**Chapter 11 Special Structures and High-Rise Buildings**

11.1 General Requirements

11.1.1 Application

The requirements of Sections 11.1 through 11.11 shall apply to occupancies regulated by Chapters 12 through 42 that are in a special structure. The applicable provisions of Chapters 12 through 42 shall apply, except as modified by this chapter. Section 11.8 shall apply to all new high-rise buildings. Section 11.8 shall apply to existing high-rise buildings only where specifically required by Chapters 12 through 42.

11.1.2 Multiple Occupancies

See 6.1.14.

11.1.3 Definitions

11.1.3.1 General

For definitions see Chapter 3 Definitions.

11.1.3.2 Special Definitions

Special terms used in this chapter are located within each special structure section.

11.1.4 Classification of Occupancy

Occupancies regulated by Chapters 12 through 42 that are in special structures shall meet the requirements of those chapters, except as modified by this chapter.

11.1.5 Classification of Hazard of Contents

Classification of hazard of contents shall be in accordance with Section 6.2.

11.1.6 Minimum Construction Requirements

Minimum construction requirements shall be in accordance with the applicable occupancy chapter.

11.1.7 Occupant Load

The occupant load of special structures shall be based on the use of the structure as regulated by Chapters 12 through 42.

11.1.8 Automatic Sprinkler Systems

Where another provision of this chapter requires an automatic sprinkler system, the automatic sprinkler system shall be installed in accordance with the subparts of 9.7.1.1 as permitted by the applicable occupancy chapter.

11.2 Open Structures

11.2.1 Application

11.2.1.1 General

The provisions of Section 11.1 shall apply.

11.2.1.2 Definition — Open Structure

See 3.3.284.7.

11.2.2\* Means of Egress

11.2.2.1 General

The means of egress provisions of the applicable occupancy chapter, Chapters 12 through 42, shall apply, except as modified by 11.2.2.2 through 11.2.2.10.

11.2.2.2 Means of Egress Components

11.2.2.2.1 Fire Escape Ladders

Open structures that are designed for occupancy by not more than three persons shall be permitted to be served by fire escape ladders complying with 7.2.9.

11.2.2.2.2 Reserved

11.2.2.3 Capacity of Means of Egress

Open structures shall be exempt from the requirements for capacity of means of egress.

11.2.2.4 Number of Means of Egress

11.2.2.4.1\*

Open structures at the finished ground level are exempt from the requirements for number of means of egress.

11.2.2.4.2

Open structures occupied by not more than three persons, with travel distance of not more than 200 ft (61 m), shall be permitted to have a single exit.

11.2.2.5 Arrangement of Means of Egress

(No modifications.)

11.2.2.6 Travel Distance to Exits

Open structures shall be exempt from travel distance limitations.

11.2.2.7 Discharge From Exits

Open structures permitted to have a single exit per 11.2.2.4 shall be permitted to have 100 percent of the exit discharge through areas on the level of exit discharge.

11.2.2.8 Illumination of Means of Egress

Open structures shall be exempt from illumination of means of egress requirements.

11.2.2.9 Emergency Lighting

Open structures shall be exempt from emergency lighting requirements.

11.2.2.10 Marking of Means of Egress

Open structures shall be exempt from marking of means of egress requirements.

11.2.3 Protection

11.2.3.1 Protection of Vertical Openings

Open structures shall be exempt from protection of vertical opening requirements.

11.2.3.2 Protection From Hazards

Every open structure, other than those structures with only occasional occupancy, shall have automatic, manual, or other protection that is appropriate to the particular hazard and that is designed to minimize danger to occupants in case of fire or other emergency before they have time to use the means of egress.

11.2.3.3 Interior Finish

(No modifications.)

11.2.3.4 Detection, Alarm, and Communications Systems

Open structures shall be exempt from requirements for detection, alarm, and communications systems.

11.2.3.5 Extinguishing Requirements

(No modifications.)

11.3 Towers

11.3.1 Application

11.3.1.1 General

The provisions of Section 11.1 shall apply.

11.3.1.2 Definition — Tower

See 3.3.293.

11.3.1.3 Use of Accessory Levels

11.3.1.3.1 Sprinklered Towers

In towers protected throughout by an automatic sprinkler system in accordance with Section 9.7, the levels located below the observation level shall be permitted to be occupied only for the following:

Uses that support tower operations such as electrical and mechanical equipment rooms, including emergency power, radar, communications, and electronics rooms

\*Incidental accessory uses that support tower operations

Other approved existing airport traffic control tower uses

11.3.1.3.2

Electronic supervision of supervisory signals shall be provided in accordance with 9.7.2.1. Waterflow alarms shall be monitored in accordance with 9.7.2.2.

11.3.1.3.3 Nonsprinklered Towers

The levels located within a tower below the observation level and the equipment room for that level in nonsprinklered towers shall not be occupied.

11.3.2 Means of Egress

11.3.2.1 General

The means of egress provisions of the applicable occupancy chapter, Chapters 12 through 42, shall apply, except as modified by 11.3.2.2 through 11.3.2.10.

11.3.2.2 Means of Egress Components

11.3.2.2.1 Fire Escape Ladders

Towers, such as forest fire observation or railroad signal towers, that are designed for occupancy by not more than three persons shall be permitted to be served by fire escape ladders complying with 7.2.9.

11.3.2.2.2 Elevators

Towers subject to occupancy by not more than 90 persons shall be permitted to use elevators in the means of egress in accordance with 7.2.13.

11.3.2.3 Capacity of Means of Egress

11.3.2.3.1

Means of egress for towers shall be provided for the number of persons expected to occupy the space.

11.3.2.3.2

Spaces not subject to human occupancy because of machinery or equipment shall be excluded from consideration.

11.3.2.4\* Number of Means of Egress

11.3.2.4.1

Towers shall be permitted to have a single exit, provided that the following conditions are met:

The tower shall be subject to occupancy by fewer than 25 persons.

The tower shall not be used for living or sleeping purposes.

The tower shall be of Type I, Type II, or Type IV construction. (See 8.2.1.)

The tower interior wall and ceiling finish shall be Class A or Class B.

No combustible materials shall be located within the tower, under the tower, or within the immediate vicinity of the tower, except necessary furniture.

