

2021 Virginia Construction Code

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, antennas, relocatable buildings, *swimming pool* enclosures and safety devices, solar energy systems, [public use restroom buildings on publicly owned lands in flood hazard areas and intermodal shipping containers](#).

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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 [International Fire 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.

3102.2 Tensile membrane structures and air-supported structures.

Tensile membrane structures and *air-supported 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.

3102.3 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-HT 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 703.3](#) 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 that 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-HT and V construction, provided that 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, snow or *flood* and seismic loads and in accordance with [Chapter 16](#).

3102.7.1 Lateral restraint.

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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.

The 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 m²) 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.

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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 [International Fire 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 m²), 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.

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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. For purposes of calculating the number of *Type B units* required by Chapter 11, structurally connected buildings and buildings with multiple wings shall be considered to be one structure.

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 not less than 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.

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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 that 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 an *automatic* 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](#).

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SECTION 3105 AWNINGS AND CANOPIES

3105.1 General.

Awnings and *canopies* shall comply with the requirements of [Sections 3105.2](#) and [3105.3](#) and other applicable sections of this code.

3105.2 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](#) 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 Awnings and canopy materials.

Awnings and *canopies* shall be provided with an approved covering that complies with one of the following:

1. The fire propagation performance criteria of Test Method 1 or Test Method 2, as appropriate, of [NFPA 701](#).
2. Has a flame spread index not greater than 25 when tested in accordance with [ASTM E84](#) or [UL 723](#).
3. Meets all of the following criteria when tested in accordance with [NFPA 286](#):
 - 3.1. During the 40 kW exposure, flames shall not spread to the ceiling.
 - 3.2. Flashover, as defined in [NFPA 286](#), shall not occur.
 - 3.3. The flame shall not spread to the outer extremity of the sample on any wall or ceiling.
 - 3.4. The peak heat release rate throughout the test shall not exceed 800 kW.

Exception: The fire propagation performance and flame spread index requirements shall not apply to awnings installed on detached one- and two-family dwellings.

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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.

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SECTION 3107 SIGNS

3107.1 General.

Signs shall be designed, constructed and maintained in accordance with this code.

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SECTION 3108 TELECOMMUNICATION AND BROADCAST TOWERS

[BS] 3108.1 General.

Towers shall be designed and constructed in accordance with the provisions of [TIA 222](#). Towers shall be designed for seismic *loads*; exceptions related to seismic design listed in Section 2.7.3 of [TIA 222](#) shall not apply. In Section 2.6.6.2 of [TIA 222](#), the horizontal extent of Topographic Category 2, escarpments, shall be 16 times the height of the escarpment.

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 on any street or other public space, or over above-ground electric utility lines, or encroach on 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.

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SECTION 3109 SWIMMING POOLS, SWIMMING POOL ENCLOSURES, AND AQUATIC RECREATIONAL FACILITIES

3109.1 General.

Swimming pools, swimming pool enclosures, and aquatic recreational facilities, as that term is defined in the [International Swimming Pool and Spa Code](#) (ISPSC), shall comply with applicable provisions of the ISPSC.

3109.1.1 Changes to the ISPSC.

The following changes shall be made to the ISPSC:

1. Add Section 410.2 and related subsections to the [ISPSC](#) to read:

410.2 Showers. Showers shall be in accordance with Sections 410.2.1 through 410.2.5.

410.2.1 Deck hand shower or shower spray unit. Not less than one and not greater than half of the total number of showers required by Section 410.1 shall be a hand shower or spray shower unit located on the deck of or at the entrance of each pool.

410.2.2 Anti-scald device. Where heated water is provided to the showers, the shower water supply shall be controlled by an antiscald device.

410.2.3 Water heater and mixing valve. Bathing access to water heaters and thermostatically controlled mixing valves for showers shall be prohibited.

410.2.4 Flow rate. Each showerhead shall have a water flow of not less than 2 gallons per minute (7.6 lpm).

410.2.5 Temperature. At each showerhead, the heated shower water temperature shall not exceed 120°F (49°C) and shall not be less than 90°F (32°C).

2. Change [Section 609.3.1](#) of the ISPSC to read:

609.3.1 Deck hand shower or shower spray unit. Not less than one and not greater than half of the total number of showers required by Section 609.2 shall be a hand shower or shower spray unit located on the deck of or at the entrance of each pool.

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SECTION 3110 AUTOMATIC VEHICULAR GATES

3110.1 General.

Automatic vehicular gates shall comply with the requirements of [Sections 3110.2](#) and [3110.3](#) and other applicable sections of this code.

