**Chapter 8 Features of Fire Protection**

8.1 General

8.1.1 Application

The features of fire protection set forth in this chapter shall apply to both new construction and existing buildings.

8.1.2 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.

8.2 Construction and Compartmentation

8.2.1 Construction

8.2.1.1

Buildings or structures occupied or used in accordance with the individual occupancy chapters, Chapters 11 through 43, shall meet the minimum construction requirements of those chapters.

8.2.1.2\*

NFPA 220 shall be used to determine the requirements for the construction classification.

8.2.1.3

Where the building or facility includes additions or connected structures of different construction types, the rating and classification of the structure shall be based on one of the following:

Separate buildings, if a 2-hour or greater vertically aligned fire barrier wall in accordance with NFPA 221 exists between the portions of the building

Separate buildings, if provided with previously approved separations

Least fire-resistive construction type of the connected portions, if separation as specified in 8.2.1.3(1) or 8.2.1.3(2) is not provided

8.2.2 General

8.2.2.1

Where required by other chapters of this Code, every building shall be divided into compartments to limit the spread of fire and restrict the movement of smoke.

8.2.2.2

Fire compartments shall be formed with fire barriers that comply with Section 8.3.

8.2.2.3

Smoke compartments shall be formed with smoke barriers that comply with Section 8.5.

8.2.2.4

Where door assemblies are required elsewhere in this Code to be smoke-leakage-rated in accordance with 8.2.2.4, door assemblies shall comply with all of the following:

They shall be tested in accordance with UL 1784, Air Leakage Tests of Door Assemblies and Other Opening Protectives.

The maximum air leakage rate of the door assembly shall be 3.0 ft3/min/ft2 (0.9 m3/min/m2) of door opening at 0.10 in. water column (25 N/m2) for both the ambient and elevated temperature tests.

Door assemblies shall be installed and maintained in accordance with NFPA 105.

8.2.2.5\* Wall Marking and Identification

For other than existing assemblies, where there is an accessible concealed floor, floor/ceiling, or attic space, fire barriers, smoke barriers, and smoke partitions shall be permanently identified with signs or stenciling in the concealed space and shall comply with all of the following:

Be located in accessible concealed floor, floor/ceiling, or attic spaces

Be located within 15 ft (4572 mm) of the end of each wall and at intervals not exceeding 30 ft (9144 mm) measured horizontally along the wall or partition

Include lettering not less than 3 in. (76 mm) in height with a minimum 3/8 in. (9.5 mm) stroke in a contrasting color

Identify the wall type and its fire resistance rating, as applicable

Upcodes Diagrams

8.2.3 Fire-Resistance-Rated Construction

8.2.3.1\*

The fire resistance of structural elements and building assemblies shall be determined in accordance with test procedures set forth in ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials, or UL 263, Fire Tests of Building Construction and Materials; other approved test methods; or analytical methods approved by the authority having jurisdiction.

8.2.3.1.1

Materials used to construct fire-resistance-rated elements and assemblies shall be limited to those permitted in this Code and installed to the manufacturer's installation instructions or listed designs.

8.2.3.1.2

In new construction, end-jointed lumber used in an assembly required to have a fire resistance rating shall have the designation "Heat Resistant Adhesive" or "HRA" included in its grade mark.

8.2.3.2

Fire-resistance-rated floor and roof assemblies shall be classified as restrained or unrestrained in accordance with ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials, or UL 263, Fire Tests of Building Construction and Materials; or other approved test methods. The construction shall be considered restrained only where a registered design professional has furnished the authority having jurisdiction with satisfactory documentation verifying that the construction is restrained. The classification of fire-resistance-rated floor and roof construction shall be identified on the plans as restrained or unrestrained.

Upcodes Diagrams

8.2.3.3

Structural elements that support fire barriers shall be permitted to have only the fire resistance rating required for the construction classification of the building, provided that both of the following criteria are met:

Such structural elements support nonbearing wall or partition assemblies that have a required 1-hour fire resistance rating or less.

Such structural elements do not serve as exit enclosures or protection for vertical openings.

8.2.3.4

The requirement of 8.2.3.3 shall not apply to health care occupancy structural elements supporting floor assemblies in accordance with the provisions of 18.1.6 and 19.1.6.

8.2.4\* Analytical Methods

8.2.4.1

Analytical methods utilized to determine the fire resistance rating of building assemblies shall comply with 8.2.4.2 through 8.2.4.5.

8.2.4.2\*

Where calculations are used to establish the fire resistance rating of structural elements or assemblies, they shall be permitted to be performed in accordance with ASCE/SEI/SFPE 29, Standard Calculation Methods for Structural Fire Protection.

8.2.4.3

Where calculations are used to establish the fire resistance rating of concrete or masonry elements or assemblies, the provisions of ACI 216.1/TMS 0216.1, Code Requirements for Determining Fire Resistance of Concrete and Masonry Construction Assemblies, shall be permitted to be used.

8.2.4.4

Except for the methods specified in 8.2.4.2 and 8.2.4.3, analytical methods used to calculate the fire resistance of building assemblies or structural elements shall be approved.

8.2.4.5

Where an approved analytical method is utilized to establish the fire resistance rating of a structural element or building assembly, the calculations shall be based upon the fire exposure and acceptance criteria specified in ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials, or UL 263, Fire Tests of Building Construction and Materials.

8.3 Fire Barriers

Upcodes Diagrams

8.3.1 General

8.3.1.1

Fire barriers used to provide enclosure, subdivision, or protection under this Code shall be classified in accordance with one of the following fire resistance ratings:

3-hour fire resistance rating

2-hour fire resistance rating

1-hour fire resistance rating

\*1/2-hour fire resistance rating

8.3.1.2\*

Diagram

Fire barriers shall comply with one of the following:

The fire barriers are continuous from outside wall to outside wall or from one fire barrier to another, or a combination thereof, including continuity through all concealed spaces, such as those found above a ceiling, including interstitial spaces.

The fire barriers are continuous from outside wall to outside wall or from one fire barrier to another, and from the floor to the bottom of the interstitial space, provided that the construction assembly forming the bottom of the interstitial space has a fire resistance rating not less than that of the fire barrier.

Upcodes Diagrams

8.3.1.3

Walls used as fire barriers shall comply with the requirements of NFPA 221 applicable to fire barrier walls.

8.3.1.4 Smoke Barrier Used as a Fire Barrier

A smoke barrier shall be permitted to be used as a fire barrier, provided that it meets the requirements of Section 8.3.

Upcodes Diagrams

8.3.2 Walls

Upcodes Diagrams

8.3.2.1

The fire-resistive materials, assemblies, and systems used shall be limited to those permitted in this Code and this chapter.

8.3.2.1.1\*

Fire resistance glazing tested in accordance with ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials, or UL 263, Fire Tests of Building Construction and Materials, shall be permitted.

8.3.2.2

The construction materials and details for fire-resistive assemblies and systems for walls described shall comply with all other provisions of this Code, except as modified herein.

8.3.2.3

Interior walls and partitions of nonsymmetrical construction shall be evaluated from both directions and assigned a fire resistance rating based on the shorter duration obtained in accordance with ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials, or UL 263, Fire Tests of Building Construction and Materials. When the wall is tested with the least fire-resistive side exposed to the furnace, the wall shall not be required to be subjected to tests from the opposite side.

8.3.3 Opening Protectives

8.3.3.1 General

Every opening in a fire barrier shall be protected to limit the spread of fire from one side of the fire barrier to the other.

8.3.3.2 Minimum Fire Protection Rating

8.3.3.2.1\*

Fire protection ratings for products required to comply with 8.3.3 shall be as determined and reported by a nationally recognized testing agency in accordance with NFPA 252; NFPA 257; UL 10B, Fire Tests of Door Assemblies; UL 10C, Positive Pressure Fire Tests of Door Assemblies; or UL 9, Fire Tests of Window Assemblies.