No high-hazard occupancies shall be located within the tower or within its immediate vicinity.

Where the tower is located above a building, the single exit from the tower shall be provided by one of the following:

Exit enclosure separated from the building with no door openings to or from the building

Exit enclosure leading directly to an exit enclosure serving the building, with walls and door separating the exit enclosures from each other, and another door allowing access to the top floor of the building that provides access to a second exit serving that floor

11.3.2.4.2

Towers with 360-degree line-of-sight requirements shall be permitted to have a single means of egress for a distance of travel to the exit not exceeding 75 ft (23 m), or 100 ft (30 m) if the tower is protected throughout by an approved, supervised automatic sprinkler system in accordance with Section 9.7.

11.3.2.4.3

Electronic supervision of sprinkler system supervisory signals shall be provided in accordance with 9.7.2.1 and waterflow alarms shall be monitored in accordance with 9.7.2.2.

11.3.2.5 Arrangement of Means of Egress

(No modifications.)

11.3.2.6 Travel Distance to Exits

Towers where ladders are permitted by 11.3.2.2.1 shall be exempt from travel distance limitations.

11.3.2.7 Discharge From Exits

Towers permitted to have a single exit per 11.3.2.4 shall be permitted to have 100 percent of the exit discharge through areas on the level of exit discharge.

11.3.2.8 Illumination of Means of Egress

Towers where ladders are permitted by 11.3.2.2.1 shall be exempt from illumination of means of egress requirements.

11.3.2.9 Emergency Lighting

11.3.2.9.1

Towers where ladders are permitted by 11.3.2.2.1 shall be exempt from emergency lighting requirements.

11.3.2.9.2

Locations not routinely inhabited by humans shall be exempt from emergency lighting requirements.

11.3.2.9.3

Structures occupied only during daylight hours, with windows arranged to provide the required level of illumination of all portions of the means of egress during such hours, shall be exempt from emergency lighting requirements where approved by the authority having jurisdiction.

11.3.2.10 Marking of Means of Egress

11.3.2.10.1

Towers where ladders are permitted by 11.3.2.2.1 shall be exempt from marking of means of egress requirements.

11.3.2.10.2

Locations not routinely inhabited by humans shall be exempt from marking of means of egress requirements.

11.3.3 Protection

11.3.3.1 Protection of Vertical Openings

11.3.3.1.1

Towers where ladders are permitted by 11.3.2.2.1 shall be exempt from protection of vertical opening requirements.

11.3.3.1.2

In towers where the support structure is open and there is no occupancy below the top floor level, stairs shall be permitted to be open with no enclosure required, or fire escape stairs shall be permitted.

11.3.3.2 Protection From Hazards

Every tower, other than structures with only occasional occupancy, shall have automatic, manual, or other protection that is appropriate to the particular hazard and that is designed to minimize danger to occupants in case of fire or other emergency before they have time to use the means of egress.

11.3.3.3 Interior Finish

(No modifications.)

11.3.3.4 Detection, Alarm, and Communications Systems

Towers designed for occupancy by not more than three persons shall be exempt from requirements for detection, alarm, and communications systems.

11.3.3.5 Extinguishing Requirements

(No modifications.)

11.3.3.6 Corridors

(No modifications.)

11.3.4 Additional Requirements for Airport Traffic Control Towers

11.3.4.1 Definition — Airport Traffic Control Tower

See 3.3.293.1.

11.3.4.2 Use of Accessory Levels

The levels located below the observation level shall be permitted to be occupied only for the following:

Uses that support tower operations such as electrical and mechanical equipment rooms, including emergency and standby power, radar, communications, and electronics rooms

\*Incidental accessory uses that support tower operations

Other approved, existing airport traffic control tower uses

11.3.4.3 Minimum Construction Requirements

New airport traffic control towers shall be of Type I or Type II construction. (See 8.2.1.)

11.3.4.4 Means of Egress

11.3.4.4.1\* Number of Means of Egress

Airport traffic control towers shall be permitted to have a single exit, provided that all the following conditions are met in addition to the requirements of 11.3.2.4:

Each level of new airport traffic control towers, served by a single exit, shall be subject to a calculated occupant load of 15 or fewer persons.

The requirements of 11.3.4.4.1(1) shall not apply to existing airport traffic control towers.

A fire alarm system shall be provided in accordance with Section 9.6. Smoke detection shall be provided throughout airport traffic control towers to meet the requirements of partial coverage, as defined in 17.5.3.2 of NFPA 72, and shall include coverage of all of the following:

Observation level

Means of egress

All equipment rooms

Incidental accessory uses

Accessible utility shafts

The requirements of 11.3.2.4.1(5) shall not apply.

Rooms or spaces used for the storage, processing, or use of combustible supplies shall be permitted in quantities deemed acceptable by the authority having jurisdiction.

Smokeproof exit enclosures shall be provided in accordance with 7.2.3.

11.3.4.4.2 Remoteness

Where an airport traffic control tower is equipped throughout with an approved, supervised automatic sprinkler system in accordance with Section 9.7, the minimum separation distance between two exits, or exit accesses, measured in accordance with 7.5.1.3.2 shall be not less than one-fourth of the length of the maximum overall diagonal dimension of the building or area to be served.

11.3.4.4.3 Accessible Means of Egress

Accessible means of egress shall not be required to serve the observation level and the floor immediately below the observation level in airport traffic control towers.

11.3.4.4.4 Egress for Occupant Load

Means of egress for airport traffic control towers shall be provided for the occupant load, as determined in accordance with 7.3.1.

11.3.4.4.5 Areas Excluded From Occupant Load

Shafts, stairs, spaces, and floors not subject to human occupancy shall be excluded from consideration in determining the total calculated occupant load of the tower, as required by 11.3.2.4.1(1) and 11.3.4.4.1(1).

11.3.4.4.6 Single Means of Egress

A single means of egress shall be permitted from the observation level of an airport traffic control tower to an exit, as permitted by 11.3.2.4.2.

11.3.4.4.7 Smokeproof Enclosures

For other than approved, existing airport traffic control towers, smokeproof exit enclosures complying with 7.2.3 shall be provided for all airport traffic control tower exit enclosures.