3110.2 Vehicular gates intended for automation.

Vehicular gates intended for automation shall be designed, constructed and installed to comply with the requirements of [ASTM F2200](#).

3110.3 Vehicular gate openers.

Vehicular gate openers, where provided, shall be *listed* in accordance with [UL 325](#).

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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 (PV) panel systems and solar thermal collectors shall be designed in accordance with [Section 1609](#).

3111.1.2 Roof live load.

Roof structures that provide support for solar energy systems shall be designed in accordance with [Section 1607.14.4](#).

3111.2 Solar thermal systems.

Solar thermal systems shall be designed and installed in accordance with [this section](#), the [International Plumbing Code](#), the [International Mechanical Code](#) and the [International Fire Code](#). Where light-transmitting plastic covers are used, solar thermal collectors shall be designed in accordance with [Section 2606.12](#).

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 [International Fire 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](#) or with both [UL 61730-1](#) and [UL 61730-2](#). 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 (PV) panel systems shall have a fire classification in accordance with [Section 1505.9](#). Building-integrated photovoltaic (BIPV) systems installed as roof coverings shall have a fire classification in accordance with [Section 1505.8](#).

3111.3.3 Building-integrated photovoltaic (BIPV) systems.

BIPV systems installed as roof coverings shall be designed and installed in accordance with [Section 1507](#).

3111.3.4 Access and pathways.

Roof access, pathways and spacing requirements shall be provided in accordance with [Section 1205](#) of the [International Fire Code](#).

3111.3.5 Ground-mounted photovoltaic systems.

Ground-mounted photovoltaic systems shall be designed and installed in accordance with [Chapter 16](#) and the [International Fire 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.

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SECTION 3112 GREENHOUSES

3112.1 General.

The provisions of this section shall apply to *greenhouses* that are designed and used for the cultivation, maintenance, or protection of plants.

3112.2 Accessibility.

Greenhouses shall be *accessible* in accordance with [Chapter 11](#).

3112.3 Structural design.

Greenhouses shall comply with the structural design requirements for *greenhouses* in [Chapter 16](#).

3112.4 Glass and glazing.

Glass and glazing used in *greenhouses* shall comply with [Section 2405](#).

3112.5 Light-transmitting plastics.

Light-transmitting plastics shall be permitted in lieu of plain glass in *greenhouses* and shall comply with [Section 2606](#).

3112.6 Membrane structures.

Greenhouses that are membrane structures shall comply with [Section 3102](#).

3112.6.1 Plastic film.

Plastic films used in *greenhouses* shall comply with [Section 3102.3](#).

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**SECTION 3113
RELOCATABLE BUILDINGS**

DELETED

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SECTION 3114 PUBLIC USE RESTROOM BUILDINGS IN FLOOD HAZARD AREAS

3114.1 General.

For the purpose of this section, public restroom buildings are located on publicly owned lands in *flood hazard areas* and intended for public use. Public restroom buildings and portions of other buildings that contain public restrooms are limited to toilet rooms, bathrooms, showers and changing rooms. Public restroom buildings and portions of buildings that contain public restrooms shall comply with the requirements of this section. Public-use restrooms that are not elevated or *dry flood-proofed* in accordance with [Section 1612](#) shall comply with [Section 3114.2](#). Portions of buildings that include uses other than public-use toilet rooms, bathrooms, showers and changing rooms shall comply with [Section 1612](#).

3114.2 Flood resistance.

Public-use restrooms on publicly owned lands in *flood hazard areas* shall comply with the requirements of [ASCE 24](#), except for elevation requirements, and shall comply with all of the following criteria:

1. The building footprint is not more than 1,500 square feet (139 m²).
2. Located, designed and constructed to resist the effects of flood hazards and flood loads to minimize flood damage from a combination of wind and water loads associated with the base flood.
3. Anchored to prevent flotation, collapse or lateral movement resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy during conditions of the base flood.
4. Constructed of flood-damage-resistant materials.
5. Where enclosed by walls, the walls have flood openings.
6. Mechanical and electrical systems are located above the *base flood elevation*.
7. Plumbing fixtures and plumbing connections are located above the *base flood elevation*.
8. An emergency plan, approved by the jurisdiction, is submitted to the building official and includes building design documents specifying implementation of protection measures prior to the onset of flooding conditions.

