

7.14.8 Occupant Evacuation Shaft System.

7.14.8.1 Occupant evacuation elevators shall be provided with an occupant evacuation shaft system consisting of all of the following:

- (1) Elevator hoistway
- (2) Enclosed elevator lobby outside the bank or group of hoistway doors on each floor served by the elevators, with the exception that elevator lobbies not be required to be enclosed where located either on the street floor or level of exit discharge
- (3) Enclosed exit stair with doors to all floors, at and above grade level, served by the elevators

7.14.8.2 Elevator Lobby Size

7.14.8.2.1* Occupant evacuation elevator lobbies shall have minimum floor area, except as otherwise provided in 7.14.8.2.2, as follows:

- (1) The elevator lobby floor area shall accommodate, at 3 ft² (0.28 m²) per person, a minimum of 25 percent of the occupant load of the floor area served by the lobby.
- (2) The elevator lobby floor area also shall accommodate one wheelchair space of 30 in. × 48 in. (760 mm × 1220 mm) for each 50 persons, or portion thereof, of the occupant load of the floor area served by the lobby.

7.14.8.2.2 The size of lobbies serving multiple banks of elevators shall be exempt from the requirement of 7.14.8.2.1(1), provided that the area of such lobbies is approved on an individual basis and is consistent with the building's emergency plan.

7.14.8.3 Access to the exit stair required by 7.14.8.1(3) shall be directly from the enclosed elevator lobby on each floor.

7.14.8.4 The occupant evacuation shaft system shall be enclosed and separated from the remainder of the building by walls complying with the following:

- (1) The shaft system walls shall be smoke barriers in accordance with Section 8.5.
- (2) The shaft system walls separating the elevator lobby from the remainder of the building shall have a minimum 1-hour fire resistance rating and minimum ¾-hour fire protection-rated opening protectives.
- (3) The shaft system walls separating the elevator hoistway from the remainder of the building shall have a minimum 2-hour fire resistance rating and minimum 1½-hour fire protection-rated opening protectives.
- (4) The shaft system walls separating the enclosed exit stair from the remainder of the building shall have a minimum 2-hour fire resistance rating and minimum 1½-hour fire protection-rated opening protectives.

7.14.8.5 Occupant evacuation shaft system enclosures shall be constructed to provide a minimum of classification Level 2 in accordance with ASTM C 1629/C 1629M, *Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels*.

7.14.8.6* An approved method to prevent water from infiltrating into the hoistway enclosure from the operation of the automatic sprinkler system outside the enclosed occupant evacuation elevator lobby shall be provided.

7.14.8.7* Occupant evacuation shaft system elevator lobby doors shall have all of the following features:

- (1) The doors shall have a fire protection rating of not less than ¾ hour.
- (2) The doors shall be smoke leakage-rated assemblies in accordance with NFPA 105, *Standard for Smoke Door Assemblies and Other Opening Protectives*.
- (3) The doors shall have an automatic positioning bottom seal to resist the passage of water at floor level from outside the shaft system.

7.14.8.8 Occupant evacuation shaft system elevator lobby doors shall have the following features:

- (1) Each door shall be automatic-closing in accordance with 7.2.1.8.2, as modified by 7.14.8.8(2).
- (2) In addition to the automatic-closing means addressed by 7.2.1.8.2, the elevator lobby door on any floor shall also close in response to any alarm signal initiated on that floor.
- (3) Each door shall be provided with a vision panel arranged to allow people within the lobby to view conditions on the other side of the door.

7.14.8.9 Each occupant evacuation shaft system exit stair enclosure door shall be provided with a vision panel arranged to allow people on either side of the door to view conditions on the other side of the door.

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* The Florida Building Code ~~NFPA 220, *Standard on Types of Building Construction*~~, 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:

- (1) Separate buildings, if a 2-hour or greater vertically aligned fire barrier wall in accordance with NFPA 221, *Standard for High Challenge Fire Walls, Fire Walls, and Fire Barrier Walls*, exists between the portions of the building
- (2) Separate buildings, if provided with previously approved separations
- (3) Least fire-resistive construction type of the connected portions, if separation as specified in 8.2.1.3(1) or (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 Fire compartments shall be formed by fire barriers complying with 8.3.1.2.

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:

- (1) They shall be tested in accordance with ANSI/UL 1784, *Standard for Air Leakage Tests for Door Assemblies*.
- (2) The maximum air leakage rate of the door assembly shall be $3.0 \text{ ft}^3/\text{min}/\text{ft}^2$ ($0.9 \text{ m}^3/\text{min}/\text{m}^2$) of door opening at 0.10 in. water column ($25 \text{ N}/\text{m}^2$) for both the ambient and elevated temperature tests.
- (3) Door assemblies shall be installed in accordance with NFPA 105, *Standard for Smoke Door Assemblies and Other Opening Protectives*.
- (4) Door assemblies shall be inspected in accordance with 7.2.1.15.