11.3.4.4.8 Discharge From Exits

11.3.4.4.8.1

Airport traffic control towers shall comply with the requirements of 7.7.2, except as permitted by 11.3.4.4.8.2.

11.3.4.4.8.2

Existing single-exit airport traffic control towers shall be permitted to have discharge of the exit comply with one of the following:

Discharge of the exit in an approved, existing single-exit airport traffic control tower is permitted to a vestibule or foyer complying with the requirements of 7.7.2 (4)(b).

\*Discharge of the exit in a single-exit airport traffic control tower is permitted within the building to a location where two means of egress are available and are arranged to allow travel in independent directions after leaving the exit enclosure, so that both means of egress do not become compromised by the same fire or similar emergency.

11.3.4.5 Protection

11.3.4.5.1 Detection, Alarm, and Communications Systems

11.3.4.5.1.1

For other than approved, existing airport traffic control towers, airport traffic control towers shall be provided with a fire alarm system in accordance with Section 9.6.

11.3.4.5.1.2

Smoke detection shall be provided throughout the airport traffic control tower to meet the requirements for partial coverage, as defined in 17.5.3.2 of NFPA 72, and shall include coverage of all of the following:

All equipment rooms

Observation level

Outside each opening into exit enclosures

Along the single means of egress permitted from observation levels in 11.3.2.4.2

Outside each opening into the single means of egress permitted from observation levels in 11.3.2.4.2

11.3.4.5.2 Extinguishing Requirements

New airport traffic control towers shall be protected throughout by an approved, supervised automatic sprinkler system in accordance with Section 9.7.

11.3.4.5.3 Standpipe Requirements

11.3.4.5.3.1

New airport traffic control towers where the floor of the observation level is greater than 30 ft (9.1 m) above the lowest level of fire department vehicle access shall be protected throughout with a Class I standpipe system in accordance with Section 9.7.

11.3.4.5.3.2

Class I standpipes shall be manual standpipes as defined in NFPA 14 where permitted by the authority having jurisdiction.

11.3.4.6 Contents and Furnishings

Contents and furnishings in airport traffic control towers shall comply with 10.3.1, 10.3.2, 10.3.5, and 10.3.6.

11.3.4.7 Uses

Sleeping areas shall be prohibited in airport traffic control towers.

11.3.4.8 Emergency Command Center

Diagram

UpCodes Diagrams

P

Fire Command Center: Size and Separation

11.3.4.8.1

In other than approved, existing airport traffic control towers, an emergency command center shall be provided in a location approved by the fire department where the floor of an occupiable story is greater than 75 ft (23 m) above the lowest level of fire department vehicle access.

11.3.4.8.2

The emergency command center shall be permitted to be located in the airport traffic control tower or an adjacent contiguous building where building functions are interdependent.

11.3.4.8.3

The emergency command center shall contain the following:

Fire department two-way telephone communication service panels and controls

Fire detection and fire alarm system control unit and annunciator

Elevator floor location and operation annunciators

Elevator fire recall switch in accordance with ASME A17.1/CSA B44, Safety Code for Elevators and Escalators

Controls and annunciators for systems supporting smokeproof enclosures

Sprinkler valve and waterflow annunciators

Emergency generator status indicators

Schematic building plans indicating a typical floor plan and detailing the building core, means of egress, fire protection systems, fire-fighting equipment, and fire department access as well as the locations of fire walls, fire barriers, fire partitions, smoke barriers, and smoke partitions

Fire pump status indicators

Telephone for fire department use with controlled access to the public telephone system

An approved building information card that contains, but is not limited to, the following information:

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 estimated building population (day, night, weekend)

Building emergency contact information that includes a list of the building's emergency contacts (e.g., building manager, building engineer, etc.) and their respective work phone numbers, cell phone numbers, and email addresses

Building construction information that includes the type of building construction (e.g., floors, walls, columns, and roof assembly)

Exit stair information that includes number of exit stairs in the building, each exit stair designation and floors served, location where each exit stair discharges, exit stairs that are pressurized, exit stairs provided with emergency lighting, each exit stair that allows reentry, and exit stairs providing roof access

Elevator information that includes the number of elevator banks, elevator bank designation, elevator car numbers and respective floors that they serve, location of elevator machine rooms, location of sky lobby, and location of freight elevator banks

Building services and system information that includes the location of mechanical rooms, location of building management system, location and capacity of all fuel oil tanks, location of emergency generator, and location of natural gas service

Fire protection system information that includes locations of standpipes, location of fire pump room, location of fire department connections, floors protected by automatic sprinklers, and location of different types of sprinkler systems installed (e.g., dry, wet, preaction)

Hazardous material information that includes location of hazardous material and quantity of hazardous material

Worktable

11.3.4.9 Emergency Action Plans and Fire Drills

11.3.4.9.1

All airport traffic control towers shall have written copies of an emergency action plan as required by Section 4.8.

11.3.4.9.2

Fire drills shall be conducted such that all employees participate at least once annually in accordance with Section 4.7.

11.3.4.9.3

Employees of airport traffic control towers shall be instructed at least annually in the emergency action plan.

11.3.4.9.4

The emergency action plan shall be updated at least annually.

11.4 Water-Surrounded Structures

11.4.1 Application

11.4.1.1 General

The provisions of Sections 11.1 and 11.4 shall apply to those structures that are not under the jurisdiction of the U.S. Coast Guard and not designed and arranged in accordance with U.S. Coast Guard regulations.

11.4.1.2 Definition — Water-Surrounded Structure

See 3.3.284.13.

11.4.2 Means of Egress

11.4.2.1 General

The means of egress provisions of the applicable occupancy chapter, Chapters 12 through 42, shall apply, except as modified by 11.4.2.2 through 11.4.2.10.

11.4.2.2 Means of Egress Components

(No modifications.)

11.4.2.3 Capacity of Means of Egress

Spaces in water-surrounded structures that are not subject to human occupancy because of machinery or equipment shall be exempt from the requirements for capacity of means of egress.

11.4.2.4 Number of Means of Egress

(No modifications.)

11.4.2.5 Arrangement of Means of Egress

(No modifications.)

11.4.2.6 Travel Distance to Exits

(No modifications.)

