



## Fire Resistive Rated Assemblies Part 2

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Chief Fire and Life Safety Officer



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3



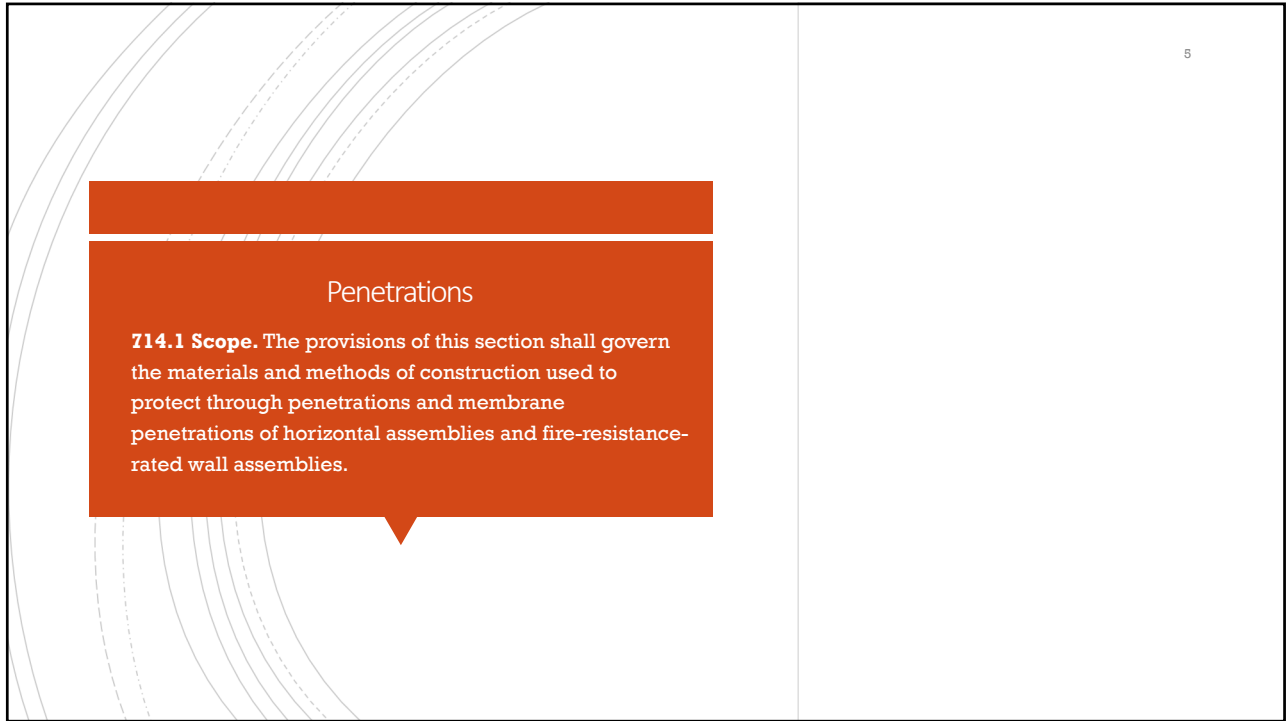
2019 CALIFORNIA BUILDING CODE  
CALIFORNIA CODE OF REGULATIONS TITLE 24, PART 2, VOLUME 2 OF 2  
Part 2 of the 2019 International Building Code  
California & Other Adopting Jurisdictions