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 E 119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, or ANSI/UL 263, *Standard for 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*.

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 E 119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, or ANSI/UL 263, *Standard for 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.

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:

- (1) Such structural elements support nonbearing wall or partition assemblies that have a required 1-hour fire resistance rating or less.
- (2) 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 of building assemblies shall comply with 8.2.4.2 or 8.2.4.3.

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/SFPE 29, *Standard Calculation Methods for Structural Fire Protection*. 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, *Standard Method for Determining Fire Resistance of Concrete and Masonry Construction Assemblies*, shall be permitted to be used.

8.2.4.3 Except for the methods specified in 8.2.4.2, analytical methods used to calculate the fire resistance of building assemblies or structural elements shall be approved. 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 E 119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, or ANSI/UL 263, *Standard for Fire Tests of Building Construction and Materials*.

8.3 Fire Barriers.

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:

- (1) 3-hour fire resistance rating
- (2) 2-hour fire resistance rating
- (3) 1-hour fire resistance rating
- (4)* ½-hour fire resistance rating

8.3.1.2* Fire barriers shall comply with one of the following:

- (1) 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.
- (2) 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.

8.3.1.3 Walls used as fire barriers shall comply with Chapter 7 of NFPA 221, *Standard for High Challenge Fire Walls, Fire Walls, and Fire Barrier Walls*. The NFPA 221 limitation on percentage width of openings shall not apply.

8.3.2 Walls.

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-rated glazing tested in accordance with ASTM E 119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, or ANSI/UL 263, *Standard for Fire Tests of Building Construction and Materials*, shall be permitted.

8.3.2.1.2 New fire resistance-rated glazing shall bear the identifier "W-XXX" where "XXX" is the fire resistance rating in minutes. Such identification shall be permanently affixed.

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 E 119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, or ANSI/UL 263, *Standard for 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.

8.3.2.4 Each new Fire Wall, Fire Barrier, Fire Partition, Smoke Barrier, Smoke Partition, or any other new wall required to have protected openings shall be permanently identified with signs or stenciling above any decorative ceiling and in concealed spaces with the wording, "FIRE AND SMOKE BARRIER - PROTECT ALL OPENINGS," or similar language. Such signs or stenciling shall be in 4 inch high letters, 1/2 inch stroke, and not more than 15 feet on-center.

8.3.3 Fire Doors and Windows.

8.3.3.1 Openings required to have a fire protection rating by Table 8.3.4.2 shall be protected by approved, listed, 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, *Standard for Fire Doors and Other Opening Protectives*, except as otherwise specified in this Code.

8.3.3.1.1 Fire resistance-rated glazing tested in accordance with ASTM E 119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, or ANSI/UL 263, *Standard for Fire Tests of Building Construction and Materials*, shall be permitted in fire door assemblies and fire window assemblies where tested and installed in accordance with their listings.

8.3.3.1.2 New fire resistance-rated glazing shall be marked in accordance with Table 8.3.3.12 and Table 8.3.4.2. Such marking shall be permanently affixed.

8.3.3.2* 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, *Standard Methods of Fire Tests of Door Assemblies*; ANSI/UL 10B, *Standard for Fire Tests of Door Assemblies*; ANSI/UL 10C, *Standard for Positive Pressure Fire Tests of Door Assemblies*; NFPA 257, *Standard on Fire Test for Window and Glass Block Assemblies*; or ANSI/UL 9, *Standard for Fire Tests of Window Assemblies*.

8.3.3.2.1 Fire protection-rated glazing shall be evaluated under positive pressure in accordance with NFPA 257, *Standard on Fire Test for Window and Glass Block Assemblies*.

8.3.3.2.2 All products required to comply with 8.3.3.2 shall bear an approved label.

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

8.3.3.3 Unless otherwise specified, fire doors shall be self-closing or automatic-closing in accordance with 7.2.1.8.

8.3.3.4 Floor fire door assemblies shall be tested in accordance with NFPA 288, *Standard Methods of Fire Tests of Horizontal Fire Door Assemblies Installed in Horizontal Fire Resistance-Rated Assemblies*,

and shall achieve a fire resistance rating not less than the assembly being penetrated. Floor fire door assemblies shall be listed and labeled.

8.3.3.5 Fire protection-rated 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* 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, *Standard on Fire Test for Window and Glass Block Assemblies*, or ANSI/UL 9, *Standard for Fire Tests of Window Assemblies*. Fire protection-rated 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, *Standard Methods of Fire Tests of Door Assemblies*; ANSI/UL 10B, *Standard for Fire Tests of Door Assemblies*; or ANSI/UL 10C, *Standard for Positive Pressure Fire Tests of Door Assemblies*.

8.3.3.7 Fire resistance-rated glazing complying with 8.3.2.1.1 shall be permitted in fire doors and fire window assemblies in accordance with their listings.

8.3.3.8 Glazing materials that have been tested, 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 8.3.4.2 and in sizes in accordance with NFPA 80, *Standard for Fire Doors and Other Opening Protectives*.