11.4.2.7 Discharge From Exits

Structures permitted to have a single exit per the applicable occupancy chapter shall be permitted to have 100 percent of the exit discharge through areas on the level of exit discharge.

11.4.2.8 Illumination of Means of Egress

(No modifications.)

11.4.2.9 Emergency Lighting

11.4.2.9.1

Locations not routinely inhabited by humans are exempt from emergency lighting requirements.

11.4.2.9.2

Structures occupied only during daylight hours, with windows arranged to provide the required level of illumination of all portions of the means of egress during such hours, shall be exempt from emergency lighting requirements where approved by the authority having jurisdiction.

11.4.2.10 Marking of Means of Egress

Locations not routinely inhabited by humans shall be exempt from marking of means of egress requirements.

11.4.3 Protection

11.4.3.1 Protection of Vertical Openings

(No modifications.)

11.4.3.2 Protection From Hazards

Every water-surrounded structure, other than structures with only occasional occupancy, shall have automatic, manual, or other protection that is appropriate to the particular hazard and that is designed to minimize danger to occupants in case of fire or other emergency before they have time to use the means of egress.

11.4.3.3 Interior Finish

(No modifications.)

11.4.3.4 Detection, Alarm, and Communications Systems

(No modifications.)

11.4.3.5 Extinguishing Requirements

(No modifications.)

11.4.3.6 Corridors

(No modifications.)

11.5\* Piers

11.5.1 Application

The provisions of Section 11.1 shall apply.

11.5.2 Number of Means of Egress

11.5.2.1

Piers used exclusively to moor cargo vessels and to store material shall be exempt from number of means of egress requirements where provided with proper means of egress from structures thereon to the pier and a single means of access to the mainland, as appropriate to the pier's arrangement.

11.5.2.2

Buildings on piers not meeting the requirements of 11.5.2.1 and occupied for other than cargo handling and storage shall be in accordance with both of the following:

Means of egress shall be arranged in accordance with Chapters 12 through 43.

One of the following measures shall be provided on piers extending over 150 ft (46 m) from shore to minimize the possibility that fire under or on the pier blocks the escape of occupants to shore:

The pier shall be arranged to provide two separate ways to travel to shore, such as by two well-separated walkways or independent structures.

The pier deck shall be open, fire resistive, and set on noncombustible supports.

The pier shall be open, unobstructed, and not less than 50 ft (15 m) in width if less than 500 ft (150 m) long, or its width shall be not less than 10 percent of its length if more than 500 ft (150 m) long.

The pier deck shall be provided with an approved automatic sprinkler system in accordance with Section 9.7 for combustible substructures and all superstructures.

The sprinkler system specified in 11.5.2.2(2)(d) shall be supervised where required by the applicable occupancy chapter, Chapters 12 through 42.

11.6\* Vehicles and Vessels

11.6.1 Vehicles

Where immobile, attached to a building, or permanently fixed to a foundation, and where subject to human occupancy, the following vehicles shall comply with the requirements of this Code that are appropriate to buildings of similar occupancy:

Trailers

Railroad cars

Streetcars

Buses

Conveyances similar to those in 11.6.1(1) through 11.6.1(4)

11.6.2 Vessels

Any ship, barge, or other vessel permanently fixed to a foundation or mooring, or unable to get underway by means of its own power, and occupied for purposes other than navigation shall be subject to the requirements of this Code that apply to buildings of similar occupancy.

11.7 Underground Structures and Limited-Access Structures

11.7.1 Application

The provisions of Section 11.1 shall apply.

11.7.2 Special Definitions

A list of special terms used in Section 11.7 follows:

Limited-Access Structure. See 3.3.284.3.

Underground Structure. See 3.3.284.12.

11.7.3 Special Provisions for Underground and Limited-Access Structures

11.7.3.1

A structure or portion of a structure that does not have openings in compliance with 11.7.3.1.1 and 11.7.3.1.2 shall be designated as a limited-access structure and shall comply with 11.7.3.4 and 11.7.3.5.

11.7.3.1.1 One-Story Structures

One-story structures shall have finished ground level doors or emergency access openings in accordance with 11.7.3.2 on two sides of the structure, spaced not more than 125 ft (38 m) apart on the exterior walls.

11.7.3.1.2 Multiple-Story Structures

Multiple-story structures shall comply with the following:

The story at the finished ground level shall comply with 11.7.3.1.1.

Other stories shall be provided with emergency access openings in accordance with 11.7.3.2 and all of the following:

\*The openings are provided on a minimum of two sides of the story and are distributed on at least 50 percent of the perimeter of the story.

The openings are spaced not more than 30 ft (9.1 m) apart.

For other than approved existing installations, the distance between each end of the applicable building exterior walls and an emergency access opening does not exceed 15 ft (4.6 m) or the distance from an access opening on one wall, and the nearest access opening on an adjacent wall does not exceed 30 ft (9.1 m).

11.7.3.2\*

Emergency access openings shall consist of a window, panel, or similar opening that complies with all of the following:

The opening shall have dimensions of not less than 22 in. (560 mm) in width and 24 in. (610 mm) in height and shall be unobstructed to allow for ventilation and rescue operations from the exterior.

The bottom of the opening shall be not more than 44 in. (1120 mm) above the floor.

The opening shall be readily identifiable from both the exterior and interior.

The opening shall be readily openable from both the exterior and interior.

11.7.3.3

A structure or portion of a structure shall not be considered an underground structure if the story is provided, on not less than two sides, with not less than 20 ft2 (1.9 m2) of emergency access opening located entirely above the adjoining finished ground level in each 50 lineal ft (15 lineal m) of exterior enclosing wall area.

11.7.3.4

Underground and limited-access structures, and all areas and floor levels traversed in traveling to the exit discharge, shall be protected by an approved, supervised automatic sprinkler system in accordance with Section 9.7, unless such structures meet one of the following criteria:

They have an occupant load of 50 or fewer persons in new underground or limited-access portions of the structure.

They have an occupant load of 100 or fewer persons in existing underground or limited-access portions of the structure.

The structure is a one-story underground or limited-access structure that is permitted to have a single exit per Chapters 12 through 43, with a common path of travel not greater than 50 ft (15 m).