ICC  
INTERNATIONAL  
CODE COUNCIL

PART 2  
FIRE AND SMOKE  
PROTECTION  
FEATURES  
Chapter 7

4

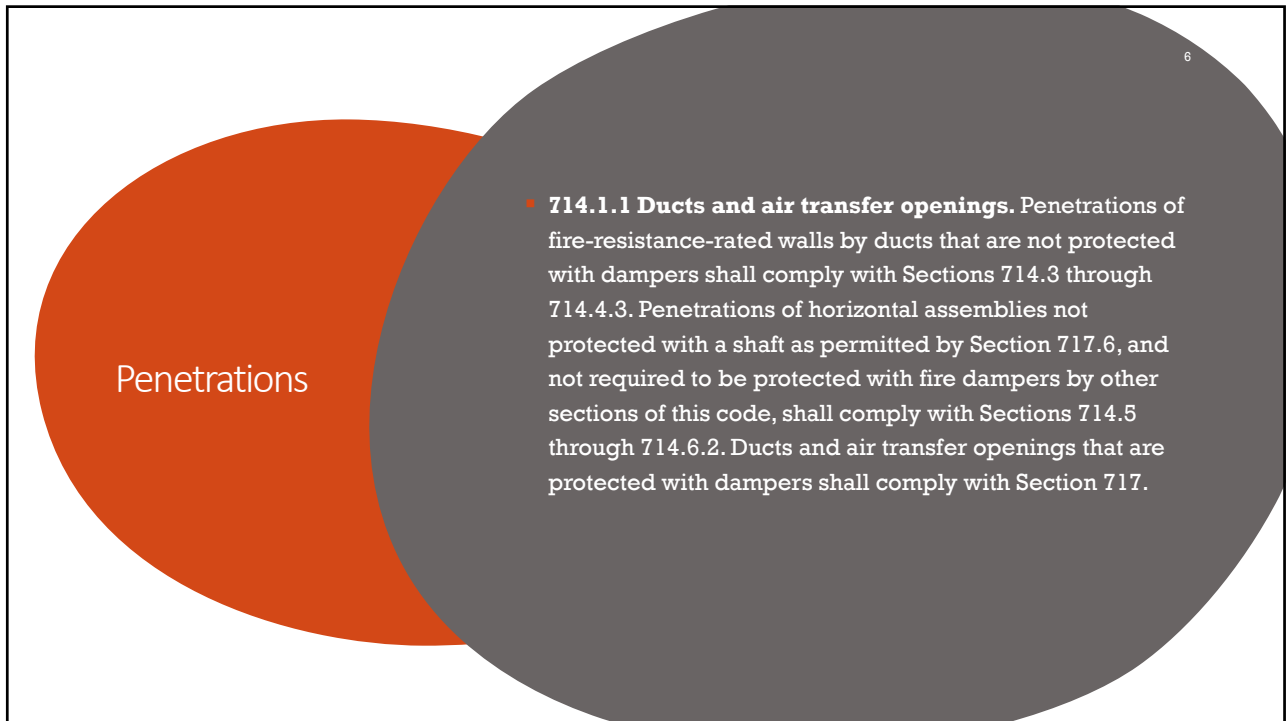
PENETRATIONS  
Section 714



5

### Penetrations

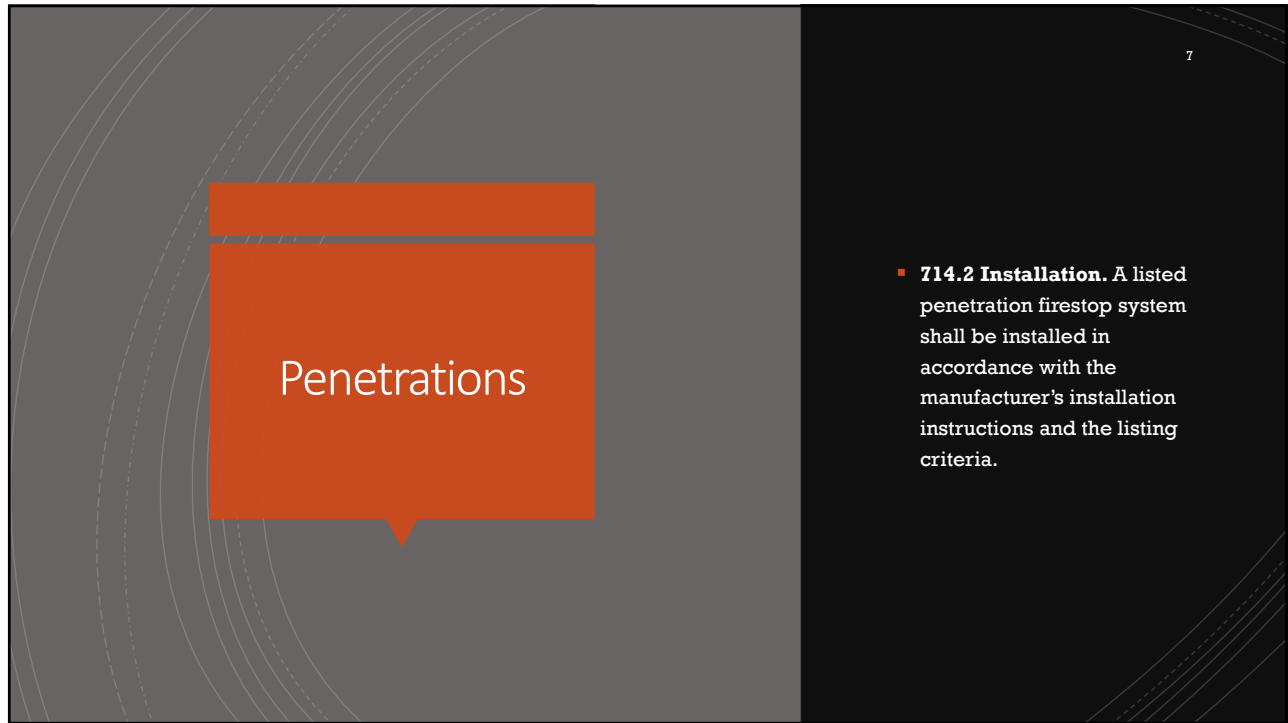
**714.1 Scope.** The provisions of this section shall govern the materials and methods of construction used to protect through penetrations and membrane penetrations of horizontal assemblies and fire-resistance-rated wall assemblies.