8.3.3.2.2\*

The minimum fire rating for opening protectives in fire barriers, fire-rated smoke barriers, and fire-rated smoke partitions shall be in accordance with Table 8.3.3.2.2, except as otherwise permitted in 8.3.3.2.3 or 8.3.3.2.4.

Table 8.3.3.2.2 Minimum Fire Ratings for Opening Protectives in Fire-Resistance-Rated Assemblies and Fire-Rated Glazing Markings

Component Walls and Partitions (hr) Fire Door Assemblies (hr) Door Vision Panel Maximum Size (in.2) Fire-Rated Glazing Marking Door Vision Panel Minimum Side Light/Transom Assembly Rating (hr) Fire-Rated Glazing Marking Side Light/Transom Panel Minimum Fire Windows Rating a,b

(hr) Fire Window Marking

Fire Protection Fire Resistance Fire Protection Fire Resistance Fire Protection Fire Resistance Fire Protection Fire Resistance

Elevator hoistways 2 11/2 155 in.2 c D-H-90 or D-H-W-90 NP 2 NP D-H-W-120 NP 2 NP W-120

1 1 155 in.2 c D-H-60 or D-H-W-60 NP 1 NP D-H-W-60 NP 1 NP W-60

1/2 1/3 85 in.2 d D-20 or D-W-20 1/3 1/3 D-H-20 D-W-20 1/3 1/3 OH-20 W-30

Elevator lobby (per 7.2.13.4) 1 1 100 in.2 a ≤100 in.2, D-H-T-60 or D-H-W-60 >100 in.2, D-H-W-60 NP 1 NP D-H-W-60 NP 1 NP W-60

Vertical shafts (including stairways, exits, and refuse chutes) 2 11/2 Maximum size tested D-H-90 or D-H-W-90 NP 2 NP D-H-W-120 NP 2 NP W-120

1 1 Maximum size tested D-H-60 or D-H-W-60 NP 1 NP D-H-W-60 NP 1 NP W-60

Replacement panels in existing vertical shafts 1/2 1/3 Maximum size tested D-20 or D-W-20 1/3 1/3 D-H-20 D-W-20 1/3 1/3 OH-20 W-30

Horizontal exits 2 11/2 Maximum size tested D-H-90 or D-H-W-90 NP 2 NP D-H-W-120 NP 2 NP W-120

Horizontal exits served by bridges between buildings 2 3/4 Maximum size testede D-H-45 or D-H-W-45 3/4e 3/4e D-H-45 D-H-W-45 3/4 3/4 OH-45 W-120

Exit access corridorsf 1 1/3 Maximum size tested D-20 or D-W-20 3/4 3/4 D-H-45 D-H-W-45 3/4 3/4 OH-45 W-60

1/2 1/3 Maximum size tested D-20 or D-W-20 1/3 1/3 D-H-20 D-H-W-20 1/3 1/3 OH-20 W-30

Other fire barriers 3 3 100 in.2 a ≤100 in.2,

D-H-180 or D-H-W-180

>100 in.2,

D-H-W-180 NP 3 NP D-H-W-180 NP 3 NP W-180

2 11/2 Maximum size tested D-H-90 or D-H-W-90 NP 2 NP D-H-W-120 NP 2 NP W-120

1 3/4 Maximum size testede D-H-45 or D-H-W-45 3/4e 3/4e D-H-45 D-H-W-45 3/4 3/4 OH-45 W-60

1/2 1/3 Maximum size tested D-20 or D-W-20 1/3 1/3 D-H-20 D-H-W-20 1/3 1/3 OH-20 W-30

Smoke barriersf 1 1/3 Maximum size tested D-20 or D-W-20 3/4 3/4 D-H-45 D-H-W-45 3/4 3/4 OH-45 W-60

1/2 1/3 Maximum size tested D-20 or D-W-20 1/3 1/3 D-H-20 D-H-W-20 1/3 1/3 OH-20 W-30

Smoke partitionsf,g 1 1/3 Maximum size tested D-20 or D-W-20 3/4 3/4 D-H-45 D-H-W-45 3/4 3/4 OH-45 W-60

1/2 1/3 Maximum size tested D-20 or D-W-20 1/3 1/3 D-H-20 D-H-W-20 1/3 1/3 OH-20 W-30

For SI units, 1 in.2 = 0.00064516 m2.

NP: Not permitted.

aFire resistance glazing tested to ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials, or UL 263, Fire Tests of Building Construction and Materials, shall be permitted in the maximum size tested (see 8.3.3.6.8).

bFire-rated glazing in exterior windows shall be marked in accordance with Table 8.3.3.6.3.

cSee ASME A17.1/CSA B44, Safety Code for Elevators and Escalators, for additional information.

dSee ASME A17.3, Safety Code for Existing Elevators and Escalators, for additional information.

eMaximum area of individual exposed lights shall be 1296 in.2 (0.84 m2), with no dimension exceeding 54 in. (1.37 m) unless otherwise tested. [80:Table 4.4.5 Note b and 80:4.4.5.1]

fFire doors are not required to have a hose stream test per UL 10B, Fire Tests of Door Assemblies, or UL 10C, Positive Pressure Fire Tests of Door Assemblies.

gFor residential board and care, see 32.2.3.1 and 33.2.3.1.

8.3.3.2.3

Existing fire door assemblies having a minimum 3/4-hour fire protection rating shall be permitted to continue to be used in vertical openings and in exit enclosures in lieu of the minimum 1-hour fire protection rating required by Table 8.3.3.2.2.

8.3.3.2.4

Where a 20-minute fire-protection-rated door is required in existing buildings, an existing 13/4 in. (44 mm) solid-bonded wood-core door, an existing steel-clad (tin-clad) wood door, or an existing solid-core steel door shall be permitted, unless otherwise specified by Chapters 11 through 43.

8.3.3.2.5

Existing doors permitted by 8.3.3.2.4 shall have a positive latch and a closer.

8.3.3.2.6

Openings required to have a fire protection rating by Table 8.3.3.2.2 shall be protected by approved, listed, and labeled fire door assemblies and fire window assemblies and their accompanying hardware, including all frames, closing devices, anchorage, and sills in accordance with the requirements of NFPA 80 except as otherwise specified in this Code.

8.3.3.3\* Fire Doors

8.3.3.3.1\*

Required fire door assemblies shall be installed, inspected, tested, and maintained in accordance with NFPA 80.

8.3.3.3.2

All fire door assemblies shall be labeled.

8.3.3.3.3

Labels on fire door assemblies shall be maintained in a legible condition.

8.3.3.3.4

In existing installations, steel door frames without a label shall be permitted where approved by the authority having jurisdiction.

8.3.3.3.5

Unless otherwise specified, fire doors shall be self-closing or automatic-closing.

8.3.3.4 Floor Fire Door Assemblies

8.3.3.4.1

Floor fire door assemblies used to protect openings in fire-resistance-rated floors shall be tested in accordance with NFPA 288 and shall achieve a fire resistance rating not less than the assembly being penetrated.

8.3.3.4.2

Floor fire door assemblies shall be listed and labeled.

8.3.3.5 Fire Windows

8.3.3.5.1

Fire window assemblies shall be installed, inspected, tested, and maintained in accordance with NFPA 80.

8.3.3.5.2

All fire window assemblies shall be labeled.

8.3.3.5.3\*

Fire window assemblies shall be permitted in fire barriers having a required fire resistance rating of 1 hour or less and shall be of an approved type with the appropriate fire protection rating for the location in which they are installed.

8.3.3.6 Glazing

Upcodes Diagrams

8.3.3.6.1

Glazing materials that have been listed and labeled to indicate the type of opening to be protected for fire protection purposes shall be permitted to be used in approved opening protectives in accordance with Table 8.3.3.2.2 and NFPA 80.

