. Such design shall be done by a registered professional engineer or registered architect proficient in structural design.

2319.12.2.3

Ceiling joists may serve as collar ties when properly designed by a registered professional engineer or registered architect proficient in structural design.

2319.12.3

The actual roof and ceiling dead loads may be used to resist uplift loads, but the maximum combined dead load used to resist uplift loads shall not exceed 10 pounds per square foot (479 Pa).

2319.13 Heavy Timber Construction

Heavy timber construction of floors or roofs shall comply with the standards in Section 2314.4. All heavy timber construction shall be designed by methods based on rational analysis performed in accordance with ASCE 7 to withstand the loads required in Chapter 16 (High-Velocity Hurricane Zones).

2319.14 Vertically Laminated Beams

Vertically laminated built-up beams shall be designed and made up of members continuous from bearing to bearing.

2319.15 Glued-Laminated Members

Glued-laminated members shall be designed to comply with applicable AITC standards adopted by this code.

2319.16 Stair Stringers

Reserved.

2319.17 Wood Trusses

2319.17.1 Trussed Rafters

Trussed rafters shall be designed by methods admitting of rational analysis by a registered professional engineer or registered architect proficient in structural design based on the standards set forth in Section 2314.4.

2319.17.1.1

Where steel is used for connecting wood members, such connectors shall be not less than 20 U.S. gage and shall be protected with a zinc coating conforming to ASTM A924 as set forth in Chapter 35 of this code. Connectors shall have product approval or shall be designed by methods admitting of rational analysis by a registered professional engineer or registered architect proficient in structural design.

2319.17.1.2

Where a ceiling is to be attached directly to the underside of trusses, the trusses shall be laterally braced with continuous 1-inch by 4-inch (25 mm by 102 mm) members nailed with 8d common nails to the upper side of the bottom chord at panel points but not to exceed 10 feet (3 m) apart. This lateral bracing shall be restrained at each end

and at 20-foot (6 m) intervals. Drywall may be considered a rigid ceiling in enclosed areas where it is protected from the elements. The drywall ceiling is not to be considered a ceiling diaphragm.

2319.17.1.3

Where a ceiling is to be attached to wood stripping which is nailed to the underside of the bottom chord of trusses with two-8d common nails at each intersection, stripping shall be not less than 1 inch by 3 inches (25 mm by 76 mm) spaced not more than 24 inches (610 mm) apart. Wood stripping may be replaced by furring channels. Furring channels shall be a minimum of $\frac{7}{8}$ -inch (22 mm) hat-shaped channels weighing 287 pounds per 1000 lineal feet (41.4 kg per 100 m) with minimum based steel of 0.0179 inch (0.445 mm) and complying with ASTM C645 attached to trusses with minimum two #6 1 $\frac{1}{4}$ -inch (32 mm) screws per intersection. Said stripping or metal furring channels may serve also as the lateral bracing of the truss bottom chord so as to minimize the effects of buckling of the bottom chord when subjected to compressive stresses under reverse load conditions. In addition, the rigid ceiling that is created by this 1-inch by 3-inch (25 mm by 76 mm) stripping or metal furring channels must also be restrained from lateral movements, in accordance with the details provided by the architect or professional engineer of record.

Exception: Where fire-rated design assembly does not allow for this specific installation, see Section 2319.17.1.2.

2319.17.1.4

Where a ceiling is attached to wood members suspended beneath trusses, the provisions of Section 2319.1 shall apply.

2319.17.2 Prefabricated Wood Trusses

Prefabricated wood trusses shall comply with this section.

2319.17.2.1 Design

2319.17.2.1.1

Prefabricated wood trusses shall be designed by a registered professional engineer (delegated engineer) and fabricated in accordance with the National Design Standard for Metal Plate Connected Wood Truss Construction of the Truss Plate Institute (TPI). The truss system designer (delegated engineer) shall prepare the truss system shop drawings. Such shop drawings shall be submitted to the building official for review and approval. The shop drawings shall meet the following requirements:

1. All shop drawings shall be in conformity with the architect or engineer of record framing plans unless prior written approval is obtained from the architect or engineer of record. If reframing is approved, the architect or engineer of record shall resubmit revised framing plans to the building official after receiving updated plans from the delegated engineer showing all adjustments necessary to safely transmit all applied loads to the foundation.
2. Permanent bracing of individual truss members may be required on certain members of the trusses to prevent the members from buckling in the plane normal to the trusses (buckling in the narrow direction). This bracing shall be designed for both upward and downward loads and shall be shown on the individual truss drawings (truss engineering usually shown on 8 $\frac{1}{2}$ -inch by 11-inch (216 mm by 279 mm) sheets ("A" size drawings). The design of this bracing shall be the responsibility of the delegated engineer. The contractor shall be responsible for seeing that this bracing is properly installed. This bracing may be in the form of (but not limited to) "T" bracing of an individual member, or lateral bracing of a series of members common to a number of trusses. Where lateral bracing is used, this bracing shall be restrained against lateral movement, in accordance with details provided by the delegated engineer or by the architect or professional engineer of record. All details and sections required to show the size and connections of all secondary members will be supplied on the delegated engineering plans and shall show all framing, connections and bracing on one or more primary plans of minimum size 24 inches by 36 inches (610 mm by 914 mm).
3. A size 8 $\frac{1}{2}$ -inches by 11-inches (216 mm by 279 mm) cut sheets showing individual member design shall also be furnished to the architect or engineer of record so that all gravity and uplift loads shown on these cut sheets can be transferred to the primary plans.
4. The size and location of all plates at each joint shall be shown on the truss design drawings.
5. The connection between trusses shall be detailed in the shop drawings. Hip sets shall be detailed in a manner to indicate all connections according to engineering drawings for the attachment of skewed members.
6. Truss design drawings shall indicate the support and minimum bearing of the roof structural system, the permanent cross/lateral bracing, bracing to transfer member buckling forces to the structure and all bracing and anchorage required to resist uplift and lateral forces.
7. Flat and floor trusses must be clearly marked so that they will be installed right side up. These marks must remain after the flooring, sheathing and insulation have been installed.

The intent of the above requirements is to provide all information on framing, connections and bracing on one composite set of plans approved by the architect or engineer of record to aid in the review, approval and field inspections for the portion of the property.

2319.17.2.1.2

Trusses shall be designed for wind loads in accordance with Chapter 16 (High-Velocity Hurricane Zones), uniformly distributed live, dead and concentrated loads, and such loads shall be indicated on the roof framing plans and the truss design drawings. Where a girder or truss is subjected to concentrated loads or any unusual loading condition, such conditions must be clearly indicated on the roof framing plans and on the truss design drawings. Where truss members have been cut, shifted or altered in any manner to meet construction needs or for any other reason, additional drawings and additional calculations must be prepared, signed and sealed by the truss designer (a Florida-delegated engineer). Such additional drawings and calculations must be approved by the engineer or architect of record and must be submitted to the building official for review and approval.

2319.17.2.1.3

Roof trusses shall be designed for a minimum live load of 30 psf (1436 Pa), a minimum dead load of 15 psf (718 Pa) on the top chord, and a minimum dead load of 10 psf (479 Pa) on the bottom chord; and wind loads in accordance with Chapter 16 of this code. Where the roof design is such that water is not directed to the interior of the roof and there are no parapets or other roof edge drainage obstructions, roof trusses with slopes of 1 $\frac{1}{2}$:12 or greater may be designed for a live load of 20 psf (958 Pa)

and a minimum total load of 45 psf (2155 Pa). Adjustment of the allowable design stress for load duration shall be in accordance with National Design Specification for Wood Construction.

2319.17.2.1.4

The allowable deflection under live load for trusses shall not exceed span/360 for plastered ceilings, span/240 for unplastered finished ceilings, or span/180 for trusses without a ceiling.

2319.17.2.1.5

Flat roof trusses shall be designed for not less than the loads set forth in Section 2319.17.2.1.3 above, except that the dead load on the top chord may be taken as 10 psf (479 Pa) in lieu of 15 psf (718 Pa), and the total load reduced to 50 psf (2394 Pa). Adjustment of the allowable design stress for load duration shall be in accordance with National Design Specification for Wood Construction.

2319.17.2.1.6

Where gable end trusses are permitted in this code, they shall be designed for a minimum live load of 30 psf (1436 Pa) and a minimum dead load of 15 psf (718 Pa) on the top chord. The minimum load of 10 psf (479 Pa) on the bottom chord may be omitted where continuous support is provided. In addition, the gable end trusses shall be designed to sustain wind load as specified in Chapter 16 (High-Velocity Hurricane Zones) but not less than 30 psf (1436 Pa) perpendicular to the plane of the truss. Such trusses shall use a rationally designed system to resist lateral wind loads and be anchored to the substructure at intervals no greater than 4 feet (1219 mm) on center to resist the uplift forces and shall be designed to transfer the loads to the substructure. The design of the system used to resist the lateral loads imposed on the truss shall be prepared by the engineer or architect of record.

2319.17.2.1.7

When girders exceed two members and when girder reactions exceed the capacity of standard connectors or hangers, these reactions shall be shown on the drawings and the connection must be designed, signed and sealed by a registered professional engineer or registered architect proficient in structural design and such design shall be included as part of the shop drawings.

2319.17.2.1.8

All trusses shall be properly braced to act as a system. Such bracing shall be included as part of the design document.

2319.17.2.2 Materials and Specifications

2319.17.2.2.1

Trusses shall be fabricated applying the design values listed in the standard Design Values for Wood Construction of the American Forest and Paper Association.

2319.17.2.2.2

Top and bottom chords shall be of No. 2 Grade or better. Web members shall be of No. 3 Grade or better. A chord member is defined as the entire top or bottom truss member which may consist of shorter spliced pieces.

2319.17.2.2.3

For trusses spanning 20 feet (6 m) or less, the minimum percentage of grade-marked members among top and bottom chords shall be 50 percent.

2319.17.2.2.4

For trusses spanning more than 20 feet (6 m) the minimum percentage of grade-marked members among top and bottom chords shall be 75 percent, and there shall be a minimum of one marked web on each truss.

2319.17.2.2.5

All lumber shall be 2 inches by 4 inches (51 mm by 102 mm) nominal or larger, and no 2-inch (51 mm) nominal member shall be less in size than 1½ inches (38 mm).

2319.17.2.2.6

The moisture content of all lumber used in wood truss fabrication shall not exceed 19 percent.

2319.17.2.2.7

Connector plates shall be not less than 20 gauge galvanized steel meeting ASTM A653/A653M or A924/A924M, and shall be identified by the manufacturer's stamp. The size and location of all plates shall be shown on the truss design drawings. Connectors shall have product approval.

2319.17.2.2.8

All connector plates over 3 inches (76 mm) and 25 percent of 3 inches (76 mm) or less, as per TPI standards, shall bear the name, logo or other markings, which clearly identify the manufacturer. Semiannually, plate manufacturers shall certify compliance with the provisions of Section 6 of the Truss Plate Institute, TPI, National Design Standard for Metal Plate Connected Wood Truss Construction, with respect to the grade of steel, thickness or gauge of material, and galvanizing to ASTM G60 as a minimum. This certification requirement shall be satisfied by submitting by an approved independent laboratory to the certification agency.

2319.17.2.3 Fabrication

2319.17.2.3.1

Manufacturers of prefabricated wood truss assemblies shall obtain a valid certificate of competency from the authority having jurisdiction.

2319.17.2.3.2

Each truss shall bear the fabricators stamp on a web member and 75 percent shall be placed so as to be clearly visible after erection and before placement of ceiling.

2319.17.2.3.3

Multiple member girder trusses shall be predrilled at the truss plant for connection bolts only. Hanger bolt holes shall be drilled on-site, on a location indicated on

approved drawings.

2319.17.2.3.4

Each manufacturer or fabricator shall retain the services of applicable organizations among those listed below for monthly inspections of the lumber grade used in fabrication. Following each inspection, a report shall be submitted by the inspection agency to the authority having jurisdiction. All inspection agencies providing any type of inspection services shall be approved by the authority having jurisdiction.

For Pine: Southern Pine Inspection Bureau or Timber Products grading agencies with appropriate jurisdiction.

For Douglas Fir, Hem-Fir or Fir-Larch: Western Wood Products Association or West Coast Lumber Inspection Bureau, Timber Products Inspection Inc., or other grading agencies with appropriate jurisdiction.

2319.17.2.3.5

In addition, the fabricator shall employ an approved testing laboratory to conduct inspections of fabrication compliance. Such inspections shall be made unannounced and at random at least once a month. Following each inspection, a report on approved forms shall be submitted by the laboratory to the authority having jurisdiction and such reports shall bear the date, signature and seal of the supervising Florida-registered architect or professional engineer.

2319.17.2.3.6

When there is evidence of noncompliance with the provisions for fabrication set forth in this paragraph or with the approved plans, the authority having jurisdiction may require the inspection laboratory to make additional job-site or plant inspections.

2319.17.2.3.7

The authority having jurisdiction may require load testing on noncomplying wood trusses. The test results shall be reported to the authority having jurisdiction.

2319.17.2.3.8

Failure of units tested or receipt of inspection reports indicating fabrication not in accordance with approved truss design drawings, or failure to submit required inspection and/or test reports, shall be cause for suspension or revocation of the certificate of competency of the manufacturer or fabricator.

2319.17.2.4 Truss Erection**2319.17.2.4.1**

Reserved.

2319.17.2.4.2

Reserved.

2319.17.2.4.3

Reserved.

2319.17.2.4.4

At gable ends, this diaphragm shall be designed to transmit lateral loads imposed on the gable to roof diaphragms and/or ceiling diaphragms where available. Where the wall supporting the gable is not designed to withstand lateral loads independent of the gable (by using shear walls or other methods), anchorage of the gable to the wall shall be designed to transmit the loads from the wall to the bracing and the bracing designed to transmit the lateral loads from the gable and wall to the roof diaphragms and/or ceiling diaphragms where available. Ceiling diaphragms that provide lateral support at gable walls shall be designed by the architect or professional engineer of record, and shall have continuous bottom chord bracing, end restraints, intermediate restraints and conditions so as to sufficiently transfer the lateral loads at the top of the gable endwalls to the intersecting shear walls. In no case shall the rigid ceiling, as defined in Section 2319.17.1.2, be used as an integral part of the system needed for lateral bracing of the gable endwalls.

2319.17.2.4.5

Reserved.

Section 2320 High-Velocity Hurricane Zones—Firestops

RESERVED

Section 2321 High-Velocity Hurricane Zones—Anchorage**2321.1**

Anchorage shall be continuous from the foundation to the roof and shall satisfy the uplift requirements of Section 1620.

2321.2 Joists**2321.2.1**

Fire-cuts into a masonry wall shall be anchored to the concrete beam on which they bear.

2321.2.2

Such anchors shall be spaced not more than 4 feet (1219 mm) apart and shall be placed at opposite ends across the building on the same run of joists.

2321.3

Joists shall be nailed to bearing plates, where such plates occur, to each other where continuous at a lap and to the studs where such studs are contiguous; and ceiling joists shall be nailed to roof rafters where contiguous.

2321.4

Every roof rafter and/or roof joist shall be anchored to the beam or studs on which they bear, and roof rafters opposing at a ridge shall be anchored across the ridge as set forth in Section 2321.6.

2321.5 Anchorage to Concrete**2321.5.1**

Anchorage designed to resist uplift forces, securing wood to concrete shall be steel straps embedded in the concrete a minimum of 4 inches (102 mm) with hooking devices to top steel of tie beam designed to withstand the uplift forces set forth by the design professional. Straps shall be approved under the criteria set by the certification agency. All anchors and related fasteners shall be galvanized.

2321.5.2

As an alternate to using the straps described in this section, the building official may approve other anchorage submitted by a Florida-registered professional engineer or a Florida-registered architect, proficient in structural design, provided that the information set forth in Section 2321.7, Items 1, 2 and 3, submitted in connection with such anchors and such anchors and the proposed assembly otherwise comply with the requirements of this code.

2321.6 Anchorage to Wood**2321.6.1**

Anchorage designed to resist uplift forces, securing wood to wood, shall be steel straps nailed to each member and shall be designed to resist uplift forces set forth by the design professional. Straps shall be approved under the criteria set by the certification agency. All anchors and relative nails shall be galvanized.

2321.6.2

As an alternate to using straps described in this section, the building official may approve other anchorage submitted by a Florida-registered architect or a Florida-registered professional engineer, proficient in structural design, provided that the information set forth in Section 2321.7, Items 1, 2 and 3 submitted in connection with such anchors and such anchors and the proposed assembly otherwise comply with the requirements of this code.

2321.7 Testing of Anchoring

Anchoring required by Sections 2321.5 and 2321.6 shall be tested under the following criteria:

1. Concrete to wood straps: Minimum design uplift load 700 pounds (3114 N), with four 16d nails with upper end bent over truss chord and nailed. Nails shall be clinched. Anchors shall have devices to hook into upper tie beam steel and embedded a minimum of 4 inches (102 mm) in concrete.
2. Wood to wood straps: Minimum design uplift 700 pounds (3114 N) with four 16d nails in each member.
3. Other anchors: Minimum design uplift 700 pounds (3114 N).
4. The criteria stated in Section 2321.7, Items 1, 2 and 3 above, are minimum requirements for product approval for the certification agency. Anchor design and uplift forces shall be submitted to the certification agency for approval together with sufficient documentation and test data to verify performance. A product approval shall be maintained at the job site for the inspector to compare with the uplift force requirements of the design professional as shown on approved plans.

Section 2322 High-Velocity Hurricane Zones—Sheathing**2322.1 Floor Sheathing****2322.1.1**

Reserved.

2322.1.2

Reserved.

2322.1.3

Square-edged or spaced subflooring may be used only under a finish floor having a strength equal to or greater than $\frac{1}{2}$ -inch (12.7 mm) tongue-and-groove wood strip flooring; and under finish floors of less strength, a tongue-and-groove or plywood subfloor shall be required.

2322.1.4

Lumber subflooring shall be not less than $\frac{5}{8}$ inch (17 mm) thick when joists are spaced no more than 16 inches (406 mm) on center nor less than $\frac{3}{4}$ inch (19 mm) thick when joists are spaced no more than 24-inches (610 mm) on center. End joints shall be on joists, joints shall be staggered and parallel to the joists, and ends at walls and similar places shall be supported by a ribbon or by blocking.

2322.1.5

Plywood subfloors of C-D grade or underlayment grade bonded to wood joist using adhesives meeting the requirements of ASTM D3498 shall be applied as indicated in Section 2322.1.6.

2322.1.6

Plywood subflooring shall be continuous over two or more spans with face grain perpendicular to the supports. The allowable spans shall not exceed those set forth in Table 2322.1.6.

TABLE 2322.1.6

PLYWOOD SUBFLOOR¹

PANEL SPAN RATING ²	MAXIMUM PLYWOOD SPAN (IN.) ³
32/16	16 ⁴
40/20	20 ⁴
48/24	24

For SI: 1 inch = 25.4 mm.

NOTES:

1. These values apply for sheathing C-D and C-C grades only. Spans shall be limited to values shown, and reduced for the possible effects of concentrated loads.
2. Span ratings shall appear on all panels.
3. Plywood edges shall have approved tongue-and-groove joints or shall be supported with blocking unless $\frac{1}{4}$ -inch minimum thickness underlay is installed or $\frac{1}{2}$ inch of approved cellular or lightweight concrete is installed or unless finish floor is 1-inch nominal wood strip. Allowable uniform load based on deflection of 1/360 of span is 100 pounds per square foot.
4. May be inches if nominal 1 inch wood strip finish floor is laid at right angles to joists.

2322.1.6.1

Plywood panels shall be nailed to supports with 6d common nails when up to $\frac{1}{2}$ inch thick (13 mm), 8d common nails when $\frac{19}{32}$ to $\frac{3}{4}$ inch (15 to 19 mm) thick and 10d common nails or 8d ring shank when $1\frac{1}{8}$ inches (29 mm) thick.

2322.1.6.2

Nail spacing shall be 6-inches (152 mm) on center at panel edges and 10-inches (254 mm) on center at intermediate supports.

2322.1.7

Reserved.

2322.1.8

Flooring shall be nailed with 8d common nails up to $\frac{3}{4}$ inch (19 mm) thick, and 10d common nails or 8d ring shank nails when greater than $\frac{3}{4}$ inch (19 mm) thick up to $1\frac{1}{8}$ inches (29 mm) thick.

2322.1.8.1

Nails shall be hand driven 8d common nails [0.131-inch (3.3 mm) diameter by $2\frac{1}{2}$ inches (63.5 mm) long with 0.281 inch (7.1 mm) diameter full round head] or power driven 8d nails of the same dimensions (0.131-inch diameter by $2\frac{1}{2}$ inches long with 0.281-inch diameter full round head). Nails of a smaller diameter or length may be used only when approved by an architect or professional engineer and only when the spacing is reduced accordingly.

2322.1.8.2

Nails shall be hand driven 10d common nails [0.148-inch (3.8 mm) diameter by 3 inches (76 mm) long with 0.312-inch (7.9 mm) diameter full round head] or power driven 10d nails of the same dimensions [0.148-inch (3.8mm) diameter by 3 inches (76 mm) long with 0.312-inch (7.9 mm) diameter full round head]. Nails of a smaller diameter or length may be used only when approved by an architect or professional engineer and only when the spacing is reduced accordingly.

2322.1.9

Nail spacing shall be 6-inches (152 mm) on center at panel edges and 10-inches (254 mm) on center at intermediate supports.

2322.1.10

Flooring shall be nailed with 8d common nails not less than two in each board at each support.

2322.1.11

Floors for heavy timber buildings shall be sheathed as specified for mill floors, Section 2319.13.

2322.1.12

Flooring shall not extend closer than $\frac{1}{2}$ inch (13 mm) from masonry walls.

2322.1.13

Reserved.

Table 2322.1.13 Allowable Span for Plywood Combination Subfloor Underlayment (Single Floor Panels). Reserved.**2322.1.14**

Reserved.

2322.1.15

Reserved.

2322.1.16 Diaphragm Boundaries

All floor sheathing acting as a diaphragm shall be attached to a minimum 2-inch-thick (51 mm) nominal nailing with its depth equal to or one size greater than the intersecting top chord. The nailing shall be connected to the wall to resist the gravity loads from the floor, wind pressure/suction from the exterior wall and the diaphragm forces. The floor sheathing shall be attached to the nailing to resist the wind pressure/suction from the exterior wall and the diaphragm forces.

2322.2 Roof Sheathing

2322.2.1

Wood roof sheathing shall be boards or shall be plywood.

2322.2.2

Board roof sheathing shall have a net thickness of not less than $\frac{3}{4}$ inch (19 mm) when the span is not more than 28 inches (711 mm) or $\frac{5}{8}$ inch (17 mm) when the span is not more than 24 inches (610 mm), shall have staggered joints and shall be nailed with 8d common nails not less than two in each 6-inch (152 mm) board nor three in each 8-inch (203 mm) board at each support.

2322.2.3

Plywood roof sheathing shall be rated for Exposure 1, and shall be designed in accordance with ASCE 7, to have a minimum nominal thickness of no less than $\frac{19}{32}$ inch (15 mm) and shall be continuous over two or more spans with face grain perpendicular to supports. Roof sheathing panels shall be provided with a minimum of 2-inch by 4-inch (51 mm by 102 mm) edgewise blocking at all horizontal panel joints with edge spacing in accordance with manufacturer's specifications, for a distance at least 4 feet (1219 mm) from each gable end. The allowable spans shall not exceed those set forth in Table 2322.2.3.

TABLE 2322.2.3

ALLOWABLE SPAN FOR PLYWOOD ROOF SHEATHING¹

PANEL SPAN RATING ²	MAXIMUM SPAN IF BLOCK OR OTHER EDGE SUPPORTS (IN.)	MAXIMUM SPAN WITHOUT EDGE SUPPORT (IN.)
32/16	24	24
40/20	40	32
48/24	48	36

For SI: 1 inch = 25.4 mm.

NOTES:

1. Values apply to sheathing grade, C-C and C-D panels.

2. Span Rating appears on all C-C and C-D panels.

2322.2.4

Plywood panels shall be nailed to supports with 8d ring shank nails.

2322.2.5

Nails and nail spacing shall be designed in accordance with ASCE 7 and shall be spaced no more than 6 inches (152 mm) on center at panel edges and at intermediate supports. Nails shall be minimum hand driven 8d ring shank or power driven 8d ring shank nails of the following minimum dimensions: (a) 0.113-inch (2.9 mm) nominal shank diameter, (b) ring diameter of 0.012 inch (0.3 mm) over shank diameter, (c) 16 to 20 rings per inch, (d) 0.280-inch (7.1 mm) full round head diameter, (e) 2-inch (60.3 mm) nail length.

2322.2.5.1

Other products with unique fastening methods may be substituted for these nailing requirements as *approved* by the building official and verified by testing.

2322.2.6

Roof sheathing for heavy timber construction shall comply with Section 2319.13 of this code.

2322.2.7 Diaphragm Boundaries

All roof sheathing acting as a diaphragm shall be attached to a minimum 2-inch (51 mm) thick nominal member with its depth equal to or one size greater than the intersecting top chord. This shall be achieved with a continuous structural subfascia, fascia or blocking at 4-inches (102 mm) on center with nails as required for the appropriate thickness of sheathing.

2322.2.8

When existing roofs are reroofed to the point that the existing roofing is removed down to the sheathing, the existing roof sheathing shall be renailed with 8d common nails [0.131-inch (3.3 mm) diameter by $2\frac{1}{2}$ inches (63.5 mm) long with 0.281-inch (7.9 mm) diameter full round head]. Nail spacing shall be 6-inches (152 mm) on center at panel edges, 6-inches (152 mm) on center at intermediate supports and, where applicable, 4-inches (102 mm) on center over gable ends and subfascia. Existing fasteners may be used to achieve such minimum spacing.

2322.3 Storm Sheathing

Exterior stud walls shall be sheathed to resist the racking load of wind as set forth in Section 1620 and the concentrated loads that result from hurricane-generated wind-borne debris as set forth in Section 1626 of this code and shall be, at a minimum, any of the following types:

1. Tightly fitted, diagonally placed boards not less than $\frac{5}{8}$ -inch (17 mm) thickness, nailed with three 8d common nails to each support for 1-inch by 6-inch (25 mm by 152 mm) boards and four 8d common nails for 1-inch by 8-inch (25 mm by 203 mm) boards.
2. Wall sheathing shall be plywood, or product approved structural panel, rated Exposure 1 with a minimum thickness of $\frac{19}{32}$ inch (15 mm) and shall be applied to studs spaced not more than 16-inches (406 mm) on center. Wall sheathing shall be continuous over three or more supports and shall be nailed to such supports with 8d common nails. Nail spacing shall not exceed 6-inches (152 mm) on center at panel edges and all intermediate supports. Nail spacing shall be 4-inches (102 mm) on center at corner studs, in all cases.
3. When plywood panel, or product approved structural panel sheathing is used, building paper and diagonal wall bracing can be omitted.
4. When siding such as shingles nailed only to plywood or product approved structural panel sheathing, the panel shall be applied with face grain across studs.

2322.4 Exterior Wall Cladding**2322.4.1**

Plywood, if protected with stucco, may serve for both sheathing and exterior cladding provided:

1. The panel thickness shall be not less than $\frac{19}{32}$ inch (15 mm) and Texture 1-11 panels, and the supporting studs shall be spaced not more than 16-inches (406 mm) on center.
2. All joints shall be backed solidly with 2-inch (51 mm) nominal blocking or studs or the joints shall be lapped horizontally or otherwise watertight.
3. Nailing shall be as set forth in Section 2322.3, Item 2.

2322.4.2

Where storm sheathing is provided in accordance with Section 2322.3, exterior cladding may be one of the following:

1. Wood siding shall be installed according to its product approval.
2. Wood shingles or shakes attached to the storm sheathing, and/or to nailing boards or shingle backer securely attached to the storm sheathing. The minimum thickness of wood shingles or shakes between nailing boards shall be $\frac{3}{8}$ inch (9.5 mm).
3. Hardboard of siding quality for exterior use shall be applied in accordance with the product approval.

Section 2323 High-Velocity Hurricane Zones—Furring

RESERVED

Section 2324 High-Velocity Hurricane Zones—Connectors**2324.1**

The allowable loads on all types of connectors shall be as set forth in the standards listed in Section 2314.4 and Table 2324.1.

TABLE 2324.1

NAIL CONNECTION FOR WOOD MEMBERS

CONNECTION	COMMON NAILS	NUMBER OR SPACING
Joists to sill or girder, toe nail	16d	2
Bridging to joist, toe nail	8d	2 each end
1-inch × 6-inch subfloor or less to each joist, face nail	8d	2
Over 1-inch × 6-inch subfloor to each joist, face nail	8d	3 + 1 for each size increase
2-inches subfloor to joist or girder, blind and face nail	16d	2
Sole plate to joist or blocking, face nail	16d	16 inches o.c.
Top or sole plate to stud, end nailed	16d	2
Stud to sole plate, toe nail	3d	3 or 2 16d

Doubled studs, face nail	16d	24 inches o.c.
Doubled top plates, face nail	16d	16 inches o.c.
Top plates, laps and intersections, face nail	16d	2
Continuous header, two pieces	16	16 inches o.c. along each edge
Ceiling joists to plate, toe nail	16d	2
Continuous header to stud, toe nail	16d	3
Ceiling joists, laps over partitions, face nail	16d	3
Ceiling joists to parallel rafters, face nail	16d	3
Rafter plate, toe nail	16d	3
1-inch × 6-inch sheathing or less, to each bearing, face nail	8d	2
Over 1-inch × 6-inch sheathing, to each bearing, face nail	8d	3 + 1 for each size increase
Built-up corner studs, face nail	16d	30 inches o.c.
Built-up girders and beams	20d	32 inches o.c. At top and bottom and staggered, 2 at ends and at each splice
2-inch planks	16d	2 each bearing

For SI: 1 inch = 25.4 mm.

NOTE: In spacing specifications, o.c. means "on-center."

2324.2

Nails, bolts and other metal connectors that are used in locations exposed to the weather shall be galvanized or otherwise corrosion resistant.

2324.3

In general, nails shall penetrate the second member a distance equal to the thickness of the member being nailed thereto. There shall be not less than two nails in any connection.

2324.4

Except for wood-based structural-use panels and other laminated members manufactured under technical control and rigid inspection, gluing shall not be considered an acceptable connector in lieu of the connectors herein specified.

2324.5

Safe loads and design practice for types of connectors not mentioned or fully covered herein shall be determined by the building official before approval.

Section 2325 High-Velocity Hurricane Zones—Wood Supporting Masonry

2325.1

Wood shall not support masonry or concrete except as permitted in Section 2325.2.

2325.2

Wood foundation piles may be used to support concrete or masonry.

2325.3

Reserved.

Section 2326 High-Velocity Hurricane Zones—Protection of Wood

2326.1

Reserved.

2326.2

Reserved.

2326.3 Ventilation

Reserved.

2326.4 Debris

2326.4.1

Reserved.

2326.4.2

In buildings or portions thereof having wood first-floor systems, all wood forms which have been used in placing concrete, if within the ground or less than 18 inches (457 mm) above the ground, shall be removed before the building is occupied or used for any purpose.

2326.4.3

Loose or casual wood shall not be stored in direct contact with the ground under any building, and this space must be thoroughly cleaned of all wood and debris.

2326.5 Termite Protection

Reserved.

2326.6 Existing Buildings

Reserved.

2326.6.1

The building official shall inspect existing buildings having wood-stud exterior walls for which application for a permit for exterior wall coverings is made and shall have the authority to order the uncovering of structural elements for inspection and to require necessary repairs as a part of such approval for a permit, or may order demolition.

Section 2327 High-Velocity Hurricane Zones—Fire-Retardant Wood

RESERVED

Section 2328 High-Velocity Hurricane Zones—Wood Fences**2328.1**

Wood fences, so located on a property that by zoning regulations they cannot be used as a wall of a building, shall be constructed to meet the minimum specifications in Sections 2328.2 and 2328.3.

2328.2

Fences not exceeding 6 feet (1829 mm) in height, shall be constructed to meet the following minimum requirements: from nominal 4-inch by 4-inch by 8-feet-long (102 mm by 102 mm by 2438 mm) posts No. 2 grade or better spaced 4-feet (1219 mm) on center, and embedded 2 feet (610 mm) into a concrete footing 10 inches (254 mm) in diameter and 2-feet (610 mm) deep.

2328.3

Fences not exceeding 5 feet (1524 mm) or 4 feet (1219 mm) in height shall be constructed as provided in Section 2328.2, except that the spacing of posts may be increased to 5-feet (1524 mm) and 6-feet (1829 mm) on center for these heights, respectively.

Section 2329 High-Velocity Hurricane Zones—Fire-Retardant-Treated Shakes and Shingles

RESERVED

Section 2330 High-Velocity Hurricane Zones—Wood Blocking**2330.1 General****2330.1.1**

Blocking is defined as wood pieces attached to the roof deck or to each other for the purpose of securing roof membrane or accessories.

2330.1.2

Wood blocking attachment for buildings greater than 40 feet (12.2 m) in height must be designed by a registered architect or professional engineer.

2330.1.3

Wood blocking attachment for lightweight insulating concrete, gypsum concrete, cementitious wood fiber and cellular concrete decks shall be designed by a registered architect or professional engineer. The decks themselves shall not be used as a wood blocking attachment substrate.

2330.1.4

Wood blocking shall not be less than nominal 2 inches by 6 inches (51 mm by 152 mm). The maximum unsupported overhang shall be 2 inches (51 mm). When the maximum overhang is employed, a nominal 2-inch by 6-inch (51 mm by 152 mm) blocking shall be installed.

2330.1.5

In recover applications, wood blocking may be reduced to nominal 1 inch (25 mm), providing the attachment is secured in compliance with this code.

2330.1.6

Sound wood blocking may be reused in a recover or reroof application, providing the attachment is secured in compliance with the requirements of this code.

2330.1.7

A fastener shall be placed within 3 inches (761 mm) of the end of each section of wood blocking and a $\frac{1}{4}$ -inch (6 mm) gap shall be left between each section of wood blocking. No piece of wood shall have less than two fasteners.

2330.1.8

Fasteners other than nails shall be predrilled prior to attachment and countersunk to be flush with the surface of the wood blocking.

2330.1.9

Wood shall be protected according to Section 2326.

2330.1.10

Powder actuated fasteners shall not be used in wood blocking attachment.

2330.2 Attachment to Masonry Block and Concrete**2330.2.1**

Prior to the installation of wood blocking to standard weight masonry block, the two top courses shall be solidly filled with concrete or a tie beam shall be provided as required by this code.

2330.2.2

The fastener's average withdrawal resistance per lineal foot shall be not less than 250 pounds per foot (3649 N/m) after the application of a 4:1 safety factor.

2330.2.3

The pullover value of the proposed fastener through the wood blocking shall be not less than 125 percent of the design load of the proposed fastener. If less, a larger bearing washer shall be added to the fastener assembly to meet this requirement. Wood blocking thickness shall be not less than 1 $\frac{1}{2}$ inches (38 mm) if a bearing washer is required.

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Chapter 24 Glass and Glazing

Section 2401 General

2401.1 Scope

The provisions of this chapter shall govern the materials, design, construction and quality of glass, light-transmitting ceramic and light-transmitting plastic panels for exterior and interior use in both vertical and sloped applications in buildings and structures. Light-transmitting plastic glazing shall also meet the applicable requirements of Chapter 26.

Exception: Buildings and structures located within the high-velocity hurricane zone shall also comply with the provisions of Sections 2410 through 2415, excluding Section 2405.5.

2401.2 Glazing Replacement

The installation of replacement glass shall be as required for new installations.

Section 2402 Definitions

2402.1 Definitions

The following terms are defined in Chapter 2:

DALLE GLASS.

DECORATIVE GLASS.

Section 2403 General Requirements for Glass

2403.1 Identification

Each pane shall bear the manufacturer's *mark* designating the type and thickness of the glass or glazing material. The identification shall not be omitted unless *approved* and an affidavit is furnished by the glazing contractor certifying that each light is glazed in accordance with *approved construction documents* that comply with the provisions of this chapter. Safety glazing shall be identified in accordance with Section 2406.3.

Each pane of tempered glass, except tempered spandrel glass, shall be permanently identified by the manufacturer. The identification *mark* shall be acid etched, sand blasted, ceramic fired, laser etched, embossed or of a type that, once applied, cannot be removed without being destroyed.

Tempered spandrel glass shall be provided with a removable paper marking by the manufacturer.

2403.2 Glass Supports

Where one or more sides of any pane of glass are not firmly supported, or are subjected to unusual load conditions, detailed *construction documents*, detailed shop drawings and analysis or test data ensuring safe performance for the specific installation shall be prepared by a *registered design professional*.

2403.3 Glass Framing

To be considered firmly supported, the framing members for each individual pane of glass shall be designed so that the deflection of the edge of the glass perpendicular to the glass pane does not exceed $1/175$ of the glass edge length where the glass edge length is not more than 13 feet 6 inches (4115 mm) or $1/240$ of the glass edge length + $1/4$ inch (6.4 mm) where the glass edge length is greater than 13 feet 6 inches (4115 mm), when subjected to the larger of the positive or negative load where loads are combined as specified in Section 1605.

2403.4 Interior Glazed Areas

Where interior glazing is installed adjacent to a walking surface, the differential deflection of two adjacent unsupported edges shall be not greater than the thickness of the panels when a force of 50 pounds per linear foot (plf) (730 N/m) is applied horizontally to one panel at any point up to 42 inches (1067 mm) above the walking surface.

2403.5 Louvered Windows or Jalousies

Float, wired and patterned glass in louvered windows and jalousies shall be no thinner than nominal $\frac{3}{16}$ inch (4.8 mm) and no longer than 48 inches (1219 mm). Exposed glass edges shall be smooth.

Wired glass with wire exposed on longitudinal edges shall not be used in louvered windows or jalousies.

Where other glass types are used, the design shall be submitted to the *building official* for approval.

Section 2404 Wind and Dead Loads on Glass

2404.1 Vertical Glass

Glass sloped 15 degrees (0.26 rad) or less from vertical in windows, curtain and window walls, doors and other exterior applications shall be designed to resist the wind loads due to ultimate design wind speed, V_{ult} , in Section 1609 for components and cladding. The load resistance of glass under uniform load shall be determined in accordance with ASTM E1300.

The design of vertical glazing shall be based on Equation 24-1.

$$0.6F_{gw} \leq F_{ga} \quad (\text{Equation 24-1})$$

where:

F_{gw} = Wind load on the glass due to ultimate design wind speed, V_{ult} , computed in accordance with Section 1609.

F_{ga} = Short duration load on the glass as determined in accordance with ASTM E1300.

2404.2 Sloped Glass

Glass sloped more than 15 degrees (0.26 rad) from vertical in skylights, sunrooms, sloped roofs and other exterior applications shall be designed to resist the most critical combinations of loads determined by Equations 24-2, 24-3 and 24-4.

$$F_g = 0.6W_o - D \quad (\text{Equation 24-2})$$

$$\bar{F}_g = 0.6W_i + D \quad (\text{Equation 24-3})$$

$$F_g = 0.3W_i + D \quad (\text{Equation 24-4})$$

where:

D	=	Glass dead load, psf (kN/m^2).
For glass sloped 30 degrees (0.52 rad) or less from horizontal,		
	=	$13 t_g$ (For SI: $0.0245 t_g$).
For glass sloped more than 30 degrees (0.52 rad) from horizontal,		
	=	$13 t_g \cos \theta$ (For SI: $0.0245 t_g \cos \theta$).
F_g	=	Total load, psf (kN/m^2) on glass.
t_g	=	Total glass thickness, inches (mm) of glass panes and plies.
W_i	=	Inward wind force, psf (kN/m^2) due to ultimate design wind speed, V_{ult} , as calculated in Section 1609.
W_o	=	Outward wind force, psf (kN/m^2) due to ultimate design wind speed, V_{ult} , as calculated in Section 1609.
θ	=	Angle of slope from horizontal.

Exception: The performance grade rating of unit skylights and tubular daylighting devices shall be determined in accordance with Section 2405.5.

The design of sloped glazing shall be based on Equation 24-5.

$$F_g \leq F_{gw}$$

(Equation 24-5)

where:

F_g = Total load on the glass as determined by Equations 24-2, 24-3 and 24-4.

F_{gw} = Short duration load resistance of the glass as determined in accordance with ASTM E1300 for Equations 24-2 and 24-3; or the long duration load resistance of the glass as determined in accordance with ASTM E1300 for Equation 24-4.

2404.3 Wired, Patterned and Sandblasted Glass

2404.3.1 Vertical Wired Glass

Wired glass sloped 15 degrees (0.26 rad) or less from vertical in windows, curtain and window walls, doors and other exterior applications shall be designed to resist the wind loads in Section 1609 for components and cladding according to the following equation:

$$0.6F_{gw} < 0.5F_{ge} \quad (\text{Equation 24-6})$$

where:

F_{gw} = Wind load on the glass due to ultimate design wind speed, V_{ult} , computed in accordance with Section 1609.

F_{ge} = Nonfactored load from ASTM E1300 using a thickness designation for monolithic glass that is not greater than the thickness of wired glass.

2404.3.2 Sloped Wired Glass

Wired glass sloped more than 15 degrees (0.26 rad) from vertical in skylights, sunspaces, sloped roofs and other exterior applications shall be designed to resist the most critical of the combinations of loads from Section 2404.2.

For Equations 24-2 and 24-3:

$$F_g < 0.5F_{ge} \quad (\text{Equation 24-7})$$

For Equation 24-4:

$$F_g < 0.3F_{ge} \quad (\text{Equation 24-8})$$

where:

F_g = Total load on the glass as determined by Equations 24-2, 24-3 and 24-4.

F_{ge} = Nonfactored load in accordance with ASTM E1300.

2404.3.3 Vertical Patterned Glass

Patterned glass sloped 15 degrees (0.26 rad) or less from vertical in windows, curtain and window walls, doors and other exterior applications shall be designed to resist the wind loads in Section 1609 for components and cladding according to Equation 24-9.

$$F_{gw} < 1.0F_{ge} \quad (\text{Equation 24-9})$$

where:

F_{gw} = Wind load on the glass due to ultimate design wind speed, V_{ult} , computed in accordance with Section 1609.

F_{ge} = Nonfactored load in accordance with ASTM E1300. The value for patterned glass shall be based on the thinnest part of the glass. Interpolation between nonfactored load charts in ASTM E1300 shall be permitted.

2404.3.4 Sloped Patterned Glass

Patterned glass sloped more than 15 degrees (0.26 rad) from vertical in skylights, sunspaces, sloped roofs and other exterior applications shall be designed to resist the most critical of the combinations of loads from Section 2404.2.

For Equations 24-2 and 24-3:

$$F_g < 1.0F_{ge} \quad (\text{Equation 24-10})$$

For Equation 24-4:

$$F_g < 0.6F_{ge} \quad (\text{Equation 24-11})$$

where:

F_g = Total load on the glass as determined by Equations 24-2, 24-3 and 24-4.

F_{ge} = Nonfactored load in accordance with ASTM E1300. The value for patterned glass shall be based on the thinnest part of the glass. Interpolation between the nonfactored load charts in ASTM E1300 shall be permitted.

2404.3.5 Vertical Sandblasted Glass

Sandblasted glass sloped 15 degrees (0.26 rad) or less from vertical in windows, curtain and window walls, doors, and other exterior applications shall be designed to resist the wind loads in Section 1609 for components and cladding according to Equation 24-12.

$$0.6F_{gw} < 0.5F_{ge} \quad (\text{Equation 24-12})$$

where:

F_g = Wind load on the glass due to ultimate design wind speed, V_{ult} , computed in accordance with Section 1609.

F_{ge} = Nonfactored load in accordance with ASTM E1300. The value for sandblasted glass is for moderate levels of sandblasting.

2404.4 Other Designs

For designs outside the scope of this section, an analysis or test data for the specific installation shall be prepared by a *registered design professional*.

Section 2405 Sloped Glazing and Skylights

2405.1 Scope

This section applies to the installation of glass and other transparent, translucent or opaque glazing material installed at a slope of more than 15 degrees (0.26 rad) from the vertical plane, including glazing materials in skylights, roofs and sloped walls.

2405.2 Allowable Glazing Materials and Limitations

Sloped glazing shall be any of the following materials, subject to the listed limitations.

1. For monolithic glazing systems, the glazing material of the single light or layer shall be laminated glass with a minimum 30-mil (0.76 mm) polyvinyl butyral (or equivalent) interlayer, wired glass, light-transmitting plastic materials meeting the requirements of Section 2606, heat-strengthened glass or fully tempered glass.
2. For multiple-layer glazing systems, each light or layer shall consist of any of the glazing materials specified in Item 1 above.

Annealed glass is permitted to be used as specified in Exceptions 2 and 3 of Section 2405.3.3.

Laminated glass and plastic materials described in Items 1 and 2 shall not require the screening or height restrictions provided in Section 2405.3.

For additional requirements for plastic skylights, see Section 2610. Glass-block construction shall conform to the requirements of Section 2110.1.

2405.3 Screening

Broken glass retention screens, where required, shall:

1. Be capable of supporting twice the weight of the glazing;
2. Be firmly and substantially fastened to the framing members; and
3. Be installed within 4 inches (102 mm) of the glass.

The screens shall be constructed of a noncombustible material not thinner than No. 12 B&S gage (0.0808 inch) with mesh not larger than 1 inch by 1 inch (25 mm by 25 mm). In a corrosive atmosphere, structurally equivalent noncorrosive screen materials shall be used.

2405.3.1 Screens Under Monolithic Glazing

Heat-strengthened glass and fully tempered glass shall have screens installed below the full area of the glazing material.

2405.3.2 Screens Under Multiple-Layer Glazing

Heat-strengthened glass, fully tempered glass and wired glass used as the bottom glass layer shall have screens installed below the full area of the glazing material.

2405.3.3 Screening Not Required for Monolithic and Multiple-Layer Sloped Glazing Systems

In monolithic and multiple-layer sloped glazing systems, the following apply:

1. Fully tempered glass shall be permitted to be installed without retention screens where glazed between intervening floors at a slope of 30 degrees (0.52 rad) or less from the vertical plane, and having the highest point of the glass 10 feet (3048 mm) or less above the walking surface.
2. Retention screens shall not be required below any glazing material, including annealed glass, where the walking surface below the glazing material is permanently protected from the risk of falling glass or the area below the glazing material is not a walking surface.
3. Retention screens shall not be required below any glazing material, including annealed glass, in the sloped glazing systems of commercial or detached noncombustible greenhouses used exclusively for growing plants and not open to the public, provided that the height of the greenhouse at the ridge does not exceed 30 feet (9144 mm) above grade.
4. Retention screens shall not be required in individual *dwelling units* in Groups R-2, R-3 and R-4 where fully tempered glass is used as single glazing or as both panes in an insulating glass unit, and all of the following conditions are met:
 - 4.1. Each pane of the glass is 16 square feet (1.5 m²) or less in area.
 - 4.2. The highest point of the glass is 12 feet (3658 mm) or less above any walking surface or other accessible area.
 - 4.3. The glass thickness is $\frac{3}{16}$ inch (4.8 mm) or less.
5. Retention screens shall not be required for laminated glass with a 15-mil (0.38 mm) polyvinyl butyral (or equivalent) interlayer used in individual *dwelling units* in Groups R-2, R-3 and R-4, where both of the following conditions are met:
 - 5.1. Each pane of glass is 16 square feet (1.5 m²) or less in area.

5.2. The highest point of the glass is 12 feet (3658 mm) or less above a walking surface or other accessible area.

2405.3.4 Screens Not Required

For all other types of glazing complying with Section 2405.2, retention screens shall not be required.

2405.4 Framing

In Type I and II construction, sloped glazing and skylight frames shall be constructed of noncombustible materials. In structures where acid fumes deleterious to metal are incidental to the use of the buildings, *approved* pressure-treated wood or other *approved* noncorrosive materials are permitted to be used for sash and frames. Framing supporting sloped glazing and skylights shall be designed to resist the tributary roof loads in Chapter 16. Skylights set at an angle of less than 45 degrees (0.79 rad) from the horizontal plane shall be mounted at least 4 inches (102 mm) above the plane of the roof on a curb constructed as required for the frame. Skylights shall not be installed in the plane of the roof where the roof pitch is less than 45 degrees (0.79 rad) from the horizontal.

Exception: Installation of a skylight without a curb shall be permitted on roofs with a minimum slope of 14 degrees (three units vertical in 12 units horizontal) in Group R-3 occupancies. All unit skylights installed in a roof with a pitch flatter than 14 degrees (0.25 rad) shall be mounted at least 4 inches (102 mm) above the plane of the roof on a curb constructed as required for the frame unless otherwise specified in the manufacturer's installation instructions.

2405.5 Unit Skylights and Tubular Daylighting Devices

Unit skylights and tubular daylighting devices shall be tested and labeled as complying with AAMA/WDMA/CSA 101/I.S./A440. The *label* shall state the name of the manufacturer, the *approved* labeling agency, the product designation and the performance grade rating as specified in AAMA/WDMA/CSA 101/I.S.2/A440. Where the product manufacturer has chosen to have the performance grade of the skylight rated separately for positive and negative design pressure, then the *label* shall state both performance grade ratings as specified in AAMA/WDMA/CSA 101/I.S.2/A440 and the skylight shall comply with Section 2405.5.2. Where the skylight is not rated separately for positive and negative pressure, then the performance grade rating shown on the *label* shall be the performance grade rating determined in accordance with AAMA/WDMA/CSA 101/I.S.2/A440 for both positive and negative design pressure and the skylight shall conform to Section 2405.5.1.

2405.5.1 Skylights Rated for the Same Performance Grade for Both Positive and Negative Design Pressure

The design of skylights shall be based on Equation 24-13.

$$F_g \leq PG \quad (\text{Equation 24-13})$$

where:

F_g = Maximum load on the skylight determined from Equations 24-2 through 24-4 in Section 2404.2.

PG = Performance grade rating of the skylight.

2405.5.2 Skylights Rated for Separate Performance Grades for Positive and Negative Design Pressure

The design of skylights rated for performance grade for both positive and negative design pressures shall be based on Equations 24-14 and 24-15.

$$F_{gi} \leq PG_{Pos} \quad (\text{Equation 24-14})$$

$$F_{go} \leq PG_{Neg} \quad (\text{Equation 24-15})$$

where:

PG_{Pos} = Performance grade rating of the skylight under positive design pressure;

PG_{Neg} = Performance grade rating of the skylight under negative design pressure; and

F_{gi} and F_{go} are determined in accordance with the following:

For $0.6W_o \geq D$,

where:

W_o = Outward wind force, psf (kN/m^2) due to ultimate design wind speed, V_{ult} , as calculated in Section 1609.

D = The dead weight of the glazing, psf (kN/m^2) as determined in Section 2404.2 for glass, or by the weight of the plastic, psf (kN/m^2) for plastic glazing.

F_{gi} = Maximum load on the skylight determined from Equations 24-3 and 24-4 in Section 2404.2.

F_{go} = Maximum load on the skylight determined from Equation 24-2.

For $0.6W_o < D$,

where:

W_o = The outward wind force, psf (kN/m^2) due to ultimate design wind speed, V_{ult} , as calculated in Section 1609.

D = The dead weight of the glazing, psf (kN/m^2) as determined in Section 2404.2 for glass, or by the weight of the plastic for plastic glazing.

F_{gi} = Maximum load on the skylight determined from Equations 24-2 through 24-4 in Section 2404.2.

F_{go} = 0.

Section 2406 Safety Glazing

2406.1 Human Impact Loads

Individual glazed areas, including glass mirrors, in hazardous locations as defined in Section 2406.4 shall comply with Sections 2406.1.1 through 2406.1.4.

Exception: Mirrors and other glass panels mounted or hung on a surface that provides a continuous backing support.

2406.1.1 Impact Test

Except as provided in Sections 2406.1.2 through 2406.1.4, all glazing shall pass the impact test requirements of Section 2406.2.

2406.1.2 Plastic Glazing

Plastic glazing shall meet the weathering requirements of ANSI Z97.1.

2406.1.3 Glass Block

Glass-block walls shall comply with Section 2101.2.5.

2406.1.4 Louvered Windows and Jalousies

Louvered windows and jalousies shall comply with Section 2403.5.

2406.2 Impact Test

Where required by other sections of this code, glazing shall be tested in accordance with CPSC 16 CFR Part 1201. Glazing shall comply with the test criteria for Category II, unless otherwise indicated in Table 2406.2(1).

Exception: Glazing not in doors or enclosures for hot tubs, whirlpools, saunas, steam rooms, bathtubs and showers shall be permitted to be tested in accordance with ANSI Z97.1. Glazing shall comply with the test criteria for Class A, unless otherwise indicated in Table 2406.2(2).