11.7.3.5

Underground or limited-access portions of structures and all areas traversed in traveling to the exit discharge, other than in one- and two-family dwellings, shall be provided with emergency lighting in accordance with Section 7.9.

11.7.4 Additional Provisions for Underground Structures

11.7.4.1

The requirements of 11.7.3 shall apply.

11.7.4.2

Exits from underground structures shall be provided with outside smoke-venting facilities or other means to prevent the exits from becoming charged with smoke from any fire in the areas served by the exits under any of the following conditions:

Occupant load of more than 100 persons in the underground portions of the structure

More than one level located below the lowest level with an exit discharge

11.7.4.3

The underground portions of an underground structure, other than an existing underground structure, shall be provided with approved automatic smoke venting in accordance with Section 9.3 where the underground structure has the following features:

Occupant load of more than 100 persons in the underground portions of the structure

More than one level located below the lowest level with an exit discharge

Combustible contents, combustible interior finish, or combustible construction

11.7.4.4

Exit stair enclosures in underground structures used for human occupancy shall be provided with signage in accordance with 7.2.2.5.4 at each floor level landing traversed in traveling to the exit discharge. The signs shall include a chevron-shaped indicator to show direction to the exit discharge.

11.8 High-Rise Buildings

11.8.1 General

11.8.1.1

The provisions of Section 11.8 shall apply to the following:

New high-rise buildings, as defined in 3.3.37.7

Existing high-rise buildings as required by Chapters 11 through 43

11.8.1.2

In addition to the requirements of Section 11.8, compliance with all other applicable provisions of this Code shall be required.

11.8.2 Means of Egress Requirements

11.8.2.1

Emergency lighting in accordance with Section 7.9 shall be provided.

11.8.2.2 Elevator Lobby Exit Access Door Locking

In other than newly constructed high-rise buildings, locks in accordance with 7.2.1.6.4 shall be permitted.

11.8.2.3

All new vertical exit enclosures serving the high-rise portion of the building shall be smokeproof enclosures in accordance with 7.2.3.

11.8.3 Extinguishing Requirements

11.8.3.1\*

High-rise buildings shall be protected throughout by an approved, supervised automatic sprinkler system in accordance with Section 9.7. A sprinkler control valve and a waterflow device shall be provided for each floor.

11.8.3.2

High-rise buildings shall be protected throughout by a Class I standpipe system in accordance with Section 9.10.

11.8.4 Detection, Alarm, and Communications Systems

11.8.4.1\*

A fire alarm system using an approved emergency voice/alarm communication system shall be installed in accordance with Section 9.6.

11.8.4.2

Two-way telephone service shall be in accordance with 11.8.4.2.1 and 11.8.4.2.2.

11.8.4.2.1

Two-way telephone communication service shall be provided for fire department use.

11.8.4.2.1.1

The two-way telephone communication system shall be in accordance with NFPA 72.

11.8.4.2.1.2

The two-way telephone communication system shall operate between the emergency command center and every elevator car, every elevator lobby, and each floor level of exit stairs.

11.8.4.2.2\*

The requirement of 11.8.4.2.1 shall not apply where the fire department radio system is approved as an equivalent system.

11.8.4.3 Risk Analysis for Mass Notification Systems

For high-rise buildings with a total occupant load of 5000 or more persons, or where the floor of an occupiable story is greater than 420 ft (128 m) above the lowest level of fire department vehicle access, a risk analysis in accordance with Section 9.14 shall be performed to determine whether a mass notification system is required.

11.8.5 Emergency and Standby Power

11.8.5.1

Emergency power requirements for electric fire pumps shall be in accordance with NFPA 20.

11.8.5.2

Emergency power requirements for detection, alarm, and communications systems shall be in accordance with NFPA 72.

11.8.5.3

Requirements for standby power shall be as specified in 11.8.5.3.1 through 11.8.5.3.4.

11.8.5.3.1

Type 60, Class 1, Level 1, standby power in accordance with NFPA 110 shall be provided.

11.8.5.3.2

The standby power system shall have a capacity and rating sufficient to supply all required equipment.

11.8.5.3.3

Selective load pickup and load shedding shall be permitted in accordance with NFPA 70.

11.8.5.3.4

The standby power system shall be connected to the following:

Jockey pump, except as otherwise provided in 40.4.2 for special-purpose industrial occupancies

Air compressor serving dry-pipe and pre-action systems, except as otherwise provided in 40.4.2 for special-purpose industrial occupancies

Emergency command center equipment and lighting

Not less than one elevator serving all floors, with standby power transferable to any elevator

Mechanical equipment for smokeproof enclosures

Mechanical equipment required to conform with the requirements of Section 9.3

Stairway video monitoring equipment as required by 11.8.8

11.8.5.4

Fuel lines supplying a generator set inside a high-rise building shall be separated from areas of the building other than the room in which the generator is located by one of the following methods:

A fire resistant pipe-protection system that meets all of the following:

Tested in accordance with UL 1489, Fire Tests of Fire Resistant Pipe Protection Systems Carrying Combustible Liquids

Installed as tested and in accordance with the manufacturer's installation instructions

Has a rating of not less than 2 hours or not less than 1 hour where the building is protected with an approved, supervised automatic sprinkler system in accordance with Section 9.7

An assembly that has a fire resistance rating of not less than 2 hours or not less than 1 hour where the building is protected with an approved, supervised automatic sprinkler system in accordance with Section 9.7

11.8.6\* Emergency Command Center

Emergency command centers shall be in accordance with 11.8.6.1 through 11.8.6.7.

Upcodes Diagrams

11.8.6.1

The location, design, content, and fire department access of the emergency command center shall be approved by the fire department. [1:11.9.1]

Upcodes Diagrams

11.8.6.2

The emergency command center shall be separated from the remainder of the building by a fire barrier having a fire resistance rating of not less than 1 hour, unless otherwise approved by the fire department.