8.3.3.9 Existing installations of wired glass of 1/4 in. (6.3 mm) thickness and labeled for fire protection purposes shall be permitted to be used in approved opening protectives, provided that the maximum size specified by the listing is not exceeded.

8.3.3.10 Nonsymmetrical fire protection-rated glazing systems shall be tested with each face exposed to the furnace, and the assigned fire protection rating shall be that of the shortest duration obtained from the two tests conducted in compliance with NFPA 257, *Standard on Fire Test for Window and Glass Block Assemblies*, or ANSI/UL 9, *Standard for Fire Tests of Window Assemblies*.

8.3.3.11 The total combined area of glazing in fire-rated window assemblies and fire-rated 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 meets one of the following criteria:

- (1) The installation is an existing fire window installation of wired glass and other fire-rated glazing materials in approved frames.
- (2) The fire protection-rated glazing material is installed in approved existing frames.

8.3.3.12 New fire protection-rated glazing shall be marked in accordance with Table 8.3.3.12 and Table 8.3.4.2, and such marking shall be permanently affixed.

8.3.4 Opening Protectives.

8.3.4.1 Every opening in a fire barrier shall be protected to limit the spread of fire and restrict the movement of smoke from one side of the fire barrier to the other.

8.3.4.2* The fire protection rating for opening protectives in fire barriers, fire-rated smoke barriers, and fire-rated smoke partitions shall be in accordance with Table 8.3.4.2, except as otherwise permitted in 8.3.4.3 or 8.3.4.4. Table 8.3.4.2 was revised by a tentative interim amendment (TIA). See page 1.

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Table 8.3.3.12 Marking Fire-Rated Glazing Assemblies

Fire Test Standard	Marking	Definition of Marking
ASTM E119, or ANSI/UL 263 ^a	W	Meets wall assembly criteria
NFPA 257	OH	Meets fire window assembly criteria, including the hose stream test
NFPA 252	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

^aASTM E 119, *Standard Test Methods for Fire Tests of Building Construction and Materials* and ANSI/UL 263, *Standard for Fire Tests of Building Construction and Materials*.

Table 8.3.4.2 was revised by a tentative interim amendment (TIA). See Page 1.

Table 8.3.4.2 Minimum Fire Protection 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) ^a	Fire-Rated Glazing Marking Door Vision Panel	Minimum Side Light/Transom Assembly Rating (hr)		Fire-Rated Glazing Marking Side Light/Transom Panel		Fire Window Assemblies ^{b,c}	
					Fire Protection	Fire Resistance	Fire Protection	Fire Resistance	(hr)	Fire-Rated Glazing Marking Window
Elevator hoistways	2	1½	155 in. ^{2d}	D-H-90 or D-H-W-90	NP	2	NP	D-H-W-120	NP	W-120
	1	1	155 in. ^{2d}	D-H-60 or D-H-W-60	NP	1	NP	D-H-W-60	NP	W-60
	½	½	85 in. ^{2e}	D-20 or D-W-20	½	½	D-H-20	D-W-20	NP	W-30
Elevator lobby (per 7.2.13.4)	1	1	100 in. ^{2b}	≤100 in. ² , D-H-T-60 or D-H-W-60 ^a	NP	1	NP	D-H-W-60	NP	W-60
				>100 in. ² , D-H-W-60 ^a						
Vertical shafts, including stairways, exits, and refuse chutes	2	1½	Maximum size tested	D-H-90 or D-H-W-90	NP	2	NP	D-H-W-120	NP	W-120
	1	1	Maximum size tested	D-H-60 or D-H-W-60	NP	1	NP	D-H-W-60	NP	W-60
Replacement panels in existing vertical shafts	½	½	Maximum size tested	D-20 or D-W-20	½	½	D-H-20	D-W-20	NP	W-30

(continues)