6

### Penetrations

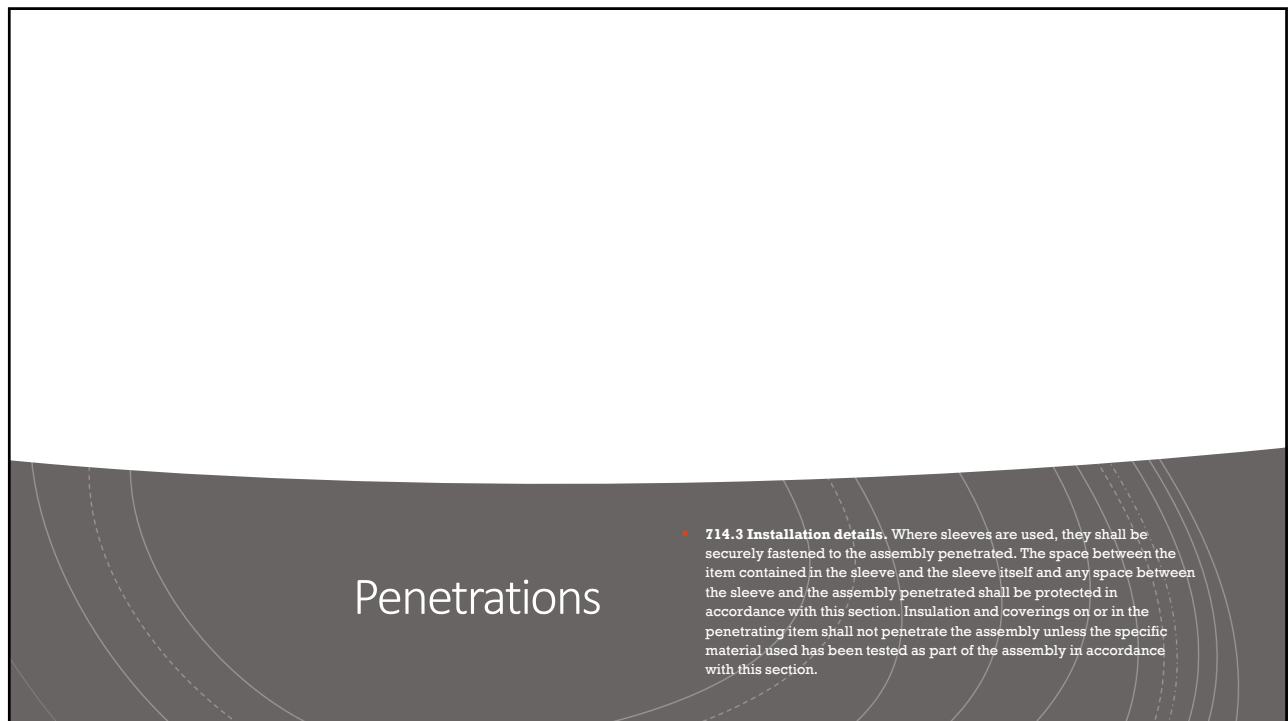
- **714.1.1 Ducts and air transfer openings.** Penetrations of fire-resistance-rated walls by ducts that are not protected with dampers shall comply with Sections 714.3 through 714.4.3. Penetrations of horizontal assemblies not protected with a shaft as permitted by Section 717.6, and not required to be protected with fire dampers by other sections of this code, shall comply with Sections 714.5 through 714.6.2. Ducts and air transfer openings that are protected with dampers shall comply with Section 717.