11.8.6.3

The emergency command center room shall be a minimum of 200 ft2 (19 m2) with a minimum dimension of 10 ft (3050 mm). [1:11.9.3]

11.8.6.4

Existing emergency command center rooms shall be maintained with the minimum square footage and dimensions previously approved by the AHJ. [1:11.9.3.1]

11.8.6.5

The following shall be provided in the emergency command center:

The emergency voice/alarm communication system unit

Fire detection and alarm system annunciator unit

The fire department communication unit

A telephone for fire department use with controlled access to the public telephone system

Schematic building plans indicating the typical floor plan and detailing the building core means of egress, fire protection systems, fire-fighting equipment, and fire department access

Work table

If applicable, hazardous material management plans for the building

Emergency lighting — generator powered with battery backup

11.8.6.6

Diagram

Where not provided on the fire alarm control panel, the following devices or functions shall be provided within the emergency command center:

Annunciator visually indicating the location of the elevators and whether they are operational

Status indicators and controls for air-handling systems

Controls for unlocking stairway doors simultaneously if provided

Sprinkler valve and waterflow detector display panel

Emergency and standby power status indicators

Fire pump status indicators

Generator supervision devices and manual start and transfer features

Public address system, where specifically required by NFPA 1

Controls required for smoke control

Stairway video monitoring equipment as required by 11.8.8

Fire department two-way telephone communication service panels and controls

Elevator floor location and operation annunciators

Elevator fire recall switch in accordance with ASME A17.1/CSA B44, Safety Code for Elevators and Escalators

Elevator fire recall switch or switches in accordance with ASME A17.1/CSA B44, Safety Code for Elevators and Escalators

Upcodes Diagrams

11.8.6.7

Devices, equipment, components, and sequences shall be individually tested in accordance with appropriate standards and manufacturers' documented instructions. [1:11.9.6]

11.8.7 Emergency Action Plans

Emergency action plans shall be provided in accordance with 4.8.2.

11.8.8 Stairway Video Monitoring

11.8.8.1\* General

11.8.8.1.1

For high-rise buildings having an occupant load of 4000 or more persons, real-time remote monitoring of exit stair usage shall be provided in accordance with 11.8.8.2 through 11.8.8.4 and shall be displayed at the emergency command center.

11.8.8.1.2

Where the monitoring system is integrated with a security system, the security system shall be in accordance with NFPA 731.

11.8.8.1.3

Where the monitoring system includes video cameras also used for video image smoke detection, the portions of the system used for such detection shall be in accordance with NFPA 72.

11.8.8.2

Approved video monitoring equipment shall be provided at the exit stairs immediately adjacent to exit stairway discharge doors to capture discharge from, entry to, and passage through the discharge floor landing.

11.8.8.3

Approved video monitoring equipment shall be provided for exit stairs above the level of exit discharge, at building height intervals not exceeding 5 stories, so that descent and ascent flows on the stairways, at the floor entry landings, can be remotely monitored.

11.8.8.4

Approved video monitoring equipment shall be provided, at locations stipulated by the authority having jurisdiction, for exit stairs below the level of exit discharge where levels are normally occupied by the public.

11.8.9 Integrated Fire Protection and Life Safety System Testing

For high-rise buildings, integrated fire protection and life safety system testing shall be in accordance with 9.11.4.2.

11.9 Permanent Membrane Structures

11.9.1 Application

11.9.1.1 General

The provisions of Section 11.1 shall apply.

11.9.1.2 Use of Membrane Roofs

Membrane roofs shall be used in accordance with the following:

Membrane materials shall not be used where fire resistance ratings are required for walls or roofs.

Where every part of the roof, including the roof membrane, is not less than 20 ft (6100 mm) above any floor, balcony, or gallery, a noncombustible or limited-combustible membrane shall be permitted to be used as the roof in any construction type.

With approval of the authority having jurisdiction, membrane materials shall be permitted to be used where every part of the roof membrane is sufficiently above every significant fire potential, such that the imposed temperature cannot exceed the capability of the membrane, including seams, to maintain its structural integrity.

11.9.1.3 Testing

Testing of membrane materials for compliance with the requirements of Section 11.9 for use of the categories of noncombustible and limited-combustible materials shall be performed on weathered-membrane material, as defined in 3.3.179.8.

11.9.1.4 Flame Spread Index

The flame spread index of all membrane materials exposed within the structure shall be Class A in accordance with Section 10.2.

11.9.1.5 Roof Covering Classification

Roof membranes shall have a roof covering classification, as required by the applicable building codes, when tested in accordance with ASTM E108, Standard Test Methods for Fire Tests of Roof Coverings, or UL 790, Test Methods for Fire Tests of Roof Coverings.

11.9.1.6 Flame Propagation Performance

11.9.1.6.1

All membrane structure fabric shall meet the flame propagation performance criteria contained in Test Method 2 of NFPA 701.

11.9.1.6.2

One of the following shall serve as evidence that the fabric materials have the required flame propagation performance:

The authority having jurisdiction shall require a certificate or other evidence of acceptance by an organization acceptable to the authority having jurisdiction.

The authority having jurisdiction shall require a report of tests made by other inspection authorities or organizations acceptable to the authority having jurisdiction.

11.9.1.6.3

Where required by the authority having jurisdiction, confirmatory field tests shall be conducted using test specimens from the original material, which shall have been affixed at the time of manufacture to the exterior of the structure.

11.9.2 Tensioned-Membrane Structures

11.9.2.1

The design, materials, and construction of the building shall be based on plans and specifications prepared by a licensed architect or engineer knowledgeable in tensioned-membrane construction.

11.9.2.2

Material loads and strength shall be based on physical properties of the materials verified and certified by an approved testing laboratory.

11.9.2.3

The membrane roof for structures in climates subject to freezing temperatures and ice buildup shall be composed of two layers separated by an air space through which heated air can be moved to guard against ice accumulation. As an alternative to the two layers, other approved methods that protect against ice accumulation shall be permitted.

11.9.2.4

Roof drains shall be equipped with electrical elements to protect against ice buildup that can prevent the drains from functioning. Such heating elements shall be served by on-site standby electrical power in addition to the normal public service. As an alternative to such electrical elements, other approved methods that protect against ice accumulation shall be permitted.

11.9.3 Air-Supported and Air-Inflated Structures

11.9.3.1 General

In addition to the general provisions of 11.9.1, the requirements of 11.9.3 shall apply to air-supported and air-inflated structures.