8.3.3.6.2

Fire-rated glazing assemblies shall be permitted as follows:

Those marked as complying with hose stream requirements (H) shall be permitted in applications that do not require compliance with hose stream requirements.

Those marked as complying with temperature rise requirements (T) shall be permitted in applications that do not require compliance with temperature rise requirements.

Those marked with ratings that exceed the ratings required by this Code shall be permitted.

8.3.3.6.3

New fire-protection glazing shall be marked in accordance with Table 8.3.3.6.3 and Table 8.3.3.2.2, and such marking shall be permanently affixed.

Table 8.3.3.6.3 Marking Fire-Rated Glazing Assemblies

Fire Test Standard Marking Definition of Marking

ASTM E119 or UL 263 W Meets wall assembly criteria

NFPA 257 or UL 9 OH Meets fire window assembly criteria, including the hose stream test

NFPA 252, UL 10B, or UL 10C D Meets fire door assembly criteria

H Meets fire door assembly hose stream test

T Meets 450°F (232°C) temperature rise criteria for 30 minutes

XXX The time, in minutes, of fire resistance or fire protection rating of the glazing assembly

8.3.3.6.4

New fire resistance glazing shall be marked in accordance with Table 8.3.3.6.3 and Table 8.3.3.2.2, and such marking shall be permanently affixed.

8.3.3.6.5

Fire protection glazing shall be permitted in fire barriers having a required fire resistance rating of 1 hour or less and shall be of an approved type with the appropriate fire protection rating for the location in which the barriers are installed.

8.3.3.6.6\*

Glazing in fire window assemblies, other than in existing fire window installations of wired glass and other fire-rated glazing material, shall be of a design that has been tested to meet the conditions of acceptance of NFPA 257 or UL 9, Fire Tests of Window Assemblies.

8.3.3.6.7

Fire protection glazing in fire door assemblies, other than in existing fire-rated door assemblies, shall be of a design that has been tested to meet the conditions of acceptance of NFPA 252, UL 10B, Fire Tests of Door Assemblies, or UL 10C, Positive Pressure Fire Tests of Door Assemblies.

8.3.3.6.8

Fire resistance glazing tested in accordance with ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials, or UL 263, Fire Tests of Building Construction and Materials, shall be permitted in fire doors and fire window assemblies in accordance with their listings.

8.3.3.6.9

Nonsymmetrical fire protection glazing systems shall be tested with each face exposed to the furnace, and the assigned fire protection rating shall be the shortest duration obtained from the two tests conducted in compliance with NFPA 257 or UL 9, Fire Tests of Window Assemblies.

8.3.3.6.10

The total combined area of fire protection glazing in fire window assemblies and fire door assemblies used in fire barriers shall not exceed 25 percent of the area of the fire barrier that is common with any room, unless the installation is an existing fire window of wired glass or other fire protection glazing in approved frames.

8.3.3.6.11

Existing installations of wired glass of 1/4 in. (6.3 mm) thickness previously approved for fire protection purposes shall be permitted to remain in use.

8.3.3.7 Sidelights and Transoms

Glazing used in sidelights and transoms adjacent to 20-minute doors in 1-hour corridor fire barriers shall be tested in accordance with 8.3.3.2, including hose stream, and shall attain a minimum 45-minute fire protection rating.

8.3.4 Penetrations

8.3.4.1 General

8.3.4.1.1

The provisions of 8.3.4 shall govern the materials and methods of construction used to protect through-penetrations and membrane penetrations in fire walls, fire barrier walls, and fire-resistance-rated horizontal assemblies.

8.3.4.1.2

The provisions of 8.3.4 shall not apply to approved existing materials and methods of construction used to protect existing through-penetrations and existing membrane penetrations in fire walls, fire barrier walls, or fire-resistance-rated horizontal assemblies, unless otherwise required by Chapters 11 through 43.

8.3.4.1.3

Penetrations shall be protected by a tested system installed and maintained in accordance with the manufacturer's instructions.

8.3.4.2\* Firestop Systems and Devices Required

8.3.4.2.1

Penetrations for cables, cable trays, conduits, pipes, tubes, combustion vents and exhaust vents, wires, and similar items to accommodate electrical, mechanical, plumbing, and communications systems that pass through a wall, floor, or floor/ceiling assembly constructed as a fire barrier shall be protected by a firestop system or device.

8.3.4.2.2 Testing

The firestop system or device shall be tested in accordance with ASTM E814, Standard Test Method for Fire Tests of Penetration Fire Stop Systems, or UL 1479, Fire Tests of Penetration Firestops, at a minimum positive pressure differential of 0.01 in. water column (2.5 Pa) between the exposed and the unexposed surface of the test assembly.

8.3.4.2.3 F Ratings

Firestop systems and devices shall have an F rating of not less than 1 hour, and not less than the required fire resistance rating of the fire barrier penetrated.

8.3.4.2.4 T Ratings

8.3.4.2.4.1

Penetrations in fire-resistance-rated horizontal assemblies shall have a T rating of not less than 1 hour, and not less than the fire resistance rating of the horizontal assembly.

8.3.4.2.4.2

A T rating shall not be required for either of the following:

Floor penetrations contained within the cavity of a wall assembly

Penetrations through floors or floor assemblies where the penetration is not in direct contact with combustible material

8.3.4.2.5 Alternative Firestop Requirements

8.3.4.2.5.1

Diagram

The requirements of 8.3.4.2 shall not apply where otherwise permitted by any one of the following:

Where penetrations are tested and installed as part of an assembly tested and rated in accordance with ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials, or UL 263, Fire Tests of Building Construction and Materials

Where penetrations through floors are enclosed in a shaft enclosure designed as a fire barrier

Where concrete, grout, or mortar has been used to fill the annular spaces around cast-iron, copper, or steel piping, conduit, or tubing that penetrates one or more concrete or masonry fire-resistance-rated assemblies, and all of the following applies:

The nominal diameter of each penetrating item does not exceed 6 in. (150 mm).

The opening size does not exceed 1 ft2 (0.09 m2).

The thickness of the concrete, grout, or mortar is the full thickness of the assembly.

Where penetration is limited to one floor, the firestopping material is capable of preventing the passage of flame and hot gases sufficient to ignite cotton waste when subjected to the time-temperature fire conditions of ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials, or UL 263, Fire Tests of Building Materials, under a minimum positive pressure differential of 0.01 in. water column (2.5 Pa) at the location of the penetration for the time period equivalent to the required fire resistance rating of the assembly penetrated, and the firestopping materials are used with the following penetrating items:

Steel, ferrous, or copper cables

Cable or wire with steel jackets

Cast-iron, steel, or copper pipes

Steel conduit or tubing

Upcodes Diagrams

8.3.4.2.5.2

The maximum nominal diameter of the penetrating item, as indicated in 8.3.4.2.5.1(4)(a) through 8.3.4.2.5.1(4)(d), shall not be greater than 4 in. (100 mm) and shall not exceed an aggregate 100 in.2 (64,520 mm2) opening in any 100 ft2 (9.3 m2) of floor or wall area.

8.3.4.3 Sleeves

Where the penetrating item uses a sleeve to penetrate the wall or floor, the sleeve shall be securely set in the wall or floor, and the space between the item and the sleeve shall be filled with a material that complies with 8.3.4.2.

8.3.4.4 Insulation and Coverings

Insulation and coverings for penetrating items shall not pass through the wall or floor unless the insulation or covering has been tested as part of the firestop system or device.

8.3.4.5 Vibration Isolation Equipment or Systems

Where vibration isolation of equipment or systems is employed, the vibration restraint(s) shall be located outside of the partition, wall, or floor assembly for which the equipment or systems pass through.

8.3.4.6 Transitions

8.3.4.6.1

Where piping penetrates a fire-resistance-rated wall or floor assembly, combustible piping shall not connect to noncombustible piping unless it can be demonstrated that the transition will not reduce the fire resistance rating, except in the case of previously approved installations.