7

## Penetrations

- **714.2 Installation.** A listed penetration firestop system shall be installed in accordance with the manufacturer's installation instructions and the listing criteria.



## Penetrations

- **714.3 Installation details.** Where sleeves are used, they shall be securely fastened to the assembly penetrated. The space between the item contained in the sleeve and the sleeve itself and any space between the sleeve and the assembly penetrated shall be protected in accordance with this section. Insulation and coverings on or in the penetrating item shall not penetrate the assembly unless the specific material used has been tested as part of the assembly in accordance with this section.

9

## Penetrations

**FIRE WALL RATED  
1 HOUR  
SEAL ALL PENETRATIONS**

- **714.4 Fire-resistance-rated walls.** Penetrations into or through fire walls, fire-barrier walls, smoke-barrier walls and fire partitions shall comply with Sections 714.4.1 through 714.4.3. Penetrations in smoke barrier walls shall also comply with Section 714.5.4.

10

- **714.4.1 Through penetrations.** Through penetrations of fire-resistance-rated walls shall comply with Section 714.4.1.1 or 714.4.1.2.
  - Exception:** Where the penetrating items are steel, ferrous or copper pipes, tubes or conduits, the annular space between the penetrating item and the fire-resistance-rated wall is permitted to be protected by either of the following measures:

## Penetrations

11

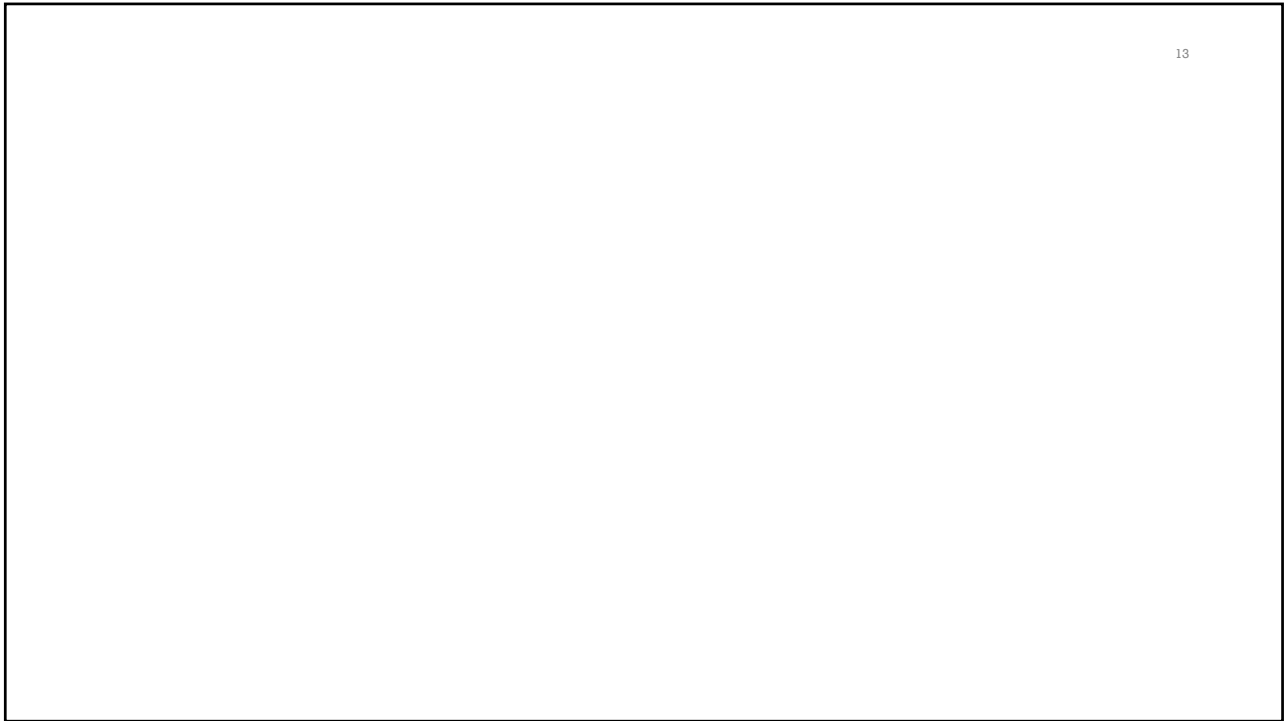
## Penetrations

- 1. In concrete or masonry walls where the penetrating item is a maximum 6-inch nominal diameter and the area of the opening through the wall does not exceed 144 square inches, concrete, grout or mortar is permitted where it is installed the full thickness of the wall or the thickness required to maintain the fire-resistance rating; or

12

## Penetrations

- 2. The material used to fill the annular space shall prevent the passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E 119 or UL 263 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inch of water at the location of the penetration for the time period equivalent to the fire-resistance rating of the construction penetrated.



13



14

Penetrations

- **714.4.1.1 Fire-resistance-rated assemblies.** Through penetrations shall be protected using systems installed as tested in the approved fire-resistance-rated assembly.

15

## Penetrations

- **714.4.1.2 Through-penetration fire stop system.** Through penetrations shall be protected by an approved penetration fire stop system installed as tested in accordance with ASTM E 814 or UL 1479, with a minimum positive pressure differential of 0.01 inch of water and shall have an F rating of not less than the required fire-resistance rating of the wall penetrated.

16

## Penetrations

- **714.4.2 Membrane penetrations.** Membrane penetrations shall comply with Section 714.4.1. Where walls or partitions are required to have a fire-resistance rating, recessed fixtures shall be installed such that the required fire resistance will not be reduced.



17

## Penetrations

**714.4.2 Membrane penetrations.**

**Exceptions:**

1. Membrane penetrations of maximum two-hour fire-resistance-rated walls and partitions by steel electrical boxes that do not exceed 16 square inches in area, provided the aggregate area of the openings through the membrane does not exceed 100 square inches in any 100 square feet of wall area. The annular space between the wall membrane and the box shall not exceed 1/8 inch. Such boxes on opposite sides of the wall or partition shall be separated by one of the following:

## Penetrations

**714.4.2 Membrane penetrations.**

**Exceptions:**

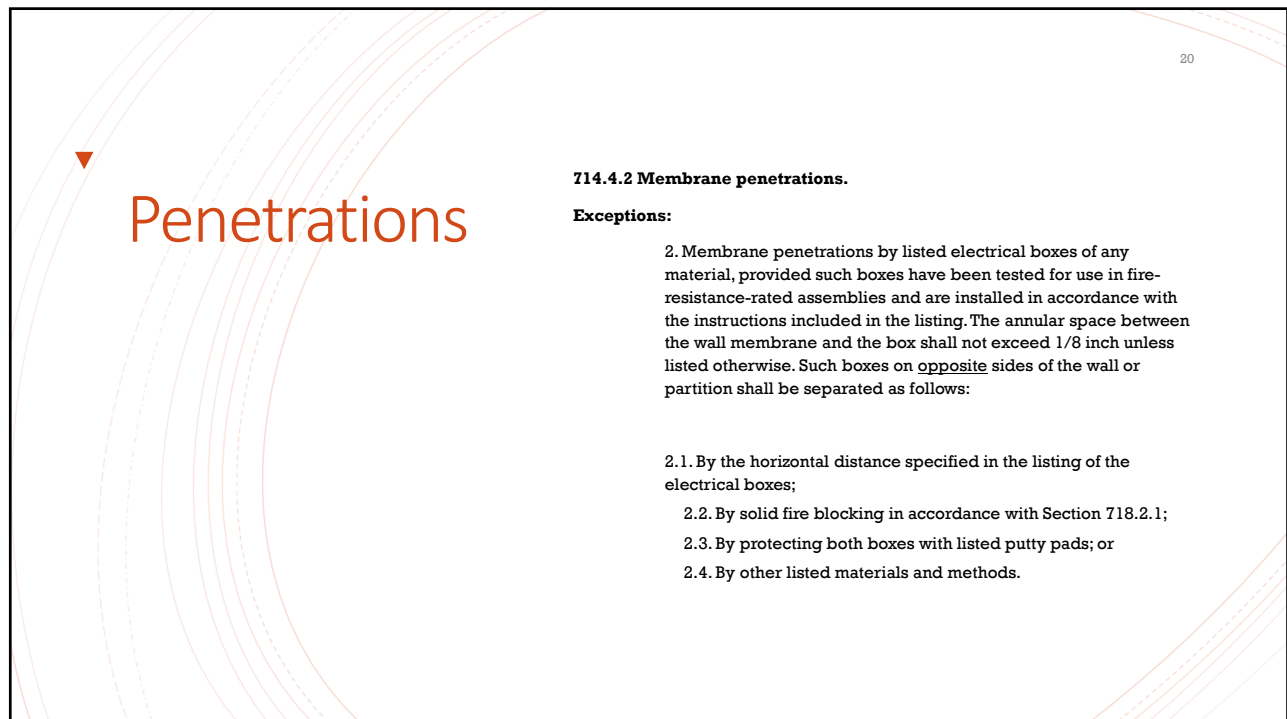
- 1.1. By a horizontal distance of not less than 18 inches where the wall or partition is constructed with individual noncommunicating stud cavities; (No punched studs or ladder studs)
- 1.2. By a horizontal distance of not less than the depth of the wall cavity where the wall cavity is filled with cellulose loose-fill, rock wool or slag mineral wool insulation;
- 1.3. By solid fire blocking in accordance with Section 718.2.1;
- 1.4. By protecting both outlet boxes with listed putty pads; or
- 1.5. By other listed materials and methods.



19

## Penetrations

- Where does it say that?
- The annular space between the wall membrane and the box shall not exceed 1/8 inch.
- 714.4.2, Exception 1 and Exception 2



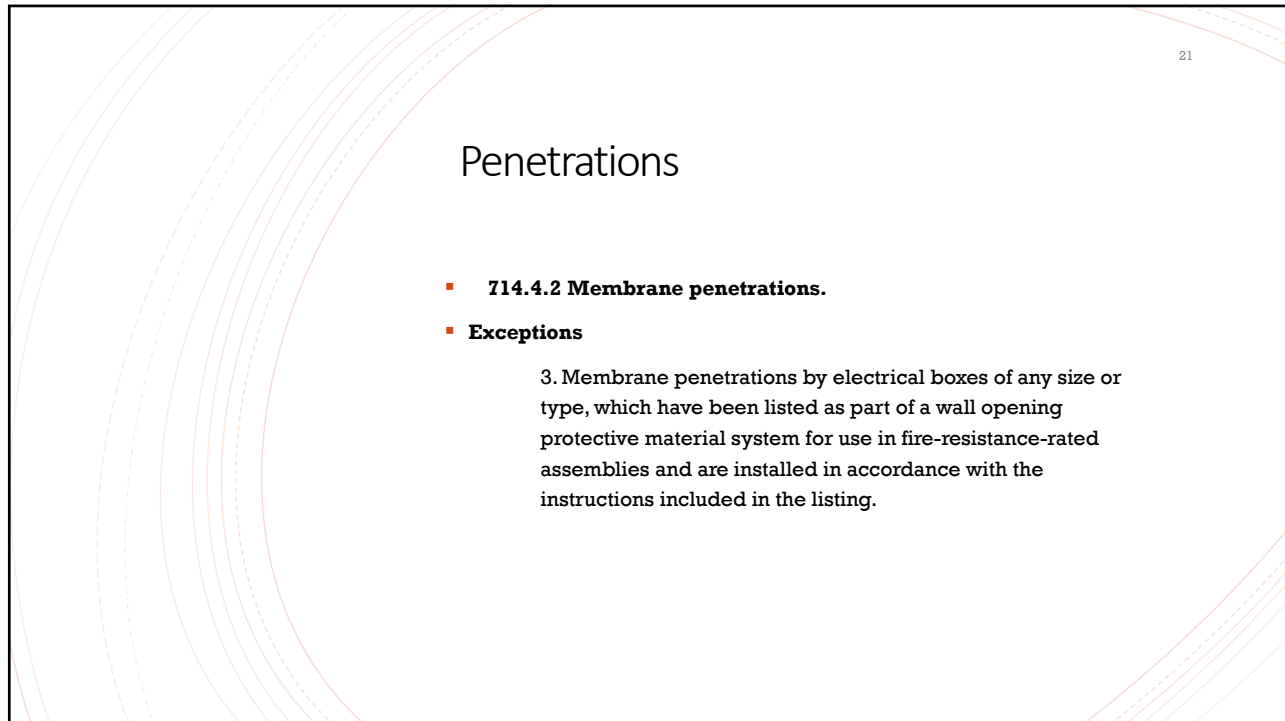
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## Penetrations