11.9.3.2 Pressurization (Inflation) System

The pressurization system shall consist of one or more operating blower units. The system shall include automatic control of auxiliary blower units to maintain the required operating pressure. Such equipment shall meet the following requirements:

Blowers shall be powered by continuous-rated motors at the maximum power required.

Blowers shall have personnel protection, such as inlet screens and belt guards.

Blower systems shall be weather protected.

Blower systems shall be equipped with backdraft check dampers.

Not less than two blower units shall be provided, each of which has capacity to maintain full inflation pressure with normal leakage.

Blowers shall be designed to be incapable of overpressurization.

The auxiliary blower unit(s) shall operate automatically if there is any loss of internal pressure or if an operating blower unit becomes inoperative.

The design inflation pressure and the capacity of each blower system shall be certified by a professional engineer.

11.9.3.3 Standby Power System

11.9.3.3.1\*

A fully automatic standby power system shall be provided. The system shall be either an auxiliary engine generator set capable of running the blower system or a supplementary blower unit that is sized for 1 times the normal operating capacity and is powered by an internal combustion engine.

11.9.3.3.2

The standby power system shall be fully automatic to ensure continuous inflation in the event of any failure of the primary power. The system shall be capable of operating continuously for a minimum of 4 hours.

11.9.3.3.3

The sizing and capacity of the standby power system shall be certified by a professional engineer.

11.9.4 Maintenance and Operation

11.9.4.1

Instructions in both operation and maintenance shall be transmitted to the owner by the manufacturer of the tensioned-membrane, air-supported, or air-inflated structure.

11.9.4.2

Annual inspection and required maintenance of each structure shall be performed to ensure safety conditions. At least biennially, the inspection shall be performed by a professional engineer, registered architect, or individual certified by the manufacturer.

11.9.5 Services

11.9.5.1 Fired Heaters

11.9.5.1.1

Only labeled heating devices shall be used.

11.9.5.1.2

Fuel-fired heaters and their installation shall be approved by the authority having jurisdiction.

11.9.5.1.3

Containers for liquefied petroleum gases shall be installed not less than 60 in. (1525 mm) from any temporary membrane structure and shall be in accordance with the provisions of NFPA 58.

11.9.5.1.4

Tanks shall be secured in the upright position and protected from vehicular traffic.

11.9.5.2 Electric Heaters

11.9.5.2.1

Only labeled heaters shall be permitted.

11.9.5.2.2

Electric heaters, their placement, and their installation shall be approved by the authority having jurisdiction.

11.9.5.2.3

Heaters shall be connected to electricity by electric cable that is suitable for outside use and is of sufficient size to handle the electrical load.

11.10 Temporary Membrane Structures

11.10.1 Application

11.10.1.1 General

The provisions of Section 11.1 shall apply.

11.10.1.2 Required Approval

Membrane structures designed to meet all the requirements of Section 11.10 shall be permitted to be used as temporary buildings subject to the approval of the authority having jurisdiction.

11.10.1.3 Alternative Requirements

Temporary tensioned-membrane structures shall be permitted to comply with Section 11.11 instead of Section 11.10.

11.10.1.4 Roof Covering Classification

Roof membranes shall have a roof covering classification, as required by the applicable building codes, when tested in accordance with ASTM E108, Standard Test Methods for Fire Tests of Roof Coverings, or UL 790, Test Methods for Fire Tests of Roof Coverings.

11.10.1.5 Flame Propagation Performance

11.10.1.5.1

All membrane structure fabric shall meet the flame propagation performance criteria contained in Test Method 2 of NFPA 701.

11.10.1.5.2

One of the following shall serve as evidence that the fabric materials have the required flame propagation performance:

The authority having jurisdiction shall require a certificate or other evidence of acceptance by an organization acceptable to the authority having jurisdiction.

The authority having jurisdiction shall require a report of tests made by other inspection authorities or organizations acceptable to the authority having jurisdiction.

11.10.1.5.3

Where required by the authority having jurisdiction, confirmatory field tests shall be conducted using test specimens from the original material, which shall have been affixed at the time of manufacture to the exterior of the structure.

11.10.2 Fire Hazards

11.10.2.1

The finished ground level enclosed by any temporary membrane structure, and the finished ground level for a reasonable distance but for not less than 10 ft (3050 mm) outside of such a structure, shall be cleared of all flammable or combustible material or vegetation that is not used for necessary support equipment. The clearing work shall be accomplished to the satisfaction of the authority having jurisdiction prior to the erection of such a structure. The premises shall be kept free from such flammable or combustible materials during the period for which the premises are used by the public.

11.10.2.2

Where prohibited by the authority having jurisdiction, smoking shall not be permitted in any temporary membrane structure.

11.10.3 Fire-Extinguishing Equipment

Portable fire-extinguishing equipment of approved types shall be furnished and maintained in temporary membrane structures in such quantity and in such locations as directed by the authority having jurisdiction.

11.10.4 Tensioned-Membrane Structures

11.10.4.1

The design, materials, and construction of the building shall be based on plans and specifications prepared by a licensed architect or engineer knowledgeable in tensioned-membrane construction.

11.10.4.2

Material loads and strength shall be based on physical properties of the materials verified and certified by an approved testing laboratory.

11.10.4.3

The membrane roof for structures in climates subject to freezing temperatures and ice buildup shall be composed of two layers separated by an air space through which heated air can be moved to guard against ice accumulation. As an alternative to the two layers, other approved methods that protect against ice accumulation shall be permitted.

11.10.4.4

Roof drains shall be equipped with electrical elements to protect against ice buildup that can prevent the drains from functioning. Such heating elements shall be served by on-site standby electrical power in addition to the normal public service. As an alternative to such electrical elements, other approved methods that protect against ice accumulation shall be permitted.

11.10.5 Air-Supported and Air-Inflated Structures

11.10.5.1 General

In addition to the general provisions of 11.10.1, the requirements of 11.10.5 shall apply to air-supported and air-inflated structures.

11.10.5.2 Pressurization (Inflation) System

The pressurization system shall consist of one or more operating blower units. The system shall include automatic control of auxiliary blower units to maintain the required operating pressure. Such equipment shall meet the following requirements:

Blowers shall be powered by continuous-rated motors at the maximum power required.

Blowers shall have personnel protection, such as inlet screens and belt guards.