8.3.4.6.2

Unshielded couplings shall not be used to connect noncombustible piping to combustible piping unless it can be demonstrated that the transition complies with the fire-resistive requirements of 8.3.4.2.

8.3.4.7 Membrane Penetrations

8.3.4.7.1

Membrane penetrations for cables, cable trays, conduits, pipes, tubes, combustion vents, exhaust vents, wires, and similar items to accommodate electrical, mechanical, plumbing, and communications systems that pass through a membrane of a wall, floor, or floor/ceiling assembly constructed as a fire barrier shall be protected by a firestop system or device and shall comply with 8.3.4.2 through 8.3.4.6.2.

8.3.4.7.2

The firestop system or device shall be tested in accordance with ASTM E814, Standard Test Method for Fire Tests of Penetration Fire Stop Systems, or UL 1479, Fire Tests of -Penetration Firestops, at a minimum positive pressure differential of 0.01 in. water column (2.5 Pa) between the exposed and the unexposed surface of the test assembly, unless one of the following conditions applies:

Membrane penetrations of ceilings that are not an integral part of a fire-resistance-rated floor/ceiling or roof/ceiling assembly

Membrane penetrations of steel, ferrous, or copper conduit, piping, or tubing, and steel electrical outlet boxes and wires, or combustion vents or exhaust vents where the annular space is protected with an approved material and the aggregate area of the openings does not exceed 100 in.2 (64,520 mm2) in any 100 ft2 (9.3 m2) of ceiling area

Electrical outlet boxes and fittings provided that such devices are listed for use in fire-resistance-rated assemblies and are installed in accordance with their listing

The annular space created by the membrane penetration of a fire sprinkler shall be permitted, provided that the space is covered by a metal escutcheon plate

8.3.4.7.3

Where walls or partitions are required to have a minimum 1-hour fire resistance rating, recessed fixtures shall be installed in the wall or partition in such a manner that the required fire resistance is not reduced, unless one of the following criteria is met:

Any steel electrical box not exceeding 16 in.2 (10,300 mm2) in area shall be permitted where the aggregate area of the openings provided for the boxes does not exceed 100 in.2 (64,520 mm2) in any 100 ft2 (9.3 m2) of wall area, and, where outlet boxes are installed on opposite sides of the wall, the boxes shall be separated by one of the following means:

Horizontal distance of not less than 24 in. (610 mm)

Horizontal distance of not less than the depth of the wall cavity, where the wall cavity is filled with cellulose loose-fill, rock wool, or slag wool insulation

\*Solid fireblocking

Other listed materials and methods

Membrane penetrations for any listed electrical outlet box made of any material shall be permitted, provided that such boxes have been tested for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the listing.

The annular space created by the membrane penetration of a fire sprinkler shall be permitted, provided that the space is covered by a metal escutcheon plate.

Membrane penetrations by electrical boxes of any size or type, which have been listed as part of a wall opening protective material system for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the listing, shall be permitted.

8.3.4.8 Ducts and Air-Transfer Openings

Openings for air-handling ductwork or air movement shall be protected in accordance with 9.2.1.

8.3.5 Joints

8.3.5.1 General

8.3.5.1.1

The provisions of 8.3.5 shall govern the materials and methods of construction used to protect joints in fire barriers, in between fire barriers, and at the perimeter of fire barriers where fire barriers meet other fire barriers, the floor or roof deck above, or the outside walls.

Upcodes Diagrams

8.3.5.1.2

The provisions of 8.3.5 shall not apply to approved existing materials and methods of construction used to protect existing joints in fire barriers, unless otherwise required by Chapters 11 through 43.

8.3.5.2 Joint System Requirements

8.3.5.2.1\*

Joints made within or at the perimeter of fire barriers, between fire-resistance-rated assemblies, or where fire barriers meet other fire barriers, the floor or roof deck above, or the outside walls shall be protected with a joint system that is designed and tested to prevent the spread of fire for a time period equal to that of the assembly in which the joint is located.

8.3.5.2.2

Joints made within or at the perimeter of fire barriers used as smoke barriers shall be capable of restricting the transfer of smoke in accordance with 8.5.7.4.

8.3.5.2.3

Joints shall be installed in accordance with a tested system, and installed and maintained in accordance with the manufacturer's instructions.

8.3.5.2.4

Testing of the joint system in a fire barrier shall be representative of the actual installation suitable for the required engineering demand without compromising the fire resistance rating of the assembly or the structural integrity of the assembly.

8.3.5.2.5

Such materials, systems, or devices shall be tested as part of the assembly in accordance with the requirements of ASTM E1966, Standard Test Method for Fire-Resistive Joint Systems, or UL 2079, Tests for Fire Resistance of Building Joint Systems.

8.3.5.2.6

All joint systems shall be tested at their maximum joint width in accordance with the requirements of ASTM E1966, Standard Test Method for Fire-Resistive Joint Systems, or UL 2079, Tests for Fire Resistance of Building Joint Systems, under a minimum positive pressure differential of 0.01 in. water column (2.5 N/m2) for a time period equal to that of the assembly.

8.3.5.2.7

All test specimens shall comply with the minimum height or length required by the standard.

8.3.5.2.8

Wall assemblies shall be subjected to a hose stream test in accordance with ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials, or UL 263, Fire Tests of Building Construction and Materials.

8.3.5.3

Joints made between a fire barrier and a non-fire-resistance-rated floor or roof sheathing, slab, or deck above shall be protected by an approved continuity head of wall joint system installed and tested in accordance with ASTM E2837, Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies, and the system shall have an F rating and T rating of not less than the required fire resistance rating of the fire barrier.

8.3.5.4\* Exterior Curtain Walls and Perimeter Joints

8.3.5.4.1

Voids created between the fire-resistance-rated floor assembly and the exterior curtain wall shall be protected with a perimeter joint system that is designed and tested in accordance with ASTM E2307, Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-Story Apparatus.

8.3.5.4.2

The perimeter joint system shall have an F rating equal to the fire resistance rating of the floor assembly.

8.4 Smoke Partitions

Upcodes Diagrams

8.4.1\* General

Where required elsewhere in this Code, smoke partitions shall be provided to limit the transfer of smoke.

8.4.2 Continuity

Smoke partitions shall comply with the following:

They shall extend from the floor to the underside of the floor or roof deck above, through any concealed spaces, such as those above suspended ceilings, and through interstitial structural and mechanical spaces.

\*They shall be permitted to extend from the floor to the underside of a monolithic or suspended ceiling system where all of the following conditions are met:

The ceiling system forms a continuous membrane.

A smoke-tight joint is provided between the top of the smoke partition and the bottom of the suspended ceiling.

The space above the ceiling is not used as a plenum.

Smoke partitions enclosing hazardous areas shall be permitted to terminate at the underside of a monolithic or suspended ceiling system where all of the following conditions are met:

The ceiling system forms a continuous membrane.

A smoke-tight joint is provided between the top of the smoke partition and the bottom of the suspended ceiling.

Where the space above the ceiling is used as a plenum, return grilles from the hazardous area into the plenums are not permitted.

8.4.3 Opening Protectives

8.4.3.1

Doors in smoke partitions shall comply with 8.4.3.2 through 8.4.3.6.

8.4.3.2

Doors shall comply with the provisions of 7.2.1.

8.4.3.3

Doors shall not include louvers.

8.4.3.4\*

Door clearances shall be in accordance with NFPA 80.

8.4.3.5

Doors shall be self-closing or automatic-closing in accordance with 7.2.1.8.

8.4.3.6

Shutters that protect openings shall be automatic-closing upon operation of approved smoke detectors installed in accordance with the provisions of NFPA 72.

8.4.4 Penetrations

The provisions of 8.4.4 shall govern the materials and methods of construction used to protect through-penetrations and membrane penetrations of smoke partitions.