**714.4.2 Membrane penetrations.**

**Exceptions:**

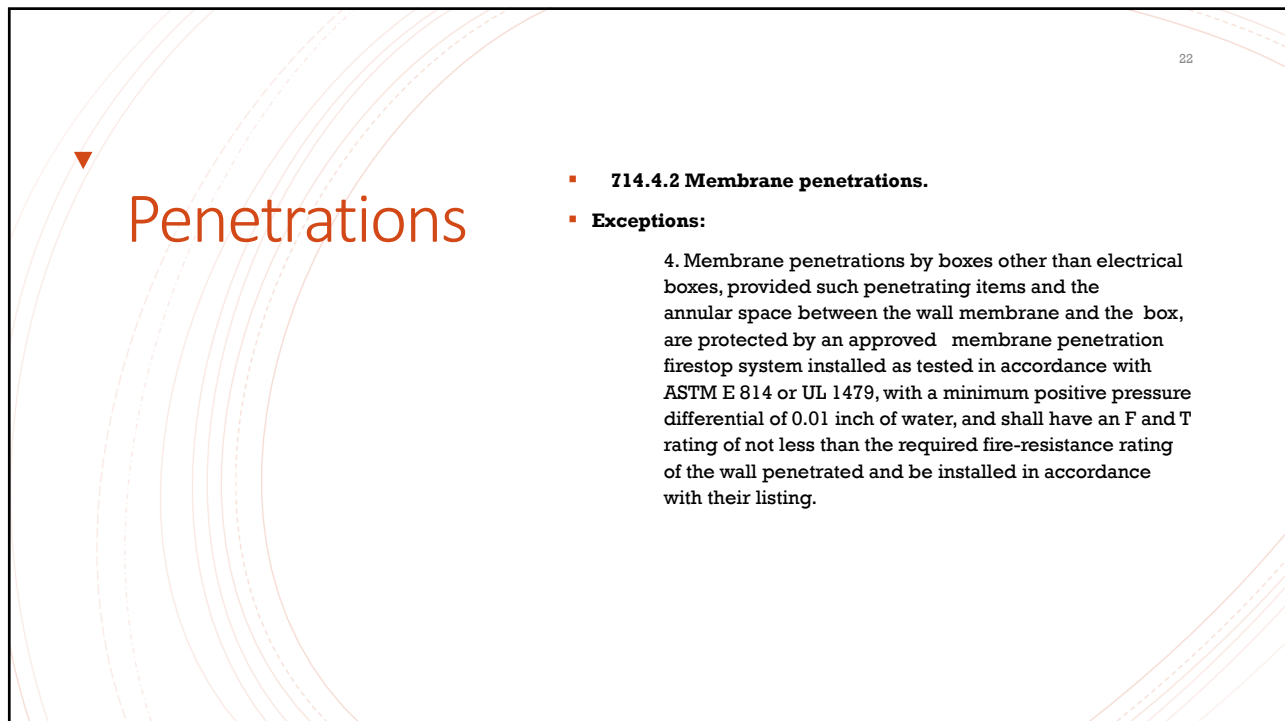
2. Membrane penetrations by listed electrical boxes of any material, provided such boxes have been tested for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the listing. The annular space between the wall membrane and the box shall not exceed 1/8 inch unless listed otherwise. Such boxes on opposite sides of the wall or partition shall be separated as follows:
  - 2.1. By the horizontal distance specified in the listing of the electrical boxes;
  - 2.2. By solid fire blocking in accordance with Section 718.2.1;
  - 2.3. By protecting both boxes with listed putty pads; or
  - 2.4. By other listed materials and methods.