Exceptions:

1. Minimum necessary electric equipment required to address health, life safety and electric code requirements is permitted below the *base flood elevation* in accordance with [ASCE 24](#) provisions for electric elements installed below the minimum elevations.
2. Plumbing fixtures and connections are permitted below the *base flood elevation* provided that the fixtures and connections are designed and installed to minimize or eliminate infiltration of floodwaters into the sanitary sewage system and discharges from sanitary sewage systems into floodwaters.

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SECTION 3115 INTERMODAL SHIPPING CONTAINERS

3115.1 General.

The provisions of Section 3115 and other applicable sections of this code shall apply to *intermodal shipping containers* that are repurposed for use as buildings or structures, or as a part of buildings or structures.

Exceptions:

1. Intermodal shipping containers previously approved as existing relocatable buildings complying with Chapter 14 of the *International Existing Building Code*.
2. Stationary storage battery arrays located in intermodal shipping containers complying with Chapter 12 of the *International Fire Code*.
3. Intermodal shipping containers that are listed as equipment complying with the standard for equipment, such as air chillers, engine generators, modular data centers, and other similar equipment.
4. Intermodal shipping containers housing or supporting experimental equipment are exempt from the requirements of Section 3115, provided that they comply with all of the following:
 - 4.1. Such units shall be single stand-alone units supported at grade level and used only for occupancies as specified under *Risk Category I* in Table 1604.5.
 - 4.2. Such units are located a minimum of 8 feet (2438 mm) from adjacent structures, and are not connected to a fuel gas system or fuel gas utility.
 - 4.3. In hurricane-prone regions and *flood hazard areas*, such units are designed in accordance with the applicable provisions of Chapter 16.

3115.2 Construction documents.

The construction documents shall contain information to verify the dimensions and establish the physical properties of the steel components and wood floor components of the *intermodal shipping container*, in addition to the information required by Sections 107 and 1603.

3115.3 Intermodal shipping container information.

Intermodal shipping containers shall bear an existing data plate containing the following information as required by SO 6346 and verified by an approved agency. A report of the verification process and findings shall be provided to the building owner.

1. Manufacturer's name or identification number.
2. Date manufactured.
3. Safety approval number.
4. Identification number.
5. Maximum operating gross mass or weight (kg) (lbs).
6. Allowable stacking load for 1.8G (kg) (lbs).
7. Transverse racking test force (Newtons).
8. Valid maintenance examination date.

Where approved by the *building official*, the markings and existing data plate are permitted to be removed from the intermodal shipping containers before they are repurposed for use as buildings or structures or as a part of buildings or structures.

3115.4 Protection against decay and termites.

Wood structural floors of *intermodal shipping containers* shall be protected from decay and termites in accordance with the applicable provisions of Section 2304.12.1.1.

3115.5 Under-floor ventilation.

The space between the bottom of the floor joists and the earth under any *intermodal shipping container*, except spaces occupied by basements and cellars, shall be provided with ventilation in accordance with Section 1202.4.

3115.6 Roof assemblies.

Intermodal shipping container roof assemblies shall comply with the applicable requirements of Chapter 15.

Exception: Single-unit, stand-alone intermodal shipping containers not attached to, or stacked vertically over, other intermodal shipping containers, buildings or structures.

3115.7 Joints and voids.

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Joints and voids that create concealed spaces between connected or stacked *intermodal shipping containers* at 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* in accordance with Section 715.

3115.8 Structural.

Intermodal shipping containers that conform to ISO 1496-1 and are repurposed for use as buildings or structures, or as a part of buildings or structures, shall be designed in accordance with Chapter 16 and this section.

3115.8.1 Foundations.

Intermodal shipping containers repurposed for use as a permanent building or structure shall be supported on foundations or other supporting structures designed and constructed in accordance with Chapters 16 through 23.

3115.8.1.1 Anchorage.

Intermodal shipping containers shall be anchored to foundations or other supporting structures as necessary to provide a continuous load path for all applicable design and environmental loads in accordance with Chapter 16.

3115.8.2 Welds.

New welds and connections shall be equal to or greater than the original connections.

3115.8.3 Structural design.

The structural design for the *intermodal shipping containers* repurposed for use as a building or structure, or as part of a building or structure, shall comply with Section 3115.8.4 or 3115.8.5.

3115.8.4 Detailed design procedure.

A structural analysis meeting the requirements of this section shall be provided to the *building official* to demonstrate the structural adequacy of the intermodal shipping containers.

Exception: Intermodal shipping containers designed in accordance with Section 3115.8.5.