Table 8.3.4.2 *Continued*

Component	Walls and Partitions (hr)	Fire Door Assemblies (hr)	Door Vision Panel Maximum Size (in ²) ^a	Fire-Rated Glazing Marking Door Vision Panel	Minimum Side Light/Transom Assembly Rating (hr)		Fire-Rated Glazing Marking Side Light/Transom Panel		Fire Window Assemblies ^{b, c}	
					Fire Protection	Fire Resistance	Fire Protection	Fire Resistance	Fire-Rated Glazing (hr)	Fire-Rated Glazing Marking Window
Fire barriers	3	3	100 in. ^{2b}	≤100 in. ² , D-H-180 or D-H-W-180 ^h	NP	3	NP	D-H-W-180	NP	W-180
				>100 in. ² , D-H-W-180 ^h						
	2	1½	Maximum size tested	D-H-90 or D-H-W-90	NP	2	NP	D-H-W-120	NP	W-120
	1	¾	Maximum size tested ^f	D-H-45 or D-H-W-45	¾ ^f	¾ ^f	D-H-45	D-H-W-45	¾	OH-45 or W-60
	½	¾	Maximum size tested	D-20 or D-W-20	½	½	D-H-20	D-W-20	½	OH-20 or W-30
Horizontal exits	2	1½	Maximum size tested	D-H-90 or D-H-W-90	NP	2	NP	D-H-W-120	NP	W-120
Horizontal exits served by bridges between buildings	2	¾	Maximum size tested ^f	D-H-45 or D-H-W-45	¾ ^f	¾ ^f	D-H-45	D-H-W-45	¾	OH-45 or W-120
Exit access corridors ^g	1	½	Maximum size tested	D-20 or D-W-20	¾	¾	D-H-45	D-H-W-20	¾	OH-45 or W-60
	½	½	Maximum size tested	D-20 or D-W-20	½	½	D-H-20	D-H-W-20	½	OH-20 or W-30
Smoke barriers ^a	1	½	Maximum size tested	D-20 or D-W-20	¾	¾	D-H-45	D-H-W-20	¾	OH-45 or W-60
Smoke partitions ^{g, h}	½	½	Maximum size tested	D-20 or D-W-20	½	½	D-H-20	D-H-W-20	½	OH-20 or W-30

NP: Not permitted.

^aNote: 1 in² = .00064516 m².^bFire resistance-rated glazing tested to ASTM E 119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, or ANSI/UL 263, *Standard for Fire Tests of Building Construction and Materials*, shall be permitted in the maximum size tested. (See 8.3.3.7.)^cFire-rated glazing in exterior windows shall be marked in accordance with Table 8.3.3.12.^dSee ASME A17.1, *Safety Code for Elevators and Escalators*, for additional information.^eSee ASTM A17.3, *Safety Code for Existing Elevators and Escalators*, for additional information.^fMaximum 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]^gFire doors are not required to have a hose stream test per NFPA 252, *Standard Methods of Fire Tests of Door Assemblies*; ASTM E 2074, *Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies*; ANSI/UL 10B, *Standard for Fire Tests of Door Assemblies*; or ANSI/UL 10C, *Standard for Positive Pressure Fire Tests of Door Assemblies*.^hFor residential board and care, see 32.2.3.1 and 33.2.3.1.

8.3.4.2.1 Fire-rated glazing assemblies marked as complying with hose stream requirements (H) shall be permitted in applications that do not require compliance with hose stream requirements. Fire-rated glazing assemblies marked as complying with temperature rise requirements (T) shall be permitted in applications that do not require compliance with temperature rise requirements. Fire-rated glazing assemblies marked with ratings that exceed the ratings required by this Code (XXX) shall be permitted.

8.3.4.3 Existing fire door assemblies having a minimum ¾-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 8.3.4.2.

8.3.4.4 Where a 20-minute fire protection-rated door is required in existing buildings, an existing 1¼ in. (44 mm) solid-bonded wood-core door, an existing steel-clad (tin-clad) wood door, or an existing solid-core steel door with positive latch and closer shall be permitted, unless otherwise specified by Chapters 11 through 43.

8.3.5 Penetrations. The provisions of 8.3.5 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. The provisions of 8.3.5 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.

8.3.5.1* Firestop Systems and Devices Required. 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. The firestop system or device shall be tested in accordance with ASTM E 814, *Standard Test Method for Fire Tests of Through Penetration Fire Stops*, or ANSI/UL 1479, *Standard for Fire Tests of Through-Penetration Firestops*, at a minimum positive pressure differential of 0.01 in. water column (2.5 N/m²) between the exposed and the unexposed surface of the test assembly.

8.3.5.1.1 The requirements of 8.3.5.1 shall not apply where otherwise permitted by any one of the following:

- (1) Where penetrations are tested and installed as part of an assembly tested and rated in accordance with ASTM E 119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, or ANSI/UL 263, *Standard for Fire Tests of Building Construction and Materials*
- (2) Where penetrations through floors are enclosed in a shaft enclosure designed as a fire barrier
- (3) Where concrete, grout, or mortar has been used to fill the annular spaces around cast-iron, copper, or steel piping that penetrates one or more concrete or masonry fire resistance-rated assemblies and both of the following criteria are also met:
 - (a) The nominal diameter of each penetrating item shall not exceed 6 in. (150 mm), and the opening size shall not exceed 1 ft² (0.09 m²).
 - (b) The thickness of the concrete, grout, or mortar shall be the full thickness of the assembly.

- (4) Where firestopping materials are used with the following penetrating items, the penetration is limited to one floor, and 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 E 119 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:
 - (a) Steel, ferrous, or copper cables
 - (b) Cable or wire with steel jackets
 - (c) Cast-iron, steel, or copper pipes
 - (d) Steel conduit or tubing

8.3.5.1.2 The maximum nominal diameter of the penetrating item, as indicated in 8.3.5.1.1(4)(a) through (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.