8.4.4.1

Penetrations for cables, cable trays, conduits, pipes, tubes, vents, wires, and similar items to accommodate electrical, mechanical, plumbing, and communications systems that pass through a smoke partition shall be protected by a system or material that is capable of limiting the transfer of smoke.

8.4.4.2

Where vibration isolation of equipment or systems is employed, the vibration restraint(s) shall be located outside of the partition, wall, or floor assembly through which the equipment or systems pass.

8.4.5 Joints

8.4.5.1

The provisions of 8.4.5 shall govern the materials and methods of construction used to protect joints in between and at the perimeter of smoke partitions or, where smoke partitions meet other smoke partitions, the floor or roof deck above, or the outside walls. The provisions of 8.4.5 shall not apply to approved existing materials and methods of construction used to protect existing joints in smoke partitions, unless otherwise required by Chapters 11 through 43.

8.4.5.2

Joints made within or at the perimeter of smoke partitions shall be protected with a joint system that is capable of limiting the transfer of smoke.

8.4.6 Air-Transfer Openings

8.4.6.1 General

The provisions of 8.4.6 shall govern the materials and methods of construction used to protect air-transfer openings in smoke partitions.

8.4.6.2\* Smoke Dampers

Air-transfer openings in smoke partitions shall be provided with approved smoke dampers designed and tested in accordance with the requirements of UL 555S, Smoke Dampers, to limit the transfer of smoke.

8.4.6.3 Smoke Damper Ratings

Smoke damper leakage ratings shall be not less than Class II. Elevated temperature ratings shall be not less than 250°F (140°C).

8.4.6.4 Smoke Detectors

Dampers in air-transfer openings shall close upon detection of smoke by approved smoke detectors installed in accordance with NFPA 72.

8.5 Smoke Barriers

Upcodes Diagrams

8.5.1\* General

Where required by Chapters 11 through 43, smoke barriers shall be provided to subdivide building spaces for restricting the movement of smoke.

8.5.2\* Continuity

8.5.2.1

Smoke barriers required by this Code shall be continuous from an outside wall to an outside wall, from a floor to a floor, or from a smoke barrier to a smoke barrier, or by use of a combination thereof.

8.5.2.2

Smoke barriers required by this Code shall be continuous through all concealed spaces, such as those found above a ceiling, including interstitial spaces.

8.5.2.3

A smoke barrier required for an occupied space below an interstitial space shall not be required to extend through the interstitial space, provided that the construction assembly forming the bottom of the interstitial space provides resistance to the passage of smoke equal to that provided by the smoke barrier.

8.5.3 Fire Barrier Used as Smoke Barrier

A fire barrier shall be permitted to be used as a smoke barrier, provided that it meets the requirements of Section 8.5.

8.5.4 Opening Protectives

8.5.4.1\*

Doors in smoke barriers shall close the opening, leaving only the minimum clearance necessary for proper operation, and shall be without louvers or grilles. For other than previously approved existing doors, the clearance under the bottom of the doors shall be a maximum of 3/4 in. (19 mm).

8.5.4.2

Where required by Chapters 11 through 43, doors in smoke barriers that are required to be smoke-leakage-rated shall comply with the requirements of 8.2.2.4.

8.5.4.3

Latching hardware shall be required on doors in smoke barriers, unless specifically exempted by Chapters 11 through 43.

8.5.4.4\*

Doors in smoke barriers shall be self-closing or automatic-closing in accordance with 7.2.1.8 and shall comply with the provisions of 7.2.1.

8.5.4.5

Fire window assemblies shall comply with 8.3.3.

8.5.5 Ducts and Air-Transfer Openings

8.5.5.1 General

The provisions of 8.5.5 shall govern the materials and methods of construction used to protect ducts and air-transfer openings in smoke barriers.

8.5.5.2 Smoke Dampers

8.5.5.2.1

Where a smoke barrier is penetrated by a duct or air-transfer opening, a smoke damper designed and tested in accordance with the requirements of UL 555S, Smoke Dampers, shall be installed.

8.5.5.2.2

Where a smoke barrier is also constructed as a fire barrier, a combination fire/smoke damper designed and tested in accordance with the requirements of UL 555, Fire Dampers, and UL 555S, Smoke Dampers, shall be installed.

8.5.5.3 Smoke Damper Exemptions

Smoke dampers shall not be required under any of the following conditions:

Where specifically exempted by provisions in Chapters 11 through 43

Where ducts or air-transfer openings are part of an engineered smoke control system and the smoke damper will interfere with the operation of a smoke control system

Where the air in ducts continues to move and the air handling system installed is arranged to prevent recirculation of exhaust or return air under fire emergency conditions

Where the air inlet or outlet openings in ducts are limited to a single smoke compartment

Where ducts penetrate floors that serve as smoke barriers

Where ducts penetrate smoke barriers forming a communicating space separation in accordance with 8.6.6(4)(a)

8.5.5.4 Installation, Testing, and Maintenance

8.5.5.4.1

Air-conditioning, heating, ventilating ductwork, and related equipment, including smoke dampers and combination fire and smoke dampers, shall be installed in accordance with NFPA 90A, NFPA 90B, NFPA 105, or NFPA 80, as applicable.

8.5.5.4.2

Smoke dampers and combination fire and smoke dampers required by this Code shall be inspected, tested, and maintained in accordance with NFPA 105.

8.5.5.4.3

The equipment specified in 8.5.5.4.1 shall be installed in accordance with the requirements of 8.5.5, the manufacturer's installation instructions, and the equipment listing.

8.5.5.5 Access and Identification

8.5.5.5.1

Access to the dampers shall be provided for inspection, testing, and maintenance.

8.5.5.5.2

Smoke and combination fire and smoke dampers in new construction shall be provided with an approved means of access, as follows:

The means of access shall be large enough to allow inspection and maintenance of the damper and its operating parts.

The access shall not affect the integrity of fire-resistance-rated assemblies or smoke barrier continuity.

The access openings shall not reduce the fire resistance rating of the assembly.

Access doors in ducts shall be tight-fitting and suitable for the required duct construction.

Access and maintenance shall comply with the requirements of the mechanical code.

8.5.5.5.3 Identification

Access points to fire and smoke dampers in new construction shall be permanently identified by one of the following:

A label having letters not less than 1/2 in. (13 mm) in height and reading as one of the following:

FIRE/SMOKE DAMPER

SMOKE DAMPER

FIRE DAMPER

Symbols as approved by the authority having jurisdiction

8.5.5.6 Smoke Damper Ratings

Smoke damper leakage ratings shall be not less than Class II. Elevated temperature ratings shall be not less than 250°F (140°C).

8.5.5.7 Smoke Detectors

8.5.5.7.1

Required smoke dampers in ducts penetrating smoke barriers shall close upon detection of smoke by approved smoke detectors in accordance with NFPA 72 unless one of the following conditions exists:

The ducts penetrate smoke barriers above the smoke barrier doors, and the door release detector actuates the damper.

Approved smoke detector installations are located within the ducts in existing installations.

8.5.5.7.2

Where a duct is provided on one side of the smoke barrier, the smoke detectors on the duct side shall be in accordance with 8.5.5.7.1.

8.5.5.7.3

Required smoke dampers in air-transfer openings shall close upon detection of smoke by approved smoke detectors in accordance with NFPA 72.

8.5.6 Penetrations

8.5.6.1

The provisions of 8.5.6 shall govern the materials and methods of construction used to protect through-penetrations and membrane penetrations of smoke barriers.

8.5.6.2

Penetrations for cables, cable trays, conduits, pipes, tubes, vents, wires, and similar items to accommodate electrical, mechanical, plumbing, and communications systems that pass through a wall, floor, or floor/ceiling assembly constructed as a smoke barrier, or through the ceiling membrane of the roof/ceiling of a smoke barrier assembly, shall be protected by a system or material capable of restricting the transfer of smoke.