3115.8.4.1 Material properties.

Structural material properties for existing intermodal shipping container steel components shall be established by material testing where the steel grade and composition cannot be identified by the manufacturer's designation as to manufacture and mill test.

3115.8.4.2 Seismic design parameters.

The seismic force-resisting system shall be designed and detailed in accordance with one of the following:

1. Where all or portions of the corrugated steel container sides are considered to be the seismic force-resisting system, design and detailing shall be in accordance with the ASCE 7, Table 12.2-1 requirements for light-frame bearing-wall systems with shear panels of all other materials.
2. Where portions of the corrugated steel container sides are retained, but are not considered to be the seismic force-resisting system, an independent seismic force-resisting system shall be selected, designed and detailed in accordance with ASCE 7, Table 12.2-1.
3. Where portions of the corrugated steel container sides are retained and integrated into a seismic force-resisting system other than as permitted by Item 1, seismic design parameters shall be developed from testing and analysis in accordance with Section 112.2 and ASCE 7, Section 12.2.1.1 or 12.2.1.2.

3115.8.4.3 Allowable shear value.

The allowable shear values for the *intermodal shipping container* corrugated steel sheet panel side walls and end walls shall be demonstrated by testing and analysis in accordance with Section 112.2. Where penetrations are made in the side walls or end walls designated as part of the lateral force-resisting system, the penetrations shall be substantiated by rational analysis.

3115.8.5 Simplified structural design of single-unit containers.

Single-unit *intermodal shipping containers* conforming to the limitations of Section 3115.8.5.1 shall be permitted to be designed in accordance with the simplified structural design provisions of Section 3115.8.5.2.

3115.8.5.1 Limitations.

The use of Section 3115.8.5 is subject to the following limitations:

1. The *intermodal shipping container* shall be a single-unit, stand-alone unit supported on a foundation and shall not be in contact with or supporting any other shipping container or other structure.
2. The *intermodal shipping container* top and bottom rails, corner castings, and columns or any portion thereof shall not be notched, cut, or removed in any manner.
3. The *intermodal shipping container* shall be erected in a level and horizontal position with the floor located at the bottom.

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- The *intermodal shipping container* shall be located in Seismic Design Category A, B, C or D.

3115.8.5.2 Simplified structural design.

Where permitted by Section 3115.8.5.1, single-unit, stand alone intermodal shipping containers shall be designed using the following assumptions for the corrugated steel shear walls:

- The appropriate detailing requirements contained in Chapters 16 through 23.
- Response modification coefficient, $R = 2$.
- Overstrength factor, $\Omega_0 = 2.5$.
- Deflection amplification factor, $C_d = 2$.
- Limits on structural height, $h_n = 9.5$ feet (2900 mm).

3115.8.5.3 Allowable shear.

The allowable shear for the corrugated steel side walls (longitudinal) and end walls (transverse) for wind design and seismic design using the coefficients of Section 3115.8.5.2 shall be in accordance with Table 3115.8.5.3, provided that all of the following conditions are met:

- The total linear length of all openings in any individual side wall or end wall shall be limited to not more than 50 percent of the length of that side wall or end wall, as shown in Figure 3115.8.5.3(1).
- Any full-height wall length, or portion thereof, less than 4 feet (305 mm) shall not be considered as a portion of the lateral force-resisting system, as shown in Figure 3115.8.5.3(2).
- All side walls or end walls used as part of the lateral force-resisting system shall have an existing or new boundary element on all sides to form a continuous load path, or paths, with adequate strength and stiffness to transfer all forces from the point of application to the final point of resistance, as shown in Figure 3115.8.5.3(3).
- Where openings are made in container walls, floors or roofs, for doors, windows and other openings:
 - The openings shall be framed with steel elements that are designed in accordance with Chapters 16 and 22.
 - The cross section and material grade of any new steel element shall be equal to or greater than the steel element removed.
- A maximum of one penetration not greater than 6 inches (152 mm) in diameter for conduits, pipes, tubes or vents, or not greater than 16 square inches (10 323 mm²) for electrical boxes, is permitted for each individual 8-foot (2438 mm) length of lateral force-resisting wall. Penetrations located in walls that are not part of the lateral force-resisting system shall not be limited in size or quantity. Existing intermodal shipping container vents shall not be considered a penetration, as shown in Figure 3115.8.5.3(4).
- End wall doors designated as part of the lateral force-resisting system shall be welded closed.