8.3.5.1.3 Firestop systems and devices shall have a minimum 1-hour F rating, but not less than the required fire resistance rating of the fire barrier penetrated.

8.3.5.1.4 Penetrations in fire-rated horizontal assemblies shall have a minimum 1-hour T rating, but not less than the fire resistance rating of the horizontal assembly. Rated penetrations shall not be required for either of the following:

- (1) Floor penetrations contained within the cavity of a wall assembly
- (2) Penetrations through floors or floor assemblies where the penetration is not in direct contact with combustible material

8.3.5.2 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 8.3.5.1.

8.3.5.3 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.

8.3.5.4 Transmission of Vibrations. Where designs take transmission of vibrations into consideration, any vibration isolation shall meet one of the following conditions:

- (1) It shall be provided on either side of the wall or floor.
- (2) It shall be designed for the specific purpose.

8.3.5.5 Transitions.

8.3.5.5.1 Where piping penetrates a fire resistance-rated wall or floor assembly, combustible piping shall not connect to noncombustible piping within 36 in. (915 mm) of the firestop system or device without demonstration that the transition will not reduce the fire resistance rating, except in the case of previously approved installations.

8.3.5.5.2 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 8.3.5.1.

8.3.5.6 Membrane Penetrations.

8.3.5.6.1 Membrane 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 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 8.3.5.1 through 8.3.5.2.

8.3.5.6.2 The firestop system or device shall be tested in accordance with ASTM E 814, *Standard Test Method for Fire Tests of Through Penetration Fire Stops*, or ANSI/UL 1479, *Standard for Fire Tests of Through-Penetration Firestops*, at a minimum positive pressure differential of 0.01 in. water column (2.5 N/m^2) between the exposed and the unexposed surface of the test assembly, unless one of the following applies:

- (1) Membrane penetrations of ceilings that are not an integral part of a fire resistance-rated floor/ceiling or roof/ceiling assembly shall be permitted.
- (2) Membrane penetrations of steel, ferrous, or copper conduits, and pipes, tubes, or combustion vents or exhaust vents, shall be permitted where the annular space is protected with an approved material and the aggregate area of the openings does not exceed 0.7 ft^2 (0.06 m^2) in any 100 ft^2 (9.3 m^2) of ceiling area.
- (3) Electrical outlet boxes and fittings shall be permitted, provided that such devices are listed for use in fire resistance-rated assemblies and are installed in accordance with their listing.
- (4) 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.

8.3.5.6.3 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 is met:

- (1) Any steel electrical box not exceeding 0.1 ft^2 (0.01 m^2) shall be permitted where the aggregate area of the openings provided for the boxes does not exceed 0.7 ft^2 (0.06 m^2) in any 100 ft^2 (9.3 m^2) 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:
 - (a) Horizontal distance of not less than 24 in. (610 mm)
 - (b) 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
 - (c)* Solid fireblocking
 - (d) Other listed materials and methods
- (2) 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.
- (3) 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.

8.3.5.7 Openings for Air-Handling Ductwork. Openings in fire barriers for air-handling ductwork or air movement shall be protected in accordance with 9.2.1.

8.3.6 Joints.

8.3.6.1 The provisions of 8.3.6 shall govern the materials and methods of construction used to protect joints in between and at

the perimeter of fire barriers or, where fire barriers meet other fire barriers, the floor or roof deck above, or the outside walls. The provisions of 8.3.6 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.

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

8.3.6.3 Joints made within or between fire barriers shall be protected with a smoke-tight joint system that is capable of limiting the transfer of smoke.

8.3.6.4 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.

8.3.6.5* Joints made within or between fire resistance-rated assemblies 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. Such materials, systems, or devices shall be tested as part of the assembly in accordance with the requirements of ASTM E 1966, *Standard Test Method for Fire-Resistive Joint Systems*, or ANSI/UL 2079, *Standard for Tests for Fire Resistance of Building Joint Systems*.

8.3.6.6 All joint systems shall be tested at their maximum joint width in accordance with the requirements of ASTM E 1966, *Standard Test Method for Fire-Resistive Joint Systems*, or ANSI/UL 2079, *Standard for Tests for Fire Resistance of Building Joint Systems*, under a minimum positive pressure differential of 0.01 in. water column (2.5 N/m^2) for a time period equal to that of the assembly. All test specimens shall comply with the minimum height or length required by the standard. Wall assemblies shall be subjected to a hose stream test in accordance with ASTM E 119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, or ANSI/UL 263, *Standard for Fire Tests of Building Construction and Materials*.

8.3.6.7* Exterior Curtain Walls and Perimeter Joints.

8.3.6.7.1 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 E 2307, *Standard Test Method for Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Apparatus*.

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

8.4 Smoke Partitions.

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:

- (1) 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.
- (2)* 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:

- (a) The ceiling system forms a continuous membrane.
 - (b) A smoke-tight joint is provided between the top of the smoke partition and the bottom of the suspended ceiling.
 - (c) The space above the ceiling is not used as a plenum.
- (3) 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:
- (a) The ceiling system forms a continuous membrane.
 - (b) A smoke-tight joint is provided between the top of the smoke partition and the bottom of the suspended ceiling.
 - (c) 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 8.4.3.5.