TABLE 2406.2(1)

MINIMUM CATEGORY CLASSIFICATION OF GLAZING USING CPSC 16 CFR PART 1201

EXPOSED SURFACE	GLAZING IN STORM OR	GLAZING IN DOORS	GLAZED PANELS	GLAZED PANELS	DOORS AND ENCLOSURES	SLIDING GLASS
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AREA OF ONE SIDE OF ONE LITE	COMBINATION DOORS (Category class)	(Category class)	REGULATED BY SECTION 2406.4.3 (Category class)	REGULATED BY SECTION 2406.4.2 (Category class)	REGULATED BY SECTION 2406.4.5 (Category class)	DOORS PATIO TYPE (Category class)
9 square feet or less	I	I	No requirement	I	II	II
More than 9 square feet	II	II	II	II	II	II

For SI: 1 square foot = 0.0929 m².

TABLE 2406.2(2)

MINIMUM CATEGORY CLASSIFICATION OF GLAZING USING ANSI Z97.1

EXPOSED SURFACE AREA OF ONE SIDE OF ONE LITE	GLAZED PANELS REGULATED BY SECTION 2406.4.3 (Category class)	GLAZED PANELS REGULATED BY SECTION 2406.4.2 (Category class)	DOORS AND ENCLOSURES REGULATED BY SECTION 2406.4.5 ^a (Category class)
9 square feet or less	No requirement	B	A
More than 9 square feet	A	A	A

For SI: square foot = 0.0929 m².

- a. Use is only permitted by the exception to Section 2406.2.

2406.3 Identification of Safety Glazing

Except as indicated in Section 2406.3.1, each pane of safety glazing installed in hazardous locations shall be identified by a manufacturer's designation specifying who applied the designation, the manufacturer or installer and the safety glazing standard with which it complies, as well as the information specified in Section 2403.1. The designation shall be acid etched, sand blasted, ceramic fired, laser etched, embossed or of a type that once applied, cannot be removed without being destroyed. A *label* meeting the requirements of this section shall be permitted in lieu of the manufacturer's designation.

Exceptions:

1. For other than tempered glass, manufacturer's designations are not required, provided the *building official* approves the use of a certificate, affidavit or other evidence confirming compliance with this code.
2. Tempered spandrel glass is permitted to be identified by the manufacturer with a removable paper designation.

2406.3.1 Multipane Assemblies

Multipane glazed assemblies having individual panes not exceeding 1 square foot (0.09 m²) in exposed areas shall have at least one pane in the assembly marked as indicated in Section 2406.3. Other panes in the assembly shall be marked "CPSC 16 CFR Part 1201" or "ANSI Z97.1," as appropriate.

2406.4 Hazardous Locations

The locations specified in Sections 2406.4.1 through 2406.4.7 shall be considered specific hazardous locations requiring safety glazing materials.

2406.4.1 Glazing in Doors

Glazing in all fixed and operable panels of swinging, sliding and bifold doors shall be considered a hazardous location.

Exceptions:

1. Glazed openings of a size through which a 3-inch-diameter (76 mm) sphere is unable to pass.
2. Decorative glazing.
3. Glazing materials used as curved glazed panels in revolving doors.
4. Commercial refrigerated cabinet glazed doors.

2406.4.2 Glazing Adjacent to Doors

Glazing in an individual fixed or operable panel adjacent to a door where the nearest vertical edge of the glazing is within a 24-inch (610 mm) arc of either vertical edge of the door in a closed position and where the bottom exposed edge of the glazing is less than 60 inches (1524 mm) above the walking surface shall be considered a hazardous location.

Exceptions:

1. Decorative glazing.
2. Where there is an intervening wall or other permanent barrier between the door and glazing.
3. Where access through the door is to a closet or storage area 3 feet (914 mm) or less in depth. Glazing in this application shall comply with Section 2406.4.3.
4. Glazing in walls on the latch side of and perpendicular to the plane of the door in a closed position in one- and two-family dwellings or within dwelling units in Group R-2.

2406.4.3 Glazing in Windows

Glazing in an individual fixed or operable panel that meets all of the following conditions shall be considered a hazardous location:

1. The exposed area of an individual pane is greater than 9 square feet (0.84 m^2).
2. The bottom edge of the glazing is less than 18 inches (457 mm) above the floor.
3. The top edge of the glazing is greater than 36 inches (914 mm) above the floor.
4. One or more walking surface(s) are within 36 inches (914 mm), measured horizontally and in a straight line, of the plane of the glazing.

Exceptions:

1. Decorative glazing.
2. Where a horizontal rail is installed on the accessible side(s) of the glazing 34 to 38 inches (864 to 965 mm) above the walking surface. The rail shall be capable of withstanding a horizontal load of 50 pounds per linear foot (730 N/m) without contacting the glass and be a minimum of $1\frac{1}{2}$ inches (38 mm) in cross-sectional height.

3. Outboard panes in insulating glass units or multiple glazing where the bottom exposed edge of the glass is 25 feet (7620 mm) or more above any grade, roof, walking surface or other horizontal or sloped (within 45 degrees of horizontal) (0.79 rad) surface adjacent to the glass exterior.

2406.4.4 Glazing in Guards and Railings

Glazing in *guards* and railings, including structural baluster panels and nonstructural in-fill panels, regardless of area or height above a walking surface shall be considered a hazardous location.

2406.4.5 Glazing and Wet Surfaces

Glazing in walls, enclosures or fences containing or facing hot tubs, spas, whirlpools, saunas, steam rooms, bathtubs, showers and indoor or outdoor swimming pools where the bottom exposed edge of the glazing is less than 60 inches (1524 mm) measured vertically above any standing or walking surface shall be considered a hazardous location. This shall apply to single glazing and all panes in multiple glazing.

Exceptions:

1. Glazing that is more than 60 inches (1524 mm), measured horizontally and in a straight line, from the water's edge of a bathtub, hot tub, spa, whirlpool or swimming pool.
2. Outboard sacrificial panes in laminated insulating glass units in walls where the exterior of the unit is not exposed to any of the hazardous locations specified in Section 2406.4.

2406.4.6 Glazing Adjacent to Stairways and Ramps

Glazing where the bottom exposed edge of the glazing is less than 60 inches (1524 mm) above the plane of the adjacent walking surface of stairways, landings between flights of stairs and ramps shall be considered a hazardous location.

Exceptions:

1. The side of a stairway, landing or ramp that has a guard complying with the provisions of Sections 1015 and 1607.9, and the plane of the glass is greater than 18 inches (457 mm) from the railing.
2. Glazing 36 inches (914 mm) or more measured horizontally from the walking surface.

2406.4.7 Glazing Adjacent to the Bottom Stairway Landing

Glazing adjacent to the landing at the bottom of a stairway where the glazing is less than 60 inches (1524 mm) above the landing and within a 60-inch (1524 mm) horizontal arc that is less than 180 degrees (3.14 rad) from the bottom tread nosing shall be considered a hazardous location.

Exception: Glazing that is protected by a guard complying with Sections 1015 and 1607.9 where the plane of the glass is greater than 18 inches (457 mm) from the guard.

2406.5 Fire Department Access Panels

Fire department glass access panels shall be of tempered glass. For insulating glass units, all panes shall be tempered glass.

Section 2407 Glass in Handrails and Guards

2407.1 Materials

Glass used in a handrail, guardrail or *guard* section shall be laminated glass constructed of fully tempered or heat-strengthened glass and shall comply with Category II or CPSC 16 CFR Part 1201 or Class A of ANSI Z97.1. Glazing in railing in-fill panels shall be of an *approved* safety glazing material that conforms to the provisions of Section 2406.1.1. For all glazing types, the minimum nominal thickness shall be $\frac{1}{4}$ inch (6.4 mm).

Exception: Single fully tempered glass complying with Category II of CPSC 16 CFR Part 1201 or Class A of ANSI Z97.1 shall be permitted to be used in handrails and guardrails where there is no walking surface beneath them or the walking surface is permanently protected from the risk of falling glass.

2407.1.1 Loads

The panels and their support system shall be designed to withstand the loads specified in Section 1607.9 using a safety factor of four.

2407.1.2 Structural Glass Baluster Panels

Guards with structural glass baluster panels shall be installed with an attached top rail or handrail. The top rail or handrail shall be supported by not fewer than three glass baluster panels, or shall be otherwise supported to remain in place should one glass baluster panel fail.

Exception: An attached top rail or handrail is not required where the glass baluster panels are laminated glass with two or more glass plies of equal thickness and of the same glass type. The panels shall be tested to remain in place as a barrier following impact or glass breakage in accordance with ASTM E2353.

2407.1.3 Parking Garages

Glazing materials shall not be installed in handrails or *guards* in parking garages except for pedestrian areas not exposed to impact from vehicles.

2407.1.4 Glazing in Wind-Borne Debris Regions

Glazing installed in in-fill panels or balusters in *wind-borne debris regions* shall comply with the following:

2407.1.4.1 Balusters and In-Fill Panels

Glass installed in exterior railing in-fill panels or balusters shall be laminated glass complying with Category II of CPSC 16 CFR Part 1201 or Class A of ANSI Z97.1.

2407.1.4.2 Glass Supporting Top Rail

When the top rail is supported by glass, the assembly shall be tested according to the impact requirements of Section 1609.1.2 (HVHZ shall comply with Section 1618.4.6.4). The top rail shall remain in place after impact.

Section 2408 Glazing in Athletic Facilities

2408.1 General

Glazing in athletic facilities and similar uses subject to impact loads, which forms whole or partial wall sections or which is used as a door or part of a door, shall comply with this section.

2408.2 Racquetball and Squash Courts

2408.2.1 Testing

Test methods and loads for individual glazed areas in racquetball and squash courts subject to impact loads shall conform to those of CPSC 16 CFR Part 1201 or ANSI Z97.1 with impacts being applied at a height of 59 inches (1499 mm) above the playing surface to an actual or simulated glass wall installation with fixtures, fittings and methods of assembly identical to those used in practice.

Glass walls shall comply with the following conditions:

1. A glass wall in a racquetball or squash court, or similar use subject to impact loads, shall remain intact following a test impact.
2. The deflection of such walls shall be not greater than $1\frac{1}{2}$ inches (38 mm) at the point of impact for a drop height of 48 inches (1219 mm).

Glass doors shall comply with the following conditions:

1. Glass doors shall remain intact following a test impact at the prescribed height in the center of the door.

2. The relative deflection between the edge of a glass door and the adjacent wall shall not exceed the thickness of the wall plus $\frac{1}{2}$ inch (12.7 mm) for a drop height of 48 inches (1219 mm).

2408.3 Gymnasiums and Basketball Courts

Glazing in multipurpose gymnasiums, basketball courts and similar athletic facilities subject to human impact loads shall comply with Category II of CPSC 16 CFR Part 1201 or Class A of ANSI Z97.1.

Section 2409 Glass in Walkways, Elevator Hoistways and Elevator Cars

2409.1 Glass Walkways

Glass installed as a part of a floor/ceiling assembly as a walking surface and constructed with laminated glass shall comply with ASTM E2751 or with the load requirements specified in Chapter 16. Such assemblies shall comply with the *fire-resistance rating* and marking requirements of this code where applicable.

2409.2 Glass in Elevator Hoistway Enclosures

Glass in elevator hoistway enclosures and hoistway doors shall be laminated glass conforming to ANSI Z97.1 or CPSC 16 CFR Part 1201.

2409.2.1 Fire-Resistance-Rated Hoistways

Glass installed in hoistways and hoistway doors where the hoistway is required to have a fire-resistance rating shall also comply with Section 716.

2409.2.2 Glass Hoistway Doors

The glass in glass hoistway doors shall be not less than 60 percent of the total visible door panel surface area as seen from the landing side.

2409.3 Visions Panels in Elevator Hoistway Doors

Glass in vision panels in elevator hoistway doors shall be permitted to be any transparent glazing material not less than $\frac{1}{4}$ inch (6.4 mm) in thickness conforming to Class A in accordance with ANSI Z97.1 or Category II in accordance with CPSC 16 CFR Part 1201. The area of any single vision panel shall be not less than 24 square inches ($15\ 484\ mm^2$) and the total area of one or more vision panels in any hoistway door shall be not more than 85 square inches ($54\ 839\ mm^2$).

2409.4 Glass in Elevator Cars

Glass in elevator cars shall be in accordance with this section.

2409.4.1 Glass Types

Glass in elevator car enclosures, glass elevator car doors and glass used for lining walls and ceilings of elevator cars shall be laminated glass conforming to Class A in accordance with ANSI Z97.1 or Category II in accordance with CPSC 16 CFR Part 1201.

Exception: Tempered glass shall be permitted to be used for lining walls and ceilings of elevator cars provided:

1. The glass is bonded to a nonpolymeric coating, sheeting or film backing having a physical integrity to hold the fragments when the glass breaks.
2. The glass is not subjected to further treatment such as sandblasting; etching; heat treatment or painting that could alter the original properties of the glass.
3. The glass is tested to the acceptance criteria for laminated glass as specified for Class A in accordance with ANSI Z97.1 or Category II in accordance with CPSC 16 CFR Part 1201.

2409.4.2 Surface Area

The glass in glass elevator car doors shall be not less than 60 percent of the total visible door panel surface area as seen from the car

side of the doors.

Section 2410 High-Velocity Hurricane Zones—General

2410.1

Exterior wall cladding, surfacing and glazing, where provided, shall be as set forth in Sections 2410 through 2415.

2410.2

Exterior wall cladding, surfacing and glazing shall be designed and constructed to sufficiently resist the full pressurization from the wind loads prescribed in Chapter 16 (High-Velocity Hurricane Zones) and the concentrated loads that result from hurricane-generated wind-borne debris.

1. Exterior wall cladding, surfacing and glazing, within the lowest 30 feet (9.1 m) of the exterior building walls shall be of sufficient strength to resist large missile impacts as outlined in Chapter 16 (High-Velocity Hurricane Zones).
2. Exterior wall cladding, surfacing and glazing located above the lowest 30 feet (9.1 mm) of the exterior building walls shall be of sufficient strength to resist small missile impacts as outlined in Chapter 16 (High-Velocity Hurricane Zones).

Exception: Exterior wall cladding, surfacing and glazing when protected by fixed, operable or portable shutters or screens which have product approval to resist full pressurization from wind loads as well as large and small missile impacts as outlined in the high-velocity hurricane provisions of Chapter 16, without deforming to the point where the substrate being protected is compromised.

2410.3 Workmanship

Reserved.

2410.4

All exterior wall cladding, surfacing, garage doors, skylights, operative and inoperative windows shall have product approval.

Section 2411 High-Velocity Hurricane Zones—Windows, Doors, Glass and Glazing

2411.1 General

2411.1.1

Windows, doors, glass and glazing shall be as set forth in this section.

2411.1.2

Glass shall comply with ASTM C1036 requirements for flat glass Type I and II and GSA DD-G-451c *Standard for Glass, Flat and Corrugated, for Glazing Mirrors and Other Uses*.

2411.1.3

Reserved.

2411.1.4

Reserved.

2411.1.5

Heat-strengthened and ceramic-coated spandrel glass shall comply with ASTM C1048.

2411.1.6

Reserved.

2411.1.7

Installed glass shall not be less than Single-Strength B quality unless otherwise approved by the building official, and where edges are

exposed they shall be seamed or ground.

2411.1.8

Where a light of glass is of such height above grade that the top 50 percent or more is in a zone of greater wind load, the area of the entire light shall be limited as for the greater height above grade.

2411.1.9

Replacement of any glazing or part thereof shall be designed and constructed in accordance with the *Florida Building Code, Existing Building*.

2411.1.10

Fixed glazing used as an exterior component shall require product approval. Comparative analysis in compliance with Section 2411.3.2.4 by a Florida-registered engineer or architect may be accepted when the actual pressure and geometry conditions differ from the conditions shown in the approval.

2411.1.11

Exterior lite of glass in an insulated glass unit shall be safety glazed.

Exceptions:

1. Large missile impact-resistant glazed assemblies.
2. Nonmissile impact units protected with shutters.

2411.2 Fixed Glass in Exterior Walls**2411.2.1 Limits of Size of Glass****2411.2.1.1**

The minimum thickness of annealed float glazing materials used in exterior walls shall be determined and shall not be less than as set forth in ASTM E1300.

2411.2.1.2

For glazing materials other than annealed float use the glazing material resistance factors used in ASTM E1300.

2411.2.1.3

Corrugated glass and other special glass shall be limited to spans determined by analysis and test to resist the loads set forth in Chapter 16 (High Wind Zones) based on fiber stresses not exceeding 4000 psi (27.58 MPa).

2411.2.1.4

Glass block shall have product approval.

2411.3 Doors and Operative Windows in Exterior Walls**2411.3.1 Design and Approval****2411.3.1.1**

The design and approval of sliding doors, swinging doors and operative windows in exterior walls, including the supporting members shall be based on the proposed use-height above grade in accordance with Chapter 16 (High-Velocity Hurricane Zones).

2411.3.1.2

Maximum glass sizes shall comply with ASTM E1300.

2411.3.1.3

Reserved.

2411.3.1.4

The architect or professional engineer of record shall be required to specify the design wind pressure, determined in accordance with Chapter 16 (High-Velocity Hurricane Zones), for all garage doors, skylights operative windows and fixed glazing. The design wind pressure for each component of the exterior building surface shall be incorporated into the building design drawing so as to allow the respective manufacturer to size the prefabricated assembly for the proper wind pressures.

2411.3.1.5

Exterior garage doors shall be designed and constructed to actively or passively lock in the closed position when subjected to a uniform lateral pressure in excess of 50 percent of the design wind pressure as prescribed in Chapter 16 (High-Velocity Hurricane Zones).

2411.3.1.6

The architect or professional engineer of record shall be required to detail on the drawings submitted for permit, rough opening dimensions, supporting framework, method of attachment and waterproofing procedures for all garage doors, passage doors, skylights, operative and inoperative windows in exterior walls. Said framework and method of attachment shall be designed and constructed so as to sufficiently resist the design wind pressures as outlined in Chapter 16 (High-Velocity Hurricane Zones).

Exception: When detailed engineered shop drawings, along with the notices of product approval, produced by the manufacturer's specialty engineer and approved by the architect or professional engineer of record, are admitted at the time of permit application, which completely identifies rough openings, supporting framework, method of attachment and waterproofing procedures are prepared and bear the signature and seal of a professional engineer.

2411.3.2 Tests

2411.3.2.1

Operative window and door assemblies shall be tested in accordance with the requirements of this section, TAS 202 and the forced entry resistance requirements from AAMA/WDMA/CSA 101/I.S.2/A440.

Exceptions:

1. Door assemblies installed in nonhabitable areas, where the door assembly and area are designed to accept water infiltration, need not be tested for water infiltration.
2. Door assemblies installed where the overhang (OH) ratio is equal to or more than 1 need not be tested for water infiltration. The overhang ratio shall be calculated by the following equation:

$$\text{OH ratio} = \text{OH length}/\text{OH height}$$

where:

OH length = The horizontal measure of how far an overhang over a door projects out from the door's surface.

OH height = The vertical measure of the distance from the door's sill to the bottom of the overhang over a door.

3. Pass-through windows for serving from a single-family kitchen, where protected by a roof overhang of 5 feet (1.5 m) or more shall be exempted from the requirements of the water infiltration test.

2411.3.2.1.1

Glazed curtain wall, window wall and storefront systems shall be tested in accordance with the requirements of this section and the laboratory test requirements of the American Architectural Manufacturers Association (AAMA) Standard 501, following test load sequence and test load duration in TAS 202.

2411.3.2.2

Such assemblies with permanent muntin bars shall be tested with muntin bars in place.

2411.3.2.3

Such assemblies shall be installed in accordance with the conditions of test and approval.

2411.3.2.4

Structural wind load design pressures for window and door units other than the size tested in accordance with Section 2411.3.2.1 shall be permitted to be different than the design value of the tested unit provided such different pressures are determined by accepted engineering analysis or validated by an additional test of the window or door unit to the different design pressure in accordance with Section 2411.3.2.1. All components of the alternate size unit shall be the same as the tested or labeled unit.

i. Operable windows and glass doors rated in this manner shall comply with the following:

1. For windows and doors (other than sliding or bi-fold), the frame area of the alternate size unit shall not exceed the frame area of the tested approved unit.
2. For sliding or bi-fold doors, the panel area of the alternate size unit shall not exceed the panel area of the tested approved unit and if the door stiles or interlocks do not meet Section 1616.3.1(6) the maximum allowed unit's frame area shall be limited to 1.5 times the tested frame area.
3. Shall vary from the tested approved unit only in width, height or load requirements.
4. Shall not exceed 100 percent of the proportional deflection and fiber stress of the intermediate members of the approved unit.
5. Shall not exceed 100 percent of the concentrated load at the juncture of the intermediate members and the frame of the approved unit.
6. Shall not exceed the air and water infiltration resistance of the tested approved unit.
7. Shall not exceed the maximum cyclic pressure of the tested approved unit when tested per TAS 201 and TAS 203.

ii. Nonoperable windows and glass doors rated in this manner shall comply with the following:

1. The frame area of the alternate size unit shall not exceed the frame area of the tested approved unit.
2. Shall vary from the tested approved unit only in width, height or load requirements.
3. The maximum uniform load distribution (ULD) of any side shall be equal to the uniform load carried by the side divided by the length of the side.
4. The ULD of any member shall not exceed the ULD of the corresponding member of the tested approved unit.
5. The ULD of each member shall be calculated in accordance with standard engineering analysis.
6. Shall not exceed the air and water infiltration resistance of the tested approved unit.

7. Shall not exceed the maximum cyclic pressure of the tested approved unit when tested per TAS 201 and 203.

2411.3.2.5

Reserved.

2411.3.2.6

Reserved.

2411.3.3 Construction Details

Construction details for fixed glass shall comply with the requirements of this paragraph except that structural glazing as defined in Section 202 need not comply with this section, but shall comply with Section 2415.

2411.3.3.1

Each light of fixed glass more than 3 feet (914 mm) in width shall have two approved setting blocks or approved suspension clamps. Setting blocks shall be Neoprene 70-90 Shore A durometer hardness or approved equal.

2411.3.3.2

Fixed glass lights shall be set in corrosion-resistant metal frames and shall comply with applicable requirements of Chapter 16 (High-Velocity Hurricane Zones) for wind loads, allowable stresses and load tests. Fixed glass lights may be set in wood, metal or concrete frames as permitted for the types of construction by Chapter 3 through Chapter 6.

2411.3.3.3

Wood shall have been preservative treated or shall be of a durable species as defined in Section 2304.12.

2411.3.3.4

Attachment shall be as set forth in Chapter 16 (High-Velocity Hurricane Zones) and shall be corrosion resistant.

2411.3.3.5

Glass in fixed lights shall be securely and continuously supported at the perimeter of each sheet unless the design is based on one or more unsupported edges. Supporting members such as division bars and mullions shall be designed by rational analysis to support the wind pressures set forth in Chapter 16 (High-Velocity Hurricane Zones). Supporting bars shall be attached at the ends to resist the loads set forth in Chapter 16 (High-Velocity Hurricane Zones).

2411.3.3.6

The depth of the glazing rabbet and depth of engagement in the rabbet, for fixed glass, shall be based on consideration of the dimensional reduction from deflection and the dimensional changes caused by temperature.

2411.3.3.7

Exterior lite of glass in an insulated glass unit shall be safety glazed.

Exceptions:

1. Large missile impact-resistant glazed assemblies.
2. Nonmissile impact units protected with shutters.

2411.3.4

Gaskets used in glazing systems shall comply with the following standards as applicable:

1. ASTM C864, Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.

2. ASTM C509, Elastomeric Cellular Preformed Gaskets and Sealing Material.

3. ASTM C1115, Dense Elastomeric Silicone Rubber Gaskets and Accessories.

4. ASTM E2203, Dense Thermoplastic Elastomers Used for Compression Seals, Gaskets, Setting Blocks, Spacers and Accessories.

2411.4 Glazed Panel Safeguards

Reserved.

2411.5 Operable Window Safeguards

Reserved.

2411.6 Interior Locations

Reserved.

2411.7 Safety Glazing

Reserved.

2411.8 Sloped Glazing

Reserved.

Section 2412 High-Velocity Hurricane Zones—Glass Veneer

2412.1

Glass veneer shall be as set forth in this section.

2412.2 Dimension

Glass veneer units shall be not less than $\frac{11}{32}$ inch (8.7 mm) in thickness. No unit shall be larger in area than 10 square feet (0.93 m²) where 15 feet (4.6 m) or less above the grade directly below, nor larger than 6 square feet (0.56 m²) where more than 15 feet (4.6 m) above the grade directly below.

2412.3 Attachment

Every glass veneer unit shall be attached to the backing with approved mastic cement and corrosion-resistant ties and shall be supported on shelf angles.

2412.3.1

Where more than 6 feet (1829 mm) above grade, veneer shall be supported by shelf angles, and ties shall be used in both horizontal and vertical joints.

2412.3.2

Below a point 6 feet (1829 mm) above grade, glass veneer shall rest on shelf angles. Veneering shall not be supported on construction which is not an integral part of the wall, and over sidewalks shall be supported on a shelf angle not less than $\frac{1}{4}$ inch (6.4 mm) above grade.

2412.3.3

All edges of glass veneer shall be ground.

2412.4 Mastic

2412.4.1

The mastic shall cover not less than one-half of the area of the unit after the unit has been set in place and shall be neither less than $\frac{1}{4}$ inch (6.4 mm) nor more than $\frac{1}{2}$ inch (12.7 mm) in thickness.

2412.4.2

The mastic shall be insoluble in water and shall not lose its adhesive qualities when dry.

2412.4.3

Absorbent surfaces shall be sealed by a bonding coat before mastic is applied. The bonding coat shall be cohesive with the mastic.

2412.4.4

Glass veneer surfaces to which mastic is applied shall be clean and uncoated.

2412.4.5

Space between edges of glass veneer shall be filled uniformly with an approved-type pointing compound.

2412.5 Shelf Angles and Ties

2412.5.1

Shelf angles shall be of corrosion resistant material capable of supporting four times the width of the supported veneer. The shelf angles shall be spaced vertically in alternate horizontal joints, but not more than 3 feet (914 mm) apart. Shelf angles shall be secured to the wall at intervals not exceeding 2 feet (610 mm) with corrosion-resistant bolts not less than $\frac{1}{4}$ inch (6.4 mm) diameter. Bolts shall be set in masonry and secured by lead shields.

2412.5.2

Ties shall be of corrosion-resistant metal as manufactured especially for holding glass-veneer sheets to masonry surfaces. There shall be not less than one such approved tie for each 2 square feet (0.19 m^2) of veneer surface.

2412.6 Backing

Exterior glass veneer shall be applied only upon masonry, concrete or stucco.

2412.7 Expansion Joints

Glass veneer units shall be separated from each other and from adjoining materials by an expansion joint at least $\frac{1}{16}$ inch (1.6 mm) in thickness. There shall be at least $\frac{1}{64}$ inch (0.4 mm) clearance between bolts and the adjacent glass.

Section 2413 High-Velocity Hurricane Zones—Storm Shutters/External Protective Devices

2413.1 General

Unless exterior wall components including but not limited to structural glazing, doors and windows of enclosed buildings have specific product approval to preserve the enclosed building envelope against impact loads as set forth in Chapter 16 (High-Velocity Hurricane Zones), all such components shall be protected by product approved storm shutters.

2413.2

The storm shutters shall be designed and constructed to insure a minimum of 1 inch (25 mm) separation at maximum deflection with components and frames of components they are to protect unless the components and frame are specifically designed to receive the load of storm shutters, and shall be designed to resist the wind pressures as set forth in Chapter 16 (High-Velocity Hurricane Zones) by methods admitting of rational analysis based on established principles of design. Storm shutter shall also be designed to comply with the impact load requirements included within Chapter 16 (High-Velocity Hurricane Zones).

2413.3

The storm shutter design calculations and detailed drawings, including attachment to the main structure, shall be prepared by and bear the seal of a qualified Florida-registered delegated engineer, or if qualified to prepare such design, by the engineer or architect of record, which architect or engineer shall be proficient in structural design. The architect or engineer of record shall, in all instances, review and approve documents prepared by the delegated engineer.

2413.4

Storm shutters shall be approved by the certification agency and shall bear the name of the company engraved in every section of the system.

2413.5

Deflection shall not exceed the limits set forth in Chapter 16 (High-Velocity Hurricane Zones).

2413.6

Reserved.

2413.6.1

Shutters used to protect openings above the first story of any building or structure must be permanently installed and closable from the inside of the building or structure unless such openings are accessible without the use of a ladder or lift, or shutters can be installed from the interior of the building or structure.

Exception: Group R3 detached single-family residences not exceeding two stories.

2413.7

Storm shutters must completely cover an opening in all directions.

2413.7.1

On any side of an opening, the maximum side clearance between the shutter and a wall or inset surface shall be $\frac{1}{4}$ inch (6.4 mm). Any distance in excess of $\frac{1}{4}$ inch (6.4 mm) shall require end closure or shutter overlap, where applicable.

2413.7.2

Shutter overlap shall be a minimum of 1.5 times the side clearance between the shutter and wall.

2413.7.3

End closures shall be designed to resist wind loads specified in Chapter 16 (High-Velocity Hurricane Zones), based on rational analysis.

Section 2414 High-Velocity Hurricane Zones—Curtain Walls**2414.1 Scope**

This section prescribes requirements for curtain walls of buildings or structures regulated by this code.

2414.2 Definition

A curtain wall is any prefabricated assembly of various components to enclose a building usually attached to and/or supported by the building frame other than a single door, or window, masonry units, poured in place concrete and siding of single membrane metal, wood or plastic.

2414.3

Curtain walls, as defined in Section 2414.2, shall be designed and constructed in accordance with the requirements of this section.

2414.4

Structural glazing in curtain walls shall also comply with the requirements of Section 2415.

2414.5 General**2414.5.1**

All structural elements of curtain wall systems and their attachments (including embedments) to the main structural frame shall be designed by and bear the seal of a qualified Florida-registered delegated engineer, or if qualified to prepare such design, by the engineer or architect of record, which architect or engineer shall be proficient in structural design. The engineer of record shall, in all instances, review and approve documents prepared by the delegated engineer.

2414.5.2

Curtain wall systems supported from more than two adjacent floors shall be designed to withstand all imposed loads without exceeding allowable stresses in the event of destruction or failure of any single span within the system. Documents for the main building permit shall include sufficient details describing the curtain wall system attachment to the main structure. This portion of the contract documents, if not prepared by the qualified engineer or architect of record, shall bear the signature and seal of the qualified Florida-registered delegated engineer charged with the responsibility for the design of the curtain wall system.

2414.5.3

Individual mullions acting as a continuous member shall transfer loads through supports from no more than three adjacent floors.

2414.5.4 Materials

The materials used in any curtain wall shall comply with the applicable provisions of this code.

2414.6 Fire Protection

Reserved.

2414.7 Inspection

Reserved.

Section 2415 High-Velocity Hurricane Zones—Structural Glazing Systems**2415.1 Scope**

This section prescribes requirements for structural glazing systems of buildings or structures regulated by this code.

2415.2 Application**2415.2.1**

Structural glazing, as defined in Section 2414.2, shall be designed and constructed in accordance with the requirements of this section.

2415.2.2

Structural glazing systems used in curtain walls shall also comply with the requirements of Section 2414.

2415.3 Definition

The terms used in this section shall be defined as set forth in Section 202.

2415.4 Standards

Adhesives and sealants used in structural glazing systems shall comply with following standards:

ASTM C794, Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants.

ASTM C920, Specification for Elastomeric Joint Sealants.

ASTM D412, Test Methods for Rubber Properties in Tension.

ASTM D624, Test Method for Rubber Property—Tear Resistance.

ASTM D2240, Test Method for Rubber Property—Durometer Hardness. Federal Specifications TT-S-001543A and TT-S-00230C.

ASTM E331, Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors.

ASTM E330, Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors.

2415.5 Design**2415.5.1 General**

Structural glazing systems shall be designed by and bear the seal of a Florida-registered professional engineer.

2415.5.2 Materials**2415.5.2.1 Identification**

All materials shall be clearly identified as to manufacturer and manufacturer's product number.

2415.5.2.2 Adhesives and Sealants

2415.5.2.2.1

Only approved silicone elastomer adhesives and sealants shall be used for fastening glass lights and other panels to curtain wall framing.

2415.5.2.2.2

Such adhesives and sealants shall be of a polymer that is 100-percent silicone.

2415.5.2.2.3

Adhesives and sealants shall have been tested in accordance with the standards set forth in Section 2415.4.

2415.5.3 Manufacturer's Testing, Recommendation and Approval**2415.5.3.1**

Compatibility of all components and fabrication procedures of structural glazing systems shall be tested, approved and recommended in writing by the manufacturer of the adhesive; the manufacturer of the coating; whether it is anodized, baked or otherwise applied and the manufacturer of the glass panel.

2415.5.3.2

Manufacturer's testing, recommendation and approval shall address, but shall not be limited in scope by the following sections.

2415.5.3.2.1

The compatibility of the sealant with metal, glazing materials, shims, spacers, setting blocks, backer rods, gaskets and other materials.

2415.5.3.2.2

Adhesion to the designated substrates and adhesion of the substrates to the base metal.

2415.5.3.2.3

The design and structural capability of silicone joints and cross sections.

2415.5.4 Structural Requirements**2415.5.4.1 Design of Structural Seals****2415.5.4.1.1**

The design stress of the structural silicone shall not exceed 20 psi (138 kPa) for materials having a minimum strength of 100 psi (690 kPa) at the weakest element in the line of stress.

2415.5.4.1.2

Such design stress shall also provide for a safety factor of not less than 5.0.

2415.5.4.1.3

Safety factors greater than 5.0 shall be specified by the engineer when required or recommended by the manufacturer.

2415.5.4.1.4

The silicone structural seal shall have a maximum modulus of elasticity to allow no more than 25-percent movement of the joint width at 20 psi (138 kPa) stress.

2415.5.4.1.5

In insulating glass units, the secondary silicone seal shall be designed to withstand a minimum of one-half the design negative wind load applicable to the outboard lights.

2415.5.4.2 Bonding Limits

Structural glazing shall be limited to adhesive bonding on one side or on two opposing sides of an infill glass lights or panel.

Exception: Three- or four-side bonding shall be permitted only when structural glazing units are shop fabricated and shop glazed.

2415.5.4.3 Job-Site Reglazing

2415.5.4.3.1

Job-site replacement reglazing shall be permitted only when performed following a procedure approved in writing by the applicable structural silicone manufacturer.

2415.5.4.3.2

Replacement shall be performed only by individuals or firms approved or certified by the silicone manufacturer.

2415.6 Fire Protection

Reserved.

2415.7 Inspections, Testing and Recertification

2415.7.1

A minimum of 1 percent of the structurally glazed panels shall be tested for load carrying capacity and sealant adhesion in accordance with Chapter 16 (High-Velocity Hurricane Zones) and ASTM E330.

2415.7.2

Structural glazed panels shall be inspected by a Florida-registered architect or professional engineer for conformance with the approved design and installation procedures determined by the authority having jurisdiction prior to the erection of such panels and after the seal curing period established by the silicone manufacturer.

2415.7.3

It shall be the responsibility of the contractor to verify the adhesion of the cured sealant periodically throughout the application to assure compliance with the manufacturer's specifications and quality of application.

2415.7.4

Structural glazing systems on threshold buildings shall be recertified by the owner as specified by the authority having jurisdiction at six month intervals for the first year after installation. Subsequently, such systems shall be recertified every five years at regular intervals.

2415.7.5

Such recertifications shall determine the structural condition and adhesion capacity of the silicone sealant.

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Chapter 25 Gypsum Board, Gypsum Panel Products and Plaster

Section 2501 General

2501.1 Scope

Provisions of this chapter shall govern the materials, design, construction and quality of gypsum board, gypsum panel products, lath, gypsum plaster, cement plaster and reinforced gypsum concrete.

2501.2 Performance

Lathing, plastering, gypsum board and gypsum panel product construction shall be done in the manner and with the materials specified in this chapter and, when required for fire protection, shall also comply with the provisions of Chapter 7.

2501.3 Other Materials

Other *approved* wall or ceiling coverings shall be permitted to be installed in accordance with the recommendations of the manufacturer and the conditions of approval.

Section 2502 Definitions

2502.1 Definitions

The following terms are defined in Chapter 2:

CEMENT PLASTER.

EXTERIOR SURFACES.

GYPSUM BOARD.

GYPSUM PANEL PRODUCT.

GYPSUM PLASTER.

GYPSUM VENEER PLASTER.

INTERIOR SURFACES.

WEATHER-EXPOSED SURFACES.

WIRE BACKING.

Section 2503 Inspection

2503.1 Inspection

Lath, gypsum board and gypsum panel products shall be inspected in accordance with Section 110.3.5.

Section 2504 Vertical and Horizontal Assemblies

2504.1 Scope

The following requirements shall be met where construction involves gypsum board, gypsum panel products or lath and plaster in vertical and horizontal assemblies.

2504.1.1 Wood Framing

Wood supports for lath, gypsum board or gypsum panel products, as well as wood stripping or furring, shall be not less than 2 inches (51 mm) nominal thickness in the least dimension.

Exception: The minimum nominal dimension of wood furring strips installed over solid backing shall be not less than 1 inch by 2 inches (25 mm by 51 mm).

2504.1.2 Studless Partitions

The minimum thickness of vertically erected studless solid plaster partitions of $\frac{3}{8}$ -inch (9.5 mm) and $\frac{3}{4}$ -inch (19.1 mm) rib metal lath, $\frac{1}{2}$ -inch-thick (12.7 mm) gypsum lath, gypsum board or gypsum panel product shall be 2 inches (51 mm).

Section 2505 Shear Wall Construction

2505.1 Resistance to Shear (Wood Framing)

Wood-frame shear walls sheathed with gypsum board, gypsum panel products or lath and plaster shall be designed and constructed in accordance with Section 2306.3 and are permitted to resist wind loads.

2505.2 Resistance to Shear (Steel Framing)

Cold-formed steel-frame shear walls sheathed with gypsum board or gypsum panel products and constructed in accordance with the materials and provisions of Section 2211 are permitted to resist wind loads.

Section 2506 Gypsum Board and Gypsum Panel Product Materials

2506.1 General

Gypsum board, gypsum panel products and accessories shall be identified by the manufacturer's designation to indicate compliance with the appropriate standards referenced in this section and stored to protect such materials from the weather.

2506.2 Standards

Gypsum board and gypsum panel products shall conform to the appropriate standards listed in Table 2506.2 and Chapter 35 and, where required for fire protection, shall conform to the provisions of Chapter 7.

TABLE 2506.2

GYPSUM BOARD AND GYPSUM PANEL PRODUCTS MATERIALS AND ACCESSORIES

MATERIAL	STANDARD
Accessories for gypsum board	ASTM C1047
Adhesives for fastening gypsum board	ASTM C557
Expandable foam adhesives for fastening gypsum wallboard	ASTM D6464
Cold-formed steel studs and track, structural	AISI S240
Cold-formed steel studs and track, nonstructural	AISI S220
Elastomeric joint sealants	ASTM C920
Factory-laminated gypsum panel products	ASTM C1766
Fiber-reinforced gypsum panels	ASTM C1278
Glass mat gypsum backing panel	ASTM C1178
Glass mat gypsum panel 5	ASTM C1658
Glass mat gypsum substrate	ASTM C1177
Joint reinforcing tape and compound	ASTM C474; C475
Nails for gypsum boards	ASTM C514, F547, F1667
Steel screws	ASTM C954; C1002
Standard specification for gypsum board	ASTM C1396

Testing gypsum and gypsum products	ASTM C22; C472; C473
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2506.2.1 Other Materials

Metal suspension systems for acoustical and lay-in panel ceilings shall comply with ASTM C635 listed in Chapter 35.

Section 2507 Lathing and Plastering

2507.1 General

Lathing and plastering materials and accessories shall be marked by the manufacturer's designation to indicate compliance with the appropriate standards referenced in this section and stored in such a manner to protect them from the weather.

2507.2 Standards

Lathing and plastering materials shall conform to the standards listed in Table 2507.2 and Chapter 35 and, where required for fire protection, shall also conform to the provisions of Chapter 7.

TABLE 2507.2

LATH, PLASTERING MATERIALS AND ACCESSORIES

MATERIAL	STANDARD
Accessories for gypsum veneer base	ASTM C1047
Blended cement	ASTM C595
Cold-formed steel studs and track, structural	AISI S240
Cold-formed steel studs and track, nonstructural	AISI S220
Exterior plaster bonding compounds	ASTM C932
Hydraulic cement	ASTM C1157; C1600
Gypsum casting and molding plaster	ASTM C59
Gypsum Keene's cement	ASTM C61
Gypsum plaster	ASTM C28
Gypsum veneer plaster	ASTM C587
Interior bonding compounds, gypsum	ASTM C631
Lime plasters	ASTM C5; C206
Masonry cement	ASTM C91
Metal lath	ASTM C847
Plaster aggregates	
Sand	ASTM C35; C897
Perlite	ASTM C35
Vermiculite	ASTM C35
Plastic cement	ASTM C1328
Portland cement	ASTM C150
Steel screws	ASTM C1002; C954

Welded wire lath	ASTM C933
Woven wire plaster base	ASTM C1032

Section 2508 Gypsum Construction

2508.1 General

Gypsum board, gypsum panel products and gypsum plaster construction shall be of the materials listed in Tables 2506.2 and 2507.2. These materials shall be assembled and installed in compliance with the appropriate standards listed in Tables 2508.1 and 2511.1.1 and Chapter 35.

TABLE 2508.1

INSTALLATION OF GYPSUM CONSTRUCTION

MATERIAL	STANDARD
Gypsum board and gypsum panel products	GA-216; ASTM C840
Gypsum sheathing and gypsum panel products	ASTM C1280
Gypsum veneer base	ASTM C844
Interior lathing and furring	ASTM C841
Steel framing for gypsum board and gypsum panel products	ASTM C754; C1007

2508.2 Limitations

Gypsum wallboard or gypsum plaster shall not be used in any exterior surface where such gypsum construction will be exposed directly to the weather. Gypsum wallboard shall not be used where there will be direct exposure to water or continuous high humidity conditions. Gypsum sheathing shall be installed on exterior surfaces in accordance with ASTM C1280.

2508.2.1 Weather Protection

Gypsum wallboard, gypsum lath or gypsum plaster shall not be installed until weather protection for the installation is provided.

2508.3 Single-Ply Application

Edges and ends of gypsum board and gypsum panel products shall occur on the framing members, except those edges and ends that are perpendicular to the framing members. Edges and ends of gypsum board and gypsum panel products shall be in moderate contact except in concealed spaces where fire-resistance-rated construction, shear resistance or diaphragm action is not required.

2508.3.1 Floating Angles

Fasteners at the top and bottom plates of vertical assemblies, or the edges and ends of horizontal assemblies perpendicular to supports, and at the wall line are permitted to be omitted except on shear resisting elements or fire-resistance-rated assemblies.

Fasteners shall be applied in such a manner as not to fracture the face paper with the fastener head.

2508.4 Adhesives

Gypsum board and gypsum panel products secured to framing with adhesives in ceiling assemblies shall be attached using an approved fastening schedule. Expandable foam adhesives for fastening gypsum wallboard shall conform to ASTM D6464. All other adhesives for the installation of gypsum wallboard shall conform to ASTM C557.

2508.5 Joint Treatment

Gypsum board and gypsum panel product fire-resistance-rated assemblies shall have joints and fasteners treated.

Exception: Joint and fastener treatment need not be provided where any of the following conditions occur:

1. Where the gypsum board or the gypsum panel product is to receive a decorative finish such as wood paneling, battens, acoustical finishes or any similar application that would be equivalent to joint treatment.
2. On single-layer systems where joints occur over wood framing members.
3. Square edge or tongue-and-groove edge gypsum board (V-edge), gypsum panel products, gypsum backing board or gypsum sheathing.
4. On multilayer systems where the joints of adjacent layers are offset.
5. Assemblies tested without joint treatment.

2508.6 Horizontal Gypsum Board or Gypsum Panel Product Diaphragm Ceilings

Gypsum board or gypsum panel products shall be permitted to be used on wood joists to create a horizontal diaphragm ceiling in accordance with Table 2508.6.

TABLE 2508.6

ALLOWABLE (ASD) SHEAR CAPACITY FOR HORIZONTAL WOOD-FRAME GYPSUM BOARD DIAPHRAGM CEILING ASSEMBLIES

MATERIAL	THICKNESS OF MATERIAL (MINIMUM) (inches)	SPACING OF FRAMING MEMBERS (inches)	SHEAR VALUE ^a (PLF OF CEILING)	MIMIMUM FASTENER SIZE
Gypsum board or gypsum panel product	1/2	16 o.c.	90	5d cooler or wallboard nail; 1 ⁵ / ₈ -inch long; 0.086-inch shank; 1 ⁵ / ₆₄ -inch head ^c
Gypsum board or gypsum panel product	1/2	24 o.c.	70	5d cooler or wallboard nail; 1 ⁵ / ₈ -inch long; 0.086-inch shank; 1 ⁵ / ₆₄ -inch head ^c

For SI: 1 inch = 25.4 mm, 1 pound per foot = 14.59 N/m.

a. Values are not cumulative with other horizontal diaphragm values and are for short-term wind loading. Values shall be reduced 25 percent for normal loading.

b. Reserved.

c. 1¹/₄-inch, No. 6 Type S or W screws are permitted to be substituted for the listed nails.

2508.6.1 Diaphragm Proportions

The maximum allowable diaphragm proportions shall be 1¹/₂:1 between shear resisting elements. Rotation or cantilever conditions shall not be permitted.

2508.6.2 Installation

Gypsum board or gypsum panel products used in a horizontal diaphragm ceiling shall be installed perpendicular to ceiling framing members. End joints of adjacent courses of gypsum board shall not occur on the same joist.

2508.6.3 Blocking of Perimeter Edges

Perimeter edges shall be blocked using a wood member not less than 2-inch by 6-inch (51 mm by 152 mm) nominal dimension. Blocking material shall be installed flat over the top plate of the wall to provide a nailing surface not less than 2 inches (51 mm) in width for the attachment of the gypsum board or gypsum panel product.

2508.6.4 Fasteners

Fasteners used for the attachment of gypsum board or gypsum panel products to a horizontal diaphragm ceiling shall be as defined in Table 2508.6. Fasteners shall be spaced not more than 7 inches (178 mm) on center at all supports, including perimeter blocking, and not more than $\frac{3}{8}$ inch (9.5 mm) from the edges and ends of the gypsum board or gypsum panel product.

2508.6.5 Lateral Force Restrictions

Gypsum board or gypsum panel products shall not be used in diaphragm ceilings to resist lateral forces imposed by masonry or concrete construction.

Section 2509 Showers and Water Closets**2509.1 Wet Areas**

Showers and public toilet walls shall conform to Section 1210.2.

2509.2 Base for Tile

Materials used as a base for wall tile in tub and shower areas and wall and ceiling panels in shower areas shall be of materials listed in Table 2509.2 and installed in accordance with the manufacturer's recommendations. Water-resistant gypsum backing board shall be used as a base for tile in water closet compartment walls when installed in accordance with GA-216 or ASTM C840 and the manufacturer's recommendations. Regular gypsum wallboard is permitted under tile or wall panels in other wall and ceiling areas when installed in accordance with GA-216 or ASTM C840.

TABLE 2509.2**BACKERBOARD MATERIALS**

MATERIAL	STANDARD
Glass mat gypsum backing panel	ASTM C1178
Fiber-reinforced gypsum panels	ASTM C1278
Nonasbestos fiber-cement backer board	ASTM C1288 or ISO 8336, Category C
Nonasbestos fiber-mat reinforced cementitious backer unit	ASTM C1325

2509.3 Limitations

Water-resistant gypsum backing board shall not be used in the following locations:

1. Over a vapor retarder in shower or bathtub compartments.
2. Where there will be direct exposure to water or in areas subject to continuous high humidity.

Section 2510 Lathing and Furring for Cement Plaster (Stucco)**2510.1 General**

Exterior and interior cement plaster and lathing shall be done with the appropriate materials listed in Table 2507.2 and Chapter 35.

2510.2 Weather Protection

Materials shall be stored in such a manner as to protect them from the weather.

2510.3 Installation

Installation of these materials shall be in compliance with ASTM C926 and ASTM C1063.

2510.4 Corrosion Resistance

Metal lath and lath attachments shall be of corrosion-resistant material.

2510.5 Backing

Backing or a lath shall provide sufficient rigidity to permit plaster applications.

2510.5.1 Support of Lath

Where lath on vertical surfaces extends between rafters or other similar projecting members, solid backing shall be installed to provide support for lath and attachments.

2510.5.2 Use of Gypsum Backing Board

Gypsum backing for cement plaster shall be in accordance with Section 2510.5.2.1 or 2510.5.2.2.

2510.5.2.1 Gypsum Board as a Backing Board

Gypsum lath or gypsum wallboard shall not be used as a backing for cement plaster.

Exception: Gypsum lath or gypsum wallboard is permitted, with a *water-resistive barrier*, as a backing for self-furred metal lath or self-furred wire fabric lath and cement plaster where either of the following conditions occur:

1. On horizontal supports of ceilings or roof soffits.
2. On interior walls.

2510.5.2.2 Gypsum Sheathing Backing

Gypsum sheathing is permitted as a backing for metal or wire fabric lath and cement plaster on walls. A *water-resistive barrier* shall be provided in accordance with Section 2510.6.

2510.5.3 Backing Not Required

Wire backing is not required under expanded metal lath or paperbacked wire fabric lath.

2510.6 Water-Resistive Barriers

Water-resistive barriers shall be installed as required in Section 1404.2 and, where applied over wood-based sheathing, shall comply with Section 2510.6.1 or Section 2510.6.2.

2510.6.1 Dry Climates

One of the following shall apply for dry (B) climate zones:

1. The *water-resistive barrier* shall be two layers of 10-minute Grade D paper or have a water resistance equal to or greater than two layers of *water-resistive barrier* complying with ASTM E2556, Type I. The individual layers shall be installed independently such that each layer provides a separate continuous plane and any flashing, installed in accordance with Section 1405.4 and intended to drain to the *water-resistive barrier*, is directed between the layers.
2. The *water-resistive barrier* shall be 60-minute Grade D paper or have a water resistance equal to or greater than one layer of *water-resistive barrier* complying with ASTM E2556, Type II. The water-resistive barrier shall be separated from the stucco by a layer of foam plastic insulating sheathing or other nonwater absorbing layer, or a drainage space.

2510.6.2 Moist or Marine Climates

In moist (A) or marine (C) *climate zones*, water-resistive barrier shall comply with one of the following:

1. In addition to complying with Item 1 or 2 of Section 2510.6.1, a space or drainage material not less than $\frac{3}{16}$ inch (4.8 mm) in depth shall be applied to the exterior side of the *water-resistive barrier*.
2. In addition to complying with Item 2 of Section 2510.6.1, drainage on the exterior side of the water-resistive barrier shall have a minimum drainage efficiency of 90% as measured in accordance with ASTM E2273 or Annex A2 of ASTM E2925.

2510.7 Preparation of Masonry and Concrete

Surfaces shall be clean, free from efflorescence, sufficiently damp and rough for proper bond. If the surface is insufficiently rough, *approved* bonding agents or a Portland cement dash bond coat mixed in proportions of not more than two parts volume of sand to one part volume of Portland cement or plastic cement shall be applied. The dash bond coat shall be left undisturbed and shall be moist cured not less than 24 hours.

Section 2511 Interior Plaster

2511.1 General

Plastering gypsum plaster or cement plaster shall be not less than three coats where applied over metal lath or wire fabric lath and not less than two coats where applied over other bases permitted by this chapter.

Exception: Gypsum veneer plaster and cement plaster specifically designed and *approved* for one-coat applications.

2511.1.1 Installation

Installation of lathing and plaster materials shall conform to Table 2511.1.1 and Section 2507.

TABLE 2511.1.1

INSTALLATION OF PLASTER CONSTRUCTION

MATERIAL	STANDARD
Cement plaster	ASTM C926
Gypsum plaster	ASTM C842
Gypsum veneer plaster	ASTM C843
Interior lathing and furring (gypsum plaster)	ASTM C841
Lathing and furring (cement plaster)	ASTM C1063
Steel framing	ASTM C754; C1007

2511.2 Limitations

Plaster shall not be applied directly to fiber insulation board. Cement plaster shall not be applied directly to gypsum lath or gypsum plaster except as specified in Sections 2510.5.1 and 2510.5.2.