Upcodes Diagrams

8.5.6.3

Where a smoke barrier is also constructed as a fire barrier, the penetrations shall be protected in accordance with the requirements of 8.3.4 to limit the spread of fire for a time period equal to the fire resistance rating of the assembly and the requirements of 8.5.6 to restrict the transfer of smoke, unless the requirements of 8.5.6.4 are met.

8.5.6.4

Where sprinklers penetrate a single membrane of a fire-resistance-rated assembly in buildings equipped throughout with an approved automatic fire sprinkler system, noncombustible escutcheon plates shall be permitted, provided that the space around each sprinkler penetration does not exceed 1/2 in. (13 mm), measured between the edge of the membrane and the sprinkler.

8.5.6.5

In new construction, through-penetrations shall be protected by an approved through-penetration firestop system installed and tested in accordance with the requirements of UL 1479, Fire Tests of Penetration Firestops, for air leakage and shall comply with one of the following:

A maximum 5 ft3/min per ft2 (0.025 m3/s per m2) of penetration opening for each through-penetration firestop system

A maximum total cumulative leakage of 50 ft3/min (0.024 m3/s) for any 100 ft2 (9.3 m2) of wall area or floor area

8.5.6.6

Where the penetrating item uses a sleeve to penetrate the smoke barrier, the sleeve shall be securely set in the smoke barrier, and the space between the item and the sleeve shall be filled with a listed system or a material capable of restricting the transfer of smoke.

8.5.6.7

Where vibration isolation of equipment or systems is employed, the vibration restraint(s) shall be located outside of the partition, wall, or floor assembly through which the equipment or systems pass.

8.5.7 Joints

8.5.7.1

The provisions of 8.5.7 shall govern the materials and methods of construction used to protect joints in between and at the perimeter of smoke barriers or, where smoke barriers meet other smoke barriers, the floor or roof deck above, or the outside walls. The provisions of 8.5.7 shall not apply to approved existing materials and methods of construction used to protect existing joints in smoke barriers, unless otherwise required by Chapters 11 through 43.

8.5.7.2

Joints made within, between, or at the perimeter of smoke barriers shall be protected with a joint system that is tested in accordance with the requirements of UL 2079, Tests for Fire Resistance of Building Joint Systems, for air leakage, and the L rating of the joint system shall not exceed 5 ft3/min per ft (0.00775 m3/s per m) of the joint.

8.5.7.3

Smoke barriers that are also constructed as fire barriers shall be protected with a joint system that is designed and tested to resist the spread of fire for a time period equal to the required fire resistance rating of the assembly and restrict the transfer of smoke in accordance with 8.5.7.2.

8.5.7.4

Testing of the joint system in a smoke barrier that also serves as fire barrier shall be representative of the actual installation.

8.6 Vertical Openings

8.6.1 Floor Smoke Barriers

Diagram

Every floor that separates stories in a building shall meet the following criteria:

It shall be constructed as a smoke barrier in accordance with Section 8.5.

It shall be permitted to have openings as described by 8.6.6 through 8.6.9, or Chapters 11 through 43.

Upcodes Diagrams

8.6.2\* Continuity

Openings through floors shall be enclosed with fire barrier walls, shall be continuous from floor to floor, or floor to roof, and shall be protected as appropriate for the fire resistance rating of the barrier.

8.6.3 Continuity Exemptions

The requirements of 8.6.2 shall not apply where otherwise permitted by any of the following:

Where penetrations for cables, cable trays, conduits, pipes, tubes, combustion vents and exhaust vents, wires, pneumatic tube conveyors, and similar items to accommodate electrical, mechanical, plumbing, and communications systems are protected in accordance with 8.3.4.2 and 8.5.6

Where specified by 8.6.6, 8.6.7, 8.6.8, 8.6.9.1, 8.6.9.2, 8.6.9.3, or Chapters 11 through 43

Where escalators and moving walks are protected in accordance with 8.6.9.6 or 8.6.9.7

Where expansion or seismic joints are designed to prevent the penetration of fire and are shown to have a fire resistance rating of not less than that required for the floor when tested in accordance with UL 2079, Tests for Fire Resistance of Building Joint Systems

Where existing mail chutes meet one of the following criteria:

The cross-sectional area does not exceed 0.1 ft2 (0.01 m2).

The building is protected throughout by an approved automatic sprinkler system in accordance with Section 9.7.

8.6.4 Shafts

Shafts that do not extend from the bottom to the top of the building or structure shall comply with 8.6.4.1, 8.6.4.2, or 8.6.4.3, as modified by 8.6.4.4 or 8.6.4.5.

Upcodes Diagrams

8.6.4.1

Shafts that do not extend to the top of the building or structure shall be enclosed at the highest level of the shaft with construction in accordance with 8.6.5.

8.6.4.2

Shafts that do not extend to the bottom of the building or structure shall be enclosed at the lowest level of the shaft with construction in accordance with 8.6.5.

8.6.4.3

Shafts that do not extend to the bottom and to the top of the building or structure shall be enclosed at the lowest and highest level of the shaft with construction in accordance with 8.6.5.

8.6.4.4

In lieu of any enclosure required at the lowest or highest level of a shaft by 8.6.4.1 through 8.6.4.3, shafts shall be permitted to terminate in a room or space having a use related to the purpose of the shaft, provided that the room or space is separated from the remainder of the building by construction having a fire resistance rating and opening protectives in accordance with 8.6.5 and 8.3.5.

8.6.4.5

Any enclosure required at the lowest or highest level of a shaft by 8.6.4.1 through 8.6.4.3 shall be permitted to be protected by approved fire dampers installed in accordance with their listing.

8.6.5\* Required Fire Resistance Rating

The minimum fire resistance rating for the enclosure of floor openings shall be not less than as follows:

Enclosures connecting four or more stories in new construction shall be 2-hour fire barriers.

Other enclosures in new construction shall be 1-hour fire barriers.

Existing enclosures in existing buildings shall be 1/2-hour fire barriers.

Enclosures for lodging and rooming houses shall be as specified in Chapter 26.

Enclosures for new hotels shall be as specified in Chapter 28.

Enclosures for new apartment buildings shall be as specified in Chapter 30.

Enclosures for exits shall be in accordance with 7.1.3.2.1.

8.6.6 Communicating Space

Unless prohibited by Chapters 11 through 43, unenclosed floor openings forming a communicating space between floor levels shall be permitted, provided that the following conditions are met:

The communicating space does not connect more than three contiguous stories.

The lowest or next-to-lowest story within the communicating space is a street floor.

The entire floor area of the communicating space shall comply with one of the following:

The area is open and unobstructed, such that a fire in any part of the communicating space will be readily obvious to the occupants of the space prior to the time it becomes an occupant hazard.

The area is open and provided with automatic smoke detection in accordance with Section 9.6.

The communicating space is separated from the remainder of the building by fire barriers with not less than a 1-hour fire resistance rating, unless one of the following is met:

In buildings protected throughout by an approved automatic sprinkler system in accordance with Section 9.7, a smoke barrier in accordance with Section 8.5 shall be permitted to serve as the separation required by 8.6.6(4).

The requirement of 8.6.6(4) shall not apply to fully sprinklered residential housing units of detention and correctional occupancies in accordance with 22.3.1(2) and 23.3.1.1(2).

The communicating space has ordinary-hazard contents protected throughout by an approved automatic sprinkler system in accordance with Section 9.7 or has only low-hazard contents. (See 6.2.2.)

Egress capacity is sufficient to allow all the occupants of all levels within the communicating space to simultaneously egress the communicating space by considering it as a single-floor area in determining the required egress capacity.

\*Each occupant within the communicating space has access to not less than one exit without having to traverse another story within the communicating space.

Each occupant not in the communicating space has access to not less than one exit without having to enter the communicating space.