Blower systems shall be weather protected.

Blower systems shall be equipped with backdraft check dampers.

Not less than two blower units shall be provided, each of which has capacity to maintain full inflation pressure with normal leakage.

Blowers shall be designed to be incapable of overpressurization.

The auxiliary blower unit(s) shall operate automatically if there is any loss of internal pressure or if an operating blower unit becomes inoperative.

The design inflation pressure and the capacity of each blower system shall be certified by a professional engineer.

11.10.5.3 Standby Power System

11.10.5.3.1

A fully automatic standby power system shall be provided. The system shall be either an auxiliary engine generator set capable of running the blower system or a supplementary blower unit that is sized for 1 times the normal operating capacity and is powered by an internal combustion engine.

11.10.5.3.2

The standby power system shall be fully automatic to ensure continuous inflation in the event of any failure of the primary power. The system shall be capable of operating continuously for a minimum of 4 hours.

11.10.5.3.3

The sizing and capacity of the standby power system shall be certified by a professional engineer.

11.10.6 Maintenance and Operation

11.10.6.1

Instructions in both operation and maintenance shall be transmitted to the owner by the manufacturer of the tensioned-membrane, air-supported, or air-inflated structure.

11.10.6.2

Annual inspection and required maintenance of each structure shall be performed to ensure safety conditions. At least biennially, the inspection shall be performed by a professional engineer, registered architect, or individual certified by the manufacturer.

11.10.7 Services

11.10.7.1 Fired Heaters

11.10.7.1.1

Only labeled heating devices shall be used.

11.10.7.1.2

Fuel-fired heaters and their installation shall be approved by the authority having jurisdiction.

11.10.7.1.3

Containers for liquefied petroleum gases shall be installed not less than 60 in. (1525 mm) from any temporary membrane structure and shall be in accordance with the provisions of NFPA 58.

11.10.7.1.4

Tanks shall be secured in the upright position and protected from vehicular traffic.

11.10.7.2 Electric Heaters

11.10.7.2.1

Only labeled heaters shall be permitted.

11.10.7.2.2

Heaters used inside a temporary membrane structure shall be approved.

11.10.7.2.3

Heaters shall be connected to electricity by electric cable that is suitable for outside use and is of sufficient size to handle the electrical load.

11.11 Tents

11.11.1 General

11.11.1.1

The provisions of Section 11.1 shall apply.

11.11.1.2

Tents shall be permitted only on a temporary basis.

11.11.1.3

Tents shall be erected to cover not more than 75 percent of the premises, unless otherwise approved by the authority having jurisdiction.

11.11.2 Flame Propagation Performance

11.11.2.1

All tent fabric shall meet the flame propagation performance criteria contained in Test Method 2 of NFPA 701.

11.11.2.2

One of the following shall serve as evidence that the tent fabric materials have the required flame propagation performance:

The authority having jurisdiction shall require a certificate or other evidence of acceptance by an organization acceptable to the authority having jurisdiction.

The authority having jurisdiction shall require a report of tests made by other inspection authorities or organizations acceptable to the authority having jurisdiction.

11.11.2.3

Where required by the authority having jurisdiction, confirmatory field tests shall be conducted using test specimens from the original material, which shall have been affixed at the time of manufacture to the exterior of the tent.

11.11.3 Location and Spacing

11.11.3.1

There shall be a minimum of 10 ft (3050 mm) between stake lines.

11.11.3.2

Adjacent tents shall be spaced to provide an area to be used as a means of emergency egress. Where 10 ft (3050 mm) between stake lines does not meet the requirements for means of egress, the distance necessary for means of egress shall govern.

11.11.3.3

Tents not occupied by the public and not used for the storage of combustible material shall be permitted to be erected less than 10 ft (3050 mm) from other structures where the authority having jurisdiction deems such close spacing to be safe from hazard to the public.

11.11.3.4

Tents, each not exceeding 1200 ft2 (112 m2) in finished ground level area and located in fairgrounds or similar open spaces, shall not be required to be separated from each other, provided that safety precautions meet the approval of the authority having jurisdiction.

11.11.3.5

The placement of tents relative to other structures shall be at the discretion of the authority having jurisdiction, with consideration given to occupancy, use, opening, exposure, and other similar factors.

11.11.4 Fire Hazards

11.11.4.1

The finished ground level enclosed by any tent, and the finished ground level for a reasonable distance, but for not less than 10 ft (3050 mm) outside of such a tent, shall be cleared of all flammable or combustible material or vegetation that is not used for necessary support equipment. The clearing work shall be accomplished to the satisfaction of the authority having jurisdiction prior to the erection of such a tent. The premises shall be kept free from such flammable or combustible materials during the period for which the premises are used by the public.

11.11.4.2 Smoking

11.11.4.2.1

Smoking shall not be permitted in any tent, unless approved by the authority having jurisdiction.

11.11.4.2.2

In rooms or areas where smoking is prohibited, plainly visible signs shall be posted that read as follows:

NO SMOKING

11.11.5 Fire-Extinguishing Equipment

Portable fire-extinguishing equipment of approved types shall be furnished and maintained in tents in such quantity and in such locations as directed by the authority having jurisdiction.

11.11.6 Services

11.11.6.1 Fired Heaters

11.11.6.1.1

Only labeled heating devices shall be used.

11.11.6.1.2

Fuel-fired heaters and their installation shall be approved by the authority having jurisdiction.

11.11.6.1.3

Containers for liquefied petroleum gases shall be installed not less than 60 in. (1525 mm) from any tent and shall be in accordance with the provisions of NFPA 58.

11.11.6.1.4

Tanks shall be secured in the upright position and protected from vehicular traffic.

11.11.6.2 Electric Heaters

11.11.6.2.1

Only labeled heaters shall be permitted.

Heaters used inside a tent shall be approved.

11.11.6.2.3

Heaters shall be connected to electricity by electric cable that is suitable for outside use and is of sufficient size to handle the electrical load.

11.12 Animal Housing Facilities

11.12.1

The provisions of Section 11.1 shall apply.

11.12.2

Where occupants are expected to delay their emergency egress to care for animals, the means of egress requirements of NFPA 150, where more stringent than those of this Code, shall be followed.