2511.3 Grounds

Where installed, grounds shall ensure the minimum thickness of plaster as set forth in ASTM C842 and ASTM C926. Plaster thickness shall be measured from the face of lath and other bases.

2511.4 Interior Masonry or Concrete

Condition of surfaces shall be as specified in Section 2510.7. *Approved* specially prepared gypsum plaster designed for application to concrete surfaces or *approved* acoustical plaster is permitted. The total thickness of base coat plaster applied to concrete ceilings shall be

as set forth in ASTM C842 or ASTM C926. Should ceiling surfaces require more than the maximum thickness permitted in ASTM C842 or ASTM C926, metal lath or wire fabric lath shall be installed on such surfaces before plastering.

2511.5 Wet Areas

Showers and public toilet walls shall conform to Sections 1210.2 and 1210.3. When wood frame walls and partitions are covered on the interior with cement plaster or tile of similar material and are subject to water splash, the framing shall be protected with an *approved* moisture barrier.

Section 2512 Exterior Plaster

2512.1 General

Plastering with cement plaster shall be not less than three coats when applied over metal lath or wire fabric lath or gypsum board backing as specified in Section 2510.5 and shall be not less than two coats when applied over masonry or concrete. If the plaster surface is to be completely covered by veneer or other facing material, or is completely concealed by another wall, plaster application need only be two coats, provided the total thickness is as set forth in ASTM C926.

2512.1.1 On-Grade Floor Slab

On wood frame or steel stud construction with an on-grade concrete floor slab system, exterior plaster shall be applied in such a manner as to cover, but not to extend below, the lath and paper. The application of lath, paper and flashing or drip screeds shall comply with ASTM C1063.

2512.1.2 Weep Screeds

A minimum 0.019-inch (0.48 mm) (No. 26 galvanized sheet gage), corrosion-resistant weep screed with a minimum vertical attachment flange of 3 $\frac{1}{2}$ inches (89 mm) shall be provided at or below the foundation plate line on exterior stud walls in accordance with ASTM C926. The weep screed shall be placed a minimum of 4 inches (102 mm) above the earth or 2 inches (51 mm) above paved areas and be of a type that will allow trapped water to drain to the exterior of the building. The *water-resistive barrier* shall lap the attachment flange. The exterior lath shall cover and terminate on the attachment flange of the weep screed.

2512.2 Plasticity Agents

Only *approved* plasticity agents and *approved* amounts thereof shall be added to Portland cement or blended cements. When plastic cement or masonry cement is used, no additional lime or plasticizers shall be added. Hydrated lime or the equivalent amount of lime putty used as a plasticizer is permitted to be added to cement plaster or cement and lime plaster in an amount not to exceed that set forth in ASTM C926.

2512.3 Limitations

Gypsum plaster shall not be used on exterior surfaces.

2512.4 Cement Plaster

Plaster coats shall be protected from freezing for a period of not less than 24 hours after set has occurred. Plaster shall be applied when the ambient temperature is higher than 40°F (4°C), unless provisions are made to keep cement plaster work above 40°F (4°C) during application and 48 hours thereafter.

2512.5 Second-Coat Application

The second coat shall be brought out to proper thickness, rodded and floated sufficiently rough to provide adequate bond for the finish coat. The second coat shall have no variation greater than $\frac{1}{4}$ inch (6.4 mm) in any direction under a 5-foot (1524 mm) straight edge.

2512.6 Curing and Interval

First and second coats of cement plaster shall be applied and moist cured as set forth in ASTM C926 and Table 2512.6.

TABLE 2512.6

CEMENT PLASTERS

COAT	MINIMUM PERIOD MOIST CURING	MINIMUM INTERVAL BETWEEN COATS
First	48 hours ^a	48 hours ^b

Second	48 hours	7 days ^c
Finish	—	Note c

- a. The first two coats shall be as required for the first coats of exterior plaster, except that the moist-curing time period between the first and second coats shall be not less than 24 hours. Moist curing shall not be required where job and weather conditions are favorable to the retention of moisture in the cement plaster for the required time period.
- b. Twenty-four-hour minimum interval between coats of interior cement plaster. For alternative method of application, see Section 2512.8.
- c. Finish coat plaster is permitted to be applied to interior cement plaster base coats after a 48-hour period.

2512.7 Application to Solid Backings

Where applied over gypsum backing as specified in Section 2510.5 or directly to unit masonry surfaces, the second coat is permitted to be applied as soon as the first coat has attained sufficient hardness.

2512.8 Alternate Method of Application

The second coat is permitted to be applied as soon as the first coat has attained sufficient rigidity to receive the second coat.

2512.8.1 Admixtures

When using this method of application, calcium aluminate cement up to 15 percent of the weight of the Portland cement is permitted to be added to the mix.

2512.8.2 Curing

Curing of the first coat is permitted to be omitted and the second coat shall be cured as set forth in ASTM C926 and Table 2512.6.

2512.9 Finish Coats

Cement plaster finish coats shall be applied over base coats that have been in place for the time periods set forth in ASTM C926. The third or finish coat shall be applied with sufficient material and pressure to bond and to cover the brown coat and shall be of sufficient thickness to conceal the brown coat.

Section 2513 Exposed Aggregate Plaster

2513.1 General

Exposed natural or integrally colored aggregate is permitted to be partially embedded in a natural or colored bedding coat of cement plaster or gypsum plaster, subject to the provisions of this section.

2513.2 Aggregate

The aggregate shall be applied manually or mechanically and shall consist of marble chips, pebbles or similar durable, moderately hard (three or more on the Mohs hardness scale), nonreactive materials.

2513.3 Bedding Coat Proportions

The bedding coat for interior or exterior surfaces shall be composed of one part Portland cement and one part Type S lime; or one part blended cement and one part Type S lime; or masonry cement; or plastic cement and a maximum of three parts of graded white or natural sand by volume. The bedding coat for interior surfaces shall be composed of 100 pounds (45.4 kg) of neat gypsum plaster and a maximum of 200 pounds (90.8 kg) of graded white sand. A factory-prepared bedding coat for interior or exterior use is permitted. The bedding coat for exterior surfaces shall have a minimum compressive strength of 1,000 pounds per square inch (psi) (6895 kPa).

2513.4 Application

The bedding coat is permitted to be applied directly over the first (scratch) coat of plaster, provided the ultimate overall thickness is a minimum of $\frac{7}{8}$ inch (22 mm), including lath. Over concrete or masonry surfaces, the overall thickness shall be a minimum of $\frac{1}{2}$ inch (12.7 mm).

2513.5 Bases

Exposed aggregate plaster is permitted to be applied over concrete, masonry, cement plaster base coats or gypsum plaster base coats installed in accordance with Section 2511 or 2512.

2513.6 Preparation of Masonry and Concrete

Masonry and concrete surfaces shall be prepared in accordance with the provisions of Section 2510.7.

2513.7 Curing of Base Coats

Cement plaster base coats shall be cured in accordance with ASTM C926. Cement plaster bedding coats shall retain sufficient moisture for hydration (hardening) for 24 hours minimum or, where necessary, shall be kept damp for 24 hours by light water spraying.

Section 2514 Reinforced Gypsum Concrete**2514.1 General**

Reinforced gypsum concrete shall comply with the requirements of ASTM C317 and ASTM C956.

2514.2 Minimum Thickness

The minimum thickness of reinforced gypsum concrete shall be 2 inches (51 mm) except the minimum required thickness shall be reduced to $1\frac{1}{2}$ inches (38 mm), provided the following conditions are satisfied:

1. The overall thickness, including the formboard, is not less than 2 inches (51 mm).
2. The clear span of the gypsum concrete between supports does not exceed 33 inches (838 mm).
3. Diaphragm action is not required.
4. The design live load does not exceed 40 pounds per square foot (psf) (1915 Pa).

Section 2515 High-Velocity Hurricane Zones—Lathing

RESERVED

Section 2516 High-Velocity Hurricane Zones—Plaster

RESERVED

Section 2517 High-Velocity Hurricane Zones—Stucco

RESERVED

Section 2518 High-Velocity Hurricane Zones—Gypsum Board Products and Accessory Items

RESERVED

Section 2519 High-Velocity Hurricane Zones—Suspended and Furred Ceilings

RESERVED

Section 2520 High-Velocity Hurricane Zones—Asbestos

RESERVED

Section 2521 High-Velocity Hurricane Zones—Tile

RESERVED

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Chapter 26 Plastic

Section 2601 General

2601.1 Scope

These provisions shall govern the materials, design, application, construction and installation of foam plastic, foam plastic insulation, plastic veneer, interior plastic finish and *trim*, light-transmitting plastics and plastic composites, including plastic lumber. See Chapter 14 for requirements for *exterior wall* finish and *trim*.

Exception: Buildings and structures located within the high-velocity hurricane zone shall also comply with the provisions of Section 2615.

Section 2602 Definitions

2602.1 Definitions

The following terms are defined in Chapter 2:

FIBER-REINFORCED POLYMER.

FOAM PLASTIC INSULATION.

LIGHT-DIFFUSING SYSTEM.

LIGHT-TRANSMITTING PLASTIC ROOF PANELS.

LIGHT-TRANSMITTING PLASTIC WALL PANELS.

PLASTIC, APPROVED.

PLASTIC COMPOSITE.

PLASTIC GLAZING.

PLASTIC LUMBER.

THERMOPLASTIC MATERIAL.

THERMOSETTING MATERIAL.

WOOD/PLASTIC COMPOSITE.

Section 2603 Foam Plastic Insulation

2603.1 General

The provisions of this section shall govern the requirements and uses of foam plastic insulation in buildings and structures.

2603.1.1 Spray-Applied Foam Plastic

Single- and multiple-component spray-applied foam plastic insulation shall comply with the provisions of Section 2603 and ICC 1100-2018.

2603.2 Labeling and Identification

Packages and containers of foam plastic insulation and foam plastic insulation components delivered to the job site shall bear the *label* of an *approved agency* showing the manufacturer's name, product listing, product identification and information sufficient to determine that the end use will comply with the code requirements.

2603.3 Surface-Burning Characteristics

Unless otherwise indicated in this section, foam plastic insulation and foam plastic cores of manufactured assemblies shall have a flame spread index of not more than 75 and a smoke-developed index of not more than 450 where tested in the maximum thickness intended

for use in accordance with ASTM E84 or UL 723. Loose fill-type foam plastic insulation shall be tested as board stock for the flame spread and smoke-developed indexes.

Exceptions:

1. Smoke-developed index for interior *trim* as provided for in Section 2604.2.
2. In cold storage buildings, ice plants, food plants, food processing rooms and similar areas, foam plastic insulation where tested in a thickness of 4 inches (102 mm) shall be permitted in a thickness up to 10 inches (254 mm) where the building is equipped throughout with an automatic fire sprinkler system in accordance with Section 903.3.1.1. The approved *automatic sprinkler system* shall be provided in both the room and that part of the building in which the room is located.
3. Foam plastic insulation that is a part of a Class A, B or C roof-covering assembly provided the assembly with the foam plastic insulation satisfactorily passes NFPA 276 or UL 1256. The smoke-developed index shall not be limited for roof applications.
4. Foam plastic insulation greater than 4 inches (102 mm) in thickness shall have a maximum flame spread index of 75 and a smoke-developed index of 450 where tested at a minimum thickness of 4 inches (102 mm), provided the end use is approved in accordance with Section 2603.9 using the thickness and density intended for use.
5. Flame spread and smoke-developed indexes for foam plastic interior signs in *covered and open mall buildings* provided the signs comply with Section 402.6.4.

2603.4 Thermal Barrier

Except as provided for in Sections 2603.4.1 and 2603.9, foam plastic shall be separated from the interior of a building by an approved thermal barrier of $\frac{1}{2}$ -inch (12.7 mm) gypsum wallboard, heavy timber in accordance with Section 602.4 or a material that is tested in accordance with and meets the acceptance criteria of both the Temperature Transmission Fire Test and the Integrity Fire Test of NFPA 275. Combustible concealed spaces shall comply with Section 718.

2603.4.1 Thermal Barrier Not Required

The thermal barrier specified in Section 2603.4 is not required under the conditions set forth in Sections 2603.4.1.1 through 2603.4.1.14.

2603.4.1.1 Masonry or Concrete Construction

A thermal barrier is not required for foam plastic installed in a masonry or concrete wall, floor or roof system where the foam plastic insulation is covered on each face by not less than 1-inch (25 mm) thickness of masonry or concrete.

2603.4.1.2 Cooler and Freezer Walls

Foam plastic installed in a maximum thickness of 10 inches (254 mm) in cooler and freezer walls shall:

1. Have a flame spread index of 25 or less and a smoke-developed index of not more than 450, where tested in a minimum 4-inch (102 mm) thickness.
2. Have flash ignition and self-ignition temperatures of not less than 600°F and 800°F (316°C and 427°C), respectively.
3. Have a covering of not less than 0.032-inch (0.8 mm) aluminum or corrosion-resistant steel having a base metal thickness not less than 0.0160 inch (0.4 mm) at any point.
4. Be protected by an *automatic sprinkler system* in accordance with Section 903.3.1.1. Where the cooler or freezer is within a building, both the cooler or freezer and that part of the building in which it is located shall be sprinklered.

2603.4.1.3 Walk-in Coolers

In nonsprinklered buildings, foam plastic having a thickness that does not exceed 4 inches (102 mm) and a maximum flame spread index of 75 is permitted in walk-in coolers or freezer units where the aggregate floor area does not exceed 400 square feet (37 m^2) and the foam plastic is covered by a metal facing not less than 0.032-inch-thick (0.81 mm) aluminum or corrosion-resistant steel having a minimum base metal thickness of 0.016 inch (0.41 mm). A thickness of up to 10 inches (254 mm) is permitted where protected by a thermal barrier.

2603.4.1.4 Exterior Walls, One-Story Buildings

For one-story buildings, foam plastic having a flame spread index of 25 or less, and a smoke-developed index of not more than 450, shall be permitted without thermal barriers in or on *exterior walls* in a thickness not more than 4 inches (102 mm) where the foam plastic is covered by a thickness of not less than 0.032-inch-thick (0.81 mm) aluminum or corrosion-resistant steel having a base metal thickness of 0.0160 inch (0.41 mm) and the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

2603.4.1.5 Roofing

A thermal barrier is not required for foam plastic insulation that is a part of a Class A, B or C roof-covering assembly that is installed in accordance with the code and the manufacturer's instructions and is either constructed as described in Item 1 or tested as described in Item 2.

1. The roof assembly is separated from the interior of the building by wood structural panel sheathing not less than 0.47 inch (11.9 mm) in thickness bonded with exterior glue, with edges supported by blocking, tongue-and-groove joints, other approved type of edge support or an equivalent material.
2. The assembly with the foam plastic insulation satisfactorily passes NFPA 276 or UL 1256.

2603.4.1.6 Attics and Crawl Spaces

Within an attic or crawl space where entry is made only for service of utilities, foam plastic insulation shall be protected against ignition by $1\frac{1}{2}$ -inch-thick (38 mm) mineral fiber insulation; $\frac{1}{4}$ -inch-thick (6.4 mm) wood structural panel, particleboard or hardboard; $\frac{3}{8}$ -inch (9.5 mm) gypsum wallboard, corrosion-resistant steel having a base metal thickness of 0.016 inch (0.4 mm); $1\frac{1}{2}$ -inch-thick (38 mm) self-supported spray-applied cellulose insulation in attic spaces only or other approved material installed in such a manner that the foam plastic insulation is not exposed. The protective covering shall be consistent with the requirements for the type of construction.

2603.4.1.7 Doors Not Required to Have a Fire Protection Rating

Where pivoted or side-hinged doors are permitted without a fire protection rating, foam plastic insulation, having a flame spread index of 75 or less and a smoke-developed index of not more than 450, shall be permitted as a core material where the door facing is of metal having a minimum thickness of 0.032-inch (0.8 mm) aluminum or steel having a base metal thickness of not less than 0.016 inch (0.4 mm) at any point.

2603.4.1.8 Exterior Doors in Buildings of Group R-2 or R-3

In occupancies classified as Group R-2 or R-3, foam-filled exterior entrance doors to individual *dwelling units* that do not require a fire-resistance rating shall be faced with aluminum, steel, fiberglass, wood or other approved materials.

2603.4.1.9 Garage Doors

Where garage doors are permitted without a fire-resistance rating and foam plastic is used as a core material, the door facing shall be metal having a minimum thickness of 0.032-inch (0.8 mm) aluminum or 0.010-inch (0.25 mm) steel or the facing shall be minimum 0.125-inch-thick (3.2 mm) wood. Garage doors having facings other than those described above shall be tested in accordance with, and meet the acceptance criteria of, DASMA 107.

Exception: Garage doors using foam plastic insulation complying with Section 2603.3 in detached and attached garages associated with one- and two-family dwellings need not be provided with a thermal barrier.

2603.4.1.10 Siding Backer Board

Foam plastic insulation of not more than 2,000 British thermal units per square feet (Btu/sq. ft.) (22.7 mJ/m²) as determined by NFPA 259 shall be permitted as a siding backer board with a maximum thickness of $\frac{1}{2}$ inch (12.7 mm), provided it is separated from the

interior of the building by not less than 2 inches (51 mm) of mineral fiber insulation or equivalent or where applied as insulation with re-siding over existing wall construction.

2603.4.1.11 Interior Trim

Foam plastic used as interior *trim* in accordance with Section 2604 shall be permitted without a thermal barrier.

2603.4.1.12 Interior Signs

Foam plastic used for interior signs in *covered mall buildings* in accordance with Section 402.6.4 shall be permitted without a thermal barrier. Foam plastic signs that are not affixed to interior building surfaces shall comply with the *Florida Fire Prevention Code*.

2603.4.1.13 Type V Construction

Foam plastic spray applied to a sill plate, joist header and rim joist in Type V construction is subject to all of the following:

1. The maximum thickness of the foam plastic shall be $3\frac{1}{4}$ inches (82.6 mm).
2. The density of the foam plastic shall be in the range of 1.5 to 2.0pcf (24 to 32 kg/m³).
3. The foam plastic shall have a flame spread index of 25 or less and an accompanying smoke-developed index of 450 or less when tested in accordance with ASTM E84 or UL 723.

2603.4.1.14 Floors

The thermal barrier specified in Section 2603.4 is not required to be installed on the walking surface of a structural floor system that contains foam plastic insulation when the foam plastic is covered by a minimum nominal $\frac{1}{2}$ -inch-thick (12.7 mm) wood structural panel or approved equivalent. The thermal barrier specified in Section 2603.4 is required on the underside of the structural floor system that contains foam plastic insulation when the underside of the structural floor system is exposed to the interior of the building.

Exception: Foam plastic used as part of an interior floor finish.

2603.5 Exterior Walls of Buildings of Any Height

Exterior walls of buildings of Type I, II, III or IV construction of any height shall comply with Sections 2603.5.1 through 2603.5.7. *Exterior walls* of cold storage buildings required to be constructed of noncombustible materials, where the building is more than one *story* in height, shall comply with the provisions of Sections 2603.5.1 through 2603.5.7. *Exterior walls* of buildings of Type V construction shall comply with Sections 2603.2, 2603.3 and 2603.4.

2603.5.1 Fire-Resistance-Rated Walls

Where the wall is required to have a fire-resistance rating, data based on tests conducted in accordance with ASTM E119 or UL 263 shall be provided to substantiate that the fire-resistance rating is maintained.

2603.5.2 Thermal Barrier

Any foam plastic insulation shall be separated from the building interior by a thermal barrier meeting the provisions of Section 2603.4, unless special approval is obtained on the basis of Section 2603.9.

Exception: One-story buildings complying with Section 2603.4.1.4.

2603.5.3 Potential Heat

The potential heat of foam plastic insulation in any portion of the wall or panel shall not exceed the potential heat expressed in Btu per square feet (mJ/m²) of the foam plastic insulation contained in the wall assembly tested in accordance with Section 2603.5.5. The potential heat of the foam plastic insulation shall be determined by tests conducted in accordance with NFPA 259 and the results shall be expressed in Btu per square feet (mJ/m²).

Exception: One-story buildings complying with Section 2603.4.1.4.

2603.5.4 Flame Spread and Smoke-Developed Indexes

Foam plastic insulation, exterior coatings and facings shall be tested separately in the thickness intended for use, but not to exceed 4 inches (102 mm), and shall each have a flame spread index of 25 or less and a smoke-developed index of 450 or less as determined in accordance with ASTM E84 or UL 723.

Exception: Prefabricated or factory-manufactured panels having minimum 0.020-inch (0.51 mm) aluminum facings and a total thickness of $\frac{1}{4}$ inch (6.4 mm) or less are permitted to be tested as an assembly where the foam plastic core is not exposed in the course of construction.

2603.5 Vertical and Lateral Fire Propagation

The exterior wall assembly shall be tested in accordance with and comply with the acceptance criteria of NFPA 285.

Exceptions:

1. One-story buildings complying with Section 2603.4.1.4.
2. Wall assemblies where the foam plastic insulation is covered on each face by not less than 1-inch (25 mm) thickness of masonry or concrete and meeting one of the following:
 - 2.1. There is no airspace between the insulation and the concrete or masonry.
 - 2.2. The insulation has a flame spread index of not more than 25 as determined in accordance with ASTM E84 or UL 723 and the maximum airspace between the insulation and the concrete or masonry is not more than 1 inch (25 mm).

2603.5.6 Label Required

The edge or face of each piece, package or container of foam plastic insulation shall bear the *label* of an *approved agency*. The *label* shall contain the manufacturer's or distributor's identification, model number, serial number or definitive information describing the product or materials' performance characteristics and *approved agency*'s identification.

2603.5.7 Ignition

Exterior walls shall not exhibit sustained flaming where tested in accordance with NFPA 268. Where a material is intended to be installed in more than one thickness, tests of the minimum and maximum thickness intended for use shall be performed.

Exception: Assemblies protected on the outside with one of the following:

1. A thermal barrier complying with Section 2603.4.
2. A minimum 1-inch (25 mm) thickness of concrete or masonry.
3. Glass-fiber-reinforced concrete panels of a minimum thickness of $\frac{3}{8}$ inch (9.5 mm).
4. Metal-faced panels having minimum 0.019-inch-thick (0.48 mm) aluminum or 0.016-inch-thick (0.41 mm) corrosion-resistant steel outer facings.
5. A minimum $\frac{7}{8}$ -inch (22.2 mm) thickness of stucco complying with Section 2510.
6. A minimum $\frac{1}{4}$ -inch (6.4 mm) thickness of fiber-cement lap, panel or shingle siding complying with Sections 1405.16 and 1405.16.1 or 1405.16.2.

2603.6 Roofing

Foam plastic insulation meeting the requirements of Sections 2603.2, 2603.3 and 2603.4 shall be permitted as part of a roof-covering assembly, provided the assembly with the foam plastic insulation is a Class A, B or C roofing assembly where tested in accordance with

ASTM E108 or UL 790.

2603.7 Foam Plastic Insulation in Plenums as Interior Finish or Interior Trim

Foam plastic insulation in plenums used as interior wall or ceiling finish, or interior trim, shall exhibit a flame spread index of 25 or less and a smoke-developed index of 50 or less when tested in accordance with ASTM E84 or UL 723 at the maximum thickness and density intended for use, and shall be tested in accordance with NFPA 286 and meet the acceptance criteria of Section 803.1.2.

Exceptions:

1. Foam plastic in plenums used as interior wall or ceiling finish, or interior trim, shall exhibit a flame spread index of 75 or less and a smoke-developed index of 450 or less when tested in accordance with ASTM E84 or UL 723 at the maximum thickness and density intended for use, where it is separated from the airflow in the plenum by a thermal barrier complying with Section 2603.4.
2. Foam plastic in plenums used as interior wall or ceiling finish, or interior trim, shall exhibit a flame spread index of 75 or less and a smoke-developed index of 450 or less when tested in accordance with ASTM E84 or UL 723 at the maximum thickness and density intended for use, where it is separated from the airflow in the plenum by corrosion resistant steel having a base metal thickness of not less than 0.0160 inch (0.4 mm).
3. Foam plastic in plenums used as interior wall or ceiling finish, or interior trim, shall exhibit a flame spread index of 75 or less and a smoke-developed index of 450 or less when tested in accordance with ASTM E84 or UL 723 at the maximum thickness and density intended for use, where it is separated from the airflow in the plenum by not less than a 1 inch (25 mm) thickness of masonry or concrete.

2603.8 Protection Against Termites

Extruded and expanded polystyrene, polyisocyanurate and other foam plastics shall not be installed on the exterior face or under interior or exterior foundation walls or slab foundations located below grade. The clearance between foam plastics installed above grade and exposed earth shall be not less than 6 inches (152 mm).

Exceptions:

1. Buildings where the structural members of walls, floors, ceilings and roofs are entirely of noncombustible materials or preservative-treated wood.
2. An approved method of protecting the foam plastic and structure from subterranean termite damage is provided.
3. On the interior side of basement walls.

Figure 2603.8 Termite Infestation Probability Map. Reserved.

2603.9 Special Approval

Foam plastic shall not be required to comply with the requirements of Section 2603.4 or those of Section 2603.6 where specifically approved based on large-scale tests such as, but not limited to, NFPA 286 (with the acceptance criteria of Section 803.1.2.1), FM 4880, UL 1040 or UL 1715. Such testing shall be related to the actual end-use configuration and be performed on the finished manufactured foam plastic assembly in the maximum thickness intended for use. Foam plastics that are used as interior finish on the basis of special tests shall also conform to the flame spread and smoke-developed requirements of Chapter 8. Assemblies tested shall include seams, joints and other typical details used in the installation of the assembly and shall be tested in the manner intended for use.

2603.10 Wind Resistance

Foam plastic insulation complying with ASTM C578 and ASTM C1289 and used as exterior wall sheathing on framed wall assemblies shall comply with ANSI/FS 100 for wind pressure resistance.

2603.11 Cladding Attachment Over Foam Sheathing to Masonry or Concrete Wall Construction

Cladding shall be specified and installed in accordance with Chapter 14 and the cladding manufacturer's installation instructions or an approved design. Foam sheathing shall be attached to masonry or concrete construction in accordance with the insulation manufacturer's installation instructions or an approved design. Furring and furring attachments through foam sheathing shall be designed to resist design loads determined in accordance with Chapter 16, including support of cladding weight as applicable. Fasteners used to attach cladding or furring through foam sheathing to masonry or concrete substrates shall be approved for application into masonry or concrete material and shall be installed in accordance with the fastener manufacturer's installation instructions.

Exceptions:

1. Where the cladding manufacturer has provided approved installation instructions for application over foam sheathing and connection to a masonry or concrete substrate, those requirements shall apply.
2. For exterior insulation and finish systems, refer to Section 1408.
3. For anchored masonry or stone veneer installed over foam sheathing, refer to Section 1405.

2603.12 Cladding Attachment Over Foam Sheathing to Cold-Formed Steel Framing

Cladding shall be specified and installed in accordance with Chapter 14 and the cladding manufacturer's approved installation instructions, including any limitations for use over foam plastic sheathing, or an approved design. Where used, furring and furring attachments shall be designed to resist design loads determined in accordance with Chapter 16. In addition, the cladding or furring attachments through foam sheathing to cold-formed steel framing shall meet or exceed the minimum fastening requirements of Sections 2603.12.1 and 2603.12.2, or an approved design for support of cladding weight.

Exceptions:

1. Where the cladding manufacturer has provided approved installation instructions for application over foam sheathing, those requirements shall apply.
2. For exterior insulation and finish systems, refer to Section 1408.
3. For anchored masonry or stone veneer installed over foam sheathing, refer to Section 1405.

2603.12.1 Direct Attachment

Where cladding is installed directly over foam sheathing without the use of furring, cladding minimum fastening requirements to support the cladding weight shall be as specified in Table 2603.12.1.

TABLE 2603.12.1

CLADDING MINIMUM FASTENING REQUIREMENTS FOR DIRECT ATTACHMENT OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT^a

CLADDING FASTENER THROUGH FOAM SHEATHING INTO:	CLADDING FASTENER TYPE AND MINIMUM SIZE ^b	CLADDING FASTENER VERTICAL SPACING (inches)	MAXIMUM THICKNESS OF FOAM SHEATHING ^c (inches)					
			16"o.c. fastener horizontal spacing			24"o.c. fastener horizontal spacing		
			Cladding weight			Cladding weight		
			3 psf	11 psf	25 psf	3 psf	11 psf	25 psf
Cold-formed steel framing (minimum penetration of	#8 screw into 33 mil steel or thicker	6	3	3	1.5	3	2	DR
		8	3	2	0.5	3	1.5	DR

steel thickness plus 3 threads)		12	3	1.5	DR	3	0.75	DR
	#10 screw into 33 mil steel	6	4	3	2	4	3	0.5
		8	4	3	1	4	2	DR
		12	4	2	DR	3	1	DR
	#10 screw into 43 mil steel or thicker	6	4	4	3	4	4	2
		8	4	4	2	4	3	1.5
		12	4	3	1.5	4	3	DR

For SI: 1 inch = 25.4 mm; 1 pound per square foot (psf) = 0.0479 kPa, 1 pound per square inch = 0.00689 MPa.

DR = design required; o.c. = on center.

- a. Cold-formed steel framing shall be minimum 33 ksi steel for 33 mil and 43 mil steel and 50 ksi steel for 54 mil steel or thicker.
- b. Screws shall comply with the requirements of AISI S240.
- c. Foam sheathing shall have a minimum compressive strength of 15 pounds per square inch in accordance with ASTM C578 or ASTM C1289.

2603.12.2 Furred Cladding Attachment

Where steel or wood furring is used to attach cladding over foam sheathing, furring minimum fastening requirements to support the cladding weight shall be as specified in Table 2603.12.2. Where placed horizontally, wood furring shall be preservative-treated wood in accordance with Section 2303.1.9 or naturally durable wood and fasteners shall be corrosion resistant in accordance Section 2304.10.5. Steel furring shall have a minimum G60 galvanized coating.

TABLE 2603.12.2

FURRING MINIMUM FASTENING REQUIREMENTS FOR APPLICATION OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT^a

FURRING MATERIAL	FRAMING MEMBER	FASTENER TYPE AND MINIMUM SIZE ^b	MINIMUM PENETRATION INTO WALL FRAMING (inches)	FASTENER SPACING IN FURRING (inches)	MAXIMUM THICKNESS OF FOAM SHEATHING ^d (inches)					
					16" o.c. furring ^e			24" o.c. furring ^e		
					Cladding weight			Cladding weight		
					3 psf	11 psf	25 psf	3 psf	11 psf	25 psf
Minimum 33 mil steel furring or minimum 1x wood furring ^c	33 mil cold-formed steel stud	#8 screw	Steel thickness plus 3 threads	12	3	1.5	DR	3	0.5	DR
				16	3	1	DR	2	DR	DR
				24	2	DR	DR	2	DR	DR
		#10 screw	Steel thickness plus 3 threads	12	4	2	DR	4	1	DR
				16	4	1.5	DR	3	DR	DR

			24	3	DR	DR	2	DR	DR
43 mil or thicker cold-formed steel stud	#8 Screw	Steel thickness plus 3 threads	12	3	1.5	DR	3	0.5	DR
			16	3	1	DR	2	DR	DR
			24	2	DR	DR	2	DR	DR
	#10 screw	Steel thickness plus 3 threads	12	4	3	1.5	4	3	DR
			16	4	3	0.5	4	2	DR
			24	4	2	DR	4	0.5	DR

For SI: 1 inch = 25.4 mm; 1 pound per square foot (psf) = 0.0479 kPa, 1 pound per square inch = 0.00689 MPa.

DR = design required: o.c. = on center.

- a. Wood furring shall be Spruce-Pine fir or any softwood species with a specific gravity of 0.42 or greater. Cold-formed steel furring shall be minimum 33 ksi steel. Steel studs shall be minimum 33 ksi steel for 33 mil and 43 mil thickness and 50 ksi steel for 54 mil steel or thicker.
- b. Screws shall comply with the requirements of AISI S240.
- c. Where the required cladding fastener penetration into wood material exceeds $\frac{3}{4}$ inch and is not more than $1\frac{1}{2}$ inches, a minimum 2-inch nominal wood furring shall be used or an approved design.
- d. Foam sheathing shall have a minimum compressive strength of 15 pounds per square inch in accordance with ASTM C578 or ASTM C1289.
- e. Furring shall be spaced not more than 24 inches on center, in a vertical or horizontal orientation. In a vertical orientation, furring shall be located over wall studs and attached with the required fastener spacing. In a horizontal orientation, the indicated 8-inch and 12-inch fastener spacing in furring shall be achieved by use of two fasteners into studs at 16 inches and 24 inches on center, respectively.

2603.13 Cladding Attachment Over Foam Sheathing to Wood Framing

Cladding shall be specified and installed in accordance with Chapter 14 and the cladding manufacturer's installation instructions. Where used, furring and furring attachments shall be designed to resist design loads determined in accordance with Chapter 16. In addition, the cladding or furring attachments through foam sheathing to framing shall meet or exceed the minimum fastening requirements of Section 2603.13.1, Section 2603.13.2 or an approved design for support of cladding weight.

Exceptions:

1. Where the cladding manufacturer has provided approved installation instructions for application over foam sheathing, those requirements shall apply.
2. For exterior insulation and finish systems, refer to Section 1408.
3. For anchored masonry or stone veneer installed over foam sheathing, refer to Section 1405.

2603.13.1 Direct Attachment

Where cladding is installed directly over foam sheathing without the use of furring, cladding minimum fastening requirements to support the cladding weight shall be as specified in Table 2603.13.1.

TABLE 2603.13.1
CLADDING MINIMUM FASTENING REQUIREMENTS FOR DIRECT ATTACHMENT OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT^a

Cladding Fastener through Foam Sheathing into:	Cladding Fastener Type and Minimum Size ^b	Cladding Fastener Vertical Spacing (inches)	Maximum Thickness of Foam Sheathing ^c (inches)							
			16" o.c. Fastener Horizontal Spacing				24" o.c. Fastener Horizontal Spacing			
			Cladding Weight:				Cladding Weight:			
			3 psf	11 psf	18 psf	25 psf	3 psf	11 psf	18 psf	25 psf
Wood Framing (minimum 1 ¹ / ₄ inch penetration)	0.113" diameter nail	6	2.00	1.45	0.75	DR	2.00	0.85	DR	DR
		8	2.00	1.00	DR	DR	2.00	0.55	DR	DR
		12	2.00	0.55	DR	DR	1.85	DR	DR	DR
	0.120" diameter nail	6	3.00	1.70	0.90	0.55	3.00	1.05	0.50	DR
		8	3.00	1.20	0.60	DR	3.00	0.70	DR	DR
		12	3.00	0.70	DR	DR	2.15	DR	DR	DR
	0.131" diameter nail	6	4.00	2.15	1.20	0.75	4.00	1.35	0.70	DR
		8	4.00	1.55	0.80	DR	4.00	0.90	DR	DR
		12	4.00	0.90	DR	DR	2.70	0.50	DR	DR
	0.162" diameter nail	6	4.00	3.55	2.05	1.40	4.00	2.25	1.25	0.80
		8	4.00	2.55	1.45	0.95	4.00	1.60	0.85	0.50
		12	4.00	1.60	0.85	0.50	4.00	0.95	DR	DR

For SI: 1 inch = 25.4 mm; 1 pound per square foot (psf) = 0.0479 kPa.

DR = design required; o.c. = on center.

- a. Wood framing shall be Spruce-Pine-Fir or any wood species with a specific gravity of 0.42 or greater in accordance with AFPA/NDS.
- b. Nail fasteners shall comply with ASTM F1667, except nail length shall be permitted to exceed ASTM F1667 standard lengths.
- c. Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with ASTM C578 or ASTM C1289.

2603.13.2 Furred Cladding Attachment

Where wood furring is used to attach cladding over foam sheathing, furring minimum fastening requirements to support the cladding weight shall be as specified in Table 2603.13.2. Where placed horizontally, wood furring shall be preservative-treated wood in accordance with Section 2303.1.9 or naturally durable wood and fasteners shall be corrosion resistant in accordance with Section 2304.10.5.

TABLE 2603.13.2

**FURRING MINIMUM FASTENING REQUIREMENTS FOR APPLICATION OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING
WEIGHT^{a,b}**

Furring Material	Framing Member	Fastener Type and Minimum Size	Minimum Penetration into Wall Framing (inches)	Fastener Spacing in Furring (inches)	Maximum Thickness of Foam Sheathing ^d (inches)							
					16" o.c. Furring ^e				24" o.c. Furring ^e			
					Siding Weight:				Siding Weight:			
					3 psf	11 psf	18 psf	25 psf	3 psf	11 psf	18 psf	25 psf
Minimum 1x Wood Furring ^c	Minimum 2x Wood Stud	0.131" diameter nail	1 ¹ / ₄	8	4.00	2.45	1.45	0.95	4.00	1.60	0.85	DR
				12	4.00	1.60	0.85	DR	4.00	0.95	DR	DR
				16	4.00	1.10	DR	DR	3.05	0.60	DR	DR
		0.162" diameter nail	1 ¹ / ₄	8	4.00	4.00	2.45	1.60	4.00	2.75	1.45	0.85
				12	4.00	2.75	1.45	0.85	4.00	1.65	0.75	DR
				16	4.00	1.90	0.95	DR	4.00	1.05	DR	DR
		No. 10 wood screw	1	12	4.00	2.30	1.20	0.70	4.00	1.40	0.60	DR
				16	4.00	1.65	0.75	DR	4.00	0.90	DR	DR
				24	4.00	0.90	DR	DR	2.85	DR	DR	DR
		¹ / ₄ " lag screw	1 ¹ / ₂	12	4.00	2.65	1.50	0.90	4.00	1.65	0.80	DR
				16	4.00	1.95	0.95	0.50	4.00	1.10	DR	DR
				24	4.00	1.10	DR	DR	3.25	0.50	DR	DR

For SI: 1 inch = 25.4 mm; 1 pound per square foot (psf) = 0.0479 kPa.

DR = design required; o.c. = on center.

- a. Wood framing and furring shall be Spruce-Pine-Fir or any wood species with a specific gravity of 0.42 or greater in accordance with AFPA/NDS.
- b. Nail fasteners shall comply with ASTM F1667, except nail length shall be permitted to exceed ASTM F1667 standard lengths.
- c. Where the required cladding fastener penetration into wood material exceeds $\frac{3}{4}$ inch (19.1 mm) and is not more than $1\frac{1}{2}$ inches (38.1 mm), a minimum 2x wood furring shall be used or an approved design.
- d. Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with ASTM C578 or ASTM C1289.
- e. Furring shall be spaced a maximum of 24 inches (610 mm) on center, in a vertical or horizontal orientation. In a vertical orientation, furring shall be located over wall studs and attached with the required fastener spacing. In a horizontal orientation, the indicated 8 inch (203.2 mm) and 12 inch (304.8 mm) fastener spacing in furring shall be achieved by use of two fasteners into studs at 16 inches (406.4 mm) and 24 inches (610 mm) on center, respectively.

Section 2604 Interior Finish and Trim

2604.1 General

Plastic materials installed as interior finish or *trim* shall comply with Chapter 8. Foam plastics shall only be installed as interior finish where approved in accordance with the special provisions of Section 2603.9. Foam plastics that are used as interior finish shall also meet the flame spread and smoke-developed index requirements for interior finish in accordance with Chapter 8. Foam plastics installed as interior *trim* shall comply with Section 2604.2.

2604.1.1 Plenums

Foam plastics installed in plenums as interior wall or ceiling finish shall comply with Section 2603.7. Foam plastics installed in plenums as interior trim shall comply with Sections 2604.2 and 2603.7.

[F] 2604.2 Interior Trim

Foam plastic used as interior *trim* shall comply with Sections 2604.2.1 through 2604.2.4.

[F] 2604.2.1 Density

The minimum density of the interior *trim* shall be 20pcf (320 kg/m³).

[F] 2604.2.2 Thickness

The maximum thickness of the interior *trim* shall be $\frac{1}{2}$ inch (12.7 mm) and the maximum width shall be 8 inches (204 mm).

[F] 2604.2.3 Area Limitation

The interior *trim* shall not constitute more than 10 percent of the specific wall or ceiling areas to which it is attached.

[F] 2604.2.4 Flame Spread

The flame spread index shall not exceed 75 where tested in accordance with ASTM E84 or UL 723. The smoke-developed index shall not be limited.

Exception: When the interior *trim* material has been tested as an interior finish in accordance with NFPA 286 and complies with the acceptance criteria in Section 803.1.2.1, it shall not be required to be tested for flame spread index in accordance with ASTM E84 or UL 723.

Section 2605 Plastic Veneer**2605.1 Interior Use**

Where used within a building, plastic veneer shall comply with the interior finish requirements of Chapter 8.

2605.2 Exterior Use

Exterior plastic veneer, other than plastic siding, shall be permitted to be installed on the *exterior walls* of buildings of any type of construction in accordance with all of the following requirements:

1. Plastic veneer shall comply with Section 2606.4.
2. Plastic veneer shall not be attached to any exterior wall to a height greater than 50 feet (15 240 mm) above grade.
3. Sections of plastic veneer shall not exceed 300 square feet (27.9 m²) in area and shall be separated by not less than 4 feet (1219 mm) vertically.

Exception: The area and separation requirements and the smoke-density limitation are not applicable to plastic veneer applied to buildings constructed of Type VB construction, provided the walls are not required to have a fire-resistance rating.

2605.3 Plastic Siding

Plastic siding shall comply with the requirements of Sections 1404 and 1405.

Section 2606 Light-Transmitting Plastics

2606.1 General

The provisions of this section and Sections 2607 through 2611 shall govern the quality and methods of application of light-transmitting plastics for use as light-transmitting materials in buildings and structures. Foam plastics shall comply with Section 2603. Light-transmitting plastic materials that meet the other code requirements for walls and roofs shall be permitted to be used in accordance with the other applicable chapters of the code.

2606.2 Approval for Use

Sufficient technical data shall be submitted to substantiate the proposed use of any light-transmitting material, as approved by the *building official* and subject to the requirements of this section.

2606.3 Identification

Each unit or package of light-transmitting plastic shall be identified with a *mark* or decal satisfactory to the *building official*, which includes identification as to the material classification.

2606.4 Specifications

Light-transmitting plastics, including thermoplastic, thermosetting or reinforced thermosetting plastic material, shall have a self-ignition temperature of 650°F (343°C) or greater where tested in accordance with ASTM D1929; a smoke-developed index not greater than 450 where tested in the manner intended for use in accordance with ASTM E84 or UL 723, or a maximum average smoke density rating not greater than 75 where tested in the thickness intended for use in accordance with ASTM D2843 and shall conform to one of the following combustibility classifications:

Class CC1: Plastic materials that have a burning extent of 1 inch (25 mm) or less where tested at a nominal thickness of 0.060 inch (1.5 mm), or in the thickness intended for use, in accordance with ASTM D635.

Class CC2: Plastic materials that have a burning rate of $2\frac{1}{2}$ inches per minute (1.06 mm/s) or less where tested at a nominal thickness of 0.060 inch (1.5 mm), or in the thickness intended for use, in accordance with ASTM D635.

2606.5 Structural Requirements

Light-transmitting plastic materials in their assembly shall be of adequate strength and durability to withstand the loads indicated in Chapter 16. Technical data shall be submitted to establish stresses, maximum unsupported spans and such other information for the various thicknesses and forms used as deemed necessary by the *building official*.

2606.6 Fastening

Fastening shall be adequate to withstand the loads in Chapter 16. Proper allowance shall be made for expansion and contraction of light-transmitting plastic materials in accordance with accepted data on the coefficient of expansion of the material and other material in conjunction with which it is employed.

2606.7 Light-Diffusing Systems

Unless the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, light-diffusing systems shall not be installed in the following occupancies and locations:

1. Group A with an *occupant load* of 1,000 or more.
2. Theaters with a stage and proscenium opening and an *occupant load* of 700 or more.
3. Group I-2.
4. Group I-3.
5. Interior exit stairways and ramps and *exit passageways*.

2606.7.1 Support

Light-transmitting plastic diffusers shall be supported directly or indirectly from ceiling or roof construction by use of noncombustible

hangers. Hangers shall be not less than No. 12 steel-wire gage (0.106 inch) galvanized wire or equivalent.

2606.7.2 Installation

Light-transmitting plastic diffusers shall comply with Chapter 8 unless the light-transmitting plastic diffusers will fall from the mountings before igniting, at an ambient temperature of not less than 200°F (111°C) below the ignition temperature of the panels. The panels shall remain in place at an ambient room temperature of 175°F (79°C) for a period of not less than 15 minutes.

2606.7.3 Size Limitations

Individual panels or units shall not exceed 10 feet (3048 mm) in length nor 30 square feet (2.79 m²) in area.

2606.7.4 Fire Suppression System

In buildings that are equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, plastic light-diffusing systems shall be protected both above and below unless the sprinkler system has been specifically approved for installation only above the light-diffusing system, or the light-diffusing system is listed and labeled in accordance with UL 723S. Areas of light-diffusing systems that are protected in accordance with this section shall not be limited.

2606.7.5 Electrical Luminaires

Light-transmitting plastic panels and light-diffuser panels that are installed in approved electrical luminaires shall comply with the requirements of Chapter 8 unless the light-transmitting plastic panels conform to the requirements of Section 2606.7.2. The area of approved light-transmitting plastic materials that is used in required *exits* or *corridors* shall not exceed 30 percent of the aggregate area of the ceiling in which such panels are installed, unless the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

2606.8 Partitions

Light-transmitting plastics used in or as partitions shall comply with the requirements of Chapters 6 and 8.

2606.9 Bathroom Accessories

Light-transmitting plastics shall be permitted as glazing in shower stalls, shower doors, bathtub enclosures and similar accessory units. Safety glazing shall be provided in accordance with Chapter 24.

2606.10 Awnings, Patio Covers and Similar Structures

Awnings constructed of light-transmitting plastics shall be constructed in accordance with the provisions specified in Section 3105 and Chapter 32 for projections. Patio covers constructed of light-transmitting plastics shall comply with Section 2606. Light-transmitting plastics used in canopies at motor fuel-dispensing facilities shall comply with Section 2606, except as modified by Section 406.7.2.

2606.11 Greenhouses

Light-transmitting plastics shall be permitted in lieu of plain glass in greenhouses.

2606.12 Solar Collectors

Light-transmitting plastic covers on solar collectors having noncombustible sides and bottoms shall be permitted on buildings not over three stories above grade plane or 9,000 square feet (836.1 m²) in total floor area, provided the light-transmitting plastic cover does not exceed 33.33 percent of the roof area for CC1 materials or 25 percent of the roof area for CC2 materials.

Exception: Light-transmitting plastic covers having a thickness of 0.010 inch (0.3 mm) or less shall be permitted to be of any plastic material provided the area of the solar collectors does not exceed 33.33 percent of the roof area.

Section 2607 Light-Transmitting Plastic Wall Panels

2607.1 General

Light-transmitting plastics shall not be used as wall panels in *exterior walls* in occupancies in Groups A-1, A-2, H, I-2 and I-3. In other groups, light-transmitting plastics shall be permitted to be used as wall panels in *exterior walls*, provided that the walls are not required to have a fire-resistance rating and the installation conforms to the requirements of this section. Such panels shall be erected and anchored on a foundation, waterproofed or otherwise protected from moisture absorption and sealed with a coat of mastic or other approved waterproof coating. Light-transmitting plastic wall panels shall comply with Section 2606.

2607.2 Installation

Exterior wall panels installed as provided for herein shall not alter the type of construction classification of the building.

2607.3 Height Limitation

Light-transmitting plastics shall not be installed more than 75 feet (22 860 mm) above *grade plane*.

2607.4 Area Limitation and Separation

The maximum area of a single wall panel and minimum vertical and horizontal separation requirements for exterior light-transmitting plastic wall panels shall be as provided for in Table 2607.4. The maximum percentage of wall area of any story in light-transmitting plastic wall panels shall not exceed that indicated in Table 2607.4 or the percentage of unprotected openings permitted by Section 705.8, whichever is smaller.

Exceptions:

1. In structures provided with approved flame barriers extending 30 inches (760 mm) beyond the *exterior wall* in the plane of the floor, a vertical separation is not required at the floor except that provided by the vertical thickness of the flame barrier projection.
2. Veneers of approved weather-resistant light-transmitting plastics used as exterior siding in buildings of Type V construction in compliance with Section 1406.
3. The area of light-transmitting plastic wall panels in *exterior walls* of greenhouses shall be exempt from the area limitations of Table 2607.4 but shall be limited as required for unprotected openings in accordance with Section 705.8.

TABLE 2607.4

AREA LIMITATION AND SEPARATION REQUIREMENTS FOR LIGHT-TRANSMITTING PLASTIC WALL PANELS^a

FIRE SEPARATION DISTANCE (feet)	CLASS OF PLASTIC	MAXIMUM PERCENTAGE AREA OF EXTERIOR WALL IN PLASTIC WALL PANELS	MAXIMUM SINGLE AREA OF PLASTIC WALL PANELS (square feet)	MINIMUM SEPARATION OF PLASTIC WALL PANELS (feet)	
				Vertical	Horizontal
Less than 6	—	Not Permitted	Not Permitted	—	—
6 or more but less than 11	CC1	10	50	8	4
	CC2	Not Permitted	Not Permitted	—	—
11 or more but less than or equal to 30	CC1	25	90	6	4
	CC2	15	70	8	4
Over 30	CC1	50	Not Limited	3 ^b	0
	CC2	50	100	6 ^b	3

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m².

a. For combinations of plastic glazing and plastic wall panel areas permitted, see Section 2607.6.

b. For reductions in vertical separation allowed, see Section 2607.4.

2607.5 Automatic Sprinkler System

Where the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, the maximum percentage area of *exterior wall* in any story in light-transmitting plastic wall panels and the maximum square footage of a single area given in Table 2607.4 shall be increased 100 percent, but the area of light-transmitting plastic wall panels shall not exceed 50 percent of the wall area in any story, or the area permitted by Section 705.8 for unprotected openings, whichever is smaller. These installations shall not be installed more than 75 feet (22 860 mm) above grade plane.

2607.6 Combinations of Glazing and Wall Panels

Combinations of light-transmitting plastic glazing and light-transmitting plastic wall panels shall be subject to the area, height and percentage limitations and the separation requirements applicable to the class of light-transmitting plastic as prescribed for light-transmitting plastic wall panel installations.

Section 2608 Light-Transmitting Plastic Glazing

2608.1 Buildings of Type VB Construction

Openings in the *exterior walls* of buildings of Type VB construction, where not required to be protected by Section 705, shall be permitted to be glazed or equipped with light-transmitting plastic. Light-transmitting plastic glazing shall comply with Section 2606.

2608.2 Buildings of Other Types of Construction

Openings in the *exterior walls* of buildings of types of construction other than Type VB, where not required to be protected by Section 705, shall be permitted to be glazed or equipped with light-transmitting plastic in accordance with Section 2606 and all of the following:

1. The aggregate area of light-transmitting plastic glazing shall not exceed 25 percent of the area of any wall face of the *story* in which it is installed. The area of a single pane of glazing installed above the first *story above grade plane* shall not exceed 16 square feet (1.5 m²) and the vertical dimension of a single pane shall not exceed 4 feet (1219 mm).

Exception: Where an *automatic sprinkler system* is provided throughout in accordance with Section 903.3.1.1, the area of allowable glazing shall be increased to not more than 50 percent of the wall face of the *story* in which it is installed with no limit on the maximum dimension or area of a single pane of glazing.

2. Approved flame barriers extending 30 inches (762 mm) beyond the *exterior wall* in the plane of the floor, or vertical panels not less than 4 feet (1219 mm) in height, shall be installed between glazed units located in adjacent stories.

Exception: Buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

3. Light-transmitting plastics shall not be installed more than 75 feet (22 860 mm) above grade level.

Exception: Buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

Section 2609 Light-Transmitting Plastic Roof Panels

2609.1 General

Light-transmitting plastic roof panels shall comply with this section and Section 2606. Light-transmitting plastic roof panels shall not be installed in Groups H, I-2 and I-3. In all other groups, light-transmitting plastic roof panels shall comply with any one of the following conditions:

1. The building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.
2. The roof construction is not required to have a fire-resistance rating by Table 601.
3. The roof panels meet the requirements for roof coverings in accordance with Chapter 15.

2609.2 Separation

Individual roof panels shall be separated from each other by a distance of not less than 4 feet (1219 mm) measured in a horizontal plane.

Exceptions:

1. The separation between roof panels is not required in a building equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.
2. The separation between roof panels is not required in low-hazard occupancy buildings complying with the conditions of Section 2609.4, Exception 2 or 3.

2609.3 Location

Where *exterior wall* openings are required to be protected by Section 705.8, a roof panel shall not be installed within 6 feet (1829 mm) of such *exterior wall*.