8.6.7\* Atriums

Unless prohibited by Chapters 11 through 43, an atrium shall be permitted, provided that all of the following conditions are met:

The atrium is separated from the adjacent spaces by fire barriers with not less than a 1-hour fire resistance rating, with opening protectives for corridor walls, unless one of the following is met:

The requirement of 8.6.7(1) shall not apply to existing, previously approved atriums.

Any number of levels of the building shall be permitted to open directly to the atrium without enclosure, based on the results of the engineering analysis required in 8.6.7(5).

\*Glass walls and inoperable windows shall be permitted in lieu of the fire barriers where all the following are met:

Automatic sprinklers are spaced along both sides of the glass wall and the inoperable windows at intervals not to exceed 6 ft (1830 mm).

The automatic sprinklers specified in 8.6.7(1)(c)i. are located at a distance from the glass wall not to exceed 12 in. (305 mm) and arranged so that the entire surface of the glass is wet upon operation of the sprinklers.

\*The glass wall is of tempered, wired, laminated, or ceramic glass held in place by a retention system that allows the glass framing system to deflect without breaking (loading) the glass before the sprinklers operate.

The automatic sprinklers required by 8.6.7(1)(c)i. are not required on the atrium side of the glass wall and the inoperable window where there is no walkway or other floor area on the atrium side above the main floor level.

Doors in the glass walls are of glass or other material that resists the passage of smoke.

Doors in the glass walls are self-closing or automatic-closing upon detection of smoke.

The glass is continuous vertically, without horizontal mullions, window treatments, or other obstructions that would interfere with the wetting of the entire glass surface.

Access to exits is permitted to be within the atrium, and exit discharge in accordance with 7.7.2 is permitted to be within the atrium.

The occupancy within the atrium meets the specifications for classification as low- or ordinary-hazard contents. (See 6.2.2.)

The entire building is protected throughout by an approved, supervised automatic sprinkler system in accordance with Section 9.7.

\*For other than existing, previously approved atriums, an engineering analysis is performed that demonstrates that the building is designed to keep the smoke layer interface above the highest unprotected opening to adjoining spaces, or 6 ft (1830 mm) above the highest floor level of exit access open to the atrium, for a period equal to 1.5 times the calculated egress time or 20 minutes, whichever is greater.

\*For other than existing, previously approved smoke control systems, where an engineered smoke control system is installed to meet the requirements of 8.6.7(5), the system is independently activated by each of the following:

Upon initiation of a smoke detection system or actuation of the required automatic sprinkler system within the atrium or areas open to the atrium

Manual controls that are readily accessible to the fire department

8.6.8 Two-Story Openings With Partial Enclosure

A vertical opening serving as other than an exit enclosure, connecting only two adjacent stories and piercing only one floor, shall be permitted to be open to one of the two stories.

8.6.9 Convenience Openings

8.6.9.1

Where permitted by Chapters 11 through 43, unenclosed vertical openings not concealed within the building construction shall be permitted as follows:

Such openings shall connect not more than two adjacent stories (one floor pierced only).

Such openings shall be separated from unprotected vertical openings serving other floors by a barrier complying with 8.6.5.

\*Such openings shall be separated from corridors.

\*In other than approved, existing convenience openings, such openings shall be separated from other fire or smoke compartments on the same floor.

In new construction, the convenience opening shall be separated from the corridor referenced in 8.6.9.1(3) by a smoke partition, unless Chapters 11 through 43 require the corridor to have a fire resistance rating.

\*Such openings shall not serve as a required means of egress.

8.6.9.2

Where permitted by Chapters 11 through 43, unenclosed vertical openings created by convenience stairways shall comply with all of the following:

The convenience stair openings shall not serve as required means of egress.

The building shall be protected throughout by an approved, supervised automatic sprinkler system in accordance with Section 9.7.

\*The convenience stair openings shall be protected in accordance with the method detailed for the protection of vertical openings in NFPA 13.

In new construction, the area of the floor opening shall not exceed twice the horizontal projected area of the stairway.

For new construction, such openings shall not connect more than four contiguous stories, unless otherwise permitted by Chapters 11 through 43.

8.6.9.3

Convenience stairs shall be permitted to be unenclosed in large open areas such as atriums and shopping malls.

8.6.9.4

For other than existing hoistways in existing buildings, elevator cars located within a building shall be enclosed as follows:

Where there are three or fewer elevator cars in the building, they shall be permitted to be located within the same hoistway enclosure.

Where there are four elevator cars in the building, they shall be divided in such a manner that not less than two separate hoistway enclosures are provided.

Where there are more than four elevator cars in the building, the number of elevator cars located within a single hoistway enclosure shall not exceed four.

8.6.9.5

Service openings for conveyors, elevators, and dumbwaiters, where required to be open on more than one story at the same time for purposes of operation, shall be provided with closing devices in accordance with 7.2.1.8.

8.6.9.6

Any escalators and moving walks serving as a required exit in existing buildings shall be enclosed in the same manner as exit stairways. (See 7.1.3.2.)

8.6.9.7

Any escalators and moving walks not constituting an exit shall have their floor openings enclosed or protected as required for other vertical openings, unless otherwise permitted by one of the following:

The requirement of 8.6.9.7 shall not apply to escalators in large open areas, such as atriums and enclosed shopping malls.

\*In existing buildings protected throughout by an approved automatic sprinkler system in accordance with Section 9.7, escalator and moving walk openings shall be permitted to be protected in accordance with the method detailed in NFPA 13 or in accordance with a method approved by the authority having jurisdiction.

In new buildings protected throughout by an approved automatic sprinkler system in accordance with Section 9.7, escalator and moving walk openings shall be permitted to be protected in accordance with the method detailed in NFPA 13 or in accordance with a method approved by the authority having jurisdiction, and the opening shall not connect more than four contiguous stories unless otherwise permitted by Chapters 11 through 43.

In buildings protected throughout by an approved automatic sprinkler system in accordance with Section 9.7, escalator and moving walk openings shall be permitted to be protected by rolling steel shutters appropriate for the fire resistance rating of the vertical opening and complying with all of the following:

The shutters shall close automatically and independently of each other upon smoke detection and sprinkler operation.

A manual means of operating and testing the operation of the shutters shall be provided.

The shutters shall be operated not less than once a week to ensure that they remain in proper operating condition.

The shutters shall operate at a speed not to exceed 30 ft/min (0.15 m/s) and shall be equipped with a sensitive leading edge.

The leading edge shall arrest the progress of a moving shutter and cause it to retract a distance of approximately 6 in. (150 mm) upon the application of a force not exceeding 20 lbf (90 N) applied to the surface of the leading edge.

The shutter, following the retraction specified in 8.6.9.7(4)(e), shall continue to close.

The operating mechanism for the rolling shutter shall be provided with standby power complying with the provisions of NFPA 70.

8.6.10 Mezzanines

Upcodes Diagrams

8.6.10.1 General

Multilevel residential housing areas in detention and correctional occupancies in accordance with Chapters 22 and 23 shall be exempt from the provisions of 8.6.10.2 and 8.6.10.3.

8.6.10.2 Area Limitations

8.6.10.2.1

The aggregate area of mezzanines located within a room, other than normally unoccupied equipment platforms, shall not exceed one-third the open area of the room in which the mezzanines are located. Enclosed space shall not be included in a determination of the size of the room in which the mezzanine is located.

8.6.10.2.2

The aggregate area of mezzanines located within a room, other than normally unoccupied equipment platforms, shall not exceed one-half the open area of the room in which the mezzanines are located, where all of following conditions are met:

The building is protected throughout with a supervised automatic sprinkler system in accordance with 9.7.1.

All portions of the mezzanines are open to the room in which the mezzanine is located, other than walls not more than 42 in. (1065 mm) high, columns, and posts.