TABLE 3115.8.5.3
ALLOWABLE SHEAR VALUES FOR INTERMODAL SHIPPING CONTAINER CORRUGATED STEEL WALLS FOR WIND OR SEISMIC LOADING

CONTAINER DESIGNATION ^b	CONTAINER DIMENSION (nominal length)	CONTAINER DIMENSION (nominal height)	ALLOWABLE SHEAR VALUES (PLF) ^a	
			Side Wall	End Wall
1EEE	45 feet	9.5 feet	75	843
1EE		8.5 feet		
1AAA	40 feet	9.5 feet	84	
1AA		8.5 feet		
1A		8.0 feet		
1AX		< 8.0 feet		
1BBB	30 feet	9.5 feet	112	
1BB		8.5 feet		
1B		8.0 feet		
1BX		< 8.0 feet		
1CC	20 feet	8.5 feet	168	
1C		8.0 feet		
1CX		< 8.0 feet		
1D	10 feet	8.0 feet	337	
1DX		< 8.0 feet		

For SI: 1 foot = 304.8 mm.

- The allowable strength shear for the side walls and end walls of the intermodal

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shipping containers are derived from ISO 1496-1 and reduced by a factor of safety of 5.

b. Container designation type is derived from ISO 668.

c. Limitations of Section 3115.8.5.1 shall apply.