2609.4 Area Limitations

Roof panels shall be limited in area and the aggregate area of panels shall be limited by a percentage of the floor area of the room or space sheltered in accordance with Table 2609.4.

Exceptions:

1. The area limitations of Table 2609.4 shall be permitted to be increased by 100 percent in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.
2. Low-hazard occupancy buildings, such as swimming pool shelters, shall be exempt from the area limitations of Table 2609.4, provided that the buildings do not exceed 5,000 square feet (465 m^2) in area and have a minimum fire separation distance of 10 feet (3048 mm).
3. Greenhouses that are occupied for growing plants on a production or research basis, without public access, shall be exempt from the area limitations of Table 2609.4 provided they have a minimum fire separation distance of 4 feet (1220 mm).
4. Roof coverings over terraces and patios in occupancies in Group R-3 shall be exempt from the area limitations of Table 2609.4 and shall be permitted with light-transmitting plastics.

TABLE 2609.4
AREA LIMITATIONS FOR LIGHT-TRANSMITTING PLASTIC ROOF PANELS

CLASS OF PLASTIC	MAXIMUM AREA OF INDIVIDUAL ROOF PANELS (square feet)	MAXIMUM AGGREGATE AREA OF ROOF PANELS (percent of floor area)
CC1	300	30
CC2	100	25

For SI: 1 square foot = 0.0929 m^2 .

Section 2610 Light-Transmitting Plastic Skylight Glazing**2610.1 Light-Transmitting Plastic Glazing of Skylight Assemblies**

Skylight assemblies glazed with light-transmitting plastic shall conform to the provisions of this section and Section 2606.

Exception: Skylights in which the light-transmitting plastic conforms to the required roof-covering class in accordance with Section 1505.

2610.1.1 Unit Skylights

Unit skylights glazed with light-transmitting plastic shall comply with Section 2405.5.

2610.2 Mounting

The light-transmitting plastic shall be mounted above the plane of the roof on a curb constructed in accordance with the requirements for the type of construction classification, but not less than 4 inches (102 mm) above the plane of the roof. Edges of the light-transmitting plastic skylights or domes shall be protected by metal or other approved noncombustible material, or the light transmitting plastic dome or skylight shall be shown to be able to resist ignition where exposed at the edge to a flame from a Class B brand as described in ASTM E108 or UL 790. The Class B brand test shall be conducted on a skylight that is elevated to a height as specified in the manufacturer's installation instructions, but not less than 4 inches (102 mm).

Exceptions:

1. Curbs shall not be required for skylights used on roofs having a minimum slope of three units vertical in 12 units horizontal (25-percent slope) in occupancies in Group R-3 and on buildings with a nonclassified roof covering.
2. The metal or noncombustible edge material is not required where nonclassified roof coverings are permitted.

2610.3 Slope

Flat or corrugated light-transmitting plastic skylights shall slope not less than four units vertical in 12 units horizontal (4:12). Dome-shaped skylights shall rise above the mounting flange a minimum distance equal to 10 percent of the maximum width of the dome but not less than 3 inches (76 mm).

Exception: Skylights that pass the Class B Burning Brand Test specified in ASTM E108 or UL 790.

2610.4 Maximum Area of Skylights

Each skylight shall have a maximum area within the curb of 100 square feet (9.3 m^2).

Exception: The area limitation shall not apply where the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or the building is equipped with smoke and heat vents in accordance with Section 910.

2610.5 Aggregate Area of Skylights

The aggregate area of skylights shall not exceed $33\frac{1}{3}$ percent of the floor area of the room or space sheltered by the roof in which such skylights are installed where Class CC1 materials are utilized, and 25 percent where Class CC2 materials are utilized.

Exception: The aggregate area limitations of light-transmitting plastic skylights shall be increased 100 percent beyond the limitations set forth in this section where the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or the building is equipped with smoke and heat vents in accordance with Section 910.

2610.6 Separation

Skylights shall be separated from each other by a distance of not less than 4 feet (1219 mm) measured in a horizontal plane.

Exceptions:

1. Buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.
2. In Group R-3, multiple skylights located above the same room or space with a combined area not exceeding the limits set forth in Section 2610.4.

2610.7 Location

Where *exterior wall* openings are required to be protected in accordance with Section 705, a skylight shall not be installed within 6 feet (1829 mm) of such *exterior wall*.

2610.8 Combinations of Roof Panels and Skylights

Combinations of light-transmitting plastic roof panels and skylights shall be subject to the area and percentage limitations and separation requirements applicable to roof panel installations.

Section 2611 Light-Transmitting Plastic Interior Signs

2611.1 General

Light-transmitting plastic interior wall signs shall be limited as specified in Sections 2611.2 through 2611.4. Light-transmitting plastic interior wall signs in *covered and open mall buildings* shall comply with Section 402.6.4. Light-transmitting plastic interior signs shall also comply with Section 2606.

2611.2 Aggregate Area

The sign shall not exceed 20 percent of the wall area.

2611.3 Maximum Area

The sign shall not exceed 24 square feet (2.23 m²).

2611.4 Encasement

Edges and backs of the sign shall be fully encased in metal.

Section 2612 Plastic Composites

2612.1 General

Plastic composites shall consist of either wood/plastic composites or plastic lumber. Plastic composites shall comply with the provisions of this code and with the additional requirements of Section 2612.

2612.2 Labeling

Plastic composite deck boards and stair treads, or their packaging, shall bear a *label* that indicates compliance to ASTM D7032 and includes the allowable load and maximum allowable span determined in accordance with ASTM D7032. Plastic composite handrails and guards, or their packaging, shall bear a *label* that indicates compliance to ASTM D7032 and includes the maximum allowable span determined in accordance with ASTM D7032.

2612.3 Flame Spread Index

Plastic composite deck boards, stair treads, handrails and guards shall exhibit a flame spread index not exceeding 200 when tested in accordance with ASTM E84 or UL 723 with the test specimen remaining in place during the test.

Exception: Materials determined to be noncombustible in accordance with Section 703.5.

2612.4 Termite and Decay Resistance

Where required by Section 2304.12, plastic composite deck boards, stair treads, handrails and guards containing wood, cellulosic or any other biodegradable materials shall be termite and decay resistant as determined in accordance with ASTM D7032.

2612.5 Construction Requirements

Plastic composites meeting the requirements of Section 2612 shall be permitted to be used as exterior deck boards, stair treads, handrails and guards where combustible construction is permitted.

2612.5.1 Span Rating

Plastic composites used as exterior deck boards shall have a span rating determined in accordance with ASTM D7032.

2612.6 Plastic Composite Deck Boards, Stair Treads, Handrails and Guards

Plastic composite deck boards, stair treads, handrails and guards shall be installed in accordance with this code and the manufacturer's instructions.

Section 2613 Fiber-Reinforced Polymer

2613.1 General

The provisions of this section shall govern the requirements and uses of fiber-reinforced polymer in and on buildings and structures.

2613.2 Labeling and Identification

Packages and containers of fiber-reinforced polymer and their components delivered to the job site shall bear the *label* of an *approved agency* showing the manufacturer's name, product listing, product identification and information sufficient to determine that the end use will comply with the code requirements.

2613.3 Interior Finishes

Fiber-reinforced polymer used as *interior finishes, decorative materials or trim* shall comply with Chapter 8.

2613.3.1 Foam Plastic Cores

Fiber-reinforced polymer used as interior finish and which contains foam plastic cores shall comply with Chapter 8 and this chapter.

2613.4 Light-Transmitting Materials

Fiber-reinforced polymer used as light-transmitting materials shall comply with Sections 2606 through 2611 as required for the specific application.

2613.5 Exterior Use

Fiber-reinforced polymer shall be permitted to be installed on the *exterior walls* of buildings of any type of construction when such polymers meet the requirements of Section 2603.5. Fireblocking shall be installed in accordance with Section 718.

Exceptions:

1. Compliance with Section 2603.5 is not required when all of the following conditions are met:

1.1. The fiber-reinforced polymer shall not exceed an aggregate total of 20 percent of the area of the specific wall to which it is attached, and no single architectural element shall exceed 10 percent of the area of the specific wall to which it is attached, and no contiguous set of architectural elements shall exceed 10 percent of the area of the specific wall to which they are attached.

1.2. The fiber-reinforced polymer shall have a flame spread index of 25 or less. The flame spread index requirement shall not be required for coatings or paints having a thickness of less than 0.036 inch (0.9 mm) that are applied directly to the surface of the fiber-reinforced polymer.

1.3. Fireblocking complying with Section 718.2.6 shall be installed.

1.4. The fiber-reinforced polymer shall be installed directly to a noncombustible substrate or be separated from the exterior wall by one of the following materials: corrosion-resistant steel having a minimum base metal thickness of 0.016 inch (0.41 mm) at any point, aluminum having a minimum thickness of 0.019 inch (0.5 mm) or other approved noncombustible material.

2. Compliance with Section 2603.5 is not required when the fiber-reinforced polymer is installed on buildings that are 40 feet (12190 mm) or less above grade when all of the following conditions are met:

2.1. The fiber-reinforced polymer shall meet the requirements of Section 1406.2.

2.2. Where the fire separation distance is 5 feet (1524 mm) or less, the area of the fiber-reinforced polymer shall not exceed 10 percent of the wall area. Where the fire separation distance is greater than 5 feet (1524 mm), there shall be no limit on the area of the *exterior wall* coverage using fiber-reinforced polymer.

2.3. The fiber-reinforced polymer shall have a flame spread index of 200 or less. The flame spread index requirements do not apply to coatings or paints having a thickness of less than 0.036 inch (0.9 mm) that are applied directly to the surface of the fiber-reinforced polymer.

2.4. Fireblocking complying with Section 718.2.6 shall be installed.

Section 2614 Reflective Plastic Core Insulation

2614.1 General

The provisions of this section shall govern the requirements and uses of reflective plastic core insulation in buildings and structures. Reflective plastic core insulation shall comply with the requirements of Section 2614 and of one of the following: Section 2614.3 or 2614.4.

2614.2 Identification

Packages and containers of reflective plastic core insulation delivered to the job site shall show the manufacturer's or supplier's name, product identification and information sufficient to determine that the end use will comply with the code requirements.

2614.3 Surface-Burning Characteristics

Reflective plastic core insulation shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 450 when tested in accordance with ASTM E84 or UL 723. The reflective plastic core insulation shall be tested at the maximum thickness intended for use. Test specimen preparation and mounting shall be in accordance with ASTM E2599.

2614.4 Room Corner Test Heat Release

Reflective plastic core insulation shall comply with the acceptance criteria of Section 803.1.2.1 when tested in accordance with NFPA 286 or UL 1715 in the manner intended for use and at the maximum thickness intended for use.

Section 2615 High-Velocity Hurricane Zones—Plastics

2615.1 General

2615.1.1

Plastic materials used as structural elements shall be designed by methods admitting of rational analysis according to established principles of mechanics.

2615.1.2

Reserved.

2615.1.3

Reserved.

2615.1.4

Plastic structural elements, other than sheets, shall be designed by a Florida-registered professional engineer or a Florida-registered architect.

2615.2 Approved Plastic

Approved plastics for outdoor exposure shall be evaluated for outdoor durability in accordance with the Voluntary Standard Uniform Load Test Procedure for Thermoformed Plastic Domed Skylights, of the AAMA/WDMA 101/IS2/NAFS, Voluntary Performance Specification for Windows, Skylights and Glass Doors, as follows:

1. Outdoor exposure conditions: Specimen exposed in Florida at 45 degree south exposure for a period of five years.

a. Impact testing, after exposure test as above, in accordance with ASTM D256, and

b. Tensile testing on controlled and weathered specimen in accordance with ASTM D638. Yield strength difference between controlled and weathered specimen shall not exceed 10 percent.

2. Alternate:

- a. Exposure to xenon arc weatherometer using a 6500-watt lamp in accordance with ASTM G155 and ASTM D2565 for a period of 4,500 hours.
- b. Impact testing, after exposure test as above, in accordance with ASTM D256, and
- c. Tensile testing on controlled and weathered specimen in accordance with ASTM D638. Yield strength difference between controlled and weathered specimen shall not exceed 10 percent.

2615.3 Foam Plastics

Reserved.

2615.4 Light-Transmitting Plastics

Reserved.

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Chapter 27 Electrical

Section 2701 General

2701.1 Scope

The provisions of this chapter and NFPA 70 shall govern the design, construction, erection and installation of the electrical components, appliances, equipment and systems used in buildings and structures covered by this code. The *Florida Fire Prevention Code* and NFPA 70 shall govern the use and maintenance of electrical components, appliances, equipment and systems. The *Florida Building Code, Existing Building* and NFPA 70 shall govern the alteration, repair, relocation, replacement and addition of electrical components, appliances, equipment and systems.

Section 2702 Emergency and Standby Power Systems

[F] 2702.1 General

Emergency power systems and standby power systems shall comply with Sections 2702.1.1 through 2702.1.8.

[F] 2702.1.1 Stationary Generators

Stationary emergency and standby power generators required by this code shall be listed in accordance with UL 2200.

[F] 2702.1.2 Fuel Line Piping Protection

Fuel lines supplying a generator set inside a high-rise building shall be separated from areas of the building other than the room the generator is located in by an approved method, or an assembly that has a fire-resistance rating of not less than 2 hours. Where the building is protected throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1, the required fire-resistance rating shall be reduced to 1 hour.

[F] 2702.1.3 Installation

Emergency power systems and standby power systems required by this code or the *Florida Fire Prevention Code* shall be installed in accordance with the *Florida Fire Prevention Code*, NFPA 70, NFPA 110 and NFPA 111.

[F] 2702.1.4 Load Transfer

Emergency power systems shall automatically provide secondary power within 10 seconds after primary power is lost, unless specified otherwise in this code. Standby power systems shall automatically provide secondary power within 60 seconds after primary power is lost, unless specified otherwise in this code.

[F] 2702.1.5 Load Duration

Emergency power systems and standby power systems shall be designed to provide the required power for a minimum duration of 2 hours without being refueled or recharged, unless specified otherwise in this code.

[F] 2702.1.6 Uninterruptable Power Source

An uninterrupted source of power shall be provided for equipment when required by the manufacturer's instructions, the listing, this code or applicable referenced standards.

[F] 2702.1.7 Interchangeability

Emergency power systems shall be an acceptable alternative for installations that require standby power systems.

[F] 2702.1.8 Group I-2 Occupancies

In Group I-2 occupancies located in flood hazard areas established in Section 1612.3, where new essential electrical systems are installed, and where new essential electrical system generators are installed, the systems and generators shall be located and installed in accordance with ASCE 24. Where connections for hookup of temporary generators are provided, the connections shall be located at or above the elevation required in ASCE 24.

[F] 2702.2 Where Required

Emergency and standby power systems shall be provided where required by Sections 2702.2.1 through 2702.2.18.

[F] 2702.2.1 Ambulatory Care Facilities

Essential electrical systems for ambulatory care facilities shall comply with Section 422.6.

[F] 2702.2.2 Elevators and Platform Lifts

Standby power shall be provided for elevators and platform lifts as required in Sections 1009.4, 1009.5, 3003.1, 3007.8 and 3008.8.

[F] 2702.2.3 Emergency Responder Radio Coverage Systems

Standby power shall be provided for emergency responder radio coverage systems required in Section 917 and the *Florida Fire Prevention Code*. The standby power supply shall be capable of operating the emergency responder radio coverage system for a duration of not less than 12 hours at 100 percent system operation capacity.

[F] 2702.2.4 Emergency Voice/Alarm Communication Systems

Standby power shall be provided for emergency voice/alarm communication systems in accordance with Section 907.5.2.

[F] 2702.2.5 Exhaust Systems

Standby power shall be provided for common exhaust systems for domestic kitchens located in multistory structures as required in Section 505.3 of the *Florida Building Code, Mechanical*. Standby power shall be provided for common exhaust systems for clothes dryers located in multistory structures as required in Section 504.10 of the *Florida Building Code, Mechanical* and Section 614.10 of the *Florida Building Code, Fuel Gas*.

[F] 2702.2.6 Exit Signs

Emergency power shall be provided for exit signs as required in Section 1013.6.3. The system shall be capable of powering the required load for a duration of not less than 90 minutes.

[F] 2702.2.7 Gas Detection Systems

Emergency or standby power shall be provided for *gas detection systems* in accordance with the *Florida Fire Prevention Code*.

[F] 2702.2.8 Group I-2 Occupancies

Essential electrical systems for Group I-2 occupancies shall be in accordance with Section 407.11.

[F] 2702.2.9 Group I-3 Occupancies

Emergency power shall be provided for power-operated doors and locks in Group I-3 occupancies as required in Section 408.4.2.

[F] 2702.2.10 Hazardous Materials

Emergency or standby power shall be provided in occupancies with hazardous materials where required by the *Florida Fire Prevention Code*.

[F] 2702.2.11 High-Rise Buildings

Emergency and standby power shall be provided in high-rise buildings as required in Section 403.4.8.

[F] 2702.2.12 Means of Egress Illumination

Emergency power shall be provided for means of egress illumination as required in Section 1008.3. The system shall be capable of powering the required load for a duration of not less than 90 minutes.

[F] 2702.2.13 Membrane Structures

Standby power shall be provided for auxiliary inflation systems in permanent membrane structures as required in Section 3102.8.2. Standby power shall be provided for a duration of not less than 4 hours. Auxiliary inflation systems in temporary air-supported and air-inflated membrane structures shall be provided in accordance with the *Florida Fire Prevention Code*.

[F] 2702.2.14 Pyrophoric Materials

Emergency power shall be provided for occupancies with silane gas in accordance with the *Florida Fire Prevention Code*.

[F] 2702.2.15 Semiconductor Fabrication Facilities

Emergency power shall be provided for semiconductor fabrication facilities as required in Section 415.11.11.

[F] 2702.2.16 Smoke Control Systems

Standby power shall be provided for smoke control systems as required in Sections 404.7, 909.11, 909.20.7.2 and 909.21.5.

[F] 2702.2.17 Special Purpose Horizontal Sliding, Accordion or Folding Doors

Standby power shall be provided for special purpose horizontal sliding, accordion or folding doors as required in Section 1010.3.3. The standby power supply shall have a capacity to operate not fewer than 50 closing cycles of the door.

[F] 2702.2.18 Underground Buildings

Emergency and standby power shall be provided in underground buildings as required in Section 405.

[F] 2702.3 Critical Circuits

Required critical circuits shall be protected using one of the following methods:

1. Cables, used for survivability of required critical circuits, that are listed in accordance with UL 2196 and have a fire-resistance rating of not less than 1 hour.
2. Electrical circuit protective systems having a fire-resistance rating of not less than 1 hour. Electrical circuit protective systems shall be installed in accordance with their listing requirements.
3. Construction having a fire-resistance rating of not less than 1 hour.

[F] 2702.4 Maintenance

Emergency and standby power systems shall be maintained and tested in accordance with the *Florida Fire Prevention Code*.

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Chapter 28 Mechanical Systems

Section 2801 General

[M] 2801.1 Scope

Mechanical appliances, equipment and systems shall be constructed, installed and maintained in accordance with the *Florida Building Code, Mechanical* and the *Florida Building Code, Fuel Gas*. Masonry chimneys, fireplaces and barbecues shall comply with the *Florida Building Code, Mechanical* and Chapter 21 of this code.

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Chapter 29 Plumbing Systems

Section 2901 General

[P] 2901.1 Scope

The provisions of this chapter and the *Florida Building Code, Plumbing* shall govern the erection, installation, *alteration*, repairs, relocation, replacement, addition to, use or maintenance of plumbing equipment and systems. Toilet and bathing rooms shall be constructed in accordance with Section 1210. Plumbing systems and equipment shall be constructed, installed and maintained in accordance with the *Florida Building Code, Plumbing*. Private sewage disposal systems shall conform to Chapter 64E—6, *Florida Administrative Code*, for Onsite Sewage Treatment and Disposal Systems.

Section 2902 Minimum Plumbing Facilities

[P] 2902.1 Minimum Number of Fixtures

Plumbing fixtures shall be provided in the minimum number as shown in Table 2902.1 based on the actual use of the building or space. Uses not shown in Table 2902.1 shall be considered individually by the code official. The number of occupants shall be determined by this code.

[P] TABLE 2902.1

MINIMUM NUMBER OF REQUIRED PLUMBING FIXTURES^a (See Sections 2902.1.1 and 2902.2)

No.	CLASSIFICATION	DESCRIPTION	WATER CLOSETS (URINALS SEE SECTION 424.2 OF THE FLORIDA BUILDING CODE, PLUMBING)		LAVATORIES		BATHTUBS/ SHOWERS	DRINKING FOUNTAINS (SEE SECTION 410 OF THE FLORIDA BUILDING CODE, PLUMBING)	OTHER
			Male	Female	Male	Female			
1	Assembly	Theaters and other buildings for the performing arts and motion pictures ^d	1 per 125	1 per 65	1 per 200	—	—	1 per 500	1 service sink
		Nightclubs, bars, taverns, dance halls and buildings for similar purposes ^d	1 per 40	1 per 40	1 per 75	—	—	1 per 500	1 service sink
		Restaurants, banquet halls and food courts ^d	1 per 75	1 per 75	1 per 200	—	—	1 per 500	1 service sink
		Casino gaming areas	1 per 100 for the first 400	1 per 50 for the first 400	1 per 250 for the first 750 and 1 per 500	—	—	1 per 1,000	1 service sink

			and 1 per 250 for the remainder exceeding 400	and 1 per 150 for the remainder exceeding 400	for the remainder exceeding 750			
	Auditoriums without permanent seating, art galleries, exhibition halls, museums, lecture halls, libraries, arcades and gymnasiums ^d	1 per 125	1 per 65	1 per 200	—	1 per 500	1 service sink	
	Passenger terminals and transportation facilities ^d	1 per 500	1 per 500	1 per 750	—	1 per 1,000	1 service sink	
	Places of worship and other religious services ^d	1 per 150	1 per 75	1 per 200	—	1 per 1,000	1 service sink	
	Coliseums, arenas, skating rinks, pools and tennis courts for indoor sporting events and activities	1 per 75 for the first 1,500 and 1 per 120 for the remainder exceeding 1,500	1 per 40 for the first 1,520 and 1 per 60 for the remainder exceeding 1,520	1 per 200	1 per 150	—	1 per 1,000	1 service sink
	Stadiums, amusement parks, bleachers and grandstands for outdoor sporting events and activities ^f	1 per 75 for the first 1,500 and 1 per 120 for the remainder exceeding 1,500	1 per 40 for the first 1,520 and 1 per 60 for the remainder exceeding 1,520	1 per 200	1 per 150	—	1 per 1,000	1 service sink
2	Business	Buildings for the transaction of business, professional services, other services involving merchandise, office	1 per 25 for the first 50 and 1 per 50 for the remainder exceeding 50	1 per 40 for the first 80 and 1 per 80 for the remainder exceeding 80	—	1 per 100	1 service sink ^e	

		buildings, banks, light industrial, ambulatory care and similar uses					
3	Educational	Educational facilities	1 per 50	1 per 50	—	1 per 100	1 service sink
4	Factory and industrial	Structures in which occupants are engaged in work fabricating, assembly or processing of products or materials	1 per 100	1 per 100	—	1 per 400	1 service sink
5	Institutional	Custodial care facilities	1 per 10	1 per 10	1 per 8	1 per 100	1 service sink
		Medical care recipients in hospitals and nursing homes ^b	1 per room ^c	1 per room ^c	1 per 15	1 per 100	1 service sink
		Employees in hospitals and nursing homes ^b	1 per 25	1 per 35	—	1 per 100	—
		Visitors in hospitals and nursing homes	1 per 75	1 per 100	—	1 per 500	—
		Prisons ^b	1 per cell	1 per cell	1 per 15	1 per 100	1 service sink
		Reformatories, detention centers and correctional centers ^b	1 per 15	1 per 15	1 per 15	1 per 100	1 service sink
		Employees in reformatories, detention centers and correctional centers ^b	1 per 25	1 per 35	—	1 per 100	—
		Adult day care and child day care	1 per 15	1 per 15	1	1 per 100	1 service sink

6	Mercantile	Retail stores, service stations, shops, salesrooms, markets and shopping centers	1 per 500	1 per 750	—	1 per 1,000	1 service sink ^e
7	Residential	Hotels, motels, boarding houses (transient)	1 per sleeping unit	1 per sleeping unit	1 per sleeping unit	—	1 service sink
		Dormitories, fraternities, sororities and boarding houses (not transient)	1 per 10	1 per 10	1 per 8	1 per 100	1 service sink
		Apartment house	1 per dwelling unit	1 per dwelling unit	1 per dwelling unit	—	1 kitchen sink per dwelling unit; 1 automatic clothes washer connection per 20 dwelling units
		One- and two-family dwellings and lodging houses with five or fewer guestrooms	1 per dwelling unit	1 per 10	1 per dwelling unit	—	1 kitchen sink per dwelling unit; 1 automatic clothes washer connection per dwelling unit
		Congregate living facilities with 16 or fewer persons	1 per 10	1 per 10	1 per 8	1 per 100	1 service sink
8	Storage	Structures for the storage of goods, warehouses, storehouses and freight depots, low and moderate hazard	1 per 100	1 per 100	—	1 per 1,000	1 service sink

- a. The fixtures shown are based on one fixture being the minimum required for the number of persons indicated or any fraction of the number of persons indicated. The number of occupants shall be determined by this code.
- b. Toilet facilities for employees shall be separate from facilities for inmates or care recipients.
- c. A single-occupant toilet room with one water closet and one lavatory serving not more than two adjacent patient sleeping units shall be permitted, provided that each patient sleeping unit has direct access to the toilet room and provisions for privacy for the toilet room user are provided.
- d. The occupant load for seasonal outdoor seating and entertainment areas shall be included when determining the minimum number of facilities required.
- e. For business and mercantile classifications with an occupant load of 15 or fewer, a service sink shall not be required.
- f. The required number and type of plumbing fixtures for outdoor swimming pools shall be in accordance with Section 403.6 of the *Florida Building Code, Plumbing*.

[P] 2902.1.1 Fixture Calculations

To determine the *occupant load* of each sex, the total *occupant load* shall be divided in half. To determine the required number of fixtures, the fixture ratio or ratios for each fixture type shall be applied to the *occupant load* of each sex in accordance with Table 2902.1. Fractional numbers resulting from applying the fixture ratios of Table 2902.1 shall be rounded up to the next whole number. For calculations involving multiple occupancies, such fractional numbers for each occupancy shall first be summed and then rounded up to the next whole number.

Exceptions:

1. The total *occupant load* shall not be required to be divided in half where approved statistical data indicate a distribution of the sexes of other than 50 percent of each sex.
2. Where multi-user facilities are designed to serve all genders, the minimum fixture count shall be calculated 100 percent, based on total *occupant load*. In such multi-user user facilities, each fixture type shall be in accordance with *Florida Building Code, Accessibility*, and each urinal that is provided shall be located in a stall.
3. Distribution of the sexes is not required where single-user water closets and bathing room fixtures are provided in accordance with Section 2902.1.2.

[P] 2902.1.2 Single-User Toilet and Bathing Room Fixtures

The plumbing fixtures located in single-user toilet and bathing rooms, including family or assisted-use toilet and bathing rooms that are required by Chapter 11, shall contribute toward the total number of required plumbing fixtures for a building or tenant space. Single-user toilet and bathing rooms and family or assisted-use toilet rooms and bathing rooms shall be identified as being available for use by all persons regardless of their sex.

The total number of fixtures shall be permitted to be based on the required number of separate facilities or based on the aggregate of any combination of single-user or separate facilities.

[P] 2902.1.3 Lavatory Distribution

Where two or more toilet rooms are provided for each sex, the required number of lavatories shall be distributed proportionately to the required number of water closets.

[P] 2902.2 Separate Facilities

Where plumbing fixtures are required, separate facilities shall be provided for each sex.

Exceptions:

1. Separate facilities shall not be required for *dwelling units* and *sleeping units*.
2. Separate facilities shall not be required in structures or tenant spaces with a total *occupant load*, including both employees and customers, of 15 or fewer.
3. Separate facilities shall not be required in mercantile occupancies in which the maximum occupant load is 100 or fewer.
4. Separate facilities shall not be required in business occupancies in which the maximum occupant load is 25 or fewer.
5. Separate facilities shall not be required to be designated by sex where single-user toilet rooms are provided in accordance with Section 2902.1.2.
6. Separate facilities shall not be required where rooms having both water closets and lavatory fixtures are designed for use by both sexes and privacy for water closets is provided in accordance with Section 405.3.4 of the *Florida Building Code, Plumbing*. Urinals shall be located in an area visually separated from the remainder of the facility or each urinal that is provided shall be located in a stall.

[P] 2902.2.1 Family or Assisted-Use Toilet Facilities Serving as Separate Facilities

Where a building or tenant space requires a separate toilet facility for each sex and each toilet facility is required to have only one water closet, two family or assisted-use toilet facilities shall be permitted to serve as the required separate facilities. Family or assisted-use toilet facilities shall not be required to be identified for exclusive use by either sex as required by Section 2902.4.

[P] 2902.3 Employee and Public Toilet Facilities

For structures and tenant spaces intended for public utilization, customers, patrons and visitors shall be provided with public toilet facilities. Employees associated with structures and tenant spaces shall be provided with toilet facilities. The number of plumbing fixtures located within the required toilet facilities shall be provided in accordance with Section 2902 for all users. Employee toilet facilities shall be either separate or combined employee and public toilet facilities.

Exception: Public toilet facilities shall not be required for:

1. Parking garages where operated without parking attendants.
2. Structures and tenant spaces intended for quick transactions, including takeout, pickup and drop-off, having a public access area less than or equal to 300 square feet (28 m^2).

[P] 2902.3.1 Access

The route to the public toilet facilities required by Section 2902.3 shall not pass through kitchens, storage rooms or closets. Access to the required facilities shall be from within the building or from the exterior of the building. Routes shall comply with the accessibility requirements of this code. The public shall have access to the required toilet facilities at all times that the building is occupied.

[P] 2902.3.2 Prohibited Toilet Room Location

Toilet rooms shall not open directly into a room used for the preparation of food for service to the public.

[P] 2902.3.3 Location of Toilet Facilities in Occupancies Other Than Malls

In occupancies other than covered and open mall buildings, the required public and employee toilet facilities shall be located not more than one story above or below the space required to be provided with toilet facilities, and the path of travel to such facilities shall not exceed a distance of 500 feet (152 m).

Exceptions:

1. The location and maximum distances of travel to required employee facilities in factory and industrial occupancies are permitted to exceed that required by this section, provided that the location and maximum distance of travel are *approved*.

2. The location and maximum distances of travel to required public and employee facilities in Group S occupancies are permitted to exceed that required by this section, provided that the location and maximum distance of travel are *approved*.

[P] 2902.3.4 Location of Toilet Facilities in Malls

In covered and open mall buildings, the required public and employee toilet facilities shall be located not more than one story above or below the space required to be provided with toilet facilities, and the path of travel to such facilities shall not exceed a distance of 300 feet (91 mm). In mall buildings, the required facilities shall be based on total square footage (m^2) within a covered mall building or within the perimeter line of an open mall building, and facilities shall be installed in each individual store or in a central toilet area located in accordance with this section. The maximum distance of travel to central toilet facilities in mall buildings shall be measured from the main entrance of any store or tenant space. In mall buildings, where employees' toilet facilities are not provided in the individual store, the maximum distance of travel shall be measured from the employees' work area of the store or tenant space.

[P] 2902.3.5 Pay Facilities

Where pay facilities are installed, such facilities shall be in excess of the required minimum facilities. Required facilities shall be free of charge.

[P] 2902.3.6 Door Locking

Where a toilet room is provided for the use of multiple occupants, the egress door for the room shall not be lockable from the inside of the room. This section does not apply to family or assisted-use toilet rooms.

[P] 2902.4 Signage

Required public facilities shall be provided with signs that designate the sex as required by Section 2902.2. Signs shall be readily visible and located near the entrance to each toilet facility. Signs for accessible toilet facilities shall comply with Section 1111.

[P] 2902.4.1 Directional Signage

Directional signage indicating the route to the required public toilet facilities shall be posted in a lobby, corridor, aisle or similar space, such that the sign can be readily seen from the main entrance to the building or tenant space.

[P] 2902.5 Drinking Fountain Location

Drinking fountains shall not be required to be located in individual tenant spaces provided that public drinking fountains are located within a distance of travel of 500 feet (152 m) of the most remote location in the tenant space and not more than one story above or below the tenant space. Where the tenant space is in a covered or open mall, such distance shall not exceed 300 feet (91 440 mm). Drinking fountains shall be located on an accessible route.

[P] 2902.6 Small Occupancies

Drinking fountains shall not be required for an *occupant load* of 15 or fewer.

[P] 2902.7 Service Sink Location

Service sinks shall not be required to be located in individual tenant spaces in a covered mall provided that service sinks are located within a distance of travel of 300 feet (91 m) of the most remote location in the tenant space and not more than one story above or below the tenant space. Service sinks shall be located on an *accessible route*.

[P] Section 2903 Installation of Fixtures

[P] 2903.1 Setting

Fixtures shall be set level and in proper alignment with reference to adjacent walls.

[P] 2903.1.1 Water Closets, Urinals, Lavatories and Bidets

A water closet, urinal, lavatory or bidet shall not be set closer than 15 inches (381 mm) from its center to any side wall, partition, vanity or other obstruction. Where partitions or other obstructions do not separate adjacent fixtures, fixtures shall not be set closer than 30 inches (762 mm) center to center between adjacent fixtures. There shall be not less than a 21-inch (533 mm) clearance in front of a

water closet, urinal, lavatory or bidet to any wall, fixture or door. Water closet compartments shall be not less than 30 inches (762 mm) in width and not less than 60 inches (1524 mm) in depth for floor-mounted water closets and not less than 30 inches (762 mm) in width and 56 inches (1422 mm) in depth for wall-hung water closets.

Exception: An accessible children's water closet shall be set not closer than 12 inches (305 mm) from its center to the required partition or to the wall on one side.

[P] 2903.1.2 Public Lavatories

In employee and public toilet rooms, the required lavatory shall be located in the same room as the required water closet.

[P] 2903.1.3 Location of Fixtures and Piping

Piping, fixtures or equipment shall not be located in such a manner as to interfere with the normal operation of windows, doors or other means of egress openings.

[P] 2903.1.4 Water Closet Compartment

Each water closet utilized by the public or employees shall occupy a separate compartment with walls or partitions and a door enclosing the fixtures to ensure privacy.

Exceptions:

1. Water closet compartments shall not be required in a single-occupant toilet room with a lockable door.
2. Toilet rooms located in child day care facilities and containing two or more water closets shall be permitted to have one water closet without an enclosing compartment.
3. This provision is not applicable to toilet areas located within Group I-3 housing areas.

[P] 2903.1.5 Urinal Partitions

Each urinal utilized by the public or employees shall occupy a separate area with walls or partitions to provide privacy. The horizontal dimension between walls or partitions at each urinal shall be not less than 30 inches (762 mm). The walls or partitions shall begin at a height not greater than 12 inches (305 mm) from and extend not less than 60 inches (1524 mm) above the finished floor surface. The walls or partitions shall extend from the wall surface at each side of the urinal not less than 18 inches (457 mm) or to a point not less than 6 inches (152 mm) beyond the outermost front lip of the urinal measured from the finished backwall surface, whichever is greater.

Exceptions:

1. Urinal partitions shall not be required in a single-occupant or family/assisted-use toilet room with a lockable door.
2. Toilet rooms located in child day care facilities and containing two or more urinals shall be permitted to have one urinal without partitions.

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Chapter 30 Elevators and Conveying Systems

Section 3001 General

3001.1 Scope

This chapter governs the design, construction, installation, *alteration*, repair and maintenance of elevators and conveying systems and their components.

Note: Other administrative and programmatic provisions may apply. See the Department of Business and Professional Regulation [DBPR] Chapter 399, *Florida Statutes*, and Rule 61C-5, *Florida Administrative Code*. The regulation and enforcement of the following sections of the adopted codes, and their addenda, are preempted to the Bureau of Elevator Safety of the Department of Business and Professional regulation: ASME A17.1, ASME A17.3 and ASME A18.1

3001.2 Referenced Standards

Except as otherwise provided for in this code, the design, construction, installation, *alteration*, repair and maintenance of elevators and conveying systems and their components shall conform to the applicable standard specified in Table 3001.2 and ASCE 24 for construction in *flood hazard areas* established in Section 1612.3. The Division of Hotels and Restaurants may grant variances and waivers to the *Elevator Safety Code* as authorized by the *Safety Code for Elevators and Escalators* (ASME A17.1, Section 1.2) and *Florida Statutes* (Chapter 120 and Chapter 399.)

TABLE 3001.2

STANDARDS FOR ELEVATORS AND CONVEYING SYSTEMS AND COMPONENTS

TYPE	STANDARD
Elevators, escalators, dumbwaiters, moving walks, material lifts	ASME A17.1/CSA B44, ASME A17.6, ASME A17.7/CSA B44.7
Existing elevators and escalators	ASME A17.3
Platform lifts, stairway chairlifts, wheelchair lifts	ASME A18.1
Belt manlifts	ASME A90.1
Conveyors and related equipment	ASME B20.1
Industrial scissors lifts	ANSI MH29.1
Automotive lifts	ALI ALCTV

3001.3 Accessibility

Passenger elevators are required to be accessible by the *Florida Building Code, Accessibility*.

3001.4 Change in Use

A change in use of an elevator from freight to passenger, passenger to freight, or from one freight class to another freight class shall comply with Section 8.7 of ASME A17.1/CSA B44.

3001.5 Design, Installation and Alteration of Elevators

3001.5.1

Each new elevator shall comply with the *Florida Elevator Safety Code* that was in effect at the time of receipt of application for the construction permit for the elevator.

3001.5.2

Each alteration to, or relocation of, an elevator shall comply with the *Florida Elevator Safety Code* that was in effect at the time of receipt

3001.5.3

All existing elevators shall comply with ASME A17.3.

3001.6

As used in this chapter, the term:

ALTERATION. Any change to equipment, including its parts, components, and/or subsystems, other than maintenance, repair, or replacement.

CERTIFICATE OF OPERATION. A document issued by the department which indicates that the conveyance has had the required safety inspection and tests and that fees have been paid as provided in Chapter 399, *Florida Statutes*.

CONVEYANCE. An elevator, dumbwaiter, escalator, moving sidewalk, platform lift and stairway chairlift.

DEPARTMENT. For the purpose of this section, the Department of Business and Professional Regulation.

DIVISION. For the purpose of this section, the Division of Hotels and Restaurants of the Department of Business and Professional Regulation.

ELEVATOR. One of the following mechanical devices:

- (a) A hoisting and lowering mechanism, equipped with a car and platform that moves in guide rails and serves two or more landings to transport material or passengers or both.
- (b) An escalator, which is a power-driven, inclined continuous stairway used for raising or lowering passengers.
- (c) A dumbwaiter, which is a hoisting and lowering mechanism equipped with a car of limited size which moves in guide rails and serves two or more landings.
- (d) A moving walk, which is a type of passenger-carrying device on which passengers stand or walk and in which the passenger-carrying surface remains parallel to its direction of motion and is uninterrupted.
- (e) An inclined stairway chairlift, which is a device used to transport physically handicapped persons over architectural barriers.
- (f) An inclined or vertical wheelchair lift, which is a device used to transport wheelchair handicapped persons over architectural barriers.

Exceptions:

Personnel hoists and material hoists within the scope of ASME A10.

Man lifts within the scope of ASME A90.1.

Mobile scaffolds, towers, and platforms within the scope of ANSI A92.

Powered platforms and equipment for exterior and interior maintenance within the scope of ASME A120.1.

Conveyors and related equipment within the scope of ASME B20.1.

Cranes, derricks, hoists, hooks, jacks and slings within the scope of ASME B30.

Industrial trucks within the scope of ASME B56.

Portable equipment, except for portable escalators that are covered by this code.

Tiered or piling machines used to move materials to and from storage located and operating entirely within one story.

Equipment for feeding or positioning materials at machine tools and printing presses.

Skip or furnace hoists.

Wharf ramps.

Railroad car lifts or dumpers.

Line jacks, false cars, shafters, moving platforms and similar equipment used for installing an elevator by a contractor licensed in this state.

Automated people movers at airports.

Elevators in television and radio towers.

Hand-operated dumbwaiters.

Sewage pump station lifts.

Automobile parking lifts.

Equipment covered in Section 1.1.2 of the *ASME A17.1 Safety Code for Elevators and Escalators*.

Elevators, inclined stairway chairlifts, and inclined or vertical wheelchair lifts located in private residences.

ESCALATOR. An installation defined as an escalator in the *Florida Building Code*.

EXISTING INSTALLATION. An installation defined as an "installation, existing" in the *Florida Building Code*.

PRIVATE RESIDENCE. A separate dwelling or a separate apartment in a multiple dwelling which is occupied by members of a single family.

Section 3002 Hoistway Enclosures

3002.1 Hoistway Enclosure Protection

Elevator, dumbwaiter and other hoistway enclosures shall be *shaft enclosures* complying with Sections 712 and 713.

3002.1.1 Opening Protectives

Openings in hoistway enclosures shall be protected as required in Chapter 7.

Exception: The elevator car doors and the associated hoistway enclosure doors at the floor level designated for recall in accordance with Section 3003.2 shall be permitted to remain open during Phase I Emergency Recall Operation.

3002.1.2 Hardware

Hardware on opening protectives shall be of an *approved* type installed as tested, except that *approved* interlocks, mechanical locks and electric contacts, door and gate electric contacts and door-operating mechanisms shall be exempt from the fire test requirements.

3002.2 Number of Elevator Cars in a Hoistway

Where four or more elevator cars serve all or the same portion of a building, the elevators shall be located in not fewer than two separate hoistways. Not more than four elevator cars shall be located in any single hoistway enclosure.

3002.3 Emergency Signs

An *approved* pictorial sign of a standardized design shall be posted adjacent to each elevator call station on all floors instructing occupants to use the *exit stairways* and not to use the elevators in case of fire. The sign shall read: IN CASE OF FIRE, ELEVATORS ARE OUT OF SERVICE. USE EXIT STAIRS.

Exceptions:

1. The emergency sign shall not be required for elevators that are part of an *accessible means of egress* complying with Section 1009.
2. The emergency sign shall not be required for elevators that are used for occupant self-evacuation in accordance with Section 3008.

3002.4 Elevator Car to Accommodate Ambulance Stretcher

Any building that is more than three stories high or in which the vertical distance between the bottom terminal landing and the top terminal landing exceeds 25 feet (7620 mm), must be constructed to contain at least one passenger elevator that is operational for building occupants and fire department emergency access to all floors. The elevator car shall be of such a size and arrangement to accommodate an ambulance stretcher 24 inches by 76 inches (610 mm by 1950 mm) with not less than 5-inch (127 mm) radius corners, in the horizontal, open position and shall be identified by the international symbol for emergency medical services (star of life). The symbol shall be not less than 3 inches (76 mm) in height and shall be placed inside on both sides of the hoistway door frame.

3002.5 Emergency Doors

Where an elevator is installed in a single blind hoistway or on the outside of a building, there shall be installed in the blind portion of the hoistway or blank face of the building, an emergency door in accordance with ASME A17.1/CSA B44.

3002.6 Prohibited Doors

Doors, other than hoistway doors and the elevator car door, shall be prohibited at the point of access to an elevator car unless such doors are readily openable from the car side without a key, tool, special knowledge or effort.

3002.7 Common Enclosure With Stairway

Elevators shall not be in a common *shaft enclosure* with a *stairway*.

Exception: Elevators within *open parking garages* need not be separated from *stairway enclosures*.

3002.8 Glass in Elevator Enclosures

Glass in elevator enclosures shall comply with Section 2409.2.

3002.9 Plumbing and Mechanical Systems

Plumbing and mechanical systems shall not be located in an elevator hoistway enclosure.

Exception: Floor drains, sumps and sump pumps shall be permitted at the base of the hoistway enclosure provided they are indirectly connected to the plumbing system.

3002.10

Automatic fire alarm initiating devices shall be located and installed in accordance with ASME A17.1 and NFPA 72.

Section 3003 Emergency Operations**[F] 3003.1 Standby Power**

In buildings and structures where standby power is required or furnished to operate an elevator, the operation shall be in accordance with Sections 3003.1.1 through 3003.1.4.

[F] 3003.1.1 Manual Transfer

Standby power shall be manually transferable to all elevators in each bank.

[F] 3003.1.2 One Elevator

Where only one elevator is installed, the elevator shall automatically transfer to standby power within 60 seconds after failure of normal power.

[F] 3003.1.3 Two or More Elevators

Where two or more elevators are controlled by a common operating system, all elevators shall automatically transfer to standby power within 60 seconds after failure of normal power where the standby power source is of sufficient capacity to operate all elevators at the same time. Where the standby power source is not of sufficient capacity to operate all elevators at the same time, all elevators shall transfer to standby power in sequence, return to the designated landing and disconnect from the standby power source. After all elevators have been returned to the designated level, at least one elevator shall remain operable from the standby power source.

[F] 3003.1.4 Venting

Where standby power is connected to elevators, the machine room *ventilation* or air conditioning shall be connected to the standby power source.

[F] 3003.2 Fire Fighters' Emergency Operation

Elevators shall be provided with Phase I emergency recall operation and Phase II emergency in-car operation in accordance with ASME A17.1/CSA B44.

[F] 3003.3 Seven Fire Service Elevator Keys

All elevators that operate in a building that is six or more stories in height shall be equipped to operate with one of seven emergency response region elevator keys in accordance with the *Florida Fire Prevention Code*.

Section 3004 Conveying Systems

3004.1 General

Escalators, moving walks, conveyors, personnel hoists and material hoists shall comply with the provisions of Sections 3004.2 through 3004.4.

3004.2 Escalators and Moving Walks

Escalators and moving walks shall be constructed of *approved* noncombustible and fire-retardant materials. This requirement shall not apply to electrical equipment, wiring, wheels, handrails and the use of $\frac{1}{28}$ -inch (0.9 mm) wood veneers on balustrades backed up with noncombustible materials.

3004.2.1 Enclosure

Escalator floor openings shall be enclosed with *shaft enclosures* complying with Section 713.

3004.2.2 Escalators

Where provided in below-grade transportation stations, escalators shall have a clear width of not less than 32 inches (815 mm).

3004.3 Conveyors

Conveyors and conveying systems shall comply with ASME B20.1.

3004.3.1 Enclosure

Conveyors and related equipment connecting successive floors or levels shall be enclosed with *shaft enclosures* complying with Section 713.

3004.3.2 Conveyor Safeties

Power-operated conveyors, belts and other material-moving devices shall be equipped with automatic limit switches that will shut off the power in an emergency and automatically stop all operation of the device.

3004.4 Personnel and Material Hoists

Personnel and material hoists shall be designed utilizing an *approved* method that accounts for the conditions imposed during the intended operation of the hoist device. The design shall include, but is not limited to, anticipated loads, structural stability, impact, vibration, and stresses. The design shall account for the construction, installation, operation and inspection of the hoist tower, car, machinery and control equipment, guide members and hoisting mechanism. Additionally, the design of personnel hoists shall include

provisions for field testing and maintenance that will demonstrate that the hoist device functions in accordance with the design. Field tests shall be conducted upon the completion of an installation or following a major *alteration* of a personnel hoist.

Section 3005 Machine Rooms

3005.1 Access

An *approved* means of access shall be provided to elevator machine rooms, control rooms, control spaces and machinery spaces.

3005.2 Venting

Elevator machine rooms, machinery spaces that contain the driving machine, and control rooms or spaces that contain the operation or motion controller for elevator operation shall be provided with an independent *ventilation* or air-conditioning system to protect against the overheating of the electrical equipment. The system shall be capable of maintaining temperatures within the range established for the elevator equipment.

3005.3 Pressurization

The elevator machine room, control rooms or control space with openings into a pressurized elevator hoistway shall be pressurized upon activation of a *heat or smoke detector* located in the elevator machine room, control room or control space.

3005.4 Machine Rooms, Control Rooms, Machinery Spaces, and Control Spaces

The following rooms and spaces shall be enclosed with *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both:

1. Machine rooms.
2. Control rooms.
3. Control spaces.
4. Machinery spaces outside of the hoistway enclosure.

The *fire-resistance rating* shall be not less than the required rating of the hoistway enclosure served by the machinery. Openings in the *fire barriers* shall be protected with assemblies having a *fire protection* rating not less than that required for the hoistway enclosure doors.

Exceptions:

1. For other than fire service access elevators and occupant evacuation elevators, where machine rooms, machinery spaces, control rooms and control spaces do not abut and have no openings to the hoistway enclosure they serve, the *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both, shall be permitted to be reduced to a 1-hour *fire-resistance rating*.
2. For other than fire service access elevators and occupant evacuation elevators, in buildings four stories or less above *grade plane* where machine room, machinery spaces, control rooms and control spaces do not abut and have no openings to the hoistway enclosure they serve, the machine room, machinery spaces, control rooms and control spaces are not required to be fire-resistance rated.

3005.5 Shunt Trip

Where elevator hoistways, elevator machine rooms, control rooms and control spaces containing elevator control equipment are protected with automatic sprinklers, a means installed in accordance with Section 21.4 of NFPA 72 shall be provided to disconnect automatically the main line power supply to the affected elevator prior to the application of water. This means shall not be self-resetting. The activation of automatic sprinklers outside the hoistway, machine room, machinery space, control room or control space shall not disconnect the main line power supply.

3005.6 Plumbing Systems

Plumbing systems shall not be located in elevator equipment rooms.

Section 3006 Elevator Lobbies and Hoistway Opening Protection

3006.1 General

Elevator hoistway openings and enclosed elevator lobbies shall be provided in accordance with the following:

1. Where hoistway opening protection is required by Section 3006.2, such protection shall be in accordance with Section 3006.3.
2. Where enclosed elevator lobbies are required for underground buildings, such lobbies shall comply with Section 405.4.3.
3. Where an area of refuge is required and an enclosed elevator lobby is provided to serve as an area of refuge, the enclosed elevator lobby shall comply with the *Florida Building Code, Accessibility*.
4. Where fire service access elevators are provided, enclosed elevator lobbies shall comply with Section 3007.6.
5. Where occupant evacuation elevators are provided, enclosed elevator lobbies shall comply with Section 3008.6.

3006.2 Hoistway Opening Protection Required

Elevator hoistway door openings shall be protected in accordance with Section 3006.3 where an elevator hoistway connects more than three stories, is required to be enclosed within a shaft enclosure in accordance with Section 712.1.1 and any of the following conditions apply:

1. The building is not protected throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2.
2. The building contains a Group I-1 Condition 2 occupancy.
3. The building contains a Group I-2 occupancy.
4. The building contains a Group I-3 occupancy.
5. The building is a high rise and the elevator hoistway is more than 75 feet (22 860 mm) in height. The height of the hoistway shall be measured from the lowest floor to the highest floor of the floors served by the hoistway.

Exceptions:

1. Protection of elevator hoistway door openings is not required where the elevator serves only open parking garages in accordance with Section 406.5.
2. Protection of elevator hoistway door openings is not required at the level(s) of exit discharge, provided the level(s) of exit discharge is equipped with an *automatic sprinkler system* in accordance with Section 903.3.1.1.
3. Enclosed elevator lobbies and protection of elevator hoistway door openings are not required on levels where the elevator hoistway opens to the exterior.

3006.3 Hoistway Opening Protection

Where Section 3006.2 requires protection of the elevator hoistway door opening, the protection shall be provided by one of the following:

1. An enclosed elevator lobby shall be provided at each floor to separate the elevator hoistway shaft enclosure doors from each floor by fire partitions in accordance with Section 708. In addition, doors protecting openings in the elevator lobby enclosure walls shall comply with Section 716.5.3 as required for corridor walls. Penetrations of the enclosed elevator lobby by ducts and air transfer openings shall be protected as required for corridors in accordance with Section 717.5.4.1.
2. An enclosed elevator lobby shall be provided at each floor to separate the elevator hoistway shaft enclosure doors from each floor by smoke partitions in accordance with Section 710 where the building is equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 or 903.3.1.2. In addition, doors protecting openings in the smoke partitions shall comply with Sections 710.5.2.2, 710.5.2.3 and 716.5.9. Penetrations of the enclosed elevator lobby by ducts and air transfer openings shall be protected as required for corridors in accordance with Section 717.5.4.1.
3. Additional doors shall be provided at each elevator hoistway door opening in accordance with Section 3002.6. Such door shall comply with the smoke and draft control door assembly requirements in Section 716.5.3.1 when tested in accordance with UL 1784 without an artificial bottom seal.
4. The elevator hoistway shall be pressurized in accordance with Section 909.21.
5. A *smoke protective curtain assembly for hoistways* shall be provided at each elevator hoistway door opening in accordance with Section 3002.6. Such curtain assemblies shall comply with the smoke and draft control requirements in Section 716.5.3.1 when tested in accordance with UL 1784 without an artificial bottom seal. Such curtain assemblies shall be equipped with a control unit listed to UL 864. Such curtain assemblies shall comply with section 2.11.6.3 of ASME A17.1/CSA B44. Installation and maintenance shall be in accordance with NFPA 105.