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, *Standard for Fire Doors and Other Opening Protectives*.

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

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 designs take transmission of vibrations into consideration, any vibration isolation shall meet one of the following conditions:

- (1) It shall be provided on either side of the smoke partition.
- (2) It shall be designed for the specific purpose.

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 ANSI/UL 555S, *Standard for 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, *National Fire Alarm and Signaling Code*.

8.5 Smoke Barriers.

8.5.1* **General.** Where required by Chapters 11 through 43, smoke barriers shall be provided to subdivide building spaces for the purpose of 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 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. The clearance under the bottom of a new door shall be a maximum of ¾ 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.** 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 ANSI/UL 555S, *Standard for Smoke Dampers*, shall be installed. 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 ANSI/UL 555, *Standard for Fire Dampers*, and ANSI/UL 555S, *Standard for Smoke Dampers*, shall be installed.

8.5.5.3 Smoke Damper Exemptions. Smoke dampers shall not be required under any of the following conditions:

- (1) Where specifically exempted by provisions in Chapters 11 through 43
- (2) Where ducts or air-transfer openings are part of an engineered smoke control system
- (3) 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
- (4) Where the air inlet or outlet openings in ducts are limited to a single smoke compartment
- (5) Where ducts penetrate floors that serve as smoke barriers
- (6) 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, *Standard for the Installation of Air-Conditioning and Ventilating Systems*, and NFPA 105, *Standard for Smoke Door Assemblies and Other Opening Protectives*.

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, *Standard for Smoke Door Assemblies and Other Opening Protectives*.

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. Access to the dampers shall be provided for inspection, testing, and maintenance. The access openings shall not reduce the fire resistance rating of the fire barrier assembly.

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, *National Fire Alarm and Signaling Code*, unless one of the following conditions exists:

- (1) The ducts penetrate smoke barriers above the smoke barrier doors, and the door release detector actuates the damper.
- (2) 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, *National Fire Alarm and Signaling Code*.

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.

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 8.3.5 to limit the spread of fire for a time period equal to the fire resistance rating of the assembly and 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 ½ in. (13 mm), measured between the edge of the membrane and the sprinkler.

8.5.6.5 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 material capable of restricting the transfer of smoke.

8.5.6.6 Where designs take transmission of vibrations into consideration, any vibration isolation shall meet one of the following conditions:

- (1) It shall be provided on either side of the smoke barrier.
- (2) It shall be designed for the specific purpose.

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 or at the perimeter of smoke barriers shall be protected with a joint system that is capable of limiting the transfer of smoke.

8.5.7.3 Joints made within or between smoke barriers shall be protected with a smoke-tight joint system that is capable of limiting the transfer of smoke.

8.5.7.4 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.

8.5.7.5 Testing of the joint system in a smoke barrier that also serves as 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.

8.6 Vertical Openings.

8.6.1 Floor Smoke Barriers. Every floor that separates stories in a building shall meet the following criteria:

- (1) It shall be constructed as a smoke barrier in accordance with Section 8.5.
- (2) It shall be permitted to have openings as described by 8.6.6, 8.6.7, 8.6.8, 8.6.9, or Chapters 11 through 43.

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:

- (1) 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 8.3.5.1 and 8.5.6
- (2) 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
- (3) Where escalators and moving walks are protected in accordance with 8.6.9.6 or 8.6.9.7
- (4) 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 ANSI/UL 2079, *Standard for Tests for Fire Resistance of Building Joint Systems*
- (5) Where existing mail chutes meet one of the following criteria:
 - (a) The cross-sectional area does not exceed 0.1 ft² (0.01 m²).
 - (b) 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 to the bottom or the top of the building or structure shall comply with either 8.6.4.1, 8.6.4.2, or 8.6.4.3.

8.6.4.1 Shafts shall be enclosed at the lowest or highest level of the shaft, respectively, with construction in accordance with 8.6.5.

8.6.4.2 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 8.3.4.

8.6.4.3 Shafts that do not extend to the bottom or top of the building or structure shall be permitted to be protected by approved fire dampers installed in accordance with their listing at the lowest or highest floor level, as applicable, within the shaft enclosure.