8.6.10.2.3

No limit on the number of mezzanines in a room shall be required.

8.6.10.2.4

For purposes of determining the allowable mezzanine area, the aggregate area of the mezzanines shall not be included in the area of the room.

8.6.10.3 Openness

The openness of mezzanines shall be in accordance with 8.6.10.3.1 or 8.6.10.3.2.

8.6.10.3.1

All portions of a mezzanine, other than walls not more than 42 in. (1065 mm) high, columns, and posts, shall be open to and unobstructed from the room in which the mezzanine is located, unless the occupant load of the aggregate area of the enclosed space does not exceed 10.

8.6.10.3.2

A mezzanine having two or more means of egress shall not be required to open into the room in which it is located if not less than one of the means of egress provides direct access from the enclosed area to an exit at the mezzanine level.

8.6.11 Concealed Spaces and Draftstops

8.6.11.1

Any concealed combustible space in which exposed building materials having a flame spread index greater than 25, when tested in accordance with 10.2.3, shall be draftstopped as follows:

Every exterior and interior wall and partition shall be fire-stopped at each floor level, at the top-story ceiling level, and at the level of support for roofs.

Every unoccupied attic space shall be subdivided by draftstops into areas not to exceed 3000 ft2 (280 m2).

Any concealed space between the ceiling and the floor or roof above shall be draftstopped for the full depth of the space along the line of support for the floor or roof structural members and, if necessary, at other locations to form areas not to exceed 1000 ft2 (93 m2) for any space between the ceiling and floor, and 3000 ft2 (280 m2) for any space between the ceiling and roof.

8.6.11.2

The requirements of 8.6.11.1 shall not apply where any of the following conditions are met:

Where the space is protected throughout by an approved automatic sprinkler system in accordance with Section 9.7

\*Where concealed spaces serve as plenums

Where the installation is an existing installation

8.6.11.3\*

Draftstopping materials shall be not less than 1/2 in. (13 mm) thick gypsum board, 15/32 in. (12 mm) thick wood structural panel, or other approved materials that are adequately supported.

8.6.11.4

The integrity of all draftstops shall be maintained.

8.6.11.5

In existing buildings, firestopping and draftstopping shall be provided as required by Chapters 11 through 43.

8.7 Special Hazard Protection

8.7.1 General

8.7.1.1\*

Protection from any area having a degree of hazard greater than that normal to the general occupancy of the building or structure shall be provided by one of the following means:

Separating the area from other parts of the building with a fire barrier having a fire resistance rating of not less than 1 hour in accordance with Section 8.3 and without windows

Protecting the area with automatic extinguishing systems in accordance with Section 9.7

Applying both 8.7.1.1(1) and 8.7.1.1(2) where the hazard is severe or where otherwise specified by Chapters 11 through 43

8.7.1.2

In new construction, where protection is provided with automatic extinguishing systems without fire-resistive separation, the space protected shall be enclosed with smoke partitions in accordance with Section 8.4, unless otherwise permitted by one of the following conditions:

Where mercantile occupancy general storage areas and stockrooms are protected by automatic sprinklers in accordance with Section 9.7

Where hazardous areas in industrial occupancies are protected by automatic extinguishing systems in accordance with 40.3.2

Where hazardous areas in detention and correctional occupancies are protected by automatic sprinklers in accordance with 22.3.2

8.7.1.3

Doors in barriers required to have a fire resistance rating shall have a minimum 3/4-hour fire protection rating and shall be self-closing or automatic-closing in accordance with 7.2.1.8.

8.7.1.4

Unless prohibited by Chapters 11 through 43, existing doors with nonrated, factory- or field-applied protective plates extending not more than 48 in. (1220 mm) above the bottom of the door shall be permitted where they are installed in accordance with the door manufacturer's published listing.

8.7.2\* Explosion Protection

Where hazardous processes or storage is of such a character as to introduce an explosion potential, an explosion venting system or an explosion suppression system specifically designed for the hazard involved shall be provided.

8.7.3 Hazardous Materials

8.7.3.1

Where required by the provisions of Chapters 11 through 43, occupancies with storage, use, and handling of hazardous materials shall comply with the following codes unless otherwise modified by other provisions of this Code. NFPA 30, NFPA 54, NFPA 55, NFPA 58, NFPA 400, and NFPA 495.

8.7.3.2\*

No storage, use, or handling of hazardous materials shall be permitted in any location where such storage, use, or handling would jeopardize egress from the structure, unless otherwise permitted by a document listed in 8.7.3.1.

8.7.3.3\* Alcohol-Based Hand-Rub Dispensers

Where permitted by Chapters 11 through 43, alcohol-based hand-rub dispensers shall be permitted provided they meet all of the following criteria:

The maximum individual dispenser fluid capacity shall be as follows:

0.32 gal (1.2 L) for dispensers in corridors and areas open to corridors

0.53 gal (2.0 L) for dispensers in rooms or suites of rooms separated from corridors

Where aerosol containers are used, the maximum capacity of the aerosol dispenser shall be 18 oz (0.51 kg) and shall be limited to Level 1 aerosols as defined in NFPA 30B.

Dispensers shall be separated from each other by horizontal spacing of not less than 48 in. (1220 mm).

Not more than an aggregate 10 gal (37.8 L) of alcohol-based hand-rub solution or 1135 oz (32.2 kg) of Level 1 aerosols, or a combination of liquids and Level 1 aerosols not to exceed, in total, the equivalent of 10 gal (37.8 L) or 1135 oz (32.2 kg,) shall be in use outside of a storage cabinet in a single smoke compartment or fire compartment or story, whichever is less in area. One dispenser complying with 8.7.3.3(1) per room and located in that room shall not be included in the aggregated quantity.

Storage of quantities greater than 5 gal (18.9 L) in a single smoke compartment or fire compartment or story, whichever is less in area, shall meet the requirements of NFPA 30.

Dispensers shall not be installed in the following locations:

Above an ignition source for a horizontal distance of 1 in. (25 mm) to each side of the ignition source

To the side of an ignition source within a 1 in. (25 mm) horizontal distance from the ignition source

Beneath an ignition source within a 1 in. (25 mm) vertical distance from the ignition source

Dispensers installed directly over carpeted floors shall be permitted only in sprinklered areas of the building.

The alcohol-based hand-rub solution shall not exceed 95 percent alcohol content by volume.

Operation of the dispenser shall comply with the following criteria:

The dispenser shall not release its contents except when the dispenser is activated, either manually or automatically by touch-free activation.

Any activation of the dispenser shall only occur when an object is placed within 4 in. (100 mm) of the sensing device.

An object placed within the activation zone and left in place shall not cause more than one activation.

The dispenser shall not dispense more solution than the amount required for hand hygiene consistent with label instructions.

The dispenser shall be designed, constructed, and operated in a manner that ensures accidental or malicious activation of the dispensing device is minimized.

The dispenser shall be tested in accordance with the manufacturer's care and use instructions each time a new refill is installed.

8.7.4 Laboratories

8.7.4.1

Laboratories that use chemicals shall comply with NFPA 45 unless otherwise modified by other provisions of this Code.

8.7.4.2

Laboratories in health care occupancies and medical and dental offices shall comply with NFPA 99.

8.7.5\* Hyperbaric Facilities

All occupancies containing hyperbaric facilities shall comply with NFPA 99 unless otherwise modified by other provisions of this Code.

8.8\* Inspection and Testing of Door Assemblies

Doors, other than those listed in 8.2.2.4 and 8.3.3.3.1, that are required to be self-closing or automatic closing shall comply with all of the following:

Door assemblies shall be inspected annually.

Doors shall be operated to confirm full closure.

openings and the surrounding areas shall be kept clear of anything that could obstruct or interfere with the free operation of the door.

Blocking or wedging of doors in the open position shall be prohibited.

Self-closing and automatic-closing devices shall be kept in working condition at all times.