3006.4 Means of Egress

Elevator lobbies shall be provided with at least one means of egress complying with Chapter 10 and other provisions in this code. Egress through an elevator lobby shall be permitted in accordance with Item 1 of Section 1016.2. Electrically locked exit access doors providing egress from elevator lobbies shall be permitted in accordance with Section 1010.2.16.

Section 3007 Fire Service Access Elevator

3007.1 General

Where required by Section 403.6.1, every floor above and including the lowest level of fire department vehicle access of the building shall be served by fire service access elevators complying with Sections 3007.1 through 3007.9. Except as modified in this section, fire service access elevators shall be installed in accordance with this chapter and ASME A17.1/CSA B44.

Exceptions:

1. Elevators that only service an open or enclosed parking garage and the lobby of the building shall not be required to serve as fire service access elevators
2. The elevator shall not be required to serve the top floor of a building where that floor is utilized only for equipment for building systems.

3007.2 Automatic Sprinkler System

The building shall be equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, except as otherwise permitted by Section 903.3.1.1.1 and as prohibited by Section 3007.2.1.

3007.2.1 Prohibited Locations

Automatic sprinklers shall not be installed in machine rooms, elevator machinery spaces, control rooms, control spaces and elevator hoistways of fire service access elevators.

3007.2.2 Sprinkler System Monitoring

The sprinkler system shall have a sprinkler control valve supervisory switch and water-flow-initiating device provided for each floor that is monitored by the building's *fire alarm system*.

3007.3 Water Protection

Water from the operation of an automatic sprinkler system outside the enclosed lobby shall be prevented from infiltrating into the hoistway enclosure in accordance with an approved method.

3007.4 Shunt Trip

Means for elevator shutdown in accordance with Section 3005.5 shall not be installed on elevator systems used for fire service access elevators.

3007.5 Hoistway Enclosures

The fire service access elevator hoistway shall be located in a *shaft enclosure* complying with Section 713.

3007.5.1 Structural Integrity of Hoistway Enclosures

The fire service access elevator hoistway enclosure shall comply with Sections 403.2.3.1 through 403.2.3.4.

3007.5.2 Hoistway Lighting

When fire-fighters' emergency operation is active, the entire height of the hoistway shall be illuminated at not less than 1 footcandle (11 lux) as measured from the top of the car of each fire service access elevator.

3007.6 Fire Service Access Elevator Lobby

The fire service access elevator shall open into a fire service access elevator lobby in accordance with Sections 3007.6.1 through 3007.6.5. Egress is permitted through the elevator lobby in accordance with Item 1 of Section 1016.2.

Exceptions:

1. Where a fire service access elevator has two entrances onto a floor, the second entrance shall be permitted to open into an elevator lobby in accordance with Section 3006.1.
2. Where a fire service access elevator is required, a 1-hour fire-rated fire service access elevator lobby with direct access from the fire service access elevator is not required if the fire service access elevator opens into an exit access corridor that is no less than 6 feet wide for its entire length and is at least 150 square feet with the exception of door openings, and has a minimum 1-hour fire rating with three-quarter hour fire- and smoke-rated openings; and during a fire event the fire service access elevator is pressurized and floor-to-floor smoke control is provided.

Exception: Where transient residential occupancies occur at floor levels more than 420 feet above the level of fire service access, a 1-hour fire-rated service access elevator lobby with direct access from the fire service access elevator is required.

3007.6.1 Access to Interior Exit Stairway or Ramp

The fire service access elevator lobby shall have direct access from the enclosed elevator lobby to an enclosure for an *interior exit stairway or ramp*.

Exception: Access to an *interior exit stairway or ramp* shall be permitted to be through a protected path of travel that has a level of fire protection not less than the elevator lobby enclosure. The protected path shall be separated from the enclosed elevator lobby through an opening protected by a smoke and draft control assembly in accordance Section 716.5.3.

3007.6.2 Lobby Enclosure

The fire service access elevator lobby shall be enclosed with a *smoke barrier* having a *fire-resistance rating* of not less than 1 hour, except that lobby doorways shall comply with Section 3007.6.3.

Exception: Enclosed fire service access elevator lobbies are not required at the *levels of exit discharge*.

3007.6.3 Lobby Doorways

Other than doors to the hoistway, elevator control room or elevator control space, each doorway to a fire service access elevator lobby shall be provided with a $\frac{3}{4}$ -hour *fire door assembly* complying with Section 716. The *fire door assembly* shall comply with the smoke and draft control door assembly requirements of Section 716.5.3.1, and be tested in accordance with UL 1784 without an artificial bottom seal.

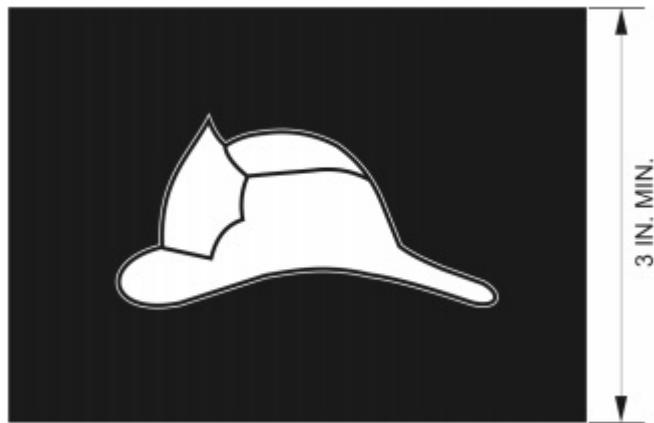
3007.6.4 Lobby Size

Regardless of the number of fire service access elevators served by the same elevator lobby, the enclosed fire service access elevator lobby shall be not less than 150 square feet (14 m^2) in an area with a dimension of not less than 8 feet (2440 mm).

3007.6.5 Fire Service Access Elevator Symbol

A pictorial symbol of a standardized design designating which elevators are fire service access elevators shall be installed on each side of the hoistway door frame on the portion of the frame at right angles to the fire service access elevator lobby. The fire service access elevator symbol shall be designed as shown in Figure 3007.6.5 and shall comply with the following:

1. The fire service access elevator symbol shall be not less than 3 inches (76 mm) in height.
2. The helmet shall contrast with the background, with either a light helmet on a dark background or a dark helmet on a light background.
3. The vertical center line of the fire service access elevator symbol shall be centered on the hoistway door frame. Each symbol shall be not less than 78 inches (1981 mm), and not more than 84 inches (2134 mm) above the finished floor at the threshold.



For SI: 1 inch = 25.4 mm.

FIGURE 3007.6.5

FIRE SERVICE ACCESS ELEVATOR SYMBOL

3007.7 Elevator System Monitoring

The fire service access elevator shall be continuously monitored at the *fire command center* by a standard emergency service interface system meeting the requirements of NFPA 72.

3007.8 Electrical Power

The following features serving each fire service access elevator shall be supplied by both normal power and Type 60/Class 2/Level 1 standby power:

1. Elevator equipment.
2. Elevator hoistway lighting.
3. *Ventilation* and cooling equipment for elevator machine rooms, control rooms, machine spaces and control spaces.

4. Elevator car lighting.

3007.8.1 Protection of Wiring or Cables

Wires or cables that are located outside of the elevator hoistway and machine room and that provide normal or standby power, control signals, communication with the car, lighting, heating, air conditioning, *ventilation* and fire-detecting systems to fire service access elevators shall be protected using one of the following methods:

1. Cables used for survivability of required critical circuits shall be listed in accordance with UL 2196 and shall have a *fire-resistance rating* of not less than 2 hours.
2. Electrical circuit protective systems shall have a *fire-resistance rating* of not less than 2 hours. Electrical circuit protective systems shall be installed in accordance with their listing requirements.
3. Construction having a *fire-resistance rating* of not less than 2 hours.

Exception: Wiring and cables to control signals are not required to be protected provided that wiring and cables do not serve Phase II emergency in-car operations.

3007.9 Standpipe Hose Connection

A Class I standpipe hose connection in accordance with Section 905 shall be provided in the *interior exit stairway* and *ramp* having direct access from the fire service access elevator lobby.

3007.9.1 Access

The *exit* enclosure containing the standpipe shall have access to the floor without passing through the fire service access elevator lobby.

Exception: Group R-1 and R-2 occupancy buildings. Standpipes in high-rise buildings of Group R-1 or R-2 must be located in stairwells and are subject only to the requirements of the *Florida Fire Prevention Code* and NFPA 14, Standard for the Installation of Standpipes and Hose Systems, adopted by the State Fire Marshal.

Section 3008 Occupant Evacuation Elevators

3008.1 General

Elevators used for occupant self-evacuation during fires shall comply with Sections 3008.1 through 3008.10.

3008.1.1 Number of Occupant Evacuation Elevators

The number of elevators available for occupant evacuation shall be determined based on an egress analysis that addresses one of the following scenarios:

1. Full building evacuation where the analysis demonstrates that the number of elevators provided for evacuation results in an evacuation time less than 1 hour.
2. Evacuation of the five consecutive floors with the highest cumulative occupant load where the analysis demonstrates that the number of elevators provided for evacuation results in an evacuation time less than 15 minutes.

A minimum of one elevator in each bank shall be designated for occupant evacuation. Not fewer than two shall be provided in each occupant evacuation elevator lobby where more than one elevator opens into the lobby. Signage shall be provided to denote which elevators are available for occupant evacuation.

3008.1.2 Additional Exit Stairway

Where an additional *means of egress* is required in accordance with Section 403.5.2, an additional *exit stairway* shall not be required to

be installed in buildings provided with occupant evacuation elevators complying with Section 3008.1.

3008.1.3 Fire Safety and Evacuation Plan

The building shall have an *approved* fire safety and evacuation plan in accordance with the applicable requirements of the *Florida Fire Prevention Code*. The fire safety and evacuation plan shall incorporate specific procedures for the occupants using evacuation elevators.

3008.1.4 Operation

The occupant evacuation elevators shall be used for occupant self-evacuation in accordance with the occupant evacuation operation requirements in ASME A17.1/CSA B44 and the building's fire safety and evacuation plan.

3008.2 Automatic Sprinkler System

The building shall be equipped throughout with an *approved*, electrically supervised *automatic sprinkler system* in accordance with Section 903.3.1.1, except as otherwise permitted by Section 903.3.1.1.1 and as prohibited by Section 3008.2.1.

3008.2.1 Prohibited Locations

Automatic sprinklers shall not be installed in elevator machine rooms, machinery spaces, control rooms, control spaces and elevator hoistways of occupant evacuation elevators.

3008.2.2 Sprinkler System Monitoring

The automatic sprinkler system shall have a sprinkler control valve supervisory switch and water-flow-initiating device provided for each floor that is monitored by the building's *fire alarm system*.

3008.3 Water Protection

Water from the operation of an automatic sprinkler system outside the enclosed lobby shall be prevented from infiltrating into the hoistway enclosure in accordance with an approved method.

3008.4 Shunt Trip

Means for elevator shutdown in accordance with Section 3005.5 shall not be installed on elevator systems used for occupant evacuation elevators.

3008.5 Hoistway Enclosure Protection

Occupant evacuation elevator hoistways shall be located in *shaft enclosures* complying with Section 713.

3008.5.1 Structural Integrity of Hoistway Enclosures

Occupant evacuation elevator hoistway enclosures shall comply with Sections 403.2.3.1 through 403.2.3.4.

3008.6 Occupant Evacuation Elevator Lobby

Occupant evacuation elevators shall open into an elevator lobby in accordance with Sections 3008.6.1 through 3008.6.6. Egress is permitted through the elevator lobby in accordance with Item 1 of Section 1016.2.

3008.6.1 Access to Interior Exit Stairway or Ramp

The occupant evacuation elevator lobby shall have direct access from the enclosed elevator lobby to an *interior exit stairway or ramp*.

Exceptions:

1. Access to an *interior exit stairway or ramp* shall be permitted to be through a protected path of travel that has a level of fire protection not less than the elevator lobby enclosure. The protected path shall be separated from the enclosed elevator lobby through an opening protected by a smoke and draft control assembly in accordance with Section 716.5.3.
2. Elevators that only service an open parking garage and the lobby of the building shall not be required to provide direct access in accordance with this section.

3008.6.2 Lobby Enclosure

The occupant evacuation elevator lobby shall be enclosed with a *smoke barrier* having a *fire-resistance rating* of not less than 1 hour, except that lobby doorways shall comply with Section 3008.6.3.

Exception: Enclosed occupant evacuation elevator lobbies are not required at the *levels of exit discharge*.

3008.6.3 Lobby Doorways

Other than the doors to the hoistway, elevator machine rooms, machinery spaces, control rooms and control spaces within the lobby enclosure smoke barrier, each doorway to an occupant evacuation elevator lobby shall be provided with a $\frac{3}{4}$ -hour *fire door assembly* complying with Section 716. The *fire door assembly* shall comply with the smoke and draft control assembly requirements of Section 716.5.3.1 and shall be tested in accordance with UL 1784 without an artificial bottom seal.

3008.6.3.1 Vision Panel

A vision panel shall be installed in each *fire door assembly* protecting the lobby doorway. The vision panel shall consist of fire-protection-rated glazing and shall comply with the requirements of Section 716 and shall be located to furnish clear vision of the occupant evacuation elevator lobby.

3008.6.3.2 Door Closing

Each *fire door assembly* protecting the lobby doorway shall be automatic-closing upon receipt of any fire alarm signal from the *emergency voice/alarm communication system* serving the building.

3008.6.4 Lobby Size

Each occupant evacuation elevator lobby shall have minimum floor area as follows:

1. The occupant evacuation elevator lobby floor area shall accommodate, at 3 square feet (0.28 m^2) per person, not less than 25 percent of the *occupant load* of the floor area served by the lobby.
2. The occupant evacuation elevator lobby floor area shall accommodate one *wheelchair space* of 30 inches by 48 inches (760 mm by 1220 mm) for each 50 persons, or portion thereof, of the *occupant load* of the floor area served by the lobby.

Exception: The size of lobbies serving multiple banks of elevators shall have the minimum floor area *approved* on an individual basis and shall be consistent with the building's fire safety and evacuation plan.

3008.6.5 Signage

An *approved* sign indicating elevators are suitable for occupant self-evacuation shall be posted on all floors adjacent to each elevator call station serving occupant evacuation elevators.

3008.6.6 Two-Way Communication System

A two-way communication system shall be provided in each occupant evacuation elevator lobby for the purpose of initiating communication with the *fire command center* or an alternate location *approved* by the fire department. The two-way communication system shall be designed and installed in accordance with Section 1009.

3008.7 Elevator System Monitoring

The occupant evacuation elevators shall be continuously monitored at the *fire command center* or a central control point *approved* by the fire department and arranged to display all of the following information:

1. Floor location of each elevator car.
2. Direction of travel of each elevator car.
3. Status of each elevator car with respect to whether it is occupied.
4. Status of normal power to the elevator equipment, elevator machinery and electrical apparatus cooling equipment where provided, elevator machine room, control room and control space *ventilation* and cooling equipment.

5. Status of standby or emergency power system that provides backup power to the elevator equipment, elevator machinery and electrical cooling equipment where provided, elevator machine room, control room and control space *ventilation* and cooling equipment.
6. Activation of any fire alarm initiating device in any elevator lobby, elevator machine room, machine space containing a motor controller or electric driving machine, control space, control room or elevator hoistway.

3008.7.1 Elevator Recall

The *fire command center* or an alternate location *approved* by the fire department shall be provided with the means to manually initiate a Phase I Emergency Recall of the occupant evacuation elevators in accordance with ASME A17.1/CSA B44.

3008.8 Electrical Power

The following features serving each occupant evacuation elevator shall be supplied by both normal power and Type 60/Class 2/Level 1 standby power:

1. Elevator equipment.
2. *Ventilation* and cooling equipment for elevator machine rooms, control rooms, machinery spaces and control spaces.
3. Elevator car lighting.

3008.8.1 Determination of Standby Power Load

Standby power loads shall be based upon the determination of the number of occupant evacuation elevators in Section 3008.1.1.

3008.8.2 Protection of Wiring or Cables

Wires or cables that are located outside of the elevator hoistway, machine room, control room and control space and that provide normal or standby power, control signals, communication with the car, lighting, heating, air conditioning, *ventilation* and fire-detecting systems to occupant evacuation elevators shall be protected using one of the following methods:

1. Cables used for survivability of required critical circuits shall be listed in accordance with UL 2196 and shall have a *fire-resistance rating* of not less than 2 hours.
2. Electrical circuit protective systems shall have a *fire-resistance rating* of not less than 2 hours. Electrical circuit protective systems shall be installed in accordance with their listing requirements.
3. Construction having a *fire-resistance rating* of not less than 2 hours.

Exception: Wiring and cables to control signals are not required to be protected provided that wiring and cables do not serve Phase II emergency in-car operation.

3008.9 Emergency Voice/Alarm Communication System

The building shall be provided with an *emergency voice/alarm communication system*. The *emergency voice/alarm communication system* shall be accessible to the fire department. The system shall be provided in accordance with Section 907.5.2.2.

3008.9.1 Notification Appliances

Not fewer than one audible and one visible notification appliance shall be installed within each occupant evacuation elevator lobby.

3008.10 Hazardous Material Areas

No building areas shall contain hazardous materials exceeding the maximum allowable quantities per *control area* as addressed in Section

Section 3009 Elevator Accessibility Requirements for the Physically Handicapped

3009.1

In a building having any elevators that do not provide access to every floor level, elevator hallway call buttons on all main levels of ingress and on any floor that is commonly served by more than one group of elevators must be marked with Arabic and braille symbols that indicate floor levels to which access is provided. The symbols must be placed directly above each call button.

3009.2

Each elevator car interior must have a support rail on at least one wall. All support rails must be smooth and have no sharp edges and must not be more than 1 $\frac{1}{2}$ inches (38 mm) thick or 2 $\frac{1}{2}$ inches (63 mm) in diameter. Support rails must be continuous and a minimum length of 42 inches (1067 mm) overall.

The inside surface of support rails must be 1 $\frac{1}{2}$ inches (38 mm) clear of the car wall. The distance from the top of the support rail to the finished car floor must be at least 31 inches (787 mm) and not more than 33 inches (838 mm). Padded or tufted material or decorative materials such as wallpaper, vinyl, cloth or the like may not be used on support rails.

3009.3

A bench or seat may be installed on the rear wall of the elevator car enclosure, if the bench or seat does not protrude beyond the vertical plane of the elevator car enclosure wall when folded into a recess provided for the bench or seat and, when not in use, the bench or seat automatically folds into the recess. The bench or seat must be capable of supporting a live load of at least 250 pounds (113.4 kg) on any 12-inch by 12-inch (305 mm by 305 mm) area. A padded, tufted or other decorative material may not be used to cover the bench or seat; or may the bench or seat encroach on the minimum clear inside-car dimensions specified in this section.

This section applies only to elevators available for the transportation of the public. This section does not apply to elevators restricted by key or similar device to a limited number of persons in a building that has an elevator that otherwise meets the requirements of this section or to elevators used only for the transportation of freight. However, elevators that are used as freight and passenger elevators for the public and employees must comply with this section. This section does not apply to dumbwaiters or escalators.

This section supersedes all other state regulations and local ordinances and rules affecting the accessibility of passenger elevators to the physically handicapped, and the standards established by this section may not be modified by municipal or county ordinance.

Section 3010 Serial Numbers

3010.1 Serial Numbers

Each elevator shall have a serial number assigned by the division or authority having jurisdiction painted on or attached to the elevator car in plain view and also to the driving mechanism. This serial number shall be shown on all required certificates and permits.

3010.1.1

Certificates of operation must be posted in a conspicuous location in the elevator and shall contain the text of Section 823.12, *Florida Statutes* relating to the prohibition against smoking in elevators. The certificate must be framed with a transparent cover.

3010.1.2

The designation "NO SMOKING" along with the international symbol for no smoking shall be conspicuously displayed within the interior of the elevator in the plain view of the public.

3010.1.3

The following ASME A17.1 and ASME A17.3 rules are hereby amended to read as follows:

- a. Rule 2.29.1.1 of ASME A17.1 is amended to add the following to the rule: "Each car in a multicar group shall be sequentially identified from left to right, as viewed from the elevator lobby."
- b. Rule 2.7.3.1.1 of ASME A17.1 is amended to add the following to the rule: "The key to the machine rooms, control rooms, machinery spaces and control spaces shall be kept on the premises at all times and be readily available for use by State of Florida Certified Elevator Inspectors."

c. Rule 3.11.3 of ASME A17.3 is amended to read as follows:

Note: Updates to the Safety Code for Existing Elevators and Escalators ASME A17.1 and ASME A17.3 which require Phase II Firefighters' Service shall apply except where Section 399.02(9) *Florida Statutes* states Phase II Firefighters' Service on elevators may not be enforced until the elevator is replaced or requires major modification, whichever occurs first, on elevators in condominiums or multifamily residential buildings, including those that are part of a continuing care facility licensed under Chapter 651, or similar retirement community with apartments, having a certificate of occupancy by the local building authority that was issued before July 1, 2008. This exception does not prevent an elevator owner from requesting a variance from the applicable codes. This subsection does not prohibit the division from granting variances pursuant to Section 120.542, *Florida Statutes*.

Section 3011 Electrolysis Protection for Underground Hydraulic Elevator Cylinders

3011.1 Electrolysis Protection for Underground Hydraulic Elevator Cylinders

All newly installed underground hydraulic pressure cylinders shall be encased in outer plastic containment to minimize electrolytic corrosion between the metal cylinder and ground cathode.

3011.1.1

The plastic casing shall be capped at the bottom, and all joints must be solvent or heat welded to ensure water tightness.

3011.1.2

The plastic casing shall be constructed of polyethylene or polyvinyl chloride (PVC). The plastic pipe wall thickness must not be less than 0.125 inch (3.175 mm).

3011.1.3

The neck of the plastic casing shall have a means of inspection provided to monitor the annulus between the pressurized hydraulic cylinder and the protective plastic casing.

3011.1.4

Replacements of existing hydraulic cylinders shall be protected by the aforementioned method where existing physical dimensions permit.

Section 3012 Alterations to Electric and Hydraulic Elevators and Escalators

3012.1 Alterations to Electric and Hydraulic Elevators and Escalators

Alterations set forth in Part 8, ASME A17.1 to include any change to equipment, including its parts, components, and/or subsystems, other than maintenance, repair, or replacement; require an elevator construction permit, along with documented performance of inspections and tests to determine conformance with ASME A17.1. A repair or replacement of equipment, parts, components or subsystems that requires inspection, tests and independent witnessing in other sections of ASME A17.1, A17.3 and A18.1 shall require an elevator construction permit.

Section 3013 Clearance Requirements Between Elevator Doors for Elevators Inside a Private Residence

3013.1 For Elevators Installed in a Private Residence:

(a) The distance between the hoistway face of the hoistway doors and the hoistway edge of the landing sill may not exceed $\frac{3}{4}$ inch for swinging doors and $2\frac{1}{4}$ inches for sliding doors.

(b)

1. Horizontal sliding car doors and gates shall be designed and installed to withstand a force of 75 pounds applied horizontally on an area 4 inches by 4 inches at right angles to and at any location on the car door without permanent deformation. The deflection may not exceed $\frac{3}{4}$ inch and may not displace the door from its guides or tracks. The force must be applied while the door is in the fully closed position.

2. Folding car doors shall be designed and installed to withstand a force of 75 pounds applied horizontally using a 4-inch-diameter sphere at any location within the folds on the car door without permanent deformation. The deflection may not exceed $\frac{3}{4}$ inch and may not displace the door from its guides or tracks. The force must be applied while the door is in the fully closed position.

(c) The distance between the hoistway face of the landing door and the hoistway face of the car door or gate shall conform to one of the following:

1. If a power-operated horizontally sliding hoistway and car doors are used, the measurement between the leading edge of the doors or sight guard, if provided, may not exceed 4 inches. If it is possible for a user to detach or disconnect either door from the operator and such detachment or disconnection allows the user to operate the door manually, the requirement in subparagraph 5 applies.
2. If swinging hoistway doors and folding car doors are used and both doors are in the fully closed position, the space between the hoistway door and the folding door must reject a 4-inch-diameter sphere at all points.
3. If swinging hoistway doors and car gates are used between the hoistway door and the car gate must reject a 4-inch-diameter sphere at all points.
4. If the car doors are powered and arranged so that they cannot be closed until after the hoistway door is closed, and the car doors automatically open when the car is at a landing and the hoistway door is opened, the measurement between the hoistway face of the hoistway door and the hoistway face of the car door at its leading edge may not exceed 4 inches. If it is possible for a user to detach or disconnect either door from the operator and such detachment or disconnection allows the user to operate the door manually, the requirement in subparagraph 5 applies.
5. If swinging or horizontally sliding hoistway doors and manual horizontally sliding car doors are used and both doors are in the fully closed position, the space between the swinging or horizontally sliding hoistway door and the manual horizontally sliding car doors must reject a 4-inch-diameter sphere at all points.

Exception: As an alternative to compliance with Section 3013.1(c), Items 2 through 5, a permanent installation of a nonremovable, hoistway door space guard is allowed. The door space guard must be designed and installed to withstand a force of 75 pounds applied horizontally using a 4-inch-diameter sphere at any location within the folds on the car door without permanent deformation.

3013.2

During normal operation, the elevator controller must monitor the closed and locked contacts of the hoistway door locking device, whether electrical or mechanical. If the closed and locked contacts of the landing locks are open while the car is not in the unlocking zone for the hoistway door locking device, the elevator controller must interrupt power to the motor and brake and must not allow the elevator car to restart until the owner or the owner's agent, with a master elevator key, has checked for obstructions above and below the elevator car, returned the hoistway door locking device contacts to the normal operating position, and manually reset the elevator controller with the master elevator key. Additionally, a visual indicator must be visible at all landings until the hoistway door locking device has been returned to the normal operating position and the elevator controller has been manually reset.

3013.3

This section applies to all new elevators in a private residence.

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Chapter 31 Special Construction

Section 3101 General

3101.1 Scope

The provisions of this chapter shall govern special building construction including membrane structures, temporary structures, *pedestrian walkways* and tunnels, automatic *vehicular gates*, *awnings* and *canopies*, *marquees*, signs, towers and antennas, and exterior elevated flooring systems.

Section 3102 Membrane Structures

3102.1 General

The provisions of Sections 3102.1 through 3102.8 shall apply to air-supported, air-inflated, membrane-covered cable, membrane-covered frame and *tensile membrane structures*, collectively known as membrane structures, erected for a period of 180 days or longer. Those erected for a shorter period of time shall comply with the *Florida Fire Prevention Code*. Membrane structures covering water storage facilities, water clarifiers, water treatment plants, sewage treatment plants, greenhouses and similar facilities not used for human occupancy are required to meet only the requirements of Sections 3102.3.1 and 3102.7. Membrane structures erected on a building, balcony, deck or other structure for any period of time shall comply with this section.

3102.1.1 Tensile Membrane Structures

Tensile membrane structures, including permanent and temporary structures, shall be designed and constructed in accordance with ASCE 55. The provisions in Sections 3102.3 through 3102.6 shall apply.

3102.2 Definitions

The following terms are defined in Chapter 2:

AIR-INFLATED STRUCTURE.

AIR-SUPPORTED STRUCTURE.

Double skin.

Single skin.

CABLE-RESTRAINED, AIR-SUPPORTED STRUCTURE.

MEMBRANE-COVERED CABLE STRUCTURE.

MEMBRANE-COVERED FRAME STRUCTURE.

NONCOMBUSTIBLE MEMBRANE STRUCTURE.

TENSILE MEMBRANE STRUCTURE.

3102.3 Type of Construction

Noncombustible membrane structures shall be classified as Type IIB construction. Noncombustible frame or cable-supported structures covered by an approved membrane in accordance with Section 3102.3.1 shall be classified as Type IIB construction. Heavy timber frame-supported structures covered by an *approved* membrane in accordance with Section 3102.3.1 shall be classified as Type IV construction. Other membrane structures shall be classified as Type V construction.

Exception: Plastic less than 30 feet (9144 mm) above any floor used in greenhouses, where occupancy by the general public is not authorized, and for aquaculture pond covers is not required to meet the fire propagation performance criteria of Test Method 1 or Test Method 2, as appropriate, of NFPA 701.

3102.3.1 Membrane and Interior Liner Material

Membranes and interior liners shall be either noncombustible as set forth in Section 703.5 or meet the fire propagation performance criteria of Test Method 1 or Test Method 2, as appropriate, of NFPA 701 and the manufacturer's test protocol.

Exception: Plastic less than 20 mil (0.5 mm) in thickness used in greenhouses, where occupancy by the general public is not authorized, and for aquaculture pond covers is not required to meet the fire propagation performance criteria of Test Method 1 or Test Method 2, as appropriate, of NFPA 701.

3102.4 Allowable Floor Areas

The area of a membrane structure shall not exceed the limitations specified in Section 506.

3102.5 Maximum Height

Membrane structures shall not exceed one story nor shall such structures exceed the height limitations in feet specified in Section 504.3.

Exception: Noncombustible membrane structures serving as roofs only.

3102.6 Mixed Construction

Membrane structures shall be permitted to be utilized as specified in this section as a portion of buildings of other types of construction. Height and area limits shall be as specified for the type of construction and occupancy of the building.

3102.6.1 Noncombustible Membrane

A noncombustible membrane shall be permitted for use as the roof or as a skylight of any building or atrium of a building of any type of construction provided the membrane is not less than 20 feet (6096 mm) above any floor, balcony or gallery.

3102.6.1.1 Membrane

A membrane meeting the fire propagation performance criteria of Test Method 1 or Test Method 2, as appropriate, of NFPA 701 shall be permitted to be used as the roof or as a skylight on buildings of Type IIB, III, IV and V construction, provided the membrane is not less than 20 feet (6096 mm) above any floor, balcony or gallery.

3102.7 Engineering Design

The structure shall be designed and constructed to sustain dead loads, loads due to tension or inflation, live loads including wind and flood loads and in accordance with Chapter 16.

3102.7.1 Lateral Restraint

For membrane-covered frame structures, the membrane shall not be considered to provide lateral restraint in the calculation of the capacities of the frame members.

3102.8 Inflation Systems

Air-supported and air-inflated structures shall be provided with primary and auxiliary inflation systems to meet the minimum requirements of Sections 3102.8.1 through 3102.8.3.

3102.8.1 Equipment Requirements

This inflation system shall consist of one or more blowers and shall include provisions for automatic control to maintain the required inflation pressures. The system shall be so designed as to prevent overpressurization of the system.

3102.8.1.1 Auxiliary Inflation System

In addition to the primary inflation system, in buildings larger than 1,500 square feet (140 m^2) in area, an auxiliary inflation system shall be provided with sufficient capacity to maintain the inflation of the structure in case of primary system failure. The auxiliary inflation system shall operate automatically when there is a loss of internal pressure and when the primary blower system becomes inoperative.

3102.8.1.2 Blower Equipment

Blower equipment shall meet all of the following requirements:

1. Blowers shall be powered by continuous-rated motors at the maximum power required for any flow condition as required by the structural design.
2. Blowers shall be provided with inlet screens, belt guards and other protective devices as required by the *building official* to provide protection from injury.

3. Blowers shall be housed within a weather-protecting structure.
4. Blowers shall be equipped with backdraft check dampers to minimize air loss when inoperative.
5. Blower inlets shall be located to provide protection from air contamination. The location of inlets shall be *approved*.

3102.8.2 Standby Power

Wherever an auxiliary inflation system is required, an *approved* standby power-generating system shall be provided. The system shall be equipped with a suitable means for automatically starting the generator set upon failure of the normal electrical service and for automatic transfer and operation of all of the required electrical functions at full power within 60 seconds of such service failure. Standby power shall be capable of operating independently for not less than 4 hours.

3102.8.3 Support Provisions

A system capable of supporting the membrane in the event of deflation shall be provided for in air-supported and air-inflated structures having an *occupant load* of 50 or more or where covering a swimming pool regardless of *occupant load*. The support system shall be capable of maintaining membrane structures used as a roof for Type I construction not less than 20 feet (6096 mm) above floor or seating areas. The support system shall be capable of maintaining other membranes not less than 7 feet (2134 mm) above the floor, seating area or surface of the water.

Section 3103 Temporary Structures

3103.1 General

The provisions of Sections 3103.1 through 3103.4 shall apply to structures erected for a period of less than 180 days. Special event structures, tents, umbrella structures and other membrane structures erected for a period of less than 180 days shall also comply with the *Florida Fire Prevention Code*. Those erected for a longer period of time shall comply with applicable sections of this code.

3103.1.1 Conformance

Temporary structures and uses shall conform to the structural strength, fire safety, *means of egress*, accessibility, light, ventilation and sanitary requirements of this code as necessary to ensure public health, safety and general welfare.

3103.1.2 Permit Required

Temporary structures that cover an area greater than 120 square feet (11.16 m^2), including connecting areas or spaces with a common *means of egress* or entrance that are used or intended to be used for the gathering together of 10 or more persons, shall not be erected, operated or maintained for any purpose without obtaining a *permit* from the *building official*.

3103.2 Construction Documents

A *permit* application and *construction documents* shall be submitted for each installation of a temporary structure. The *construction documents* shall include a site plan indicating the location of the temporary structure and information delineating the *means of egress* and the *occupant load*.

3103.3 Location

Temporary structures shall be located in accordance with the requirements of Table 705.5 based on the *fire-resistance rating* of the *exterior walls* for the proposed type of construction.

3103.4 Means of Egress

Temporary structures shall conform to the *means of egress* requirements of Chapter 10 and shall have an *exit access* travel distance of 100 feet (30 480 mm) or less.

Section 3104 Pedestrian Walkways and Tunnels

3104.1 General

This section shall apply to connections between buildings such as *pedestrian walkways* or tunnels, located at, above or below grade level, that are used as a means of travel by persons. The *pedestrian walkway* shall not contribute to the *building area* or the number of *stories* or

height of connected buildings.

3104.1.1 Application

Pedestrian walkways shall be designed and constructed in accordance with Sections 3104.2 through 3104.9. Tunnels shall be designed and constructed in accordance with Sections 3104.2 and 3104.10.

3104.2 Separate Structures

Buildings connected by *pedestrian walkways* or tunnels shall be considered to be separate structures.

Exceptions:

1. Buildings that are on the same lot and considered as portions of a single building in accordance with Section 503.1.2.
2. Reserved.

3104.3 Construction

The *pedestrian walkway* shall be of noncombustible construction.

Exceptions:

1. Combustible construction shall be permitted where connected buildings are of combustible construction.
2. *Fire-retardant-treated wood*, in accordance with Section 603.1, Item 1.3, shall be permitted for the roof construction of the *pedestrian walkway* where connected buildings are a minimum of Type I or II construction.

3104.4 Contents

Only materials and decorations *approved* by the *building official* shall be located in the *pedestrian walkway*.

3104.5 Connections of Pedestrian Walkways to Buildings

The connection of a *pedestrian walkway* to a building shall comply with Section 3104.5.1, 3104.5.2, 3104.5.3 or 3104.5.4.

Exception: Buildings that are on the same lot and considered as portions of a single building in accordance with Section 503.1.2.

3104.5.1 Fire Barriers

Pedestrian walkways shall be separated from the interior of the building by not less than 2-hour *fire barriers* constructed in accordance with Section 707 and Sections 3104.5.1.1 through 3104.5.1.3.

3104.5.1.1 Exterior Walls

Exterior walls of buildings connected to *pedestrian walkways* shall be 2-hour fire-resistance rated. This protection shall extend not less than 10 feet (3048 mm) in every direction surrounding the perimeter of the pedestrian walkway.

3104.5.1.2 Openings in Exterior Walls of Connected Buildings

Openings in exterior walls required to be fire-resistance rated in accordance with Section 3104.5.1.1 shall be equipped with opening protectives providing a not less than $\frac{3}{4}$ -hour *fire protection rating* in accordance with Section 716.

3104.5.1.3 Supporting Construction

The fire barrier shall be supported by construction as required by Section 707.5.1.

3104.5.2 Alternative Separation

The wall separating the *pedestrian walkway* and the building shall comply with Section 3104.5.2.1 or 3104.5.2.2 where:

1. The distance between the connected buildings is more than 10 feet (3048 mm).

2. The *pedestrian walkway* and connected buildings are equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, and the roof of the walkway is not more than 55 feet (16 764 mm) above grade connecting to the fifth, or lower, story above grade plane, of each building.

Exception: Open parking garages need not be equipped with an automatic sprinkler system.

3104.5.2.1 Passage of Smoke

The wall shall be capable of resisting the passage of smoke.

3104.5.2.2 Glass

The wall shall be constructed of a tempered, wired or laminated glass and doors separating the interior of the building from the *pedestrian walkway*. The glass shall be protected by an *automatic sprinkler system* in accordance with Section 903.3.1.1 that, when actuated, shall completely wet the entire surface of interior sides of the wall or glass. Obstructions shall not be installed between the sprinkler heads and the wall or glass. The glass shall be in a gasketed frame and installed in such a manner that the framing system will deflect without breaking (loading) the glass before the sprinkler operates.

3104.5.3 Open Sides on Walkway

Where the distance between the connected buildings is more than 10 feet (3048 mm), the walls at the intersection of the *pedestrian walkway* and each building need not be fire-resistance rated provided both sidewalls of the pedestrian walkway are not less than 50 percent open with the open area uniformly distributed to prevent the accumulation of smoke and *toxic gases*. The roof of the walkway shall be located not more than 40 feet (12 160 mm) above grade plane, and the walkway shall only be permitted to connect to the third or lower story of each building.

Exception: Where the *pedestrian walkway* is protected with a sprinkler system in accordance with Section 903.3.1.1, the roof of the walkway shall be located not more than 55 feet (16 764 mm) above grade plane and the walkway shall only be permitted to connect to the fifth or lower story of each building.

3104.5.4 Exterior Walls Greater Than 2 Hours

Where *exterior walls* of connected buildings are required by Section 705 to have a *fire-resistance rating* greater than 2 hours, the walls at the intersection of the pedestrian walkway and each building need not be fire-resistance rated provided:

1. The *pedestrian walkway* is equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1.
2. The roof of the walkway is not located more than 55 feet (16 764 mm) above grade plane and the walkway connects to the fifth, or lower, story above grade plane of each building.

3104.6 Public Way

Pedestrian walkways over a *public way* shall comply with Chapter 32.

3104.7 Egress

Access shall be provided at all times to a *pedestrian walkway* that serves as a required *exit*.

3104.8 Width

The unobstructed width of *pedestrian walkways* shall be not less than 36 inches (914 mm). The total width shall be not greater than 30 feet (9144 mm).

3104.9 Exit Access Travel

The length of *exit access travel* shall be 200 feet (60 960 mm) or less.

Exceptions:

1. *Exit access travel* distance on a *pedestrian walkway* equipped throughout with an *automatic sprinkler system* in accordance with

Section 903.3.1.1 shall be 250 feet (76 200 mm) or less.

2. *Exit access* travel distance on a *pedestrian walkway* constructed with both sides not less than 50 percent open shall be 300 feet (91 440 mm) or less.
3. *Exit access* travel distance on a *pedestrian walkway* constructed with both sides not less than 50 percent open, and equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1, shall be 400 feet (122 m) or less.

3104.10 Tunneled Walkway

Separation between the tunneled walkway and the building to which it is connected shall be not less than 2-hour fire-resistant construction and openings therein shall be protected in accordance with Section 716.

Section 3105 Awnings and Canopies

3105.1 General

Awnings and *canopies* shall comply with the requirements of Sections 3105.2 through 3105.6 and other applicable sections of this code.

3105.2 Definition

The following terms are defined in Chapter 2:

AWNING.

RETRACTABLE AWNING.

3105.3 Design and Construction

Awnings and *canopies* shall be designed and constructed to withstand wind or other lateral loads and live loads as required by Chapter 16 and in accordance with Section 3105.4 of this code with due allowance for shape, open construction and similar features that relieve the pressures or loads. Structural members shall be protected to prevent deterioration. *Awnings* shall have frames of noncombustible material, *fire-retardant-treated wood*, heavy timber complying with Section 2304.11, or 1-hour construction with combustible or noncombustible covers and shall be either fixed, retractable, folding or collapsible.

3105.3.1 Location

3105.3.1.1

Fabric awnings and fabric-covered frames located over public property or in areas accessible to the general public shall be constructed so that no rigid part of such fabric awnings or fabric-covered frames shall be less than 7 feet 6 inches (2286 mm) from the grade directly below, and no part of the cloth drop shall be less than 7 feet (2134 mm).

3105.3.1.2

A fixed fabric awning or fabric-covered frame shall not extend over public property more than two-thirds the distance from the property line to the nearest curb line in front of the building site as measured from the exterior face of the building, nor shall any portion be closer than 18 inches (457 mm) to the curb line.

Exceptions:

1. If installed over 14 feet (4267 mm) in height, it may occupy the entire width of the sidewalk.
2. Unless otherwise regulated by local zoning requirements.

3105.3.1.3

Fabric-covered framework in whole or in part of fabric, erected in connection with gasoline service stations may not be erected within 15 feet (4572 mm) of where flammable liquids are transferred.

3105.3.1.4

Movable fabric awnings or fabric covered frames may extend over public property for a distance of not more than 5 feet (1524 mm), provided such awnings or any part thereof maintain a clear height of 8 feet (2438 mm) above the sidewalk. All such movable awnings shall be supported on metal frames attached to the building.

3105.3.1.5

Every fabric awning or fabric-covered frame shall be located as not to interfere with the operation of any exterior standpipe, stairway, fire escape or any means of egress to and from the building.

3105.3.2 Area

No fabric awning or fabric-covered frame shall exceed the area of the building to which it is attached.

3105.3.3

Reserved.

3105.3.4 Material**3105.3.4.1**

Fabric used for awnings or fabric-covered frames shall meet the flame propagation performance criteria of NFPA 701 or have a flame spread index not greater than 25 when tested in accordance with ASTM E84 or UL 723.

Exception: Awnings or fabric-covered frames used in conjunction with Group R-3 occupancies.

3105.3.4.2

Supports for fabric awnings and fabric-covered frame shall be of metal or similar durable material.

3105.4 Design**3105.4.1**

Design of the framing members shall not be based on removal or repositioning of parts, or the whole, during periods of 75 mph wind velocity.

3105.4.2

Design of the structural framing members shall be based on rational analysis, using the applicable wind loads of Chapter 16 as shown below:

3105.4.2.1

The wind design loads for any fabric or membrane-covered structure designed with a quick removal or breakaway membrane or fabric at wind velocities of 75 mph, shall be based on the following criteria:

1. Minimum wind speed 105 mph
2. Exposure Category B, C or D as defined in Chapter 16.

3105.4.2.2

The wind design loads for any fabric or membrane covered structure designed with a permanent or nonremovable fabric or membrane, shall be based on the following criteria:

1. Minimum wind speed velocity as required in Chapter 16 using Figure 1609.3(4).
2. Exposure B, C or D as defined in Chapter 16.

3105.4.3

The fabric portions of awnings fabric covered frames shall be securely laced, tied or otherwise fastened to the frame; no rafter or front bar will be permitted in pockets; and in no case shall a rolling curtain be caused to operate over a canopy frame.

3105.4.4

The horizontal projection of cantilevered portions shall not be greater than two times the height, except where the building construction does not permit a proper installation; in which case, variance may be permitted by the building official, based on special design and construction.

3105.5 Rigid Awnings and Canopy Shutters**3105.5.1 Loads**

Rigid awnings and canopy shutters shall be designed to resist the loads set forth in Chapter 16 of this code except that structures or parts thereof which are intended to be removed or repositioned during periods of high wind velocity shall be designed in their open or extended position to design pressures based on a basic wind speed of minimum 115 mph, 3-second wind gust with applicable shape factors and to resist not less than 10 psf (478 Pa) roof live load.

3105.5.2

Where such structure is intended to be folded or otherwise repositioned to close an opening when the building is unattended or act as a storm shutter, the design in the closed position shall also comply with Chapter 16 and shall be impact resistant in accordance with Section 1609.1.2 or 1626 for HVHZ.

3105.5.3

Structures designed to be readily removed or repositioned during periods of high wind velocity shall be posted with a legible and readily visible decal or painted instructions to the owner or tenant to remove or reposition the structure or part thereof during such periods of time as are designated by the U.S. Weather Bureau as being a hurricane warning or alert.

3105.6 Awnings and Canopy Materials

Awnings and *canopies* shall be constructed of a rigid framework and shall be provided with an *approved* covering that meets the fire propagation performance criteria of Test Method 1 or Test Method 2, as appropriate, of NFPA 701 or has a *flame spread index* not greater than 25 when tested in accordance with ASTM E84 or UL 723.

Exception: The fire propagation performance and flame spread index requirements shall not apply to awnings installed on detached one- and two-family dwellings.

Section 3106 Marquees**3106.1 General**

Marquees shall comply with Sections 3106.2 through 3106.5 and other applicable sections of this code.

3106.2 Thickness

The height or thickness of a marquee measured vertically from its lowest to its highest point shall be not greater than 3 feet (914 mm) where the marquee projects more than two-thirds of the distance from the *lot line* to the curb line, and shall be not greater than 9 feet (2743 mm) where the marquee is less than two-thirds of the distance from the lot line to the curb line.

3106.3 Roof Construction

Where the roof or any part thereof is a skylight, the skylight shall comply with the requirements of Chapter 24. Every roof and skylight of a marquee shall be sloped to downspouts that shall conduct any drainage from the marquee in such a manner so as not to spill over the sidewalk.

3106.4 Location Prohibited

Every marquee shall be so located as not to interfere with the operation of any exterior standpipe, and such that the marquee does not obstruct the clear passage of *stairways* or *exit discharge* from the building or the installation or maintenance of street lighting.

3106.5 Construction

A marquee shall be supported entirely from the building and constructed of noncombustible materials. Marquees shall be designed as

required in Chapter 16. Structural members shall be protected to prevent deterioration.

Section 3107 Signs

3107.1 General

Signs shall be designed, constructed and maintained in accordance with this code.

Section 3108 Telecommunication and Broadcast Towers

[BS] 3108.1 General

Towers shall be designed and constructed in accordance with the provisions of TIA-222.

Exception: Single free-standing poles used to support antennas not greater than 75 feet (22 860 mm), measured from the top of the pole to grade, shall not be required to be noncombustible.

[BS] 3108.2 Location and Access

Towers shall be located such that guy wires and other accessories shall not cross or encroach upon any street or other public space, or over above-ground electric utility lines, or encroach upon any privately owned property without the written consent of the owner of the encroached-upon property, space or above-ground electric utility lines. Towers shall be equipped with climbing and working facilities in compliance with TIA-222. Access to the tower sites shall be limited as required by applicable OSHA, FCC and EPA regulations.

Section 3109 Structures Seaward of a Coastal Construction Control Line

3109.1 General

The provisions of this section shall apply to the design and construction of *habitable structures*, and *substantial improvement* or repair of *substantial damage* of such structures, that are entirely seaward of, and portions of such structures that extend seaward of, the *coastal construction control line* or seaward of the *50-foot setback line*, whichever is applicable. This section does not apply to structures that are not *habitable structures*, as defined in this section. Section 1612 shall apply to *habitable structures* and structures that are not *habitable structures* if located in whole or in part in *special flood hazard areas* established in Section 1612.3.

3109.1.1 Modification, Maintenance or Repair of Existing Habitable Structures

The requirements of Section 3109 do not apply to the modification, maintenance or repair of existing *habitable structures*, provided all of the following apply to the modification, maintenance or repair:

1. Is within the limits of the existing foundation.
2. Does not require, involve or include any additions to, or repair or modification of, the existing foundation.
3. Does not include any additions or enclosures added, constructed, or installed below the lowest floor or deck.

Advisory Note. If the modification or repair is determined to be *substantial improvement* or *substantial damage*, and if the building is located in a *special flood hazard area* (Zone A and Zone V) established in Section 1612.3, the requirements of *Florida Building Code, Existing Building* applicable to *flood hazard areas* shall apply.

3109.1.2 Approval Prior to Construction

An environmental permit from the Florida Department of Environmental Protection is required prior to the start of construction. When issued, a copy of the environmental permit shall be submitted to the building official. The environmental permit may impose special siting considerations to protect the beach-dune system, proposed or existing structures, and public beach access, and may condition the nature, timing and sequence of construction of permitted activities to provide protection to nesting sea turtles and hatchlings and their habitat, including submittal and approval of lighting plans.

3109.1.3 Elevation Certification

As part of the permit process, upon placement of the *lowest horizontal structural member* of the *lowest floor* and prior to further vertical construction, certification of the elevation of the bottom of the *lowest horizontal structural member* of the *lowest floor* shall be submitted

to the building official. Any work undertaken prior to submission of the certification or subsequent to submission and prior to the building official's review shall be at the applicant's risk.

3109.2 Definitions

The following words and terms shall, for the purposes of this section, have the indicated meanings shown herein.

ALLOWED USE. For the purpose of Section 3109.3.4, use of enclosures above, or with *dry floodproofing* to, the elevation specified in ASCE 24 and below the *100-year storm elevation*, includes, but is not limited to use for parking of vehicles, storage, building access, small mechanical and electrical rooms, retail shops, commercial pool bars and other bars, snack bars, commercial grills with portable cooking equipment, commercial dining areas where the permanent kitchen is located landward of the *coastal construction control line* or above the *100-year storm elevation*, toilet rooms and bathrooms, cabanas, recreational spaces such as gyms and card rooms, commercial service/storage/back-of-house facilities; and uses of a similar nature that are not spaces for living, sleeping or cooking.

COASTAL A ZONE. See Section 202.

COASTAL CONSTRUCTION CONTROL LINE. The line established by the State of Florida pursuant to Section 161.053, *Florida Statutes*, and recorded in the official records of the respective county and which defines that portion of the beach-dune system subject to severe fluctuations based on a 100-year storm surge, storm waves or other predictable weather conditions.

COASTAL HIGH HAZARD AREA. See Section 202.

COMBINED TOTAL STORM TIDE ELEVATION (VALUE). The elevation of combined total tides including storm surges, astronomical tide and dynamic wave setup which occurs primarily inside the wave breaking zone. The *combined total storm tide elevations (values)* for various return periods are determined by the Florida Department of Environmental Protection for each coastal county with an established *coastal construction control lines* and published in reports for each county titled "Revised Combined Total Storm Tide Frequency Analysis."

DESIGN GRADE. The predicted eroded grade, accounting for erosion and localized scour resulting from the presence of structural components, used in the calculation of flood loads, pile reactions and bearing capacities. The design grade shall be determined by a site-specific analysis prepared by a qualified registered design professional or the design grade may be determined by the Florida Department of Environmental Protection in the report titled "One-Hundred-Year Storm Elevation Requirements for Habitable Structures Located Seaward of a Coastal Construction Control Line" (1999).

DRY FLOODPROOFING. See Section 202.

FIFTY-FOOT SETBACK LINE. A line of jurisdiction, established pursuant to the provisions of Section 161.052, *Florida Statutes*, in which construction is prohibited within 50 feet (15.13 m) of the line of mean high water at any riparian coastal location fronting the Gulf of Mexico or the Atlantic coast shoreline.

FLOOD HAZARD AREA. See Section 202.

HABITABLE STRUCTURE. Structures designed primarily for human occupancy. Typically included within this category are residences, hotels and restaurants.

LOW-RISE BUILDING. A structure with mean roof height less than or equal to 60 feet.

LOWEST FLOOR. For the purpose of Section 3109, the *lowest floor* of the lowest enclosed area, excluding any enclosure that complies with the requirements and limitations of Section 3109.3.4 applicable to enclosures below the flood elevation.

LOWEST HORIZONTAL STRUCTURAL MEMBER. A horizontal structural member that supports floor, wall or column loads and transmits the loads to the foundation.

100-YEAR STORM ELEVATION. The height of the breaking wave crest or wave approach as superimposed on the storm surge with dynamic wave setup of a 100-year (one-percent-annual chance) storm. The 100-year storm elevation is determined by the Florida Department of Environmental Protection based on studies published as part of the Coastal Construction Control Line establishment process and an analysis of topographic and other site specific data and found in the report "One-Hundred-Year Storm Elevation Requirements for Habitable Structures Located Seaward of a Coastal Construction Control Line" (1999). An applicant may request the Department of Environmental Protection to determine a site-specific *100-year storm elevation* for the location of the applicant's proposed structure as part of the environmental permit application process.