8.6.5* Required Fire Resistance Rating. The minimum fire resistance rating for the enclosure of floor openings shall be as follows (*see 7.1.3.2.1 for enclosure of exits*):

- (1) Enclosures connecting four or more stories in new construction — 2-hour fire barriers
- (2) Other enclosures in new construction — 1-hour fire barriers

- (3) Existing enclosures in existing buildings — ½-hour fire barriers
- (4) Enclosures for lodging and rooming houses — as specified in Chapter 26
- (5) Enclosures for new hotels — as specified in Chapter 28
- (6) Enclosures for new apartment buildings — as specified in Chapter 30

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:

- (1) The communicating space does not connect more than three contiguous stories.
- (2) The lowest or next-to-lowest story within the communicating space is a street floor.
- (3) The entire floor area of the communicating space is open and unobstructed, such that a fire in any part of the space will be readily obvious to the occupants of the space prior to the time it becomes an occupant hazard.
- (4) 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:
 - (a) 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).
 - (b) 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).
- (5) 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.*)
- (6) 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.
- (7)* Each occupant within the communicating space has access to not less than one exit without having to traverse another story within the communicating space.
- (8) 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 the following conditions are met:

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

- (c)* Glass walls and inoperable windows shall be permitted in lieu of the fire barriers where all the following are met:
- i. Automatic sprinklers are spaced along both sides of the glass wall and the inoperable windows at intervals not to exceed 6 ft (1830 mm).
 - ii. 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.
 - iii. The glass wall is of tempered, wired, or laminated glass held in place by a gasket system that allows the glass framing system to deflect without breaking (loading) the glass before the sprinklers operate.
 - iv. 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.
 - v. Doors in the glass walls are of glass or other material that resists the passage of smoke.
 - vi. Doors in the glass walls are self-closing or automatic-closing upon detection of smoke.
 - vii. The glass is continuous vertically, without horizontal mullions, window treatments, or other obstructions that would interfere with the wetting of the entire glass surface.

- (2) 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.
- (3) The occupancy within the atrium meets the specifications for classification as low or ordinary hazard contents. (See 6.2.2.)
- (4) The entire building is protected throughout by an approved, supervised automatic sprinkler system in accordance with Section 9.7.
- (5)* 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.
- (6)* In other than existing, previously approved atriums, 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:
 - (a) Required automatic sprinkler system
 - (b) 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:

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

- (2) Such openings shall be separated from unprotected vertical openings serving other floors by a barrier complying with 8.6.5.
- (3) Such openings shall be separated from corridors.
- (4)* In other than approved, existing convenience openings, such openings shall be separated from other fire or smoke compartments on the same floor.
- (5) 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.
- (6)* 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 be permitted as follows:

- (1) The convenience stair openings shall not serve as required means of egress.
- (2) The building shall be protected throughout by an approved, supervised automatic sprinkler system in accordance with Section 9.7.
- (3) The convenience stair openings shall be protected in accordance with the method detailed for the protection of vertical openings in NFPA 13, *Standard for the Installation of Sprinkler Systems*.

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:

- (1) Where there are three or fewer elevator cars in the building, they shall be permitted to be located within the same hoistway enclosure.
- (2) 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.
- (3) 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:

- (1) The requirement of 8.6.9.7 shall not apply to escalators in large open areas, such as atriums and enclosed shopping malls.
- (2)* 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 in accordance with the method detailed in NFPA 13, *Standard for the Installation of Sprinkler Systems*, or in accordance with a method approved by the authority having jurisdiction.
- (3) 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:

- (a) The shutters shall close automatically and independently of each other upon smoke detection and sprinkler operation.
- (b) A manual means of operating and testing the operation of the shutters shall be provided.
- (c) The shutters shall be operated not less than once a week to ensure that they remain in proper operating condition.
- (d) 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.
- (e) 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.
- (f) The shutter, following the retraction specified in 8.6.9.7(3)(e), shall continue to close.
- (g) The operating mechanism for the rolling shutter shall be provided with standby power complying with the provisions of *NFPA 70, National Electrical Code*.

8.6.10 Mezzanines.

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 those located in special-purpose industrial occupancies, 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 No limit on the number of mezzanines in a room shall be required.

8.6.10.2.3 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 building materials having a flame spread index greater than Class A are exposed shall be draftstopped as follows:

- (1) Every exterior and interior wall and partition shall be firestopped at each floor level, at the top story ceiling level, and at the level of support for roofs.

- (2) Every unoccupied attic space shall be subdivided by draftstops into areas not to exceed 3000 ft² (280 m²).
- (3) 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:

- (1) Where the space is protected throughout by an approved automatic sprinkler system in accordance with Section 9.7
- (2)* Where concealed spaces serve as plenums
- (3) Where the installation is an existing installation

8.6.11.3 Draftstopping materials shall be not less than ½ in. (13 mm) thick gypsum board, 1⁵/₃₂ in. (12 mm) thick plywood, 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:

- (1) Enclosing the area with a fire barrier without windows that has a 1-hour fire resistance rating in accordance with Section 8.3
- (2) Protecting the area with automatic extinguishing systems in accordance with Section 9.7
- (3) Applying both 8.7.1.1(1) and (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:

- (1) Where mercantile occupancy general storage areas and stockrooms are protected by automatic sprinklers in accordance with Section 9.7
- (2) Where hazardous areas in industrial occupancies are protected by automatic extinguishing systems in accordance with 40.3.2
- (3) 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 ¾-hour fire protection rating and shall be self-closing or automatic-closing in accordance with 7.2.1.8.