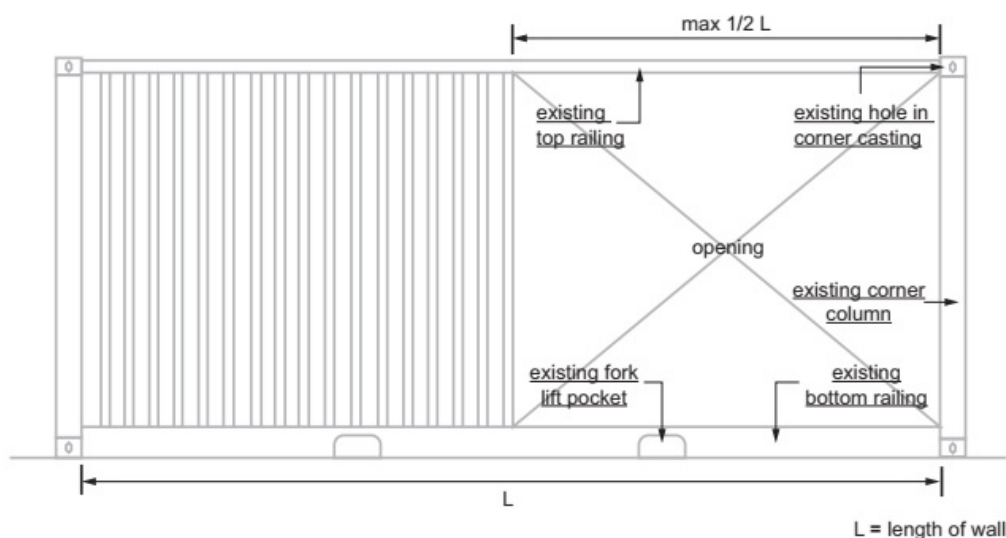


FIGURE 3115.8.5.3(1)
BRACING UNIT DISTRIBUTION—MAXIMUM LINEAR LENGTH

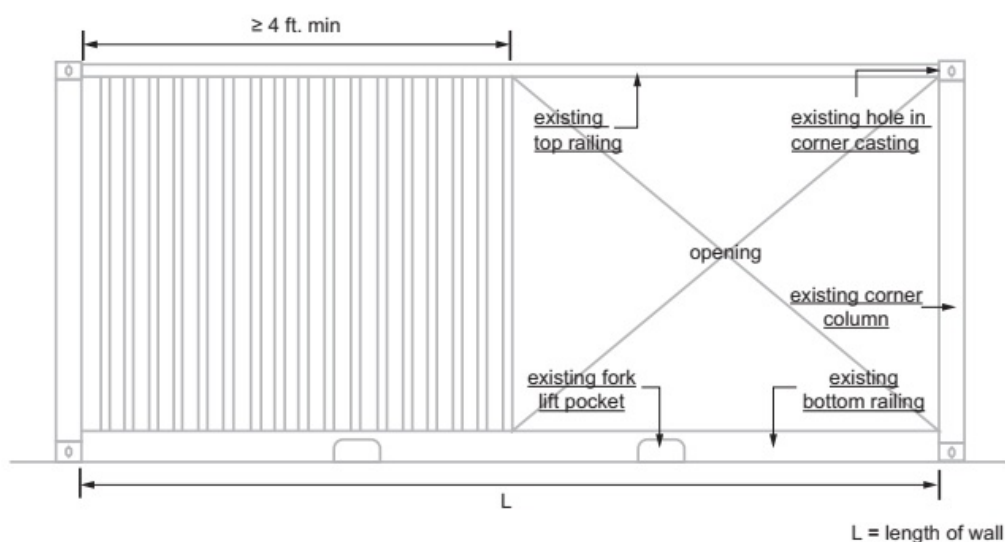


FIGURE 3115.8.5.3(2)
BRACING UNIT DISTRIBUTION—MINIMUM LINEAR LENGTH

For SI: 1 foot = 304.8 mm.

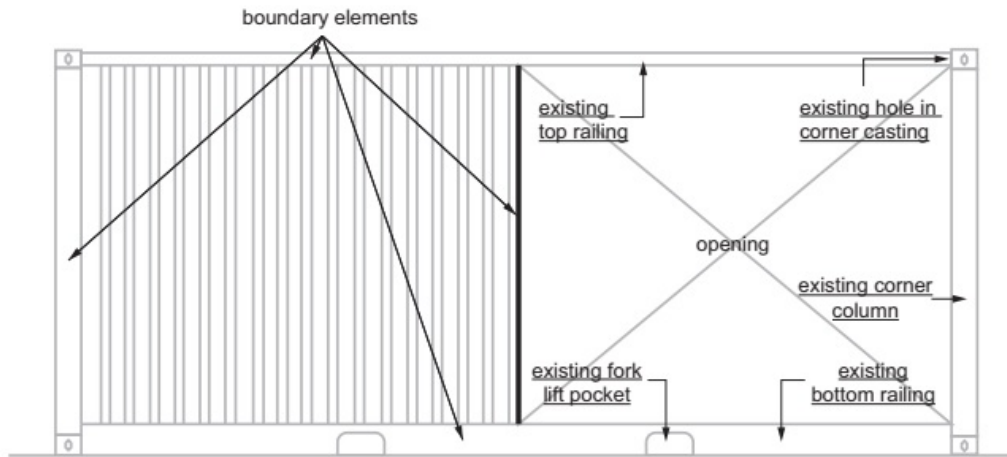
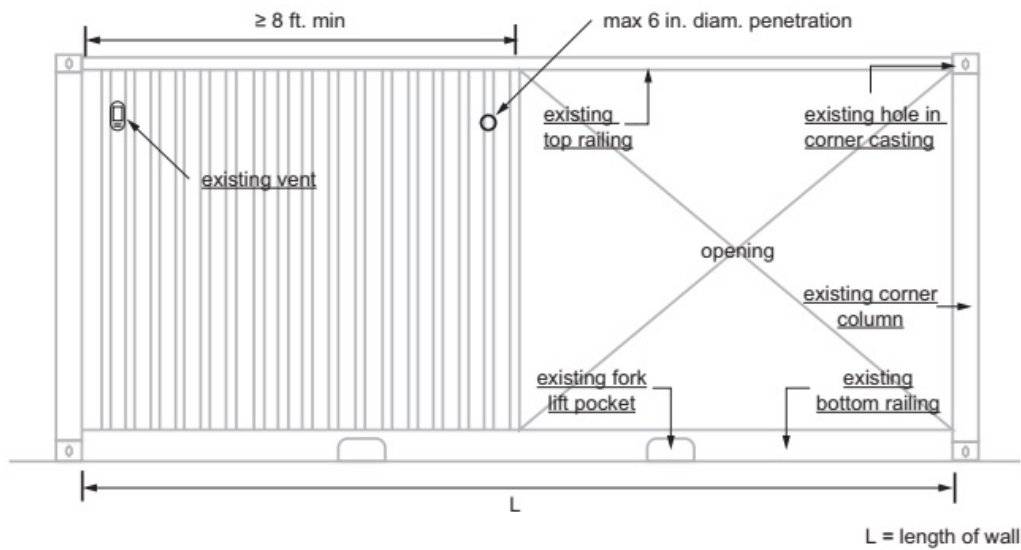


FIGURE 3115.8.5.3(3)
BRACING UNIT DISTRIBUTION—BOUNDARY ELEMENTS



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

FIGURE 3115.8.5.3(4)
BRACING UNIT DISTRIBUTION—PENETRATION LIMITATIONS