SPECIAL FLOOD HAZARD AREA. See Section 202.

SUBSTANTIAL DAMAGE. See Section 202.

SUBSTANTIAL IMPROVEMENT. See Section 202.**3109.3 Design and Construction**

The design and construction of *habitable structures*, including *substantial improvement* and repair of *substantial damage* to such structures, shall be in accordance with this section and with Section 1612 and ASCE 24, as applicable. *Habitable structures* subject to this section shall be designed to minimize the potential for wind- and water-borne debris during storms.

Exception: Additions, repairs, and alterations that, when combined with all other work on a structure, do not constitute *substantial improvement* or repair of *substantial damage*, and provided all of the following apply:

- a. The work does not violate the terms of previously issued permits.
- b. Any addition does not advance the seaward limits of the existing structure.

3109.3.1 Flood Loads

Flood loads shall be determined according to Chapter 5 of ASCE 7, where the stillwater depth shall be the difference between the *design grade* at the location and the higher of:

1. The stillwater elevation specified in the applicable Flood Insurance Study referenced to the datum on the Flood Insurance Rate Map, if the structure is also in a *coastal high hazard area* (Zone V); or
2. The *combined total storm tide elevation (value)* for the 100-year return period identified by the Florida Department of Environmental Protection in reports titled "Revised Combined Total Storm Tide Frequency Analysis" prepared for each county with an established *coastal construction control lines*.

3109.3.2 Foundations

Habitable structures shall be elevated and supported on piles or columns that are designed to comply with this section. The space below elevated *habitable structures* shall be free of obstructions and walls, if any, shall comply with Section 3109.3.4. Foundations shall be designed to comply with ASCE 24 Section 4.5, except shallow foundations and stemwalls are not permitted.

3109.3.2.1 Piles and Columns

In addition to the requirements of ASCE 24 Section 4.5 for pile and columns foundations:

1. The design ratio or pile spacing to pile diameter, or column spacing to column diameter, shall be not less than 8:1 for individual piles or columns extending above the *design grade*, unless justified by a geotechnical analysis and the foundation design.
2. The tops of grade beams and pile caps shall be at or below the natural grade and below the *design grade* unless designed to resist increased flood loads associated with setting the grade beam or pile cap above the *design grade*.
3. Pile penetration shall take into consideration the anticipated loss of soil above the *design grade*.

3109.3.2.2 Shear Walls

Shear walls shall comply with one of the following:

1. Shear walls are permitted perpendicular to the shoreline where perpendicular shall mean less than or equal to ± 20 degrees from a line drawn normal to the shoreline.
2. Shear walls not perpendicular to the shoreline shall be limited to a maximum of 20 percent of the building length in the direction running parallel to the shore, and wall segments, spacing between wall segments, and elevator shafts shall be located

and positioned to allow floodwater to flow easily around the walls and elevator shafts.

Exception: *Habitable structures other than low-rise buildings* are permitted to have shear walls that are not perpendicular to the shoreline and that exceed 20 percent of the total building length provided the design requires a length greater than 20 percent, wall segments, spacing between wall segments, and elevator shafts are located and positioned to allow floodwater to flow easily around the walls and elevator shafts, and the following design documentation is submitted:

- a. A hydraulic analysis conducted and certified by a Florida-registered professional engineer qualified to evaluate the potential impact of flow increase on the subject parcel and adjacent properties and demonstrates the increased shear wall length will not result in substantial increase of flow velocities and drag forces on the structural components of the proposed structure and neighboring structures.
- b. The certified design documentation shall include a statement that the increased length of shear walls over 20 percent of total building length is located landward of the predicted 100-year storm erosion limit.

3109.3.3 Elevation Standards

The bottom of the *lowest horizontal structural member* of the *lowest floor* shall be at or above the higher of the following:

1. The elevation specified in ASCE 24 Chapter 4 if the structure is in a *coastal high hazard area* or *Coastal A Zone*;
2. The elevation specified by the jurisdiction; or
3. The 100-year storm elevation determined by the Florida Department of Environmental Protection in the report titled "One-Hundred-Year Storm Elevation Requirements for Habitable Structures Located Seaward of a Coastal Construction Control Line" (1999). An applicant may request determination of a site-specific *100-year storm elevation* (see definition).

3109.3.4 Walls and Enclosures Below the Flood Elevation

Walls and enclosures below the elevation required by Section 3109.3.3 and above the *design grade* elevation shall comply with all of the following, as applicable:

1. Walls seaward of the CCCL shall comply with the breakaway wall requirements of ASCE 24 Section 4.6 using the lesser of the flood loads specified by Section 3109.3.1.
2. Elevator shafts and stairways shall comply with ASCE 24.
3. For nonresidential buildings located outside of a *coastal high hazard area* (Zone V):
 - a. Small mechanical and electrical rooms with *dry floodproofing* to the elevation specified in ASCE 24 or by the jurisdiction are not required to be breakaway.
 - b. Stairwells are not required to be breakaway provided the walls have flood openings in accordance with this section.
4. In *special flood hazard areas* (Zone V and Zone A), all breakaway walls below the elevation specified in ASCE 24 or the elevation specified by the jurisdiction shall have flood openings in accordance with ASCE 24 Section 4.6.2. Flood openings are not required in:

- a. Shear walls designed in accordance with Section 3109.3.2.2.
- b. Walls of enclosures below buildings not located in *special flood hazard areas* (Zone X).
- c. Walls that are designed and constructed in conformance with the *dry floodproofing* requirements of ASCE 24 in areas other than *coastal high hazard areas*.

5. In *special flood hazard areas* (Zone V and Zone A):

- a. Enclosures below the elevation specified in ASCE 24 or the elevation specified by the jurisdiction shall be used solely for parking of vehicles, building access, or storage unless enclosures are designed and constructed in accordance with the *dry floodproofing* requirements of ASCE 24.
- b. Enclosures above the elevation specified in ASCE 24 or by the jurisdiction and below the *100-year storm elevation*, or enclosures with *dry floodproofing* to the elevation specified in ASCE 24 or by the jurisdiction, shall be limited to allowed use as defined in this section.

6. In *habitable structures* not located in *special flood hazard areas* (Zone X), uses of enclosures below the *100-year storm elevation* shall be limited to *allowed use* as defined in this section.

3109.3.5 Structural Slabs Below the 100-Year Storm Elevation

Structural slabs below the *100-year storm elevation* and below the *lowest floor* are not required to be breakaway provided the slabs are designed by a qualified Florida-registered professional engineer to withstand the flood loads specified by Section 3109.3.1.

3109.4 Documentation

In addition to documentation specified in Section 1612.5, where applicable the following documentation shall be prepared, signed, and sealed by a qualified Florida-registered professional engineer and submitted to the building official:

1. For site-specific determination of *design grade*, a report of the assumptions and methods used.
2. For shear walls, the certifications required in Section 3109.3.2.

Section 3110 Automatic Vehicular Gates

3110.1 General

Automatic vehicular gates shall comply with the requirements of Sections 3110.2 through 3110.4 and other applicable sections of this code.

3110.2 Definition

The following term is defined in Chapter 2:

VEHICULAR GATE.

3110.3 Vehicular Gates Intended for Automation

Vehicular gates intended for automation shall be designed, constructed and installed to comply with the requirements of ASTM F2200.

3110.4 Vehicular Gate Openers

Vehicular gate openers, where provided, shall be *listed* in accordance with UL 325.

Section 3111 Solar Energy Systems

3111.1 General

Solar energy systems shall comply with the requirements of this section.

3111.1.1 Wind Resistance

Rooftop-mounted photovoltaic panels and modules and solar thermal collectors shall be designed in accordance with Section 1510.7.

For buildings and structures located within the high-velocity hurricane zone, refer to Section 1620.

3111.1.2 Roof Live Load

Roof structures that provide support for solar energy systems shall be designed in accordance with Section 1607.13.4.

3111.2 Solar Thermal Systems

Solar thermal systems shall be designed and installed in accordance with the *Florida Building Code, Plumbing*, the *Florida Building Code, Mechanical*, and the *Florida Fire Prevention Code*.

3111.2.1 Equipment

Solar thermal systems and components shall be listed and labeled in accordance with ICC 900/SRCC 300 and ICC 901/SRCC 100.

3111.3 Photovoltaic Solar Energy Systems

Photovoltaic solar energy systems shall be designed and installed in accordance with this section, the *Florida Fire Prevention Code*, NFPA 70 and the manufacturer's installation instructions.

3111.3.1 Equipment

Photovoltaic panels and modules shall be listed and labeled in accordance with UL 1703. Inverters shall be listed and labeled in accordance with UL 1741. Systems connected to the utility grid shall use inverters listed for utility interaction.

3111.3.2 Fire Classification

Rooftop-mounted photovoltaic systems shall have a fire classification in accordance with Section 1505.9. Building-integrated photovoltaic systems shall have a fire classification in accordance with Section 1505.8. For buildings and structures located within the high-velocity hurricane zone, refer to Section 1516.

3111.3.3 Building-Integrated Photovoltaic Systems

Building-integrated photovoltaic systems that serve as roof coverings shall be designed and installed in accordance with Section 1507.17. For buildings and structures located within the high-velocity hurricane zone, refer to Section 1518.11.

3111.3.4 Access and Pathways

Roof access, pathways and spacing requirements shall be provided in accordance with Section 11.12.2.2 of the *Florida Fire Prevention Code*.

3111.3.5 Ground-Mounted Photovoltaic Systems

Ground-mounted photovoltaic systems shall be designed and installed in accordance with Chapter 16 and the *Florida Fire Prevention Code*.

3111.3.5.1 Fire Separation Distances

Ground-mounted photovoltaic systems shall be subject to the fire separation distance requirements determined by the local jurisdiction.

Section 3112 Deposit of Material in Tidewater Regulated

3112.1

It is not lawful for any person to discharge or cause to be discharged or deposit or cause to be deposited, in the tide or salt waters of any bay, port, harbor or river of this state, any ballast or material of any kind other than clear stone or rock, free from gravel or pebbles, which said clear stone or rock shall be deposited or discharged only in the construction of enclosures in connection with wharves, piers, quays,

jetties or in the construction of permanent bulkheads connecting the solid and permanent portion of wharves. It is lawful to construct three characters of bulkheads for retention of material in solid wharves.

1. First, clear stone or rock enclosures, or bulkheads, may be built upon all sides to a height not less than $2\frac{1}{2}$ feet (762 mm) above high watermark; and after the enclosures have been made so solid, tight and permanent as to prevent any sand, mud, gravel or other material that may be discharged or deposited in them from drifting or escaping through such enclosures, any kind of ballast may be discharged or deposited within the enclosures. The enclosures may be constructed of wood, stone and rock combined, the stone and rocks to be placed on the outside of the wood to a height not less at any point than $2\frac{1}{2}$ feet (762 mm) above high watermark; and after the enclosures have been made so solid, tight and permanent as to prevent any sand, mud gravel or other material that may be discharged or deposited in them from drifting or escaping through such enclosures, any kind of ballast may be discharged or deposited within the enclosures.
2. Second, a bulkhead may be built by a permanent wharf consisting of thoroughly creosoted piles not less than 12 inches (305 mm) in diameter at the butt end, to be driven close together and to be capped with timber not less than 10 or 14 inches drift (254 or 302 mm), bolted to each pile, and one or more longitudinal stringers to be placed on the outside of the bulkhead and securely anchored by means of iron rods to piles driven within the bulkheads, clear rock to be on the inside of the bulkhead, to a height of not less than $2\frac{1}{2}$ feet (762 mm) above high water; and after this is done, ballast or other material may be deposited within the permanent enclosure so constructed.
3. Third, a bulkhead may be constructed to consist of creosoted piles, as described herein, driven not exceeding 4 feet (1219 mm) apart from center to center, inside of which two or more longitudinal stringers may be placed and securely bolted to the piles. Inside of these longitudinal pieces, two thicknesses of creosoted sheet piling are to be driven, each course of the sheet piling to make a joint with the other to form an impenetrable wharf; and within this permanent bulkhead so constructed, any ballast or other material may be deposited.
4. No such enclosure, pier, quay or jetty shall be begun until the point where it is to be built shall have been connected by a substantial wharf with a shore or with a permanent wharf; except that the owners of wharves may at any time, with the consent of the Board of Pilot Commissioners of the Division of Professions of the Department of Business and Professional Regulation, build wharves of clear stone or rock, or creosoted walls as hereinafter provided, on each side of their wharves from the shore to a point at which the water is not more than 15 feet (4.6 m) deep, and when such walls have attained a height of $2\frac{1}{2}$ feet (762 mm) above high watermark and have been securely closed at the deepwater end by stone or creosoted walls of the same height, any kind of ballast may be deposited in them.
5. Nothing contained in this section shall interfere with any rights or privileges now enjoyed by riparian owners. While this section empowers those who desire to construct the several characters of wharves, piers, quays, jetties and bulkheads provided for and described herein, nothing in this section shall be so construed as to require any person not desiring to construct a permanent wharf by filling up with ballast, stone or other material to construct under the specifications contained herein; and nothing in this chapter shall be so construed as to prevent any person from constructing any wharf or placing any pilings, logs or lumber in any waters where the person would have heretofore had the right so to do.

3112.2

This section shall not prohibit Escambia County from placing in Pensacola Bay, on the Escambia County side, beside the old Pensacola Bay Bridge, certain materials, as recommended by the Department of Environmental Protection, in coordination with the Fish and Wildlife Conservation Commission, to increase the number of fish available for persons fishing from the old Pensacola Bay Bridge.

3112.3

This section shall not prohibit Manatee County from placing in the Manatee County portions of Sarasota Bay and Tampa Bay and in the Manatee River, certain materials, as recommended by the Department of Environmental Protection, in coordination with the Fish and Wildlife Conservation Commission, to increase the number of fish available for persons fishing in the above areas.

3112.4

This section shall not prohibit Pinellas County from placing in Tampa Bay certain materials as recommended by the Department of Environmental Protection, in coordination with the Fish and Wildlife Conservation Commission, to increase the number of fish available for persons fishing in the bay. Deposit of material on a wharf or quay is regulated. It is not lawful for any person to deposit or cause to be

deposited on any wharf or quay, any ballast, stone, earth or like material, except such wharf or quay may be so secured as to prevent such ballast or other material from washing into the waters of the harbor.

Section 3113 Lighting, Mirrors, Landscaping

3113.1

Each operator of an automated teller machine that controls the access area or defined parking area to be lighted shall comply with Sections (2), (3), and (4) no later than one year after October 1, 1994. If the access area or defined parking area to be lighted is controlled by a person other than the operator, such other person shall comply with Sections (2), (3), and (4) no later than one year after October 1, 1994.

3113.2

Each operator, or other person responsible for an automated teller machine pursuant to Sections 655.960 through 655.965, shall provide lighting during the hours of darkness with respect to an open and operating automated teller machine and any defined parking area, access area and the exterior of an enclosed automated teller machine installation, as follows:

1. There shall be a minimum of 10 footcandle (108 lux) power at the face of the automated teller machine and extending in an unobstructed direction outward 5 feet (1.5 m).
2. There shall be a minimum of 2 footcandle (21.5 lux) power within 50 feet (15.25 m) in all unobstructed directions from the face of the automated teller machine. If the automated teller machine is located within 10 feet (3 m) of the corner of the building and the automated teller machine is generally accessible from the adjacent side, there shall be a minimum of 2 footcandle (21.5 lux) power along the first 40 unobstructed feet (12 m) of the adjacent side of the building.
3. There shall be a minimum of 2 footcandle (12.5 lux) power in that portion of the defined parking area within 60 feet (18 m) of the automated teller machine.
4. The operator shall provide reflective mirrors or surfaces at each automated teller machine which provide the customer with a rear view while the customer is engaged in using the automated teller machine.
5. The operator, or other person responsible pursuant to Sections 655.960 through 655.965 for an automated teller machine, shall ensure that the height of any landscaping, vegetation or other physical obstructions in the area required to be lighted pursuant to Section (2) for any open and operating automated teller machine shall not exceed 3 feet (914 mm), except that trees trimmed to a height of 10 feet (3 m) and whose diameters are less than 2 feet (610 mm) and manmade physical obstructions required by statute, law, code, ordinance or other governmental regulation shall not be affected by this section.

Section 3114 Airport Noise

3114.1 Airport Noise Study Guidelines

The Aviation Safety and Noise Abatement Act of 1979 14 CFR Part 150 (US Department of Transportation) including revisions through January 2005 and hereby adopted as a guideline for establishing airport noise control. When required by a local government by local ordinance to provide noise attenuation in a new structure or addition to an existing structure near an airport in the area of the local government, the applicant must provide either:

1. A testing certificate from an accredited noise testing lab that a new structure or addition to existing structure built to the submitted engineering plans will achieve an average minimum dBA reduction equal to or greater than the reduction required,
2. An engineering judgment signed and sealed by an engineer licensed in the State of Florida that the structure or addition built to the submitted engineering plans will achieve an average minimum dBA reduction equal to or greater than the reduction required, or

3. Plans using the standards contained in "Guidelines for Sound Insulation of Residences Exposed to Aircraft Operations" prepared for the Department of the Navy by Wyle Research and Consulting, Arlington, Virginia, April 2005 on file with the Florida Building Commission.

Section 3115 Exterior Elevated Flooring Systems

3115.1 Scope

This section applies to exterior elevated flooring systems installed over roof assemblies or other exterior supporting structures, such as an exterior deck. Each exterior elevated flooring system consists of pedestrian deck panels or pavers supported by pedestals placed directly on roof assemblies or other exterior supporting structures, to provide a level walking surface. Pedestals may be adjustable or a fixed height. The pedestals need not be mechanically or adhesively attached to the supporting structure. The exterior elevated flooring system comprised of the pedestrian deck panels or pavers and pedestals shall be restrained on all sides and along any ramps and walkway areas against horizontal and vertical movement using a perimeter-restraining system.

3115.1.1 Attached Exterior Elevated Flooring Systems

Attached systems shall be designed and constructed as a roofing system in accordance with Chapter 15 of this code.

3115.1.2 Independent Exterior Elevated Flooring Systems

Independent systems shall comply with the provisions of Section 3115.

3115.2 Materials Information Submitted With Permit Application

In addition to other information required to accompany the permit application, product-specific information shall be provided as follows:

3115.2.1 Pedestrian Deck Panels or Pavers

Documentation describing the weight, dimensions and specifications, and the manufacturing process of the materials. Specifications for materials shall include required material strength properties used in analysis or reference to appropriate tests used to determine paver load capacity.

3115.2.2 Pedestals

Documentation describing materials, dimensions, specifications and manufacturer's installation instructions. Specifications shall include the allowable axial compression capacity of the pedestal.

3115.2.3 Fasteners

Documentation describing mechanical fasteners and adhesives as applicable. A statement shall be provided regarding whether or not the fasteners are commonly available or are proprietary.

3115.2.4 Plastics for Outdoor Exposure HVHZ

Plastics for outdoor exposure in the HVHZ shall comply with *Florida Building Code, Building* Section 2615.2.

3115.2.5 Packaging and Identification

A description of the method of packaging and identification of pedestrian deck panels or pavers, pedestals and accessory components. Identification provisions shall include the manufacturer's name, the product name and a copy of the installation instructions as packaged with the product.

3115.3 Product Approval and Manufacturer's Installation Instructions

3115.3.1 Product Approval

Exterior elevated flooring systems shall have Florida product approval or local product approval.

3115.3.2 Manufacturer's Installation Instructions

Manufacturer's installation instructions shall include information on the protection of the roof surface during installation, procedures for removing pavers to facilitate reroofing, roofing repairs, and roofing maintenance. In addition to the copy of the manufacturer's

installation instructions submitted with the permit application, the manufacturer's installation instructions shall be kept on the job site and made available to inspection personnel.

3115.4 Structural Requirements for Exterior Elevated Flooring Systems

3115.4.1 General

Exterior elevated flooring systems shall withstand the applicable uniform loads of *Florida Building Code, Building* Table 1607.1, the applicable load combinations and other applicable loads contained in the *Florida Building Code, Building*, Chapter 16. Independent systems shall not be permitted in the HVHZ.

3115.4.2 Pedestrian Deck Panels or Pavers

Where analysis of panels or pavers is not consistent with codified material design procedures, testing for uniform load and concentrated load capacities shall be performed in accordance with ASTM E2322 and CISCA Recommended Test Procedures for Access Floors achieving a load capacity three (3) times the uniform load capacity designated in the specifications.

3115.4.3 Pedestals

Where analysis of pedestals is not consistent with codified material design procedures, testing for axial load capacity shall be performed in accordance with CISCA Recommended Test Procedures for Access Floors, Section 5 achieving a load capacity three (3) times the axial load capacity designated in the specifications.

3115.4.4 Wind Resistance

Wind resistance of independent exterior elevated flooring systems shall be determined by wind tunnel testing in accordance with ASCE 7 Chapter 31 and Section 30.1.5 where applicable. Testing shall be conducted, and the data analyzed by a registered design professional. Exterior elevated flooring systems shall be evaluated by a registered design professional to withstand applicable wind loads as specified in ASCE 7 Chapters 26 through 30, as applicable, as well as combined load effects of other applicable gravity loads in the *Florida Building Code, Building*, Chapter 16, such as live and dead loads.

3115.4.5 Deflection

Pedestrian deck panels or pavers shall meet the deflection requirement of floor members in Table 1604.3 and Section 1616.3.1 in the HVHZ.

3115.5 Substrate Requirements for Exterior Elevated Flooring Systems

3115.5.1 Bearing Capacity

Pedestal support surface or roofing membrane shall be able to support a concentrated surface load of 40 psi (6.89 kPa) under the pedestal base.

3115.5.2 Drainage

The substrate immediately below the pedestals shall provide positive drainage.

3115.5.3 Analysis

Load effects on structural members and their connections that provide support for independent exterior elevated flooring systems shall be determined by methods of structural analysis that take into account equilibrium, general stability, geometric compatibility and both short- and long-term material properties. Roof structures that provide support for exterior elevated flooring systems shall be checked for deflection in accordance with Section 1604.3.6 or Section 1616 for buildings sited in the HVHZ. Roof structures shall be checked in accordance with Section 1611 for ponding. The design shall account for concentrated loads of the pedestals.

3115.6 Accessibility

Accessibility shall comply with the *Florida Building Code, Accessibility*.

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Chapter 32 Encroachments Into the Public Right-of-Way

Section 3201 General

3201.1 Scope

The provisions of this chapter shall govern the encroachment of structures into the public right-of-way.

3201.2 Measurement

The projection of any structure or portion thereof shall be the distance measured horizontally from the *lot line* to the outermost point of the projection.

3201.3 Other Laws

The provisions of this chapter shall not be construed to permit the violation of other laws or ordinances regulating the use and occupancy of public property.

3201.4 Drainage

Drainage water collected from a roof, *awning*, canopy or marquee, and condensate from mechanical equipment shall not flow over a public walking surface.

Section 3202 Encroachments

3202.1 Encroachments Below Grade

Encroachments below grade shall comply with Sections 3202.1.1 through 3202.1.3.

3202.1.1 Structural Support

A part of a building erected below grade that is necessary for structural support of the building or structure shall not project beyond the *lot lines*, except that the footings of street walls or their supports that are located not less than 8 feet (2438 mm) below grade shall not project more than 12 inches (305 mm) beyond the street *lot line*.

3202.1.2 Vaults and Other Enclosed Spaces

The construction and utilization of vaults and other enclosed spaces below grade shall be subject to the terms and conditions of the applicable governing authority.

3202.1.3 Areaways

Areaways shall be protected by grates, *guards* or other *approved* means.

3202.2 Encroachments Above Grade and Below 8 Feet in Height

Encroachments into the public right-of-way above grade and below 8 feet (2438 mm) in height shall be prohibited except as provided for in Sections 3202.2.1 through 3202.2.3. Doors and windows shall not open or project into the public right-of-way.

3202.2.1 Steps

Steps shall not project more than 12 inches (305 mm) and shall be guarded by *approved* devices not less than 3 feet (914 mm) in height, or shall be located between columns or pilasters.

3202.2.2 Architectural Features

Columns or pilasters, including bases and moldings, shall not project more than 12 inches (305 mm). Belt courses, lintels, sills, architraves, pediments and similar architectural features shall not project more than 4 inches (102 mm).

3202.2.3 Awnings

The vertical clearance from the public right-of-way to the lowest part of any *awning*, including valances, shall be not less than 7 feet (2134 mm).

3202.3 Encroachments 8 Feet or More Above Grade

Encroachments 8 feet (2438 mm) or more above grade shall comply with Sections 3202.3.1 through 3202.3.4.

3202.3.1 Awnings, Canopies, Marquees and Signs

Awnings, canopies, marquees and signs shall be constructed so as to support applicable loads as specified in Chapter 16. *Awnings*, canopies, marquees and signs with less than 15 feet (4572 mm) clearance above the sidewalk shall not extend into or occupy more than two-thirds the width of the sidewalk measured from the building. Stanchions or columns that support *awnings*, canopies, marquees and signs shall be located not less than 2 feet (610 mm) in from the curb line.

3202.3.2 Windows, Balconies, Architectural Features and Mechanical Equipment

Where the vertical clearance above grade to projecting windows, balconies, architectural features or mechanical equipment is more than 8 feet (2438 mm), 1 inch (25 mm) of encroachment is permitted for each additional 1 inch (25 mm) of clearance above 8 feet (2438 mm), but the maximum encroachment shall be 4 feet (1219 mm).

3202.3.3 Encroachments 15 Feet or More Above Grade

Encroachments 15 feet (4572 mm) or more above grade shall not be limited.

3202.3.4 Pedestrian Walkways

The installation of a pedestrian walkway over a public right-of-way shall be subject to the approval of the applicable governing authority. The vertical clearance from the public right-of-way to the lowest part of a *pedestrian walkway* shall be not less than 15 feet (4572 mm).

3202.4 Temporary Encroachments

Where allowed by the applicable governing authority, vestibules and storm enclosures shall not be erected for a period of time exceeding seven months in any one year and shall not encroach more than 3 feet (914 mm) nor more than one-fourth of the width of the sidewalk beyond the street *lot line*. Temporary entrance *awnings* shall be erected with a clearance of not less than 7 feet (2134 mm) to the lowest portion of the hood or *awning* where supported on removable steel or other *approved* noncombustible support.

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Chapter 33 Safeguards During Construction

Section 3301 General

3301.1 Scope

The provisions of this chapter shall govern safety during construction and the protection of adjacent public and private properties.

3301.2 Storage and Placement

Construction equipment and materials shall be stored and placed so as not to endanger the public, the workers or adjoining property for the duration of the construction project.

Section 3302 Construction Safeguards

3302.1 Alterations, Repairs and Additions

Required *exits*, existing structural elements, fire protection devices and sanitary safeguards shall be maintained at all times during *alterations, repairs or additions* to any building or structure.

Exceptions:

1. Where such required elements or devices are being altered or repaired, adequate substitute provisions shall be made.
2. Maintenance of such elements and devices is not required when the existing building is not occupied.

3302.2 Manner of Removal

Waste materials shall be removed in a manner that prevents injury or damage to persons, adjoining properties and public rights-of-way.

3302.3 Fire Safety During Construction

Fire safety during construction shall comply with the applicable requirements of this code and the applicable provisions of the *Florida Fire Prevention Code*.

Section 3303 Demolition

3303.1 Construction Documents

Construction documents and a schedule for demolition shall be submitted where required by the *building official*. Where such information is required, no work shall be done until such *construction documents* or schedule, or both, are *approved*.

3303.2 Pedestrian Protection

The work of demolishing any building shall not be commenced until pedestrian protection is in place as required by this chapter.

3303.3 Means of Egress

A *horizontal exit* shall not be destroyed unless and until a substitute *means of egress* has been provided and *approved*.

3303.4 Vacant Lot

Where a structure has been demolished or removed, the vacant lot shall be filled and maintained to the existing grade or in accordance with the ordinances of the jurisdiction having authority.

3303.5 Water Accumulation

Provision shall be made to prevent the accumulation of water or damage to any foundations on the premises or the adjoining property.

3303.6 Utility Connections

Service utility connections shall be discontinued and capped in accordance with the *approved* rules and the requirements of the applicable governing authority.

3303.7 Fire Safety During Demolition

Fire safety during demolition shall comply with the applicable requirements of this code and the applicable provisions of the *Florida Fire Prevention Code*.

3303.8 Resiliency and Safe Structures

3303.8.1 Definitions

As used in this section, the term:

Coastal construction control line. Means the boundary established under s. 161.053.

Law. Means any statute, ordinance, rule, regulation, policy, resolution, code enforcement order, agreement, or other governmental act.

Local government. Means a municipality, county, special district, or any other political subdivision of the state.

Nonconforming structure. Means a structure or building that does not conform to the base flood elevation requirements for new construction issued by the National Flood Insurance Program for the applicable flood zone.

Replacement structure. Means a new structure or building built on a property where a structure or building was demolished or will be demolished in accordance with this section.

3303.8.2 Qualifying Structures and Buildings

(a) Subject to paragraph (b), this section applies to any structure or building on a property in which all or a portion of such property is seaward of the coastal construction control line and the structure or building is:

1. A nonconforming structure;
2. A structure or building determined to be unsafe by a local building official; or
3. A structure or building ordered to be demolished by a local government that has proper jurisdiction.

(b) This section does not apply to any of the following structures or buildings:

1. A structure or building individually listed in the National Register of Historic Places.
2. A single-family home.
3. A contributing structure or building within a historic district which was listed in the National Register of Historic Places before January 1, 2000.
4. A structure or building located on a barrier island in a municipality with a population of less than 10,000 according to the most recent decennial census and which has at least six city blocks that are not located in zones V, VE, AO, or AE, as identified in the Flood Insurance Rate Map issued by the Federal Emergency Management Agency.

3303.8.3 Restrictions on Demolition Prohibited

A local government may not prohibit, restrict, or prevent the demolition of any structure or building identified in paragraph 3303.8.2(a) for any reason other than public safety. A local government may only administratively review an application for a demolition permit sought under this section for compliance with the Florida Building Code, the Florida Fire Prevention Code, and the Life Safety Code, or local amendments thereto, and any regulation applicable to a similarly situated parcel. The local government may not impose additional local land development regulations or public hearings on an applicant for a permit under this section.

3303.8.4 Restrictions on Redevelopment Prohibited

A local government shall authorize replacement structures for qualifying buildings identified in paragraph 3303.8.2(a) to be developed to the maximum height and overall building size authorized by local development regulations for a similarly situated parcel within the same zoning district. A local government may not do any of the following:

- (a) Limit, for any reason, the development potential of replacement structures below the maximum development potential allowed by local development regulations for a similarly situated parcel within the same zoning district.
- (b) Require replication of a demolished structure.
- (c) Require the preservation of any elements of a demolished structure.
- (d) Impose additional regulatory or building requirements on replacement structures which would not otherwise be applicable to a similarly situated vacant parcel located in the same zoning district.
- (e) Impose additional public hearings or administrative processes that would not otherwise be applicable to a similarly situated vacant parcel within the same zoning district.

3303.8.5 Development Applications

Development applications submitted for replacement structures for qualifying buildings identified in paragraph 3303.8.2(a) must be processed in accordance with the process outlined in local land development regulations including any required public hearings in front of the local historic board. However, a local government may not impose additional public hearings or administrative processes that would not otherwise be applicable to a similarly situated vacant parcel within the same zoning district.

3303.8.6 Application and Construction

This section applies retroactively to any law adopted contrary to this section or its intent and must be liberally construed to effectuate its intent. This section does not apply to or affect s. 553.79(26), Florida Statutes.

3303.8.7 Preemption

A local government may not adopt or enforce a law that in any way limits the demolition of a structure identified in paragraph (3)(a) or that limits the development of a replacement structure in violation of subsection (5). A local government may not penalize an owner or a developer of a replacement structure for a demolition pursuant to this section or otherwise enact laws that defeat the intent of this section. Any local government law contrary to this section is void.

Section 3304 Site Work

3304.1 Excavation and Fill

Excavation and fill for buildings and structures shall be constructed or protected so as not to endanger life or property. Stumps and roots shall be removed from the soil to a depth of not less than 12 inches (305 mm) below the surface of the ground in the area to be occupied by the building. Wood forms that have been used in placing concrete, if within the ground or between foundation sills and the ground, shall be removed before a building is occupied or used for any purpose. Before completion, loose or casual wood shall be removed from direct contact with the ground under the building.

3304.1.1 Slope Limits

Slopes for permanent fill shall be not steeper than one unit vertical in two units horizontal (50-percent slope). Cut slopes for permanent excavations shall be not steeper than one unit vertical in two units horizontal (50-percent slope). Deviation from the foregoing limitations for cut slopes shall be permitted only upon the presentation of a soil investigation report acceptable to the *building official*.

3304.1.2 Surcharge

No fill or other surcharge loads shall be placed adjacent to any building or structure unless such building or structure is capable of withstanding the additional loads caused by the fill or surcharge. Existing footings or foundations that can be affected by any excavation shall be underpinned adequately or otherwise protected against settlement and shall be protected against lateral movement.

3304.1.3 Footings on Adjacent Slopes

For footings on adjacent slopes, see Chapter 18.

3304.1.4 Fill Supporting Foundations

Fill to be used to support the foundations of any building or structure shall comply with Section 1804.6.

Section 3305 Sanitary

3305.1 Facilities Required

Sanitary facilities shall be provided during construction, remodeling or demolition activities in accordance with the *Florida Building Code, Plumbing*.

Section 3306 Protection of Pedestrians

3306.1 Protection Required

Pedestrians shall be protected during construction, remodeling and demolition activities as required by this chapter and Table 3306.1. Signs shall be provided to direct pedestrian traffic.

TABLE 3306.1

PROTECTION OF PEDESTRIANS

HEIGHT OF CONSTRUCTION	DISTANCE FROM CONSTRUCTION TO LOT LINE	TYPE OF PROTECTION REQUIRED
8 feet or less	Less than 5 feet	Construction railings
	5 feet or more	None
More than 8 feet	Less than 5 feet	Barrier and covered walkway
	5 feet or more, but not more than one-fourth the height of construction	Barrier and covered walkway
	5 feet or more, but between one-fourth and one-half the height of construction	Barrier
	5 feet or more, but exceeding one-half the height of construction	None

For SI: 1 foot = 304.8 mm.

3306.2 Walkways

A walkway shall be provided for pedestrian travel in front of every construction and demolition site unless the applicable governing authority authorizes the side-walk to be fenced or closed. A walkway shall be provided for pedestrian travel that leads from a building entrance or exit of an occupied structure to a public way. Walkways shall be of sufficient width to accommodate the pedestrian traffic, but in no case shall they be less than 4 feet (1219 mm) in width. Walkways shall be provided with a durable walking surface. Walkways shall be accessible in accordance with Chapter 11 and shall be designed to support all imposed loads and in no case shall the design live load be less than 150 pounds per square foot (psf) (7.2 kN/m²).

3306.3 Directional Barricades

Pedestrian traffic shall be protected by a directional barricade where the walkway extends into the street. The directional barricade shall be of sufficient size and construction to direct vehicular traffic away from the pedestrian path.

3306.4 Construction Railings

Construction railings shall be not less than 42 inches (1067 mm) in height and shall be sufficient to direct pedestrians around construction areas.

3306.5 Barriers

Barriers shall be not less than 8 feet (2438 mm) in height and shall be placed on the side of the walkway nearest the construction. Barriers shall extend the entire length of the construction site. Openings in such barriers shall be protected by doors that are normally kept closed.

3306.6 Barrier Design

Barriers shall be designed to resist loads required in Chapter 16 unless constructed as follows:

1. Barriers shall be provided with 2-inch by 4-inch (51 mm by 102 mm) top and bottom plates.
2. The barrier material shall be boards not less than $\frac{3}{4}$ -inch (19.1 mm) thick or wood structural panels not less than $\frac{1}{4}$ -inch (6.4 mm) thick.
3. Wood structural use panels shall be bonded with an adhesive identical to that for exterior wood structural use panels.
4. Wood structural use panels $\frac{1}{4}$ inch (6.4 mm) or $\frac{5}{16}$ inch (23.8 mm) in thickness shall have studs spaced not more than 2 feet (610 mm) on center.
5. Wood structural use panels $\frac{3}{8}$ inch (9.5 mm) or $\frac{1}{2}$ inch (12.7 mm) in thickness shall have studs spaced not more than 4 feet (1219 mm) on center provided a 2-inch by 4-inch (51 mm by 102 mm) stiffener is placed horizontally at mid-height where the stud spacing is greater than 2 feet (610 mm) on center.
6. Wood structural use panels $\frac{5}{8}$ inch (15.9 mm) or thicker shall not span over 8 feet (2438 mm).

3306.7 Covered Walkways

Covered walkways shall have a clear height of not less than 8 feet (2438 mm) as measured from the floor surface to the canopy overhead. Adequate lighting shall be provided at all times. Covered walkways shall be designed to support all imposed loads. In no case shall the design live load be less than 150 psf (7.2 kN/m^2) for the entire structure.

Exception: Roofs and supporting structures of covered walkways for new, light-frame construction not exceeding two stories above grade plane are permitted to be designed for a live load of 75 psf (3.6 kN/m^2) or the loads imposed on them, whichever is greater. In lieu of such designs, the roof and supporting structure of a covered walkway are permitted to be constructed as follows:

1. Footings shall be continuous 2-inch by 6-inch (51 mm by 152 mm) members.
2. Posts not less than 4 inches by 6 inches (102 mm by 152 mm) shall be provided on both sides of the roof and spaced not more than 12 feet (3658 mm) on center.
3. Stringers not less than 4 inches by 12 inches (102 mm by 305 mm) shall be placed on edge upon the posts.
4. Joists resting on the stringers shall be not less than 2 inches by 8 inches (51 mm by 203 mm) and shall be spaced not more than 2 feet (610 mm) on center.
5. The deck shall be planks not less than 2 inches (51 mm) thick or wood structural panels with an exterior exposure durability classification not less than $\frac{23}{32}$ inch (18.3 mm) thick nailed to the joists.
6. Each post shall be knee braced to joists and stringers by members not less than 2 inches by 4 inches (51 mm by 102 mm); 4 feet (1219 mm) in length.
7. A curb that is not less than 2 inches by 4 inches (51 mm by 102 mm) shall be set on edge along the outside edge of the deck.

3306.8 Repair, Maintenance and Removal

Pedestrian protection required by this chapter shall be maintained in place and kept in good order for the entire length of time pedestrians are subject to being endangered. The owner or the owner's authorized agent, upon the completion of the construction activity, shall immediately remove walkways, debris and other obstructions and leave such public property in as good a condition as it was before such work was commenced.

3306.9 Adjacent to Excavations

Every excavation on a site located 5 feet (1524 mm) or less from the street *lot line* shall be enclosed with a barrier not less than 6 feet (1829 mm) in height. Where located more than 5 feet (1524 mm) from the street *lot line*, a barrier shall be erected where required by the *building official*. Barriers shall be of adequate strength to resist wind pressure as specified in Chapter 16.

Section 3307 Protection of Adjoining Property

3307.1 Protection Required

Adjoining public and private property shall be protected from damage during construction, remodeling and demolition work. Protection shall be provided for footings, foundations, party walls, chimneys, skylights and roofs. Provisions shall be made to control water runoff and erosion during construction or demolition activities. The person making or causing an excavation to be made shall provide written notice to the *owners* of adjoining buildings advising them that the excavation is to be made and that the adjoining buildings should be protected. Said notification shall be delivered not less than 10 days prior to the scheduled starting date of the excavation.

3307.2 Excavation Retention Systems

Where a retention system is used to provide support of an excavation for protection of adjacent *structures*, the system shall conform to the requirements in Section 3307.2.1 through 3307.2.3.

3307.2.1 Excavation Retention System Design

Excavation retention systems shall be designed by a registered design professional to provide vertical and lateral support.

3307.2.2 Excavation Retention System Monitoring

The retention system design shall include requirements for monitoring of the system and adjacent structures for horizontal and vertical movement.

3307.2.3 Retention System Removal

Elements of the system shall only be removed or decommissioned when adequate replacement support is provided by backfill or by the new structure. Removal or decommissioning shall be performed in such a manner that protects the adjacent property.

Section 3308 Temporary Use of Streets, Alleys and Public Property

3308.1 Storage and Handling of Materials

The temporary use of streets or public property for the storage or handling of materials or of equipment required for construction or demolition, and the protection provided to the public shall comply with the provisions of the applicable governing authority and this chapter.

3308.1.1 Obstructions

Construction materials and equipment shall not be placed or stored so as to obstruct access to fire hydrants, standpipes, fire or police alarm boxes, catch basins or manholes, nor shall such material or equipment be located within 20 feet (6096 mm) of a street intersection, or placed so as to obstruct normal observations of traffic signals or to hinder the use of public transit loading platforms.

3308.2 Utility Fixtures

Building materials, fences, sheds or any obstruction of any kind shall not be placed so as to obstruct free approach to any fire hydrant, fire department connection, utility pole, manhole, fire alarm box or catch basin, or so as to interfere with the passage of water in the gutter. Protection against damage shall be provided to such utility fixtures during the progress of the work, but sight of them shall not be obstructed.

Section 3309 Fire Extinguishers

[F] 3309.1 Where Required

Structures under construction, *alteration* or demolition shall be provided with no fewer than one *approved* portable fire extinguisher in accordance with Section 906 and sized for not less than ordinary hazard as follows:

1. At each *stairway* on all floor levels where combustible materials have accumulated.
2. In every storage and construction shed.

3. Additional portable fire extinguishers shall be provided where special hazards exist, such as the storage and use of flammable and combustible liquids.

[F] 3309.2 Fire Hazards

The provisions of this code and the *Florida Fire Prevention Code* shall be strictly observed to safeguard against all fire hazards attendant upon construction operations.

Section 3310 Means of Egress

3310.1 Stairways Required

Where a building has been constructed to a *building height* of 50 feet (15 240 mm) or four stories, or where an existing building exceeding 50 feet (15 240 mm) in *building height* is altered, no fewer than one temporary lighted *stairway* shall be provided unless one or more of the permanent stairways are erected as the construction progresses.

[F] 3310.2 Maintenance of Means of Egress

Required *means of egress* shall be maintained at all times during construction, demolition, remodeling or *alterations* and *additions* to any building.

Exception: Existing means of egress need not be maintained where *approved* temporary *means of egress* systems and facilities are provided.

Section 3311 Standpipes

[F] 3311.1 Where Required

In buildings required to have standpipes by Section 905.3.1, no fewer than one standpipe shall be provided for use during construction. Such standpipes shall be installed prior to construction exceeding 40 feet (12 192 mm) in height above the lowest level of fire department vehicle access. Such standpipes shall be provided with fire department hose connections at accessible locations adjacent to usable *stairways*. Such standpipes shall be extended as construction progresses to within one floor of the highest point of construction having secured decking or flooring.

[F] 3311.2 Buildings Being Demolished

Where a building is being demolished and a standpipe exists within such a building, such standpipe shall be maintained in an operable condition so as to be available for use by the fire department. Such standpipe shall be demolished with the building but shall not be demolished more than one floor below the floor being demolished.

[F] 3311.3 Detailed Requirements

Standpipes shall be installed in accordance with the provisions of Chapter 9.

Exception: Standpipes shall be either temporary or permanent in nature, and with or without a water supply, provided that such standpipes conform to the requirements of Section 905 as to capacity, outlets and materials.

Section 3312 Automatic Sprinkler System

[F] 3312.1 Completion Before Occupancy

In buildings where an *automatic sprinkler system* is required by this code, it shall be unlawful to occupy any portion of a building or structure until the *automatic sprinkler system* installation has been tested and *approved*, except as provided in Section 111.3.

[F] 3312.2 Operation of Valves

Operation of sprinkler control valves shall be permitted only by properly authorized personnel and shall be accompanied by notification of duly designated parties. When the sprinkler protection is being regularly turned off and on to facilitate connection of newly completed segments, the sprinkler control valves shall be checked at the end of each work period to ascertain that protection is in service.

Section 3313 Water Supply for Fire Protection

[F] 3313.1 Where Required

An *approved* water supply for fire protection, either temporary or permanent, shall be made available as soon as combustible material arrives on the site.

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Chapter 34

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Chapter 35 Referenced Standards

This chapter lists the standards that are referenced in various sections of this document. The standards are listed herein by the promulgating agency of the standard, the standard identification, the effective date and title, and the section or sections of this document that reference the standard. The application of the referenced standards shall be as specified in Section 102.4.



Aluminum Association
1525 Wilson Boulevard, Suite 600
Arlington, VA 22209

ADM1—2020	Aluminum Design Manual: Part 1— Specification for Aluminum Structures	1604.3.5, 2002.1
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ASM 35—00	Aluminum Sheet Metal Work in Building Construction (Fourth Edition)	2002.1
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Aluminum Association of Florida, Inc.
3203 Lawton Road #110
Orlando, FL 32803

AAF—20	Guide to Aluminum Construction in High Wind Areas (2020)	2002.4.1, 1622.1.2
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AAMA Standards by FGIA

Fenestration & Glazing Industry Alliance
1900 E Gold Road, Suite 1250
Schaumburg, IL 60173

AAMA 450—10 or	Voluntary Performance Rating Method for Mulled Fenestration Assemblies	1709.8
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AAMA 450—20	Performance Rating Method for Mulled Combination Assemblies, Composite Units, and Other Mulled Fenestration Systems	1709.8
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AAMA 501—15	Methods of Test for Exterior Walls	1709.8.4
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AAMA 506—16	Voluntary Specifications for Impact and Cycle Testing of Fenestration Products	1609.1.2
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AAMA 711—13, 20 or 22	Voluntary Specification for Self-Adhering Flashing Used for Installation of Exterior Wall Fenestration Products	1405.4, Table 1507.1.1.1, 1507.1.1.2, 1518.2.1
AAMA 714—15 or 19	Voluntary Specification for Liquid Applied Flashing Used to Create a Water-Resistive Seal around Exterior Wall Openings in Buildings	1405.4
AAMA 1402—09	Standard Specifications for Aluminum Siding, Soffit and Fascia	1404.5.1
AAMA 2502—19	Comparative Analysis Procedure for Window and Door Products	1709.5.1
AAMA/NSA 2100—19	Voluntary Specifications for Sunrooms	202, 2002.6.1, 2002.6.2
AAMA/WDMA/CSA 101/I.S.2/A440—08, 11 or 17	North American Fenestration Standard/Specification for Windows, Doors, and Skylights	1010.1.6, 1709.5.1, 2405.5, 2411.3.2.1
FMA/AAMA 100—12	Standard Practice for the Installation of Windows with Flanges or Mounting	1405.4.1.4
FMA/AAMA 200—12	Standard Practice for the Installation of Windows with Frontal Flanges	1405.4.1.4
FMA/WDMA 250—10	Standard Practice for the Installation of Non-Frontal Flange Windows with Mounting Flanges for Surface Barrier Masonry for Extreme Wind/Water Conditions	1405.4.1.4
FMA/AAMA/WDMA300—12	Standard Practice for the Installation of Exterior Doors in Wood Frame Construction for Extreme Wind/Water Exposure	1405.4.1.4
FMA/AAMA/WDMA 400—13	Standard Practice for the Installation of Exterior Doors in Surface Barrier Masonry Construction for Extreme Wind/Weather Exposure	1405.4.1.4
FMA/AAMA/WDMA 2710—20	Guidelines for the Full Frame Replacement of Windows without Removal of External Brick Veneer	1405.4



American Concrete Institute
8800 Country Club Drive
Farmington Hills, MI 48331-3439

117—10	Specification for Tolerances for Concrete Construction and Materials	1901.7.1
ITG-7—09	Specification for Tolerances for Precast Concrete	1901.7.2
216.1—14	Code Requirements for Determining Fire Resistance of Concrete and Masonry Construction Assemblies	Table 721.1(2), 722.1
318—19	Building Code Requirements for Structural Concrete	1604.3.2, 1615.3.1, 1615.4.1, 1808.8.2, Table 1808.8.2, 1808.8.5, 1810.1.3, 1810.2.4, 1810.3.2.1.2, 1810.3.8.3.1, 1810.3.8.3.3, 1810.3.9.4, 1810.3.9.4.2.1, 1810.3.9.4.2.2, 1810.3.10.1, 1810.3.11.1, 1810.3.12, 1901.2, 1901.3, 1902.1, 1903.1, 1904.1, 1904.2, 1905.1, 1905.1.1, 1905.1.2, 1905.1.3, 1905.1.4, 1905.1.6, 1905.1.8, 1906.1, 1908.1, 1909.1, 1909.2, 2206.1, E303.2.2



American Forest & Paper Association
1111 19th Street, NW, Suite 800
Washington, DC 20036

AF&PA—92	Wood Structural Design Data	2314.4.7
AF&PA—05	Design Values for Joists and Rafters	2314.4.7
PWF—07	Permanent Wood Foundation (PWF) Design Specification	2314.4.7
AF&PA—12	Span Tables for Joists and Rafters	2314.4.7, 2317.1.1
WCD 1—01	Wood Construction Data No. 1, Details for Conventional Wood Frame Construction	2314.4.7

WCD 4—03

Wood Construction Data No. 4, Plank and Beam Framing for Residential Buildings

2314.4.7, 2306.1.2

WCD 5—89

Wood Construction Data No. 5, Heavy Timber Construction Details

2314.4.7, 2203.1, 2203.2, 2205.1, 2206.1

AHA

American Hardboard Association
1210 West N.W. Highway
Palatine, IL 60067

A135.4—04

Basic Hardboard

1404.3.1, 2314.4.1

A135.5—04

Prefinished Hardboard Paneling

2314.4.1

A135.6—98

Hardboard Siding

2314.4.1

A194.1—85

Cellulosic Fiber Board

2314.4.1

IB Spec. No. 1

Recommended Product and Application Specification —Structural Insulating Roof Deck

2314.4.1

IB Spec. No. 2

Recommended Product and Application Specification — $\frac{1}{2}$ inch Fiberboard Nail-Base Sheathing

2314.4.1

IB Spec. No. 3

Recommended Product and Application Specification — $\frac{1}{2}$ inch Intermediate Fiberboard Sheathing

2314.4.1

AISC

American Institute of Steel Construction
130 East Randolph, Suite 2000
Chicago, IL 60601

AISC DG09—2003

Torsional Analysis of Structural Steel Members, 2003

2214.3

AISC—2017

Steel Construction Manual, 2017

2214.3

AISC DG15—2018

Rehabilitation and Retrofit, 2018

2214.3

AISC DG03—2003

Serviceability Design Considerations for Steel Buildings, 2003 2214.3

ANSI/AISC 341—16

Seismic Provisions for Structural Steel Buildings 2205

ANSI/AISC 360—22

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American Iron and Steel Institute
25 Massachusetts Avenue, NW, Suite 800
Washington, DC 20001

AISI S100—16(2020) w/S2—20

North American Specification for the Design of Cold-Formed Steel Structural Members, 2016 Edition (Reaffirmed 2020), with Supplement 2, 2020 Edition

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AISI S202—20

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2211.1.3.1

AISI S220—20

North American Standard for Cold-Formed Steel Framing-Nonstructural Members, 2020

2203.1, 2203.2, 2211.1, 2211.2, 2214.3, Table 2506.2, Table 2507.2

AISI S230—19

Standard for Cold-Formed Steel Framing-Prescriptive Method for One- and Two-Family Dwellings, 2019

1609.1.1, 1609.1.1.1, 2211.1.2, 2214.3

AISI S240—20

AISI S240, North American Standard for Cold-Formed Steel Structural Framing, 2020

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AISI S400—20

North American Standard for Seismic Design of Cold-Formed Steel Structural Systems, 2020

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AISI S913—17

Test Standard for Hold-Downs Attached to Cold-Formed Steel Structural Framing

2210.3

AISI S914—17

Test Standard for Joist Connectors Attached to Cold-Formed Steel Structural Framing

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2314.4.2



American Institute of Timber Construction
333 West Hampden Avenue
Englewood, CO 80110

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113—10	Dimensions of Structural Glued Laminated Timber	2306.1, 2314.4.2
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Automotive Lift Institute
P.O. Box 85
Cortland, NY 13045

ALI ALCTV—2017

Standard for Automotive Lifts—Safety Requirements for Construction, Testing and Validation (ANSI)

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Air Movement and Control Association International
30 West University Drive
Arlington Heights, IL 60004

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American National Standards Institute
25 West 43rd Street, Fourth Floor
New York, NY 10036

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A108.6—99 (Reaffirmed 2019)

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Resistant, Water Cleanable Tile-Setting and -
Grouting Epoxy

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A108.8—99 (Reaffirmed 2019)

Installation of Ceramic Tile with Chemical-
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A108.9—99 (Reaffirmed 2019)