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 Flammable Liquids and Gases.

8.7.3.1 The storage and handling of flammable liquids or gases shall be in accordance with the following applicable standards:

- (1) NFPA 30, *Flammable and Combustible Liquids Code*
- (2) NFPA 54, *National Fuel Gas Code*
- (3) NFPA 58, *Liquefied Petroleum Gas Code*

8.7.3.2* No storage or handling of flammable liquids or gases shall be permitted in any location where such storage would jeopardize egress from the structure, unless otherwise permitted by 8.7.3.1.

8.7.4 Laboratories.

8.7.4.1 Laboratories that use chemicals shall comply with NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals*, 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, *Health Care Facilities Code*.

8.7.5* **Hyperbaric Facilities.** All occupancies containing hyperbaric facilities shall comply with NFPA 99, *Health Care Facilities Code*, Chapter 20, unless otherwise modified by other provisions of this Code.

Chapter 9 Building Service and Fire Protection Equipment

9.1 Utilities.

9.1.1 **Gas.** Equipment using gas and related gas piping shall be in accordance with NFPA 54, *National Fuel Gas Code*, or NFPA 58, *Liquefied Petroleum Gas Code*, unless such installations are approved existing installations, which shall be permitted to be continued in service.

9.1.2 **Electrical Systems.** Electrical wiring and equipment shall be in accordance with NFPA 70, *National Electrical Code*, unless such installations are approved existing installations, which shall be permitted to be continued in service.

9.1.3 **Emergency Generators and Standby Power Systems.** Where required for compliance with this Code, emergency generators and standby power systems shall comply with 9.1.3.1 and 9.1.3.2.

9.1.3.1 Emergency generators and standby power systems shall be installed, tested, and maintained in accordance with NFPA 110, *Standard for Emergency and Standby Power Systems*.

9.1.3.2 New generator controllers shall be monitored by the fire alarm system, where provided, or at an attended location, for the following conditions:

- (1) Generator running
- (2) Generator fault
- (3) Generator switch in nonautomatic position

9.1.4 **Stored Electrical Energy Systems.** Stored electrical energy systems shall be installed, tested, and maintained in accordance with NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems*.

9.2 Heating, Ventilating, and Air-Conditioning.

9.2.1 **Air-Conditioning, Heating, Ventilating Ductwork, and Related Equipment.** Air-conditioning, heating, ventilating ductwork, and related equipment shall be in accordance with

NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems*, or NFPA 90B, *Standard for the Installation of Warm Air Heating and Air-Conditioning Systems*, as applicable, unless such installations are approved existing installations, which shall be permitted to be continued in service.

9.2.2 **Ventilating or Heat-Producing Equipment.** Ventilating or heat-producing equipment shall be in accordance with NFPA 91, *Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids*; NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances*; NFPA 31, *Standard for the Installation of Oil-Burning Equipment*; NFPA 54, *National Fuel Gas Code*; or NFPA 70, *National Electrical Code*, as applicable, unless such installations are approved existing installations, which shall be permitted to be continued in service.

9.2.3 **Commercial Cooking Equipment.** Commercial cooking equipment shall be in accordance with NFPA 96, *Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations*, unless such installations are approved existing installations, which shall be permitted to be continued in service.

9.2.4 **Ventilating Systems in Laboratories Using Chemicals.** Ventilating systems in laboratories using chemicals shall be in accordance with NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals*, or NFPA 99, *Health Care Facilities Code*, as appropriate.

9.3 Smoke Control.

9.3.1 Where required by the provisions of another section of this Code, smoke control systems shall be installed, inspected, tested, and maintained in accordance with NFPA 92, *Standard for Smoke Control Systems*; NFPA 204, *Standard for Smoke and Heat Venting*; or nationally recognized standards, engineering guides, or recommended practices, as approved by the authority having jurisdiction.

9.3.2 The engineer of record shall clearly identify the intent of the system, the design method used, the appropriateness of the method used, and the required means of inspecting, testing, and maintaining the system.

9.3.3 Acceptance testing shall be performed by a special inspector in accordance with Section 9.9.

9.3.4 Smoke Control System Operation.

9.3.4.1 Floor- or zone-dependent smoke control systems shall be automatically activated by sprinkler waterflow or smoke detection systems.

9.3.4.2 Means for manual operation of smoke control systems shall be provided at an approved location.

9.4 Elevators, Escalators, and Conveyors.

9.4.1* **General.** An elevator, other than an elevator in accordance with 7.2.13, shall not be considered a component in a required means of egress but shall be permitted as a component in an accessible means of egress.

9.4.2 Code Compliance.

9.4.2.1 Except as modified herein, new elevators, escalators, dumbwaiters, and moving walks shall be in accordance with the requirements of ASME A17.1/CSA B44, *Safety Code for Elevators and Escalators*.