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APA - Engineered Wood Association
7011 South 19th Street
Tacoma, WA 98466

ANSI 117—2020

Standard Specification for Structural Glued
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Laminated Timber

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Standard for Performance-Rated Cross-
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ANSI/APA PRP 210—2019

Standard for Performance-Rated Engineered
Wood Siding

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APA PDS Supplement 2—12

Design and Fabrication of Plywood-Lumber
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APA PDS Supplement 3—12

Design and Fabrication of Plywood Stressed-
Skin Panels (revised 2013)

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APA PDS Supplement 4—12

Design and Fabrication of Plywood Sandwich
Panels (revised 2013)

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APA PDS Supplement 5—16

Design and Fabrication of All-Plywood Beams

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APA S560—20

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APA T300—16

Glulam Connection Details 2306.1

APA X440—17

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APA X450—18

Glulam in Residential Building Construction
Guide 2306.1

APSP (PHTA Standards)

Pool & Hot Tub Alliance
2111 Eisenhower Avenue, Suite 500
Alexandria, VA 22314

ANSI/APSP/ICC 3—2014

American National Standard for Permanently
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ANSI/APSP/ICC 4— 2012(R2022)

American National Standard for Aboveground
/Onground Residential Swimming Pools 454.2.6.1

ANSI/APSP/ICC 5-2012(R2022)

American National Standard for Residential
Inground Swimming Pools 454.2.6.1

ANSI/APSP/ICC 6—2013

American National Standard for Residential
Portable Spas and Swim Spas

454.2.6.1

ANSI/PHTA/ICC 7—2020

American National Standard for Suction
Entrapment Avoidance in Swimming Pools,
Wading Pools, Spas, Hot Tubs, and Catch
Basins

454.2.6.1, 454.2.6.3, 454.2.6.6

ANSI/APSP 16—2017

American National Standard for Suction Outlet
Fittings Assemblies (SOFA) for Use in Pools,
Spas, and Hot Tubs

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ASABE

American Society of Agricultural and
Biological Engineers
2950 Niles Road
St. Joseph, MI 49085

EP 484.3 (R2008) MON DEC2017

Diaphragm Design of Metal-Clad, Wood-Frame
Rectangular Buildings

2306.1

EP 486.3 SEP2017

Shallow-Post and Pier Foundation Design

2306.1

EP 559.1 W/Corr. (2010)2014

Design Requirements and Bending Properties
for Mechanically Laminated Wood Assemblies

2306.1

ASCE/SEI

American Society of Civil Engineers
Structural Engineering Institute
1801 Alexander Bell Drive
Reston, VA 20191-4400

7—22

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32—01	Design and Construction of Frost Protected Shallow Foundations	1809.5
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ASHRAE

ASHRAE, Inc.
180 Technology Parkway
Peachtree Corners, GA 30092

62—01	Ventilation for Acceptable Indoor Air Quality	C502.1, E306.1
ANSI/ASHRAE/ASHE 170—08	Ventilation of Health Care Facilities	450.3.14, 450.3.14.4, 469.4.12.1

ASME

American Society of Mechanical Engineers
Two Park Avenue
New York, NY 10016-5990

ASME/A17.1—2019/CSA B44—2019	Safety Code for Elevators and Escalators	469.4.9.1, 907.3.3, 911.1.6, 1607.10.1, 3001.2, 3001.1, Table 3001.2, 3001.4, 3001.6, 3002.5, 3002.10, 3003.2, 3006.3, 3007.1, 3008.1.3, 3008.1.4, 3008.7.1, 3010.1.3, 3012.1
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ANSI/ASSE Z359.1—2020

The Fall Protection Code

American Society of Safety Engineers
1800 East Oakton Street
Des Plaines, IL 60018



A6/A6M—17a

Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes and Sheet

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1810.3.2.3

A90/A90M—13

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A153/A153M—16a

Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

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A240/A240M—17

Standard Specification for Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and General Applications

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A252—10(2018)

Specification for Welded and Seamless Steel Pipe Piles

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A361

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A416/A416M—17a

Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete

1810.3.2.2

A446

Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality

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A463/A463M—15

Standard Specification for Steel Sheet,
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A572/A572M—18

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1810.3.2.3

A588/A588M—15

Specification for High-Strength Low-Alloy
Structural Steel with 50 ksi (345 MPa) Minimum
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1810.3.2.3

A611

Standard Specification for Structural Steel (SS),
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1917.4.3

A615/A615M—15ae1

Specification for Deformed and Plain Carbon-
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1810.3.10.2

A641/A641M—14

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(Galvanized) Carbon Steel Wire

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A690/A690M—13a(2018)

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Resistance for Use in Marine Environments

1810.3.2.3

A706/A706M—16

Specification for Low-Alloy Steel Deformed and
Plain Bars for Concrete Reinforcement

2107.3

A722/A722M—18

Specification for High-Strength Steel Bar for
Prestressing Concrete

1810.3.10.2

A755/A755M—16e1

Specification for Steel Sheet, Metallic-coated by
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Coil-Coating Process for Exterior Exposed
Building Products

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B42—15a	Specification for Seamless Copper Pipe, Standard Sizes	909.13.1
B43—15	Specification for Seamless Red Brass Pipe, Standard Sizes	909.13.1
B68/B68M—11	Specification for Seamless Copper Tube, Bright Annealed (Metric)	909.13.1
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B251/B251M—17	Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube	909.13.1

B280—18

Specification for Seamless Copper Tube for Air
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C474—15

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Table 2506.2

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C476—19

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C494/C494M—99

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C495—99a

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2411.3.4

C513

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C946—18	Standard Practice for Construction of Dry-Stacked, Surface-Bonded Walls	2103.2.2, 2109.2.2
C954—18	Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 inch (0.84 mm) to 0.112 inch (2.84 mm) in Thickness	Table 2506.2, Table 2507.2
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C1570—03(2016)

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D1143/D1143M—07(2013)e1	Standard Test Methods for Deep Foundations Under Static Axial Compressive Load	1810.3.3.1.2
D1227—13	Specification for Emulsified Asphalt Used as a Protective Coating for Roofing	Table 1507.10.2, 1507.15.2
D1557—12e1	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort [56,000 ft-lb/ft ³ (2,700 KN m/m ³)]	J107.5, J111, 1804.5, 1804.6

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D2823/D2823M—05(2011)e1	Specification for Asphalt Roof Coatings, Asbestos Containing	Table 1507.10.2
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D2843—16	Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics	2606.4
D2856	Standard Test Method for Open-Cell Content of Rigid Cellular Plastics by the Air-Pycnometer	1523.6.5.2.17.5
D2859—16	Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials	804.4.1, 804.4.2
D2898—10(2017)	Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing	1505.1, 1516.1, 2303.2.4, 2303.2.6, 2314.4.4
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D4086

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D4272—15

Test Method for Total Energy Impact of Plastic
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D4318—17e1

Test Methods for Liquid Limit, Plastic Limit and
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D4434/D4434M—15

Specification for Poly (Vinyl Chloride) Sheet
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D4479/D4479M—07(2018)

Specification for Asphalt Roof Coatings—
Asbestos-Free

Table 1507.10.2

D4533(2015)

Standard Test Method for Trapezoid Tearing
Strength of Geo Textiles

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D4586/D4586M—07(2018)e1

Specification for Asphalt Roof Cement—
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D4601/D4601M—04(2012)e1

Specification for Asphalt-Coated Glass Fiber
Base Sheet Used in Roofing

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Specification for EPDM Sheet Used in Single-Ply
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Specification for Asphalt-Coated Glass Fiber
Venting Base Sheet Used in Roofing

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Test Method for High-Strain Dynamic Testing of
Deep Foundations

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Specification for Coal Tar Glass Felt Used in
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D5456—21el

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D5516—18

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2303.2.5.1

D5643/D5643M—06(2018)

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2303.2.5.2

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(SBS) Modified Bituminous Sheet Materials

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Fiber Reinforcements

D6163/D6163M—16	Specification for Styrene-Butadiene-Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements	1507.11.2
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D6222/D6222M—16	Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using Polyester Reinforcements	1507.11.2
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D6305—08(2015)e1	Practice for Calculating Bending Strength Design Adjustment Factors for Fire-Retardant-Treated Plywood Roof Sheathing	2303.2.5.1
D6380/D6380—03(2018)	Standard Specification for Asphalt Roll Roofing (Organic Felt)	1507.2.9.2, 1507.6.5
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E108—17	Standard Test Methods for Fire Tests of Roof Coverings	453.12.1, 1505.1, 1513.1, 1516.1, 2603.6, 2610.2, 2610.3
E119—18b	Standard Test Methods for Fire Tests of Building Construction and Materials	703.2, 703.2.2, 703.2.1.3, 703.2.1.5, 703.2.2, 703.6, 704.12, 705.7, 705.8.5, 707.6, 712.1.13.2, 714.3.1, 714.4.1, 715.1, 715.3, 715.4, 716.2, Table 716.3, Table 716.5, 716.5.6, 716.5.8.1.1, Table 716.6, 716.6.7.1, 717.3.1, 717.5.2, 717.5.3, 717.6.1, 716.6.2.1, Table 721.1(1), 2103.1, 2603.5.1
E136—19	Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C	703.5.1
E283—04(2012) or E283/283M—19	Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen	202
E330/E330M—14 or 14(2021)	Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference	1709.5.2, 1709.5.2.1, 1709.8, 2415.4, 2415.7.1
E331—00(2009 or 2016)	Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference	1403.2, 1404.2, 2415.4
E336-19a	Standard Test Method f or Measurement of Airborne Sound Attenuation Between Rooms in Buildings	1207.2

E492—09(2016)e1	Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine	1207.3
E648—17a	Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source	406.1.4, 424.2, 804.2, 804.3
E681—2009(2015)	Test Methods for Concentration Limits of Flammability of Chemical Vapors and Gases	202
E736/E736M—17	Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members	704.13.3.2
E814—2013a(2017)	Standard Test Method of Fire Tests of Through-Penetration Firestops	202, 714.3, 714.4.1.2, 714.5.1.2
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E1347	Standard Test Method for Color and Color-Difference Measurement by Tristimulus Colorimetry	454.1.2.4, 454.1.11.3
E1354—17	Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter	424.2, 1403.5
E1477	Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers	454.1.2.4

E1592—05(2017)

Test Method for Structural Performance of
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Uniform Static Air Pressure Difference

1504.3.2

E1602—03(2017)

Guide for Construction of Solid Fuel-Burning
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E1886—13a or 19

Test Method for Performance of Exterior
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Missiles and Exposed to Cyclic Pressure
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E2072—14

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Standard Test Method for Water Penetration of
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E2273—18

Standard Test Method for Determining the
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E2307—15be1

Standard Test Method for Determining Fire
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Intermediate-Scale, Multistory Test Apparatus

715.4

E2322—03(2015)

Standard Test Method for Conducting
Transverse and Concentrated Load Tests on
Panels Used in Floor and Roof Construction

3115.4.2

E2353—16	Standard Test Methods for Performance of Glazing in Permanent Railing Systems, Guards and Balustrades	2407.1.2
E2397/E2397M—2015	Standard Practice for Determination of Dead Loads and Live Loads Associated with Vegetative Green Roof Systems	1607.13.3.1
E2404—17	Standard Practice for Specimen Preparation and Mounting of Textile, Paper or Vinyl Wall or Ceiling Coverings to Assess Surface Burning Characteristics	803.1.4
E2556/E2556M—10(2016)	Standard Specification for Vapor Permeable Flexible Sheet Water-Resistive Barriers Intended for Mechanical Attachment	2510.6
E2568—17a	Standard Specification for PB Exterior Insulation and Finish Systems	1408.2
E2570/E2570—07(2014)e1	Standard Test Method for Evaluating Water-Resistive Barrier (WRB) Coatings Used Under Exterior Insulation and Finish Systems (EIFS) for EIFS with Drainage	1408.4.1.1
E2573—17	Standard Practice for Specimen Preparation and Mounting of Site-Fabricated Stretch Systems to Assess Surface Burning Characteristics	803.10
E2599—18	Standard Practice for Specimen Preparation and Mounting of Reflective Insulation Materials and Vinyl Stretch Ceiling Materials for Building Applications to Assess Surface Burning Characteristics	2614.3
E2634—18	Standard Specification for Flat Wall Insulating Concrete Form (ICF) Systems	1903.4
E2652—16	Standard Test Method for Behavior of Materials in a Tube Furnace with a Cone-Shaped Airflow Stabilizer at 750°C	703.5.1
E2751/E2751M—17a	Standard Practice for Design and Performance of Supported Laminated Glass Walkways	2409.1

E2925—17

Standard Specification for Manufactured
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2510.6.2

F547—17

Terminology of Nails for Use with Wood and
Wood-Based Materials

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Performance Specification for Safety Covers
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F1487

Standard Consumer Safety Performance
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Specification for Driven Fasteners: Nails, Spikes
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F2006—17 or 21

Standard/Safety Specification for Window Fall
Prevention Devices for Nonemergency Escape
(Egress) and Rescue (Ingress) Windows

1015.8

F2090—17 or 21

Specification for Window Fall Prevention
Devices with Emergency Escape (Egress)
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1015.8, 1015.8.1

F2200—17

Standard Specification for Automated
Vehicular Gate Construction

3110.3

F2208—14

Standard Safety Specification for Residential
Pool Alarms

454.2.17.1.9

F2286—16

Standard Design and Performance
Specification for Removable Mesh Fencing for
Swimming Pools, Hot Tubs, and Spas

454.2.17.1.15

F2376—17a

Standard Practice for Classification, Design,
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Water Slide Systems

454.1.9.2.1.1

F3125/F3125M—15	Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions	2214.3
G53—96	Practice for Operating Light-and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials	454.2.17.1.15
G60—01	Standard Practice for Conducting Cyclic Humidity Tests	2319.17.2.2.8, 2603.12.2
G85	Standard Practice for Modified Salt Spray (Fog) Testing	1517.5.1, 1517.5.2, 1523.6.5.2.10, 1523.6.5.2.11
G152—13	Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials	1504.6
G153	Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials	1504.6
G154—16a	Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials	1504.6
G155—13	Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials	1504.6, 2615.2



American Wood Council
222 Catoctin SE, Suite 201
Leesburg, VA 20175

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ANSI/AWC WFCM—2018	Wood Frame Construction Manual for One- and Two-Family Dwellings	1609.1.1, 1609.1.1.1, 2301.2, 2309.1, 2314.4.7
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AWPA

American Wood Protection Association
 P.O. Box 361784
 Birmingham, AL 35236-1784

C1—03	All Timber Products-Preservative Treatment by Pressure Processes	1505.6
M4—2015	Standard for the Care of Preservative-Treated Wood Products	1810.3.2.4.1, 2303.1.9, 2314.4.5
U1—20	USE CATEGORY SYSTEM: User Specification for Treated Wood Except Commodity Specification H	1403.6, Table 1507.9.6, 1807.1.4, 1807.3.1, 1809.12, 1810.3.2.4.1, 2303.1.9, 2304.12.1, 2304.12.2, 2304.12.2.7, 2304.2.8, 2304.12.2.9, 2304.12.4, 2304.12.5, 2304.12.6, 2314.4.5

AWS

American Welding Society
 8669 NW 36 Street, #130
 Doral, FL 33166

B2.1—B2.1M—2014-AMD1	Specification for Welding Procedure and Performance Qualification	2214.3
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D1.3—D1.3M—2018

Structural Welding Code—Sheet Steel

2214.3

D1.4—D1.4M—2018-AMD1

Structural Welding Code—Reinforcing Steel

2214.3

D9.1—D9.1M—2018

Sheet Metal Welding Code

2214.3



Builders Hardware Manufacturers' Association
355 Lexington Avenue, 17th Floor
New York, NY 10017-6603

A156.10—2017

Power Operated Pedestrian Doors

1010.1.3.2

A156.19—2020

Power Assist and Low Energy Operated Doors

1010.1.3.2

A156.27—2019

Power and Manual Operated Revolving
Pedestrian Doors

1010.1.3.2

A156.38—2019

Low Energy Power Operated Sliding and
Folding Doors

1010.1.3.2



European Committee for Standardization (CEN) B-10 50 Brussels
Central Secretariat
Rue de Stassart 36

EN 1081—98

Resilient Floor Coverings—Determination of
the Electrical Resistance

406.7.1

BS EN 15250—2007

Slow Heat Release Appliances Fired By Solid
Fuel Requirements and Test Methods

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Canadian General Standards Board
Place du Portage 111, 6B1
11 Laurier Street
Gatineau, Quebec, Canada K1A 1G6

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Roofing and Waterproofing Membrane, Sheet
Applied, Elastomeric

1504.7, 1507.12.2

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Membrane, Modified, Bituminous,
Prefabricated and Reinforced for Roofing—
with December 1985 Amendment

1507.11.2

Polyvinyl Chloride Roofing and Waterproofing
Membrane 1507.13.2



Ceilings and Interior Systems Construction Association
1010 Jorie Boulevard, Suite 30
Oak Brook, IL 60523

CISCA—2007

Recommended Test Procedures for Access
Floors 3115.4.2, 3115.4.3



Composite Panel Association
19465 Deerfield Avenue, Suite 306
Leesburg, VA 20176

ANSI A135.4—2012

Basic Hardboard 1404.3.1, 2303.1.7, 2314.4.1

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A208.1—2016

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Consumer Product Safety Commission
4330 East West Highway
Bethesda, MD 20814-4408

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Safety Standard for Architectural Glazing
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16 CFR Part 1209 (2002)

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Cellulose Insulation 720.6

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16 CFR Part 1507 (2002)	Fireworks Devices	202
16 CFR Part 1630 (2007)	Standard for the Surface Flammability of Carpets and Rugs	804.4.1, 804.4.2
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CSA

Canadian Standards Association
8501 East Pleasant Valley
Cleveland, OH 44131-5516

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CSSB

Cedar Shake and Shingle Bureau
P. O. Box 1178
Sumas, WA 98295-1178

CSSB—97	Grading and Packing Rules for Western Red Cedar Shakes and Western Red Shingles of the Cedar Shake and Shingle Bureau	Table 1507.8.5, Table 1507.9.6
	New Roof Construction Manual (2015)	1507.8

DASMA

Door and Access Systems Manufacturers Association International
1300 Summer Avenue
Cleveland, OH 44115-2851

ANSI/DASMA 107—2012	Room Fire Test Standard for Garage Doors Using Foam Plastic Insulation	2603.4.1.9
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DECO

ANSI Z358.1—04

Emergency Eyewash and Shower Equipment

450.3.11.7

Document Engineering Co., Inc.
5210 Stagg Street
Van Nuys, CA 91405

DOC/NIST

CS236

Mat-Formed Particleboard

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U.S. Department of Labor
Occupational Safety and Health Administration
Frances Perkins Building
200 Constitution Avenue, NW
Washington, DC 20210

DOL/OSHA

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202

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DOTn

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of 1979

U.S. Department of Transportation
c/o Superintendent of Documents
1200 New Jersey Avenue, SE
Washington, DC 20402-9325

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3114.1

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Florida Office of Educational Facilities
1014 Turlington Building
325 West Gaines Street
Tallahassee, FL 32399-0400

SREF	Size of Space and Occupant Design Criteria	453.4.1, 453.8.2
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Federal Emergency Management Agency
Federal Center Plaza
500 C Street, SW
Washington, DC 20472

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The Facility Guidelines Institute
9750 Fall Ridge Trail
St. Louis, MO 63127

GHCF—22	Guidelines for Design and Construction of Hospitals	449.2.2, 449.3.2, 449.3.3, 449.3.4, 449.3.5, 449.3.6, 449.3.7, 449.3.9, 449.3.11, 449.3.13, 469.2.1.2
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Federation Internationale de Natation Amateur
Av. de l' Avant-Poste 4
1005 Lausanne
SWITZERLAND,

CHG-22

FINA Handbook 1998—2000

454.1.2.2.1

FINA Handbook 2005—2009

454.1.2.7

Florida Codes

Florida Building Commission
Building Codes and Standards Office
Department of Business and Professional Regulation
2601 Blair Stone Road
Tallahassee, FL 32399

FBC-A—Eighth Edition (2023)

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Factory Mutual Global Research
 Standards Laboratories Department
 1151 Boston-Providence Turnpike
 Norwood, MA 02062

4470—2016

Approval Standard for Single-Ply Polymer-
Modified Bitumen Sheet, Built-Up Roof (BUR)
And Liquid Applied Roof Assemblies for use in
Class 1 and Noncombustible Roof Deck
Construction

4471 (1992)

Approval Standard for Class I Panel Roofs

1515.1.1, Table 1515.2,
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4474 (2011)

American National Standard for Evaluating the
Simulated Wind Uplift Resistance of Roof
Assemblies Using Static Positive and/or
Negative Differential Pressures

1504.2.1.1, 1504.3.1, 1504.3.3

4880—2017

Approval American National Standard for
Evaluating the Fire Performance Insulated
Building Panel Assemblies and Interior Finish
Materials

2603.9

FRSA

Florida Roofing and Sheet Metal Contractors Association
P.O. Box 4850
Winter Park, FL 32793

FRSA/TRI Alliance December 2023(12—23)

Florida High Wind Concrete and Clay Roof Tile
Installation Manual, Seventh Edition

1507.3.2, 1507.3.3, 1507.3.3.1,
1507.3.7, 1507.3.8, 1507.3.9

FS

Federal Specification
941 Jefferson Davis Highway, Suite 104
Arlington, VA 22202

TTC 555B

Test Specification for Wind Driven Rain
Infiltration Resistance

1523.6.2.1.1, 1523.6.3.1

GA

Gypsum Association
6525 Belcrest Road, Suite 480
Hyattsville, MD 20782

GA-216—2018

Application and Finishing of Gypsum Panel
Products

Table 2508.1, 2509.2

GA-600—2018

Fire-Resistance and Sound Control Design
Manual, 22nd Edition

Table 721.1(1), Table 721.1(2),
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DD-G-451c (1977)

2411.1.2



General Services Administration
1800 F Street, NW
Washington, DC 20405

Standard for Glass, Flat and Corrugated, for
Glazing Mirrors and Other Uses



Hardwood Plywood Veneer Association
1825 Michael Faraday Drive
Reston, VA 20190

ANSI/HPVA HP-1—2016

American National Standard for Hardwood and
Decorative Plywood

2303.3, 2304.7



International Code Council, Inc.
200 Massachusetts Avenue, NW, Suite 250
Washington, DC 20001

ICC A117.1—17

Accessible and Usable Buildings and Facilities

202, 907.5.2.3.3, 1009.8.2, 1009.9,
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ICC 300—17

ICC Standard on Bleachers, Folding and
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ICC 400—17

Standard on Design and Construction of Log
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ICC 500—20

ICC/NSSA Standard on the Design and
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453.24.4.3, 1604.5.1

ICC 600—20

Standard for Residential Construction in High-
Wind Regions

1609.1.1, 1609.1.1.1

ICC 1100—18

Standard for Spray-Applied Foam Plastic
Insulation

2603.1.1

SBCCI SSTD 11—97

Test Standard for Determining Wind Resistance
of Concrete or Clay Roof Tiles

1504.2.1.1, 1504.2.1.2

IEEE

457.1.4.1.5, 449.3.15.5, 450.3.19.4



Institute of Electrical and Electronics Engineers
2001 L Street, NW, Suite 700
Washington, DC 20036-4910

Appropriate standards for the type of equipment being protected



Illuminating Engineering Society of North America
120 Wall Street, 17th Floor
New York, NY 10005-4001

ANSI/IESNA RP-28-07

Lighting and the Visual Environment for Senior Living

450.3.15.3

ANSI/IESNA TM-15-11 Addendum A

Backlight, Uplight, and Glare (BUG) Ratings

Table 453.10.3.7(2)



International Organization for Standardization
ISO Central Secretariat
1 ch, de la Voie-Creuse, Case Postale 56
CH-1211 Geneva 20, Switzerland

ISO 8115—86

Cotton Bales—Dimensions and Density

Table 307.1(1), Table 415.11.1.1.1

ISO 8336—09

Fiber-Cement Flat Sheets—Product Specification and Test Methods

1404.10, 1405.16.1, 1405.16.2,
1410.4, Table 2509.2

Material Handling Institute
8720 Red Oak Boulevard, Suite 201
Charlotte, NC 28217

ANSI MH29.1—2008

Safety Requirements for Industrial Scissors Lifts

Table 3001.2



Marble Institute of America
28901 Clemens Road, Suite 100
Cleveland, OH 44145

MIA (1998)

Appropriate standards for marble selection, cutting and design

460.6.4, 460.7.1.3, 460.9.2

FP 1001—17

Guide Specifications for Design of Metal Flag Poles

1609.1.1



National Association of Architectural Metal Manufacturers
800 Roosevelt Road, Bldg. C, Suite 312
Glen Ellyn, IL 60137

NAAMM MBG 531—2017

Metal Grating Manual

2214.3



National Concrete Masonry Association
13750 Sunrise Valley
Herndon, VA 22071-4662

TEK 5—8B(2005)

Detailing Concrete Masonry Fire Walls

Table 721.1(2)



National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471

10—18	Standard for Portable Fire Extinguishers	453.15.3, 906.1, 906.2, 906.3.2, 906.3.4, Table 906.3(1), Table 906.3(2)
11—16	Standard for Low-, Medium-, and High-Expansion Foam	904.7
12—18	Standard on Carbon Dioxide Extinguishing Systems	904.8, 904.12
12A—18	Standard on Halon 1301 Fire Extinguishing Systems	904.9
13—19	Standard for the Installation of Sprinkler Systems	105.3.1.2, 461.1, 712.1.3.1, 903.3.1.1, 903.3.1.2, 903.3.2, 903.3.8.2, 903.3.8.5, 904.12, 905.3.4, 907.6.4, 1019.3
13D—19	Standard for the Installation of Sprinkler Systems in One- and Two-family Dwellings and Manufactured Homes	903.2.11.3, 903.3.1.3
13R—19	Standard for the Installation of Sprinkler Systems in Low Rise Residential Occupancies	903.2.11.3, 903.3.1.2, 903.3.5.2, 903.4
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16—19	Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems	904.7, 904.12
17—21	Standard for Dry Chemical Extinguishing Systems	904.6, 904.12
17A—21	Standard for Wet Chemical Extinguishing Systems	904.5, 904.12
20—19	Standard for the Installation of Stationary Pumps for Fire Protection	412.3.4.1, 449.3.10, 450.3.13.1, 451.3.9.1, 904.10, 913.1, 913.2.1, 913.5
30—21	Flammable and Combustible Liquids Code	415.6, 468.3.6.5, 507.8.1.1.1, 507.8.1.1.2
30A—21	Code for Motor Fuel-Dispensing Facilities and Repair Garages	406.1.9.2
31—20	Standard for the Installation of Oil-Burning Equipment	2113.15
32—16	Standard for Drycleaning Facilities	415.9.3
40—19	Standard for the Storage and Handling of Cellulose Nitrate Film	409.1
58—20	Liquefied Petroleum Gas Code	415.9.2
61—20	Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities	426.1
70—20	National Electrical Code (NEC)	108.3, 202, 406.1.7, 406.1.9, 415.11.1.8, 449.4.2.9.1, 450.4.2.9.1, 450.4.2.9.6.4, 453.17.8, 453.25.5, 453.25.5.2, 454.1.10.4.2, 457.1.4.1.5, 464.4.2.2.1, 469.4.14.1, 469.4.14.7.1, 469.4.14, 453.17.8, Table 509.1, 904.3.1, 907.6.1, 909.12.2, 909.16.3, 910.4.6, 1006.2.2.4, 1010.1.10.1, 1205.4.1,

72—19	National Fire Alarm and Signaling Code	407.4.4.3, 407.4.4.5, 407.4.4.5.1, 449.3.12.2, 450.3.16.2, 453.7.7, 466.7.1.1, 466.7.1.2, 466.7.2, 466.10.5.1, 466.10.5.2, 469.4.14.10.1, 901.6, 903.4.1, 904.3.5, 907.1.2, 907.2, 907.2.6, 907.2.9.3, 907.2.11, 907.2.13.2, 907.3, 907.3.3, 907.3.4, 907.5.2.1.2, 907.5.2.1.3.1, 907.5.2.2, 907.5.2.2.5, 907.6, 907.6.1, 907.6.2, 907.6.6, 907.6.6.1, 907.7, 907.7.1, 907.7.2, 907.2.9.3, 911.1.6, 2702.2.4, 3002.10, 3005.5, 3007.7
74—89	Standards for the Installation, Maintenance and Use of Household Fire Warning Equipment	461.1
80—19	Standard for Fire Doors and Other Opening Protectives	410.3.5, 509.4.2, 716.1, 716.5.7, 716.5.8.1, 716.5.9.2, 716.6.4, 717.4.1.2, 1010.3.3
82—19	Standard on Incinerators and Waste and Linen Handling Systems and Equipment	713.13
85—19	Boiler and Combustion Systems Hazards Code	426.1
91—04	Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids	468.3.6.5
92—18	Standard for Smoke Control Systems	909.7, 909.8
96—21	Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations	466.6.2
99—21	Health Care Facilities Code	407.11, 425.1, 422.6, 449.3.11.10, 449.3.13, 449.3.14.1, 449.3.14.7, 449.4.2.9.1, 450.3.12, 450.3.14.3, 450.3.17, 450.3.18.1, 450.4.2.9.1, 451.3.13.1, 451.3.15, 451.3.16, 469.4.11.1.1, 469.4.11.1.2, 469.4.14.1, 469.4.14.7.1, 469.4.14.9.3
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 457.1.4.1.1, 457.1.4.2.13,
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 1030.6.2

105—19	Standard for Smoke Door Assemblies and Other Opening Protectives	405.4.2, 710.5.2.2, 716.5.3, 717.4.1.2, 909.20.4.1, 909.20.6.1, 2702.1.3, 3006.3
110—19	Standard for Emergency and Standby Power Systems	449.3.14.1, 449.3.14.3, 449.3.14.7, 450.3.18.1, 450.3.18.3, 451.3.13.1, 451.3.13.3, 467.2.8.1, 469.4.14.9.2, 2702.1.2
111—19	Standard on Stored Electrical Energy Emergency and Standby Power Systems	469.4.14.9.2, 2702.1.3
120—20	Standard for Fire Prevention and Control in Coal Mines	426.1
170—18	Standard for Fire Safety and Emergency Symbols	1025.2.6.1
211—19	Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances	2112.5
221—21	Standard for High Challenge Fire Walls, Fire Walls, and Fire Barrier Walls	706.2, Table 716.5
252—17	Standard Methods of Fire Tests of Door Assemblies	Table 716.3, 716.3.1, 716.4, 716.5.1, 716.5.3, 716.5.4, 716.5.5.1, 716.5.8.1.1
253—19	Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radian Heat Energy Source	406.1.4, 406.8.3, 424.2, 804.2, 804.3
257—17	Standard on Fire Test for Window and Glass Block Assemblies	Table 716.3, 716.4, 716.5.3.2, 716.6, 716.6.1, 716.6.2, 716.6.7.3
259—18	Standard Test Method for Potential Heat of Building Materials	2603.4.1.10, 2603.5.3

265—19

Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings on Full Height Panels and Walls

803.1.3, 803.1.3.1

268—17

Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source

1406.2.1.1, 1406.2.1.1.1,
1406.2.1.1.2, 2603.5.7, D105.1,
D106

275—17

Standard Method of Fire Tests for the Evaluation of Thermal Barriers

508.4.4.1, 509.4.1, 1407.10.2,
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276—19

Standard Method of Fire Test for Determining the Heat Release Rate of Roofing Assemblies With Combustible Above-Deck Roofing Components

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Standard Fire Test Method for the Evaluation of Fire Propagation Characteristics of Exterior Nonload-Bearing Wall Assemblies Containing Combustible Components

718.2.6, 1403.5, 1407.10.4,
1409.10.4, 1510.6.2, 2603.5.5

286—19

Standard Methods of Fire Test for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth

402.6.4.4, 803.1.2, 803.1.2.1,
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288—17

Standard Methods of Fire Tests of Horizontal Fire Door Assemblies Installed in Horizontal Fire Resistance-Rated Assemblies

712.1.13.1

289—19

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Standard on Aircraft Hangars

412.4.6, Table 412.4.6, 412.4.6.1,
412.6.5

418—16

Standard for Heliports

412.8.4

484—19

Standard for Combustible Metals

426.1

654—20

Standard for the Prevention of Fire & Dust Explosions from the Manufacturing, Processing and Handling of Combustible Particulate Solids

426.1

655—17	Standard for the Prevention of Sulfur Fires and Explosions	426.1
664—20	Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities	426.1
701—19	Standard Method of Fire Tests for Flame-Propagation of Textiles and Films	410.3.6, 424.2, 801.4, 806.1, 806.3, 806.4, 809.2, 3102.3, 3102.3.1, 3102.6.1.1, 3105.3.4.1, 3105.4, 3105.6, D102.2.8, D106, H106.1.1, H115
704—17	Standard System for the Identification of the Hazards of Materials for Emergency Response	202, 415.5.2
750—19	Standard on Water Mist Fire Protection Systems	202, 904.11.1.1
780—17	Standard for the Installation of Lightning Protection Systems	449.3.15.1, 450.3.19.1, 453.17.7
1124—17	Code for the Manufacture, Transportation and Storage of Fireworks and Pyrotechnic Articles	415.6.1.1
2001—18	Standard on Clean Agent Fire Extinguishing Systems	904.10

NSF

NSF International
P.O. Box 130140
789 N. Dixboro Road
Ann Arbor, MI 48113-0140, USA

NSF 50—19	Equipment for Pools, Spas, Hot Tubs, and Other Recreational Water Facilities	454.1.1, 454.1.2.1, 454.1.6.5.1, 454.1.6.5.16, 454.1.6.5.16.4.2, 454.1.6.5.16.5.2, 454.1.9.2.5.2, 454.1.9.8.6.1, 454.1.10.3, 454.1.11.9
NSF 60—05	Drinking Water Treatment Chemicals—Health Effects	454.1.2.1, 454.1.6.5.18, 454.1.11.19
NSF/ANSI 61—2019	Drinking Water System Components—Health Effects	454.1.11.3



Precast Prestressed Concrete Institute
200 West Adams Street, Suite 2100
Chicago, IL 60606-6938

PCI 124—18

Specification for Fire Resistance of Precast
Prestressed Concrete

722.2.3.1

MNL 128—19

Specification for Glass Fiber Reinforced
Concrete Panels

1903.3



Post-Tensioning Institute
38800 Country Club Drive
Farmington Hills, MI 48331

PTI DC—10.5-19

Standard Requirements for Design and
Analysis of Shallow Post-Tensioned Concrete
Foundations on Expansive and Stable Soils

1808.6.2



Research Council on Structural Connections
c/o Stanley D. Lindsey & Assoc. Ltd.
2244 Metro Center Boulevard, Suite 208
Nashville, TN 37228-1320

RCSC—20

Specification for Structural Joints Using High-
Strength Bolts, 2020

2214.3



Rack Manufacturers Institute
8720 Red Oak Boulevard, Suite 201
Charlotte, NC 28217

ANSI MH16.1—12

Specification for Design, Testing and Utilization
of Industrial Steel Storage Racks

2209.1

ANSI MH16.3—16

Specification for the Design, Testing, and
Utilization of Industrial Steel Cantilevered
Storage Racks

2209.2



Structural Building Components Association
6300 Enterprise Lane
Madison, WI 53719

ANSI/SBCA FS 100—2012
(R2018)

Standard Requirements for Wind Pressure
Resistance of Foam Plastic Insulating Sheathing
Used in Exterior Wall Covering Assemblies

2603.10



Steel Deck Institute
P. O. Box 25
Fox River Grove, IL 60021

ANSI/SDI NC—2017	Standard for Noncomposite Steel Floor Deck	2210.1.1.1, 2214.3
ANSI/SDI RD—2017	Standard for Steel Roof Deck	2210.1.1.2, 2214.3
DDM04—15	Diaphragm Design Manual, 4th Edition, 2015, with Addendum 1 (2015) and Addendum 2 (2016)	2214.3, 2222.4
ANSI/SDI C—2017	Standard for Composite Steel Floor Deck Slabs	2210.1.1.3, 2214.3



Steel Joist Institute
140 W. Evans Street, Suite 203
Florence, SC 29501

SJI-100—15	Standard Specification for K-Series, LH-Series, and DLH-Series Open Web Steel Joists and for Joist Girders, 2015	1604.3.3, 2203.2, 2207.1
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Single-Ply Roofing Institute
411 Waverly Oaks Road, Suite 331B
Waltham, MA 02452

ANSI/SPRI/FM4435-ES-1—2017	Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems	1504.5
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GT-1—2016	Test Standard for Gutter Systems	1504.5.1



Steel Tube Institute
2516 Waukegan Road, Suite 172
Glenview, IL 60025

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STI, 2021. HSS Design Manual, Volume 2A	Member Design 2016, Steel Tube Institute, 2021	2214.3
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TECO

Timber Company, Inc.
2402 Daniels Street
Madison, WI 53704

TECO PRP-133

Performance Standards and Policies for
Structural Use Panels

2314.4.8

TIA

Telecommunications Industry Association
1320 N. Courthouse Road
Arlington, VA 22201-3834

ANSI/TIA222-H—2017

Structural Standard for Antenna Supporting
Structures and Antennas and Small Wind
Turbine Support Structures

1609.1.1, 3108.1, 3108.2

TMS

The Masonry Society
105 South Sunset Street, Suite Q
Longmont, CO 80501

216—14

Standard Method for Determining Fire
Resistance of Concrete and Masonry
Construction Assemblies

Table 721.1(2), 722.1

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Standard Method for Determining the Sound
Transmission Ratings for Masonry Assemblies

1207.2.1

402—16

Building Code Requirements for Masonry
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1405.6, 1405.10, 1604.3.4,
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2105.1, 2106.1, 2107.1, 2107.2,
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403—17

Direct Design Handbook for Masonry
Structures

2101.2

404—16

Standard for the Design of Architectural Cast
Stone

2101.2

504—16

2103.1

Standard for the Fabrication of Architectural
Cast Stone

604—16	Standard for the Installation of Architectural Cast Stone	2104
602—16	Specification for Masonry Structures	1405.6.1, 1807.1.6.3, 2103.1, 2103.2.1, 2103.3, 2103.4, 2104.1, 2105.1, 2108.1, 2121.1.6, 2122.1, 2122.2.3, 2122.3, 2122.4, 2122.7.4, 2122.8.1, 2122.8.2, 2122.8.3, 2122.8.4, 2122.8.6, 2122.8.8



Truss Plate Institute
218 N. Lee Street, Suite 312
Alexandria, VA 22314

TPI 1—2014	National Design Standard for Metal-Plate-Connected Wood Truss Construction	2303.4.6, 2306.1, 2319.17.2.1.1, 2319.17.2.2.8
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UL LLC
333 Pfingsten Road
Northbrook, IL 60062-2096

9—2009	Fire Tests of Window Assemblies—with Revisions through February 2015	Table 716.3, 716.3.2, 716.4, 716.5.3.2, 716.6, 716.6.1, 716.6.2, 716.6.7.3
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10B—2008	Fire Tests of Door Assemblies—with Revisions through February 2015	716.3.1, Table 716.3, 716.5.2, 716.5.4, 716.5.5.1, 716.5.8.1.1
10C—2016	Positive Pressure Fire Tests of Door Assemblies	Table 716.3, 716.3.1, 716.5.1, 716.5.3, 716.5.4, 716.5.5.1, 716.5.8.1.1, 1010.1.10.1, 1010.2.9.1
14B—2008	Sliding Hardware for Standard Horizontally Mounted Tin-Clad Fire Doors—with Revisions through July 2017	716.5

14C—2006	Swinging Hardware for Standard Tin Clad Fire Doors Mounted Singly and in Pairs—with Revisions through July 2017	716.5
55A—2004	Materials for Built-Up Roof Coverings	1507.10.2
103—2010	Factory-Built Chimneys, for Residential Type and Building Heating Appliances—with Revisions through July 2017	718.2.5.1
127—2011	Factory-Built Fireplaces—with Revisions through May 2016	718.2.5.1, 2111.12
181—2005	Standard for Factory-Made Air Ducts and Air Connectors	449.3.6.4, 451.3.6.3, 451.3.6.3.4
199E—2004	Outline of Investigation for Fire Testing of Sprinklers and Water Spray Nozzles for Protection of Deep Fat Fryers	904.12.4.1
217—2015	Single and Multiple Station Smoke Alarms—with Revisions through November 2016	907.2.11
263—2011	Standard for Fire Tests of Building Construction and Materials—with Revisions through March 2018	703.2, 703.2.1.1, 703.2.2, 703.2.1.3, 703.2.1.5, 703.2.2, 703.6, 704.12, 705.7, 705.8.5, 707.6, 712.1.13, 714.4.1.1, 714.5.1, 715.1, 716.2, Table 716.3, 716.5.6, 716.5.8.1.1, Table 716.6, 716.7.1, 717.3.1, 717.5.2, 717.5.3, 717.6.1, 717.6.2.1, Table 721.1(1), 2103.1, 2603.5.1
268—2016	Smoke Detectors for Fire Alarm Systems—with Revisions through July 2016	407.9, 407.9, 907.2.6.2, 907.2.11.7
294—2018	Access Control System Units—with Revisions through October 2018	1010.2.14, 1010.1.9.8, 1010.1.9.9, 1010.1.9.10, 1010.1.9.13, 1010.2.11, 1010.2.12, 1010.2.13, 1010.2.14
300—2005(R2010)	Fire Testing of Fire Extinguishing Systems for Protection of Commercial Cooking Equipment—with Revisions through December 2014	904.12
300A—2006		407.2.6, 407.2.7, 904.13

Outline of Investigation for Extinguishing
System Units for Residential Range Top
Cooking Surfaces

305—2012	Panic Hardware—with Revisions through March 2017	1010.1.10
325—2017	Door, Drapery, Gate, Louver and Window Operations and Systems	406.1.1, 3110.4
555—2006	Fire Dampers—with Revisions through October 2016	717.3
555C—2014	Ceiling Dampers—with Revisions through May 2017	717.3
555S—2014	Smoke Dampers—with Revisions through October 2016	717.3.1
580—2006	Test for Uplift Resistance of Roof Assemblies—with Revisions through October 2018	1504.3.1, 1504.3.2, 1504.3.3, 2222.4.6
641—2010	Type L Low-Temperature Venting Systems—with Revisions through April 2018	2113.11.1.4
710B—2011	Recirculating Systems—with Revisions through August 2014	904.12
723—2018	Standard for Test for Surface Burning Characteristics of Building Materials	202, 402.6.4.4, 406.7.2, 602.4.1.1, 602.4.2.1, 602.4.3.1, 703.5.1, 720.1, 720.4, 803.1.1, 803.1.4, 803.10, 803.11, 806.7, 1403.5, 1404.12.1, 1407.9, 1407.10.1, 1409.9, 1409.10.1, 1510.6.2, 1510.6.3, 2303.2, 2603.3, 2603.4.1.13, 2603.5.4, 2603.5.5, 2606.3.5.4, 2603.7, 2604.2.4, 2606.4, 2612.3, 2614.3, 3105.3.4.1, 3105.6, D102.2.8, D106
723S—2006	Drop-Out Ceilings Installed Beneath Automatic Sprinklers	2606.7.4
790—2004	Standard Test Methods for Fire Tests of Roof Coverings—with Revisions through October 2018	1505.1, 1513.1, 1516.1, 2603.6, 2610.2, 2610.3

793—2008	Standards for Automatically Operated Roof Vents for Smoke and Heat— with Revisions through March 2017	910.3.1
864—2014	Standards for Control Units and Accessories for Fire Alarm Systems— with Revisions through March 2018	909.12
924—2016	Standard for Safety Emergency Lighting and Power Equipment— with Revisions through May 2018	1013.5, 3006.3
1040—1996	Fire Test of Insulated Wall Construction— with Revisions through April 2017	1407.10.3, 1409.10.3, 2603.9
1069—2007	Hospital Signaling and Nurse Call Equipment, 7 th Edition	449.3.13.1, 450.3.17, 451.3.11.1, 467.8.3.6
1256—2002	Fire Test of Roof Deck Construction— with Revisions through August 2018	1508.1, 2603.3, 2603.4.1.5
1479—2015	Fire Tests of Through-Penetration Firestops	202, 714.4.1.2, 714.5.1.2, 714.5.4
1482—2011	Solid-Fuel-Type Room Heaters—with Revisions through August 2015	2112.2, 2112.5
1703—2002	Flat-Plate Photovoltaic Modules and Panels—with Revisions through September 2018	1505.8, 1505.9, 1507.17.6, 1510.7.4, 1518.11.1, 3111.3.1
1715—1997	Fire Test of Interior Finish Material— with Revisions through April 2017	1407.10.3, 1409.10.2, 1409.10.3, 2603.4, 2603.9, 2614.4
1741—2010	Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources—with Revisions through February 2018	3111.3.1
1777—2007	Chimney Liners—with Revisions through April 2014	2113.11.1, 2113.19
1784—2015	Air Leakage Tests of Door Assemblies	405.4.3, 710.5.2.2, 710.5.2.2.1, 716.5.3.1, 716.5.7.1, 716.5.7.3, 3006.3, 3007.6.3, 3008.6.3

1897—2015	Uplift Tests for Roof Covering Systems	1504.2.1.1, 1504.3.1, 1504.3.3
1975—2006	Fire Test of Foamed Plastics Used for Decorative Purposes	402.6.2, 402.6.4.5, 424.2
1994—2015	Luminous Egress Path Marking Systems	411.7, 1008.2.1, 1025.2.1, 1025.2.3, 1025.2.4, 1025.2.5
2017—2008	Standards for General-Purpose Signaling Devices and Systems— with Revisions through May 2011	454.2.17.1.9
2034—2017	Standard for Single- and Multiple-Station Carbon Monoxide Alarm— with Revisions through September 2018	202
2075—2013	Standard for Gas and Vapor Detectors and Sensors—with Revisions through December 2017	202
2079—2015	Tests for Fire Resistance of Building Joint Systems	202, 715.3, 715.6, 715.8
2196—2017	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables	909.20.7.1, 913.2.2, 2702.3, 3007.8.1, 3008.8.2
2200—2012	Stationary Engine Generator Assemblies—with Revisions through October 2015	2702.1.1
2202—2009(2012)	Standard for Electric Vehicle (EV) Charging System Equipment— with Revisions through February, 2018	406.1.7
2594—2016	Standard for Electric Vehicle Supply Equipment, 2013	406.1.7
2703—2014	Mounting Systems, Mounting Devices, Clamping/Retention Devices and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels— with Revisions through December 2019	1505.9
CAN/ULC S 102.2—2018		720.2, 720.3, 720.4



Underwriters Laboratories of Canada
7 Underwriters Road
Toronto, Ontario, Canada M1R3B4

Standard Method of Test for Surface Burning
Characteristics of Flooring, Floor Coverings and
Miscellaneous Materials and Assemblies



United States Code
c/o Superintendent of Documents
U.S. Government Printing Office
732 North Capitol Street, NW
Washington, DC 20401

18 USC Part 1, Ch.40

Importation, Manufacture, Distribution and
Storage of Explosive Materials

202



West Coast Lumber Inspection Bureau
P. O. Box 23145
Portland, OR 97281

AITC 104—03

Typical Construction Details

2306.1

AITC 110—01

Standard Appearance Grades for Structural
Glued Laminated Timber

2306.1

AITC 113—10

Standard for Dimensions of Structural Glued
Laminated Timber

2306.1

AITC 117—10

Standard Specifications for Structural Glued
Laminated Timber of Softwood Species

2306.1

AITC 119—96

Standard Specifications for Structural Glued
Laminated Timber of Hardwood Species

2306.1

AITC 200—09

Manufacturing Quality Control Systems Manual
for Structural Glued Laminated Timber

2306.1



Window and Door Manufacturers Association
2025 M Street, NW, Suite 800
Washington, DC 20036-3309

AAMA/WDMA/CSA 101/I.S.2/A440—08, 11 or 17 North American Fenestration
Standard/Specification for Windows, Doors and

1010.1.7, 1709.5.1, 2405.5,
2411.3.2

Unit Skylights

FMA/AAMA/WDMA 2710—20 Guidelines for the Full Frame Replacement of Windows without Removal of External Brick Veneer 1405.4

WDMA/I.S.11—2018 Analytical Method for Design Pressure (DP) Ratings of Fenestration Products 1709.5.1



Wire Reinforcement Institute, Inc.
942 Main Street, Suite 300
Hartford, CT 06103

WRI/CRSI—81 Design of Slab-on-Ground Foundations—with 1996 Update 1808.6.2

2023 FBC - Building, 8th edition

Chapter 36 Florida Fire Prevention Code

Section 3601

3601.1 Scope

Provisions of this chapter shall govern the design, construction and arrangement of elements to provide a safe means of egress from buildings and structures and to minimize hazard to life and property due to fire and panic.

3601.2

In addition to the provisions of this code, buildings shall comply with the 8th Edition (2023) *Florida Fire Prevention Code* as adopted by the Florida State Fire Marshal.

2023 FBC - Building, 8th edition

Appendix E

FLORIDA STANDARD FOR RADON-RESISTANT NEW COMMERCIAL CONSTRUCTION

Chapter E101 General

E101 General

The design and construction requirements set forth in the following chapters and sections shall constitute and be known as the *Florida Standard For Radon-Resistant Commercial Building Construction*, hereinafter referred to as "this standard."

E102 Intent

This standard was developed in accordance with Section 553.98, *Florida Statutes*, to minimize radon entry into newly constructed commercial buildings, in compliance with the state health standard. The design, construction, and operation of buildings are governed by a variety of codes, standards, guidelines, and regulations. Nothing in this standard is intended to create a conflict with existing health and life-safety regulations.

E103 Scope

E103.1 Applicability

The provisions of this standard shall apply to the design and construction of new commercial buildings and additions to existing commercial buildings, except single-family and multiple-family residential buildings of three or fewer stories above grade and those identified in Section E104.3. When adopted by county and local government, this standard shall be applied uniformly countywide. This standard shall not be modified by a local government or building-regulatory agency.

E103.2 Additions

When the cost of an addition to an existing building exceeds 50 percent of the current value of the building; only the addition must be brought into compliance with all applicable portions of this standard, as defined in Section E104.

E104 Compliance

E104.1 General

Buildings designed and constructed in accordance with all the applicable provisions of this standard are deemed to comply.

E104.2 New Buildings and Additions

All new commercial buildings and additions to existing buildings shall meet the following compliance requirements of this standard:

1. Compliance with existing local building codes and Chapter 13 of *Florida Building Code, Building*.
2. Use of methods described in Chapters 3 and 4 of this standard.

E104.3 Exemptions

All buildings described below in Items 1 through 5 of this section are exempted from compliance with this standard. Buildings described in Item 6 are exempted from compliance with Sections E306 and E307, and Chapter 4 of this standard. Elevated buildings that comply with all provisions of Item 7 are exempted from compliance with other portions of this standard.

1. Temporary structures.
2. Free-standing greenhouses used exclusively for the cultivation of live plants.
3. Open-air reviewing stands, grandstands and bleachers.

4. Farm structures used only for storage or to shelter animals.
5. Residential buildings defined as one- or two-family detached houses or townhouse apartments with no more than three stories.
6. Buildings of occupancy classification S, storage, or H, hazardous (standard building code designations).
7. Elevated buildings that satisfy all the following conditions:
 - a. The structure shall be separated from the ground by a vertical separation, measured between the final grade and the lower surface of the floor, of at least 18 inches (457 mm);
 - b. All pilings, posts, piers or other supports shall be solid, or if hollow, shall be capped by a solid masonry unit or sealed at the surface of the soil with a construction complying with all applicable portions of Chapter 3 of this standard;
 - c. Enclosures of any kind, including but not limited to chases, storage rooms, elevator shafts and stairwells, that connect between the soil and the structure, shall comply with all applicable provisions of Chapter 3 and shall have a soil contact area of less than five percent of the projected building floor area; and
 - d. The perimeter of the structure, from the ground plane to the lower surface of the lowest floor, shall be totally open for ventilation.

E104.4 Required Documentation

In order to comply with this standard, all structures must include in the construction documents provided for permitting, a summary of the radon-resistant design strategies being implemented in the structure. Additionally, the building owner shall be provided with a manual substantiating the radon-resistance features. This manual shall include: a summary of the radon-resistant design strategies incorporated into the structure; a listing of the design specifications for all relevant motor-driven systems; a maintenance schedule for maintaining design specifications, including active soil depressurization and heating, ventilating, and air conditioning systems; and a listing of all critical adjustments, such as intake-air damper settings.

Chapter E201 Definitions

E201 General

For the purpose of this standard, certain abbreviations, terms, phrases, words and their derivatives shall be construed as set forth in this chapter. Words not defined herein shall have the meanings stated in *the Florida Building Code, Building; Florida Building Code, Mechanical; Florida Building Code, Plumbing; Florida Building Code, Fuel Gas; and Florida Fire Prevention Code*. Words not defined in these codes shall have the meanings in *Webster's Ninth New Collegiate Dictionary*, as revised. When cited throughout this standard, ASTM and ACI standards refer to the latest editions.

E202 Definitions

ACTIVE SOIL-DEPRESSURIZATION. The lowering of air-pressure in the soil, relative to the atmospheric pressure immediately above ground level.

ACTIVE SOIL-DEPRESSURIZATION SYSTEM. A system designed to lower the air-pressure in the soil beneath a building, relative to the atmospheric pressure immediately above ground level, by continuously withdrawing air from below a membrane covering the soil. An active soil-depressurization system consists of a pressure distribution manifold, one or more radon vents, an operating fan, and a fan-failure indicator.

ADDITION. An extension or increase in floor area that can be occupied or that exchange air with the conditioned space of the building.

AND/OR. When referring to a choice of two or more provisions of this standard, signifies that use of any one provision is acceptable, and that two or more provisions may also be used together.

APPROVED. Accepted by the building official or other authority having jurisdiction.

AREA. The maximum horizontally projected area of a building or space, measured to the outside surface of the enclosing walls.

AUTOMATIC. Self-acting, providing an emergency function without human intervention, and activated as a result of a predetermined event such as an interruption of air-flow, a change in air-pressure, or the loss of electrical supply.

BACKER ROD. See "Backup."

BACKUP. A compressible material used in the bottom of sealant reservoirs to reduce the depth of the sealant, thus improving its shape factor. Backup also serves to support the sealant against sag or indentation while curing.

BLEACHERS. Tiered or stepped seating facilities without backrests in which an area of 3 square feet (0.28 m^2) or less is assigned per person.

BUILDING. Any structure that encloses a space used for sheltering any occupancy. Each portion of a building separated from other portions by a fire wall shall be considered as a separate building.

BUILDING OFFICIAL. The officer or other designated authority, or their duly authorized representative, charged with the administration and enforcement of building codes.

BUTT JOINT. A nonbonded plain, square joint, a keyed joint or a doweled joint between two members, where primarily movement is at right angles to the plane of the joint. Sealant in a butt joint will generally be in tension or compression, but not shear.

CAVITY WALL. A wall built of any combination of materials, so arranged as to provide a vertical air space within the wall.

COMMERCIAL BUILDING. A structure or building classified according to use by the standard building code as occupancy groups: A - Assembly, B - Business, E - Educational, F - Factory Industrial, I - Institutional, M - Mercantile, and R-Residential (except those already covered by the Florida *Standard for Passive Radon-Resistant New Residential Building Construction*).

CONSTRUCTION JOINT. The surface where two successive placements of concrete meet and are to be bonded; reinforcement is not interrupted and tie bars are used as required.

CONTRACTION JOINT. A formed or sawed groove in a concrete structure, extending normal to the surface and to a depth of at least one-fourth the thickness of a concrete element, for the purpose of creating a weakened plane that induces a crack as internal stresses develop due to drying shrinkage.

CONTROL JOINT. See "Contraction joint."

CRAWL SPACE. The unconditioned space between the bottom surface of the lowest floor of a structure and the earth that is created when the lowest floor of the structure spans between structural supports rather than being directly supported by the earth beneath the floor.

CURING. For concrete, the maintenance of a satisfactory moisture content and temperature during its early stages so that desired properties may develop. For sealants, the maintenance of a satisfactory moisture content and temperature while the physical properties of the sealant are changed by chemical reaction.

CURING COMPOUND. A liquid that can be applied as a coating to the surface of newly placed concrete to retard the loss of water, or in the case of pigmented compounds, also to reflect heat so as to provide an opportunity for the concrete to develop its properties in a favorable temperature and moisture environment.

DETERIORATION. The physical manifestation of failure of a material or assembly (e.g., cracking, delamination, flaking, pitting, scaling) caused by environmental or internal autogenous influences during testing or service.

DIFFUSION. The movement of radon from areas of high concentration to areas of low concentration.

ELASTOMERIC SEALANT. A sealant whose macromolecular material returns rapidly to approximately its initial dimensions and shape after substantial deformation by a weak stress and release of the stress.

EMANATION. The gaseous elements produced by and given off from the radioactive disintegration of radium.

EQUILIBRIUM. The condition where the rate of decay of a radioactive parent isotope is exactly matched by the rate of decay of every intermediate daughter isotope.

EXISTING. As applied to a building or structure, one which was erected or permitted prior to the adoption of this standard.

FIELD-MOLDED SEALANT. A liquid or semisolid material molded into the desired shape in the joint into which it is installed.

FOOTING. That portion of the foundation of a structure which spreads and transmits load directly to the piles, or to the soil or supporting grillage.

FOUNDATION WALL. A wall below the first floor extending below the adjacent ground level and serving as a structural support for a wall, pier, column or other structural element.

GASKET. A deformable material clamped between essentially stationary faces to prevent the passage of air through an opening or joint.

GRADE. The top surface of the ground adjoining the exterior of a building.

GRADE BEAM. A reinforced concrete beam, usually at ground level, to form a foundation for the walls of a superstructure.

GRANDSTANDS. Tiered or stepped seating facilities where an area of more than 3 square feet (0.28 m^2) is provided for each person.

GRANULAR SOIL. A soil with an air permeability greater than or equal to 10^{-12} m^2 .

GROUT. A mixture of cementitious material and water, with or without aggregate, proportioned to produce a pourable consistency without segregation of the constituents.

HIGH-RANGE WATER REDUCER. A chemical admixture capable of reducing the water content of concrete at least 12 percent. This admixture shall conform to ASTM C494 Type F and/or Type O.

HOLLOW MASONRY WALL. A wall built of masonry units so arranged as to provide an air space within the wall.

HONEYCOMB. Voids left in concrete due to failure of the mortar to effectively fill the spaces among coarse aggregate particles.

ISOLATION JOINT. A nonbonded separation between adjoining parts of a structure, usually in a vertical plane, designed to allow relative movement in three directions in order to accommodate differential horizontal or vertical movement without the development of cracks elsewhere in the structure. May be either a butt joint or a lap joint, used to structurally separate the floor slab from other building elements.

KEYED. Fastened or fixed in position in a notch or other recess.

KEYWAY. A recess or groove in one lift or placement of concrete which is filled with concrete of the next placement, providing improved shear resistance at the joint.

LAITANCE. A layer of weak and nondurable material containing cement and fines from aggregates, brought by bleeding water to the outer surface of concrete.

LAP. The length by which one material overlays another at a lap joint.

LAP JOINT. A nonbonded joint in which the materials being joined override each other so that any movement of the materials is primarily parallel to the plane of the joint, putting sealants in shear rather than tension or compression. Formed slab joints that are not attached with a keyway are considered to be lap joints.

MANUFACTURED SANDS. Sands resulting from the crushing of rock, gravel or slag.

MASONRY. Construction composed of shaped or molded units, usually small enough to be handled by one person and composed of stone, ceramic brick or tile, concrete, glass, adobe, or the like.

MASTIC. A sealant with putty-like properties.

MEMBRANE. A flexible, continuous sheet. See also: "Membrane-forming," "wring compound," "Soil-gas-retarder membrane;" "Waterproofing membrane."

MEMBRANE-FORMING CURING COMPOUND. A liquid material that, when applied over the surface of freshly placed concrete, forms a solid, impervious layer which holds the mixing water in the concrete.

MIDRANGE WATER REDUCER. A chemical admixture capable of reducing the water content of concrete from 6 to 15 percent. This admixture shall conform to ASTM C494 Type A and/or Type F.

NATURAL SANDS. Sands resulting from the natural disintegration and abrasion of rock.

NET-FREE AREA. When referring to foundation vents, the area determined by multiplying the overall width and height of the object and subtracting the total area obstructed by any solid object, such as screen, mesh, louvers, and frame of the vent.

OPEN AIR. When referring to reviewing stands, grandstands and bleachers, indicates a seating facility in which the side toward which the audience faces is without an enclosing wall.

PICOCURIES PER GRAM, pCi/g. a measure of radioactivity corresponding to 0.037 radioactive disintegrations per second per gram of dry weight of a sample.

PICOCURIES PER LITER, pCi/L. a measure of radioactivity corresponding to 0.037 radioactive disintegrations per second per liter of volume.

PLASTICIZER. See "Midrange water-reducer."

POLYETHYLENE. A thermoplastic high-molecular-weight organic compound often used in sheet form as a water-vapor retarder.

POLYURETHANE SEALANT. A building sealant consisting primarily of a polyurethane compound.

POLYVINYLCHLORIDE. A synthetic resin used in the manufacture of pipes and nonmetallic waterstops.

PREFORMED SEALANT. A sealant functionally preshaped by the manufacturer so that only a minimum of field fabrication is required prior to installation.

PRESSURE SENSITIVE. Capable of adhering to a surface without the application of additional adhesives when pressed against it.

PSI. Pounds force per square inch.

RADIUM (Ra). A naturally occurring radioactive element resulting from the decay of uranium. For the purposes of this standard, radium applies to Radium-226. It is the parent of radon gas.

RADON. A naturally occurring, chemically inert, radioactive gas. It is part of the Uranium-238 decay series. For the purposes of this standard radon applies to Radon-222; thus, it is the direct decay product of Radium-226.

RADON POTENTIAL. A measure of the potential of soils at a building site for contributing to indoor radon concentrations.

SEALANT. Any material used to seal joints or openings against passage of solids, liquids, or gases.

SHAFT. A vertical opening extending through one or more stories of a building, for utilities, an elevator, dumbwaiter, light, ventilation, plumbing or electrical installation or a similar purpose.

SHAPE FACTOR. The relationship between the depth and width of a field-molded sealant.

SOIL GAS-RETARDER MEMBRANE. A durable, flexible and non-deteriorating material, installed in a continuous sheet to retard the pressure-driven flow of soil gas through elements of a structure.

SOLID REINFORCED MASONRY. Masonry construction in which mortar, grout or concrete completely fills all joints and voids and in which steel reinforcement is embedded in such a manner that the materials act together in resisting forces.

STORY. That portion of a building between the upper surface of a floor and the upper surface of the floor or roof next above.

STRUCTURE. That which is built or constructed. A structure may contain one or more buildings separated by fire-rated construction elements in accordance with prevailing building codes.

SUBGRADE. The soil prepared and compacted to support a structure.

SUPERPLASTICIZER. See "High-range water reducer."

SUPERSTRUCTURE. All of that part of a structure that is above grade.

TEMPORARY STRUCTURE. A structure which is erected, occupied, and disassembled or otherwise removed from the site within a total time period of 90 calendar days or less.

WATERPROOFING MEMBRANE. A liquid sealing compound (e.g., bituminous and paraffinic emulsions, coal tar cut-backs, etc.) or nonliquid protective coatings (e.g., sheet plastics, etc.) used separately or together in a manner which renders the structural surface to which they are applied essentially impervious to water in either the liquid or vapor state.

WATER-REDUCING ADMIXTURE. A chemical additive to concrete conforming to ASTM C94 capable of producing a reduction in mixing water or increase in flowability without causing undue set retardation or entrainment of air in the mortar or concrete.

WATERSTOP. A diaphragm used across a joint as a sealant, usually manufactured specifically to prevent the passage of water through joints in concrete structures.

WORKING LEVEL (WL). A measure of radioactive exposure equal to the total quantity of radon decay products in one liter of air that will result in the ultimate emission of 1.3×10^5 MeV (million electron volts) of energy from alpha particles. In perfect equilibrium, 1 WL equals 100 pCi/L (picoCuries per liter). It is often assumed that the air inside buildings is not in equilibrium, and that only half the radon daughters are moving freely in the air, while half are attached to dust or building surfaces. When this condition exists, an equilibrium ratio of 0.5 is said to exist. At an equilibrium ratio of 0.5, 1 WL = 200 pCi/L. For purposes of this standard, 1 WL is defined as equal to 200 pCi/L.

ZONE. That portion of a building in which the HVAC system is controllable from a single point.

Chapter E301 Construction Requirements for Passive Controls

E301 General

Construction to these standards will limit radon entry points through building floors, walls, and foundations and will limit mechanical depressurization of buildings, which can enhance radon entry. Structural radon barriers are primarily intended to stop the pressure-driven flow of soil gas through unsealed cracks and openings in the foundation and/or floor and into the building. Barriers can also be effective in controlling the diffusion of radon through materials and the emanation of radon from materials. An acceptable degree of redundancy and reliability is achieved only when these components are implemented as part of an integrated system of radon resistance as prescribed by this standard. All structures shall be isolated from the soil by an approved structural barrier as defined by the applicable portions of this standard. No crack, joint, duct, pipe, conduit, chase or other opening in the building foundation or floor shall be allowed to connect soil gas to a conditioned space or to the interior space of an enclosed space that is either adjacent to, or connected to, a conditioned space.

E302 Soil Gas-Retarder Membrane

E302.1 Membrane Materials

Acceptable soil gas-retarder membranes shall consist of a single layer of polyethylene, not less than 0.006-inch (6 mils) thick with a maximum perm rating of 0.3. Polyvinyl chloride (PVC), ethylene propylene diene ter polymer (EPDM), neoprene or other nondeteriorating, nonporous material may be used instead of polyethylene, provided the installed thickness of the alternate material has greater or equal tensile strength, resistance to water-vapor transmission, resistance to puncture, and resistance to deterioration determined in accordance with ASTM E154. The membrane shall be placed to minimize seams and to cover all of the soil below the building floor.

E302.2 Tape

Tape used to install the soil-gas retarder shall have a minimum width of 2 inches (51 mm) and shall be pressure sensitive vinyl or other nondeteriorating pressure sensitive tape compatible with the surfaces being joined. Paper tape and/or cloth tape shall not be used for these purposes.

E302.3 Mastic

Mastic used to install the soil-gas retarder shall be compatible with the surfaces being joined, and shall be installed in accordance with the manufacturer's recommendations for the materials, surface conditions and temperatures involved. Mastic may be used to join sections of membrane to one another or to elements of the building foundation, or to seal penetrations in the membrane.

E302.4 Installation

The soil-gas retarder shall be placed under the entire soil-contact area of the floor in a manner that minimizes the required number of joints and seams. Care shall be taken to prevent damage to the membrane during the construction process. In buildings incorporating the subslab portions of an active soil-depressurization system, the soil-gas retarder serves an important second purpose: to prevent mastic, cement or other materials from blocking the pressure distribution manifolds or pits.

E302.5 Seams

Seams between portions of the soil-gas retarder shall maintain a minimum of 12 inches (305 mm) of lap when concrete is placed. This may be accomplished by securing the lapped edges of the membrane with tape or mastic or using larger unsecured overlaps prior to placing concrete.

E302.6 Slab Edges and Joints

The soil-gas retarder shall fully cover the soil beneath the building floor. Where the slab edge is cast against a foundation wall or grade beam, the soil-gas retarder shall contact the foundation element, and shall not extend vertically into the slab more than one half of the

slab thickness.

E302.7 Penetrations

At all points where pipes, conduits, reinforcing bars or other objects pass through the soil-gas-retarder membrane, the membrane shall be fitted to within $\frac{1}{2}$ inch (12.7 mm) of the penetration and sealed to the penetration. When penetrations occur within 24 inches (610 mm) of a soil-depressurization-system mat or pit, the gap between the penetrating object and the soil-gas retarder shall be taped closed. When necessary, to meet this requirement, a second layer of the membrane, cut so as to provide a minimum 12-inch (305 mm) lap on all sides, shall be placed over the object and shall be sealed to the soil-gas retarder with a continuous band of tape.

E302.8 Punctures, Cuts and Tears

All damaged portions of the soil-gas-retarder membrane within 24 inches (610 mm) of any portion of a soil-depressurization-system mat or pit shall be sealed with tape or with a patch made from the same or compatible material, cut so as to provide a minimum 12-inch (305 mm) lap from any opening, and taped continuously about its perimeter.

E302.9 Mastics

Mastic may be used to join sections of soil-gas retarder to one another or to elements of the building foundation, or to seal penetrations in the soil-gas retarder, provided that mastic is kept at least 24 inches (610 mm) from any portion of a soil-depressurization-system mat or pit. Only tape may be used to seal the soil-gas-retarder membrane within 24 inches (610 mm) of a soil-depressurization-system mat or pit.

E302.10 Repairs

Where portions of an existing slab have been removed and are about to be replaced, a soil-gas-retarder membrane shall be carefully fitted to the opening, and all openings between the membrane and the soil closed with tape or mastic. Special care must be exercised to assure that mastic does not enter any portion of a soil-depressurization system located beneath the slab.

E303 Concrete Floors in Contact With Soil Gas

E303.1 General

Concrete slabs supported on soil or spanning over exposed soil, that are used as floors for conditioned space or enclosed spaces adjacent to or connected to conditioned spaces, shall be constructed in accordance with the following provisions of Section E303.

E303.2 Concrete for Slabs

E303.2.1 Compressive Strength

Design strength for all concrete mixes used in the construction of slab-on-grade floors shall be a minimum of 3,000 psi (21 MPa) at 28 days and shall be designed, delivered and placed in accordance with ASTM C94.

E303.2.2 Shrinkage Control

In order to limit the uncontrolled cracking of floor slabs, the concrete mix design, placing practices, and curing practices prescribed in this section shall be followed. All concrete slabs-on-grade or slabs spanning above exposed soil shall be designed, placed, finished, and cured in accordance with local governing codes and applicable portions of ACI 318, *Building Code Requirements for Reinforced Concrete*; ACI 302, *Guide for Concrete Floor and Slab Construction*; and if fiber-reinforced concrete is used, the recommendations of the ACI Committee 544, *State of the Art Report on Fiber Reinforced Concrete*. ACI 302 and 544 may not be incorporated by reference for design.

E303.2.3 Mix Design

Mix design for all concrete used in the construction of slab-on-grade floors shall specify a maximum design slump not to exceed 4 inches (102 mm). On-site slumps shall not exceed 5 inches (127 mm) provided that the total water added to the mix, including plant, transit, and site added water, does not exceed the total following parameters:

1. For mixes using only natural sands, water content shall not exceed 275 pounds per cubic yard of concrete.
2. For mixes using manufactured sands, water content shall not exceed 292 pounds per cubic yard of concrete.

E303.2.4 Slump and Workability

For concretes that do not contain midrange or high-range water reducers, concrete slump measured at the point of placement in accordance with ASTM C172, shall not exceed 5 inches (127 mm). For concretes designed and mixed containing mid-range or high-range water reducers conforming with ASTM C494, slump measured at the point of placement in accordance with ASTM C172, shall not exceed 7 inches (178 mm) for mid-range and 8 inches (203 mm) for high-range water reducers.

E303.2.5 Hot Weather Placing and Finishing

All concrete shall be placed and finished in accordance with the provisions of ACI 301, *Specifications for Structural Concrete for Buildings*. When necessary, provision for wind breaks, shading, fog spraying, sprinkling, ponding or wet covering with a light colored material shall be made in advance of placement, and such protective measures shall be taken as quickly as concrete hardening and finishing operations will allow.

E303.2.6 Curing

Concrete floors shall be cured by one of the means described below and shall not be subjected to loading until the architect or engineer has determined the slab to be structurally adequate for the loads imposed.

1. Concrete floor slabs shall be cured by covering the entire slab surface for a period of seven days with clean, ponded water.
2. Concrete floor slabs shall be cured by covering the entire slab surface for a period of seven days with a continuous mist or spray of clean, potable water.
3. Concrete floor slabs shall be cured by covering the entire slab surface for a period of seven days with an impermeable sheet material conforming to ASTM C171.
4. Concrete floor slabs shall be cured by covering the entire slab surface with a liquid membrane-forming compound that conforms with ASTM C309. Curing compounds shall be compatible with materials specified in Section E303.3.1.

E303.3 Sealing of Construction Joints, Penetrations, Cracks, and Other Connections**E303.3.1 Sealants**

Sealants shall be selected and installed in compliance with ASTM C920, *Standard Specification for Elastomeric Joint Sealants*, and ASTM C 1193, *Standard Guide for Use of Joint Sealants*.

1. Sealant materials shall be compatible with the materials they join, including curing compounds and admixtures, and with materials that will be applied over them, including floor finishing materials.
2. Field-molded sealants shall be installed in sealant reservoirs proportioned, cleaned of laitance and prepared in accordance with the manufacturer's recommendations. For elastomeric sealants, this generally requires the installation of a bond breaker or backer rod.
3. When the installed sealant is not protected by a finished floor or other protective surface, it shall be suitable to withstand the traffic to which it will be exposed.
4. Waterstops shall be preformed from polyvinyl chloride or other noncorrosive material and shall be selected and installed in compliance with ACI 504R

E303.3.2 Joints

All joints between sections of concrete floor slabs, between the floor slab and a wall or other vertical surface, or between a section of floor and another object that passes through the slab, shall be sealed to prevent soil gas entry in accordance with the provisions of this section. Joint design depends upon the amount and type of movement that the joint must withstand. Ideally, sealing should occur as late in the construction process as possible. No portion of any joint shall be covered or rendered inaccessible unless the

seal has first been inspected and approved by the building official. All such joints shall be sealed prior to the structure being certified for occupancy.

1. Butt joints. All nonbonded butt joints shall be sealed to prevent radon entry using an elastomeric sealant or a waterstop specified above. The sealant reservoir shall be sufficiently large to prevent failure of the sealant or waterstop, but in no case shall the sealant reservoir be less than $\frac{1}{4}$ inch by $\frac{1}{4}$ inch (6.4 mm by 6.4 mm) in cross section
2. Lap joints. All nonbonded lap joints shall be sealed with either a field-molded or preformed elastomeric sealant or with a flexible waterstop as specified above. The lap joint shall be sufficiently large to prevent failure of the sealant or waterstop, but in no case shall the sealant reservoir be less than $\frac{1}{2}$ inch by $\frac{1}{2}$ inch (12.7 mm by 12.7 mm) in cross section.
3. Isolation joints. All nonbonded isolation joints shall be sealed with either a field-molded or preformed elastomeric sealant or with a flexible waterstop as specified above. Isolation joints shall be sufficiently large to prevent failure of the sealant or waterstop, but in no case shall the sealant reservoir be less than $\frac{1}{2}$ inch by $\frac{1}{2}$ inch (12.7 mm by 12.7 mm) in cross section.
4. Control or contraction joints. May be used to limit unplanned cracking of floor slabs. In locations where continued movement of the slab portions can be reasonably expected, flexible sealants must be installed in reservoirs complying with the requirements of above section on butt joints, or a flexible waterstop must be used.
5. Construction joints. All bonded construction joints shall be sealed to prevent radon entry using either a rigid or an elastomeric sealant or a waterstop as specified above. Where movement of the joint is not prevented by continuous reinforcing and tie bars, flexible sealants must be installed in reservoirs complying with the requirements of above section on lap joints, or a flexible waterstop must be used.

E303.3.3 Cracks

All cracks in concrete slabs supported on soil or spanning over exposed soil, that are used as floors for conditioned space or enclosed spaces adjacent to or connected to conditioned spaces, shall be sealed against radon entry in accordance with the provisions of this section and Section E303.3.1. Ideally, sealing should occur as late in the construction process as possible.

1. Cracks greater than $\frac{1}{4}$ inch (6.4 mm) wide; all cracks that exhibit vertical displacement; all cracks that connect weakened zones in the slab such as vertical penetrations or re-entrant corners; and, all cracks that cross changes in materials or planes in the structure, shall be sealed with a flexible field-molded elastomeric sealant installed in accordance with above section on isolation joints.
2. Cracks greater than $\frac{1}{16}$ inch (1.6 mm) in width, that do not meet any of the conditions described in Item 1 above, shall be enlarged to contain a sealant reservoir not less than $\frac{1}{2}$ inch by $\frac{1}{4}$ inch (12.7 mm by 6.4 mm) in cross-section along the entire length of the crack; and shall be sealed with a flexible, field-molded elastomeric sealant installed in accordance with above section on butt joints.
3. Cracks less than $\frac{1}{16}$ inch (1.6 mm) in width, that do not meet any of the conditions described in Item 1 above, may be left unsealed.

E303.3.4 Stakes, Pipe Penetrations and Other Small Objects

All objects that pass through the slab shall be sealed gas tight. A sealant reservoir, appropriately dimensioned to accommodate any differential movement between the object and the concrete, shall be formed continuously around the object, and the joint shall be sealed with a field molded elastomeric sealant as prescribed for isolation joints and in accordance with the provisions of Section E303.3.1. Where pipes or other penetrations are separated from the concrete by flexible sleeves, the sleeve shall be removed to provide bonding of the sealant to the object. Where stakes are used to support plumbing, electrical conduits or other objects that will penetrate the slab, the stakes shall be solid, non-porous and resistant to decay, corrosion and rust. Special care must be taken to avoid honeycombing between multiple or ganged penetrations.

1. Large utility service openings through the slab shall be sealed gas-tight. For slab-on-grade construction, this can be accomplished by fully covering the exposed soil with a vapor-retarder membrane, covered to a minimum depth of 1 inch with an elastomeric sealant. Alternatively, the opening may be closed with an expansive concrete or hydraulic cement to within $\frac{1}{2}$ inch (12.7 mm) of the top of the slab, and the remaining $\frac{1}{2}$ inch (12.7 mm) filled with an elastomeric sealant. When the opening connects to a crawlspace, the opening shall be closed with sheet metal or other rigid impermeable materials and sealed with an elastomeric sealant compatible with the materials and conditions.

2. For openings made through existing slabs, they must be sealed to meet the appropriate provisions of this section. If the opening is partially repaired with concrete, any resulting crack shall be sealed in accordance with the Section E303.3.

3. Any sump located in a habitable portion of a building and connecting to the soil, either directly or through drainage piping, shall be fined with a gasketed lid. The lid shall be attached so as to provide a gas-tight seal between the sump and the access space above.

E304 Walls in Contact With Soil Gas

E304.1 General

Walls separating below-grade conditioned space from the surrounding earth or from a crawlspace or other enclosed volume with an exposed earth floor shall be isolated from the soil by an approved structural baffle as described in Section E302 of this standard. Foundation walls consisting of cavity walls, or constructed of hollow masonry products or of any material in such a way as to create an air-space within the wall, shall be capped at the floor level of the first finished floor they intersect. The cap shall be either at least 8 inches (203 mm) of solid concrete or concrete filled block, or a cap that provides airflow resistance at least equal to the adjacent floor. No crack, honeycomb, joint duct, pipe, conduit chase or other opening in the wall shall be allowed to connect soil gas to a conditioned space or to an enclosed space adjacent to or connected to a conditioned space.

E304.2 Materials

Walls governed by the provisions of this section shall be constructed of reinforced concrete, or solid reinforced masonry construction.

E305 Buildings With Crawl Spaces

E305.1 General

For the purpose of this standard, buildings with crawl spaces include all buildings with the floor supported above grade.

E305.1.1 Reinforced Concrete Floor Systems

A reinforced concrete floor constructed over crawl spaces shall conform to all applicable provisions of Section E304.

E305.1.2 Wood-Framed Floor Systems

Wood-framed floors spanning over soil that are used as floors for conditioned space, or enclosed spaces adjacent to or connected to conditioned spaces, shall be constructed in accordance with the provisions of this section.

E305.2 Materials

Wood-framed floors constructed over a crawl space shall be constructed of American Plywood Association (APA) certified tongue-in-groove plywood, and otherwise comply with Paragraph 4.1.2 of Appendix C to Chapter 13 of the *Florida Building Code, Building*. Oriented structural board shall not be an acceptable substitute material.

E305.3 Utility Penetrations

All penetrations through the floor, including but not limited to plumbing pipes and wiring, shall be fully sealed to the floor structure with approved sealant materials as per Section E303.3.1. Large service openings through the slab, such as beneath bath tub drains, shall be sealed gastight. Where large openings are created, sheet metal or other rigid materials shall be used in conjunction with sealants to close and seal the openings.

E305.4 Vertical Joints

All vertical joints between the subfloor and foundation wall or the subfloor and any vertical plane of the building which extends from

the crawlspace to the top of the subfloor shall be sealed with an approved sealant (see Section E303.3.1).

E305.5 Doors and Service Openings

Doors, hatches or removable closures of any kind that can create an opening in the floor-plane should be avoided, but when required, shall be gasketed and installed with a latch or other permanent fastening device.

E305.6 Other Radon-Entry Paths

All openings which connect a crawlspace and construction cavities, such as the space between wall studs, hollow masonry or precast concrete units, or floor and ceiling planes, shall be closed and sealed with an approved sealant (see Section E303.3.1).

E305.7 Crawl Space Ventilation

Crawl spaces shall be passively ventilated or shall be constructed with an active soil-depressurization system in compliance with Chapter 4. No portion of an air distribution system shall pass through a crawlspace.

E305.7.1 Required Ventilation

Crawl spaces shall be ventilated by openings through the perimeter wall connecting to the exterior of the foundation. Required vents shall have a combined net free area not less than 1 square inch (0.000645 m^2) per 1 square foot (0.0929 m^2) of crawl space, and shall conform to the following conditions:

1. Openings shall be distributed uniformly around the outside walls of the crawl space.
2. Vents shall be fitted with corrosion and decay-resistant wire mesh or grilles with openings not less than $\frac{1}{4}$ inch (6 mm) nor more than $\frac{1}{2}$ inch (12.7 mm) in size. Vents shall not be fitted with operable louvers, dampers, or other closure mechanisms.
3. Plumbing located in a ventilated crawlspace shall be protected from freezing with insulation and/or heat tape.

E305.7.2 Prohibited Uses

Crawl spaces shall not be used as an air-duct or plenum or to house any duct or fan that is part of a heating, ventilating or air-conditioning system.

E306 Space Conditioning Systems and Ventilating

E306.1 General

All heating, ventilating and air-conditioning systems shall be designed, installed, inspected and maintained in accordance with ANSI/ASHRAE 62-1989, *Ventilation for Acceptable Indoor Air Quality*, Chapter 13 of the *Florida Building Code, Building*, and with the provisions of this section. Construction to the provisions of this section will limit radon entry points through mechanical depressurization of buildings, which can enhance radon entry. Additionally, ventilating systems shall be designed to meet all applicable codes and the provisions of this section for use of outside air of low radon concentration.

E306.2 Condensate Drains

All joints in condensate piping shall be solvent welded, soldered, or otherwise connected in a leakproof and gas-tight manner. Condensate drains shall be trapped and terminate in the building sewer or outside the building, a minimum of 6 inches (152 mm) above finished grade. If the condensate piping penetrates a floor or wall separating enclosed space from the soil or from a crawl space, the penetration shall be sealed in accordance with the applicable provisions of Chapter 3. The condensate drain piping shall not terminate in a return plenum.

E306.3 Other Piping

When any piping penetrates a floor or wall separating enclosed space from the soil or from a crawl space, the penetration shall be sealed in accordance with the applicable provisions of Chapter 3. In the case of insulated piping, the insulation must be removed at the point of the seal and required seal must be made between the pipe and the building structure. Sealant must be compatible with the materials and anticipated operating temperatures. Piping shall not terminate in a return plenum.

E306.4 Plumbing and Wiring Chases

Wherever piping or wiring is installed in a chase that is at any point in contact with the soil or a crawl space, the chase shall be sealed to the floor or wall where it first enters the structure, in accordance with the applicable portions of Chapter 3. Piping contained in such a chase shall be sealed to the chase at the interior plane of that floor or wall. No portion of any chase shall terminate in a return air duct or plenum. Where it is impractical or prohibited by another code to seal wiring into an electrical chase or conduit, the chase shall comply with all applicable portions of Chapter 3 or the conduit shall be entirely fabricated of gas-tight components and materials.

E307 Air Distribution Systems

E307.1 Air Distribution Systems

Any air duct, plenum, fan enclosure, or fan that is part of a building's heating, ventilating or air-conditioning system shall be completely isolated from the soil gas by a structural barrier complying with the provisions of Chapter 3. Heating, ventilating, and air conditioning systems supplying spaces that have floors or walls in contact with soil or soil gas shall be designed to minimize air-pressure differences and eliminate negative pressures, that cause significant flow of soil gas through the structural barrier and into the building. Return ducts, plenums, and air handlers shall not be located in a crawl space.

E307.2 Exhaust Fans, Hoods, Equipment, and Appliances

For each zone, the required volume of outside ventilation air shall be equal to or greater than the combined volume of air capable of being exhausted by all exhaust fans, hoods, equipment, and appliances installed in the zone. This amount may not be reduced by use factors unless devices are wired and switched in a manner that prevents their simultaneous operation.

E307.3 Combustion Air Ducts

Ducts that provide combustion air to fuel-burning appliances and equipment shall be completely isolated from the soil-gas by a structural barrier complying with the provisions of Chapter 3.

Chapter E401 Active Soil-Depressurization Systems

E401 General

A soil-depressurization system maintains a lower air pressure in the soil directly beneath the building floor and foundation than exists within the building. This not only draws radon away, but also causes the direction of the airflow through any possible failure in the structural barrier to be out of the building and into the soil-depressurization system. Soil depressurization systems may be installed beneath concrete slabs supported directly on the soil, or beneath the soil gas-retarder membrane in crawl spaces.

E401.1 Prohibited Uses

Soil-depressurization systems components may not extend beneath areas that are required to be depressurized by other codes for the protection of public health, for example rooms containing general anesthesia, pathogens, or poisonous chemicals. Soil depressurization systems may be installed beneath rooms that are required to be depressurized for other reasons, such as toilets and kitchens.

E402 System Components

An active soil-depressurization (ASD) system is comprised of the following components: pressure distribution system porous media or manifolds; a soil cover; one or more vents; a suction fan; and a system failure indicator.

E402.1 Pressure Distribution Media or Manifolds

A wide variety of means can be utilized to extend the low-pressure zone across the entire area beneath the structure. Acceptable means include synthetic ventilation mats, a system of perforated pipe, and an air-permeable gravel layer. Different types of pressure distribution media may be used in the same system, provided each complies with the installation requirements of this chapter. Pressure distribution media must be installed in such a way as to assure that they are never blocked by water.

1. Ventilation mats shall have a soil contact area of at least 216 square inches (0.14 m^2) per lineal foot and provide a cross-section profile of at least 9 square inches (0.006 m^2).
2. Perforated pipe may be used to construct pressure extension manifolds. These pipes may be installed directly under the soil cover or in gravel or a similar porous medium that provides an adequate airflow connection between the pipe and the subsoil and that protects the pipe from becoming blocked by soil.

3. Continuous gravel layers of at least 4 inches (102 mm) thick are an acceptable pressure distribution medium, provided they completely cover the area of soil to be depressurized.

E402.2 Soil Cover

In slab-on-grade construction, the soil cover consists of the soil gas-retarder membrane and the concrete slab. In crawl spaces, the concrete slab may be omitted, providing the soil gas-retarder membrane will not be subjected to wear and damage due to required maintenance procedures. In all instances, the soil gas-retarder membrane shall be fully sealed to the radon vents in accordance with the provisions of Section E302.

E402.3 Radon Vents

Radon vents are gas-tight pipes that carry the soil gas to an area above and away from the building. Radon vent pipes shall be of a material approved by the governing local building code for plumbing vents.

E402.4 Suction Fans

Suction fans create the critical pressure difference between the subslab and indoors. Suction fans shall be designed for continuous operation. Fan performance is determined by the soil characteristics, the airflow characteristics of the pressure distribution system, and the system layout, and shall comply with the airflows and operating pressures determined by the system design, as determined using the large-building active soil-depressurization model, or with criteria below for alternate compliance method. The computer model program is available through the Department of Business and Professional Regulation, Codes and Standards Office, 2601 Blair Stone Road, Tallahassee, Florida, 32399.

E402.5 Fan-Failure Indicator

Each soil-depressurization system shall have a failure indicator labeled with the words "RADON REDUCTION SYSTEM FAN-FAILURE INDICATOR" mounted so as to be conveniently visible to the building occupants. The fan-failure indicator may be either a visual device consisting of a light of not less than $\frac{1}{5}$ footcandle (2 lux) at the floor level, or an alarm that produces a minimum 60 db audible signal. The indicator shall be made to operate automatically when the pressure inside any radon vent pipe fitted with an operable fan is less than 0.40-inch water column (100 pascals) lower than the air pressure inside the building.

E403 ASD System Design Requirements

E403.1 General

All ASD systems must comply with a design shown by the large-building active soil-depressurization model to be capable of maintaining a 0.02-inch (5 pascal) pressure differential over 90 percent of the slab or crawlspace area.

E403.2 Ventilation Mat Systems

Mat systems may be designed and installed in accordance with a design shown by the large-building active soil-depressurization model to be capable of maintaining a 5-pascal pressure differential over 90 percent of the slab area or with Section 503.2.2.

E403.2.1 Installation

Radon ventilation mats shall be installed immediately prior to placing the soil gas-retarder membrane, to reduce the chance for soil to enter and block the mat. Mats shall be arranged in a pattern that provides at least two possible flow paths from any point on the mat to a radon vent pipe. Mats shall be placed with the filter material facing the compacted soil. Where sections of mat join, a minimum 6-inch (152 mm) long section of filter material at the end of one of the mats shall be loosened and the other piece of mat inserted between the loosened filter material and the first section of mat. The mats will be pressed tightly together at this lap and mechanically attached together with hog rings or metal pins driven through the mat and into the soil. Wire ties, which will puncture or tear the soil gas-retarder membrane, shall not be used to join the mats. When properly joined, the filter material will extend continuously across the joint and the full cross-sectional area of the mat will be preserved across the splice.

E403.2.2 Alternate Compliance Method

Systems installed on sand or granular soil, can demonstrate compliance by meeting the following design limits:

1. Mats shall be located at least 15 feet (4572 mm) and not more than 25 feet (7620 mm) from the outside edge of the floor.
2. Mats shall be spaced not more than 50 feet (15 240 mm) on center.

3. No portion of a building floor shall be isolated from a mat by a construction feature, such as an internal footing, grade beam, foundation wall, or other obstacle having a depth greater than the exterior foundation walls.
4. No portion of a building floor shall be more than 35 feet (10 668 mm) from a mat.
5. Mats shall be run parallel to the longest slab dimension unless obstructed by a construction feature, and arranged in a pattern that provides at least two possible flow paths from any point on the mat to a radon vent pipe.

E403.2.3 Radon Vent Connection

The radon vent pipe shall join to the mat in a manner that does not restrict the full air-flow capacity of the pipe. Depending upon the thickness and effective net-free area of the ventilation mat, this may require enlarging the diameter of the vent pipe at the connection with a suitable flange, or increasing the net-free area of the mat by installing additional layers of mat or a layer of gravel beneath the connection point. The soil gas-retarder membrane shall be fully sealed to the radon vents in accordance with the provisions of Section 302.

E403.3 Perforated Pipe Systems

Perforated pipes shall be of a material approved by the governing local building code for foundation drainage, and sized according to the air-flow estimated from the large-building active soil-depressurization model. Where perforated pipes are installed in gravel meeting ASTM D448, numbers 4 or 5 gravel, with not more than 5 percent passing a $\frac{3}{8}$ inch (10 mm) screen.

E403.3.1 Installation

Perforated pipe pressure distribution manifolds shall be installed only after the installation of all other utilities has been completed and immediately prior to the soil gas-retarder membrane. Pipes shall be installed with a row of perforations located at the bottom of the pipe in order to allow condensate to drain from the system. Pipes shall be arranged in a pattern that provides at least two possible flow paths from any point in the system to a radon vent pipe. Separate sections of pipe shall be solvent welded or mechanically fastened together.

E403.3.2 Radon Vent Connection

The radon vent pipe shall join to the perforated pipe with a fitting that allows for the full air-flow capacity of the vent pipe. The soil gas-retarder membrane shall be fully sealed to the radon vents in accordance with the provisions of Section E302.

E403.4 Continuous Gravel Layer Systems

Gravel used as the pressure distribution medium shall be installed only after the installation of all other utilities has been completed, and immediately prior to the soil gas-retarder membrane. Where regions of gravel are isolated from one another by interior foundation elements, separate suction points shall be provided in each region, or regions shall be interconnected with pipes run horizontally through the obstruction. The size and number of such pipes shall be sufficient to provide at least two-times the anticipated air-flow. In no case shall fewer than two pipes be used to interconnect one gravel area with another. These pipes shall be separated by a horizontal distance not less than one-half the length of the boundary between the connecting gravel areas.

E403.4.1 Radon Vent Connection

The radon vent pipe shall join to the gravel layer with a "T" fitting that allows for the full airflow capacity of the vent pipe from either side of the "T." The fitting shall be installed with two arms in the gravel and a single arm connected to the radon vent pipe. The soil-gas-retarder membrane shall be fully sealed to the radon vents in accordance with the provisions of Section E302.

E403.5 Radon Vent Pipe Installation

Radon vent pipes shall be solvent welded or otherwise joined to create a gas-tight connection from the soil-suction point to the vent termination point. They shall be sloped a minimum of $\frac{1}{8}$ inch (3 mm) per foot in a manner that will drain all rain and condensate back to the soil, and shall be supported in compliance with regulations for plumbing vents.

E403.5.1 Labeling

All portions of the radon vent pipe not permanently encased in a wall or chase shall be labeled to prevent accidental misuse. Labels shall consist of a pressure-sensitive 2-inch (51 mm) yellow band with the words "RADON REDUCTION SYSTEM" printed in black letters at least 1 inch (25 mm) in height. These labels shall be placed on every visible portion of the vent pipe at a spacing of not more than 3 feet (914 mm). The labels shall be placed so as to be visible from any direction.

The size of vent pipes shall be determined by application of appropriate engineering principles, based on air-flow rates predicted with the large-building active soil-depressurization model. For systems that comply with the alternate compliance method, Section E403.2.2, and are installed in buildings with straight runs of vent pipes no more than 50 feet (15 240 mm) in height, the required number and size of vent pipes may be determined as follows:

1. For up to 100 linear feet (30 480 mm) of ventilation mat use one 2-inch (51 mm) diameter pipe.
2. For up to 200 linear feet (60 960 mm) of ventilation mat use one 3-inch (76 mm) diameter pipe, or two 2-inch (76 mm) diameter pipes.
3. For up to 400 linear feet (121 920 mm) of ventilation mat use one 4-inch (102 mm) diameter pipe, or two 3-inch (76 mm) diameter pipes, or four 2-inch (30 480 mm) diameter pipes.

E403.5.2 Terminals

Radon vent pipes shall terminate with a rain cap, installed above the roof of the structure, and shall be located in accordance with existing codes for toxic or noxious exhausts. If not specifically addressed or applicable, vent pipes shall be terminated in locations that minimize human exposure to their exhaust air, such that the location is:

1. At least 12 inches (305 mm) above the surface of the roof;
2. At least 10 feet (3048 mm) from any window, door, or other opening (e.g., operable skylight or air intake) to conditioned spaces of the structure; and
3. Ten feet (3048 mm) from any opening into an adjacent building.

The total required distance [10 feet (3048 mm)] shall be measured either directly between the two points or be the sum of measurements made around the intervening obstacles. If the discharge point is within two feet of elevation of the opening into conditioned space, the distance [10 feet (3048 mm)] shall be the horizontal distance between the points.

E403.6 Suction Fans

Soil-depressurization system fans shall be designed to maintain the following minimum air-pressure differences at the lower opening of the radon vent pipe as compared to the air pressure of the conditioned space above:

1. For systems using ventilation mats, 0.5 inch (0.52 kPa) water column.
2. For systems using perforated pipe, 0.5 inch (0.52 kPa) water column.
3. For systems using continuous gravel layers, 1.0 inch (0.2488 kPa) water column.

E403.6.1 Fan Sizing

Soil-depressurization systems that comply with the alternative compliance method, Section E403.2.2, and sizing, Section E403.5.2, may comply by sizing the fan as follows:

1. For up to 100 lineal feet (30 480 mm) of ventilation mat the fan shall be rated for 50 cfm (24 L/s) at 1-inch (30 480 mm) water column.
2. For 100 to 200 lineal feet (30 480 mm to 60 960 mm) of ventilation mat, the fan shall be rated for at least 100 cfm (30 480 mm) at 1-inch (30 480 mm) water column.

3. For 200 to 400 lineal feet (60 960 mm to 121 920 mm) of ventilation mat, the fan shall be rated for at least 175 cfm (83 L/S) at 1-inch (0.2488 kPa) water column.

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Appendix N Board of Appeals

Section N101 General

N101.1 Scope

A board of appeals shall be established within the jurisdiction for the purpose of hearing applications for modification of the requirements of this code pursuant to the provisions of Section 113 (Means of Appeals). The board shall be established and operated in accordance with this section, and shall be authorized to hear evidence from appellants and the code official pertaining to the application and intent of this code for the purpose of issuing orders pursuant to these provisions.

N101.2 Application for Appeal

Any person shall have the right to appeal a decision of the code official to the board. An application for appeal shall be based on a claim that the intent of this code or the rules legally adopted hereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equally good or better form of construction is proposed. The application shall be filed on a form obtained from the code official within 20 days after the notice was served.

N101.2.1 Limitation of Authority

The board shall not have authority to waive requirements of this code or interpret the administration of this code.

N101.2.2 Stays of Enforcement

Appeals of notice and orders, other than Imminent Danger notices, shall stay the enforcement of the notice and order until the appeal is heard by the board.

N101.3 Membership of Board

The board shall consist of five voting members appointed by the chief appointing authority of the jurisdiction. Each member shall serve for [INSERT NUMBER OF YEARS] years or until a successor has been appointed. The board member's terms shall be staggered at intervals, so as to provide continuity. The code official shall be an ex officio member of said board but shall not vote on any matter before the board.

N101.3.1 Qualifications

The board shall consist of five individuals, who are qualified by experience and training to pass on matters pertaining to building construction and are not employees of the jurisdiction.

N101.3.2 Alternate Members

The chief appointing authority is authorized to appoint two alternate members who shall be called by the board chairperson to hear appeals during the absence or disqualification of a member. Alternate members shall possess the qualifications required for board membership, and shall be appointed for the same term or until a successor has been appointed.

N101.3.3 Vacancies

Vacancies shall be filled for an unexpired term in the same manner in which original appointments are required to be made.

N101.3.4 Chairperson

The board shall annually select one of its members to serve as chairperson.

N101.3.5 Secretary

The chief appointing authority shall designate a qualified clerk to serve as secretary to the board. The secretary shall file a detailed record of all proceedings which shall set forth the reasons for the board's decision, the vote of each member, the absence of a member and any failure of a member to vote.

N101.3.6 Conflict of Interest

A member with any personal, professional or financial interest in a matter before the board shall declare such interest and refrain from participating in discussions, deliberations and voting on such matters.

N101.3.7 Compensation of Members

Compensation of members shall be determined by law.

N101.3.8 Removal From the Board

A member shall be removed from the board prior to the end of their terms only for cause. Any member with continued absence from regular meeting of the board may be removed at the discretion of the chief appointing authority.

N101.4 Rules and Procedures

The board shall establish policies and procedures necessary to carry out its duties consistent with the provisions of this code and applicable state law. The procedures shall not require compliance with strict rules of evidence, but shall mandate that only relevant information be presented.

N101.5 Notice of Meeting

The board shall meet upon notice from the chairperson, within 10 days of the filing of an appeal or at stated periodic intervals.

N101.5.1 Open Hearing

All hearings before the board shall be open to the public. The appellant, the appellant's representative, the code official and any person whose interests are affected shall be given an opportunity to be heard.

N101.5.2 Quorum

Three members of the board shall constitute a quorum.

N101.5.3 Postponed Hearing

When five members are not present to hear an appeal, either the appellant or the appellant's representative shall have the right to request a postponement of the hearing.

N101.6 Legal Counsel

The jurisdiction shall furnish legal counsel to the board to provide members with general legal advice concerning matters before them for consideration. Members shall be represented by legal counsel at the jurisdiction's expense in all matters arising from service within the scope of their duties.

N101.7 Board Decision

The board shall only modify or reverse the decision of the code official by a concurring vote of three or more members.

N101.7.1 Resolution

The decision of the board shall be by resolution. Every decision shall be promptly filed in writing in the office of the code official within three days and shall be open to the public for inspection. A certified copy shall be furnished to the appellant or the appellant's representative and to the code official.

N101.7.2 Administration

The code official shall take immediate action in accordance with the decision of the board.

N101.8 Court Review

Any person, whether or not a previous party of the appeal, shall have the right to apply to the appropriate court for a writ of certiorari to correct errors of law. Application for review shall be made in the manner and time required by law following the filing of the decision in the office of the chief administrative officer.

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Appendix O Performance-Based Application

Section O101 General

O101.1 Introduction

The following administrative provisions are excerpted from the ICC Performance Code for Buildings and Facilities and can be used in conjunction with the Alternate Methods provisions in Chapter 1, or for a review of submittals requiring a rational analysis or performance-based design. These provisions provide an established framework for the code official in terms of the design expertise needed, the necessary submittals, a review framework and related items.

O101.2 Qualifications

Registered design professionals shall possess the knowledge, skills and abilities necessary to demonstrate compliance with this code.

O101.3 Construction Document Preparation

Construction documents required by this code shall be prepared in adequate detail and submitted for review and approval in accordance with Section 107.

O101.3.1 Review

Construction documents submitted in accordance with this code shall be reviewed for code compliance with the appropriate code provisions in accordance with Section 107.

O101.4 Construction

Construction shall comply with the approved construction documents submitted in accordance with this code, and shall be verified and approved to demonstrate compliance with this code.

O101.4.1 Facility Operating Policies and Procedures

Policies, operations, training and procedures shall comply with approved documents submitted in accordance with this code, and shall be verified and approved to demonstrate compliance with this code.

O101.4.2 Maintenance

Maintenance of the performancebased design shall be ensured throughout the life of the building or portion thereof.

O101.4.3 Changes

The owner or the owner's authorized agent shall be responsible to ensure that any change to the facility, process, or system does not increase the hazard level beyond that originally designed without approval and that changes shall be documented in accordance with the code.

O101.5 Documentation

The registered design professional shall prepare appropriate documentation for the project that clearly provides the design approach and rationale for design submittal, construction and future use of the building, facility or process.

O101.5.1 Reports and Manuals

The design report shall document the steps taken in the design analysis, clearly identifying the criteria, parameters, inputs, assumptions, sensitivities and limitations involved in the analysis. The design report shall clearly identify bounding conditions, assumptions and sensitivities that clarify the expected uses and limitations of the performance analysis. This report shall verify that the design approach is in compliance with the applicable codes and acceptable methods and shall be submitted for concurrence by the code official prior to the construction documents being completed. The report shall document the design features to be incorporated based on the analysis.

The design report shall address the following:

1. Project scope.

2. Goals and objectives.

3. Performance criteria.

4. Hazard scenarios.

5. Design fire loads and hazards.

6. Final design.

7. Evaluation.

8. Bounding conditions and critical design assumptions.

9. Critical design features.

10. System design and operational requirements.

11. Operational and maintenance requirements.

12. Commissioning testing requirements and acceptance criteria.

13. Frequency of certificate renewal.

14. Supporting documents and references.

15. Preliminary site and floor plans.

O101.5.2 Design Submittal

Applicable construction documents shall be submitted to the code official for review. The documents shall be submitted in accordance with the jurisdiction's procedures and in sufficient detail to obtain appropriate permits.

O101.6 Review

Construction documents submitted in accordance with this code shall be reviewed for code compliance with the appropriate code provisions.

O101.6.1 Peer Review

The owner or the owner's authorized agent shall be responsible for retaining and furnishing the services of a registered design professional or recognized expert, who will perform as a peer reviewer, where required and approved by the code official.

O101.6.2 Costs

The costs of special services, including contract review, where required by the code official, shall be borne by the owner or the owner's authorized agent.

O101.7 Permits

Prior to the start of construction, appropriate permits shall be obtained in accordance with the jurisdiction's procedures and applicable codes.

O101.8 Verification of Compliance

Upon completion of the project, documentation shall be prepared that verifies performance and prescriptive code provisions have been met. Where required by the code official, the registered design professional shall file a report that verifies bounding conditions are met.

O101.9 Extent of Documentation

Approved construction documents, the operations and maintenance manual, inspection and testing records, and certificates of occupancy with conditions shall be included in the project documentation of the code official's records.

O101.10 Analysis of Change

The registered design professional shall evaluate the existing building, facilities, premises, processes, contents and the applicable documentation of the proposed change as it affects portions of the building, facility, premises, processes and contents that were previously designed for compliance under a performance-based code. Prior to any change that was not documented in a previously approved design, the registered design professional shall examine the applicable design documents, bounding conditions, operation and maintenance manuals, and deed restrictions.