21

## Penetrations

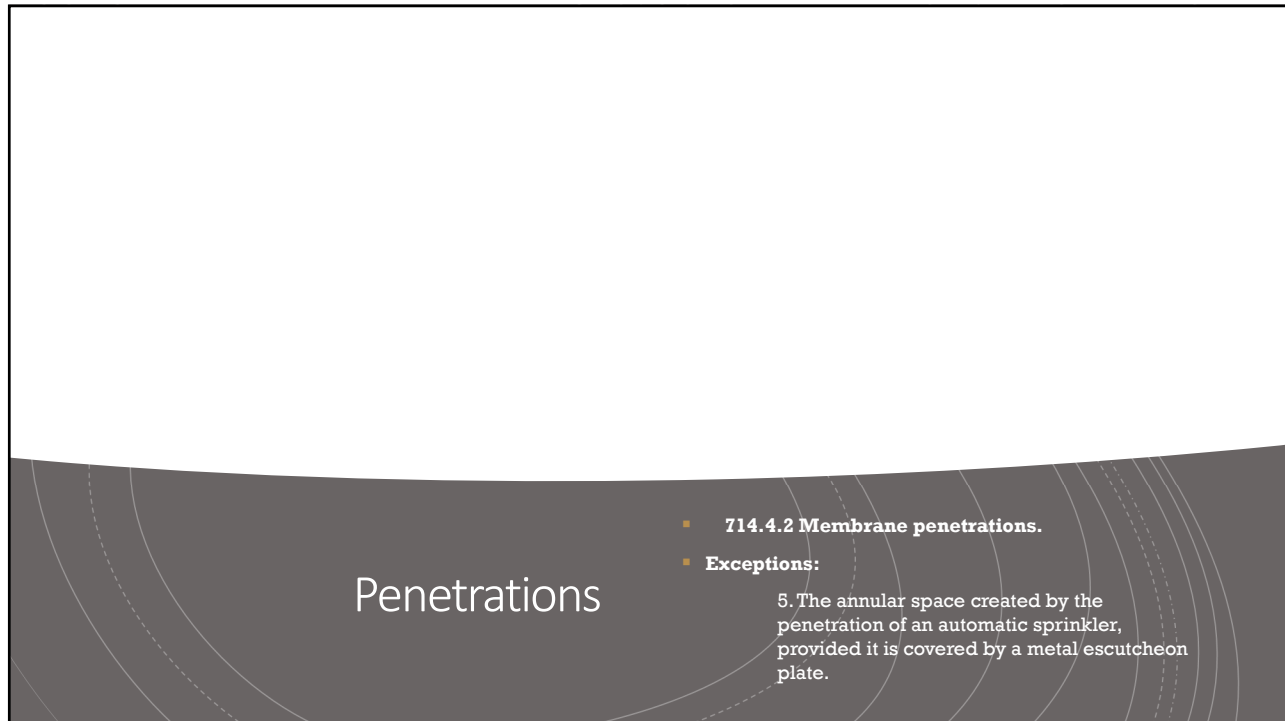
- **714.4.2 Membrane penetrations.**
- **Exceptions**
  3. Membrane penetrations by electrical boxes of any size or type, which have been listed as part of a wall opening protective material system for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included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



22

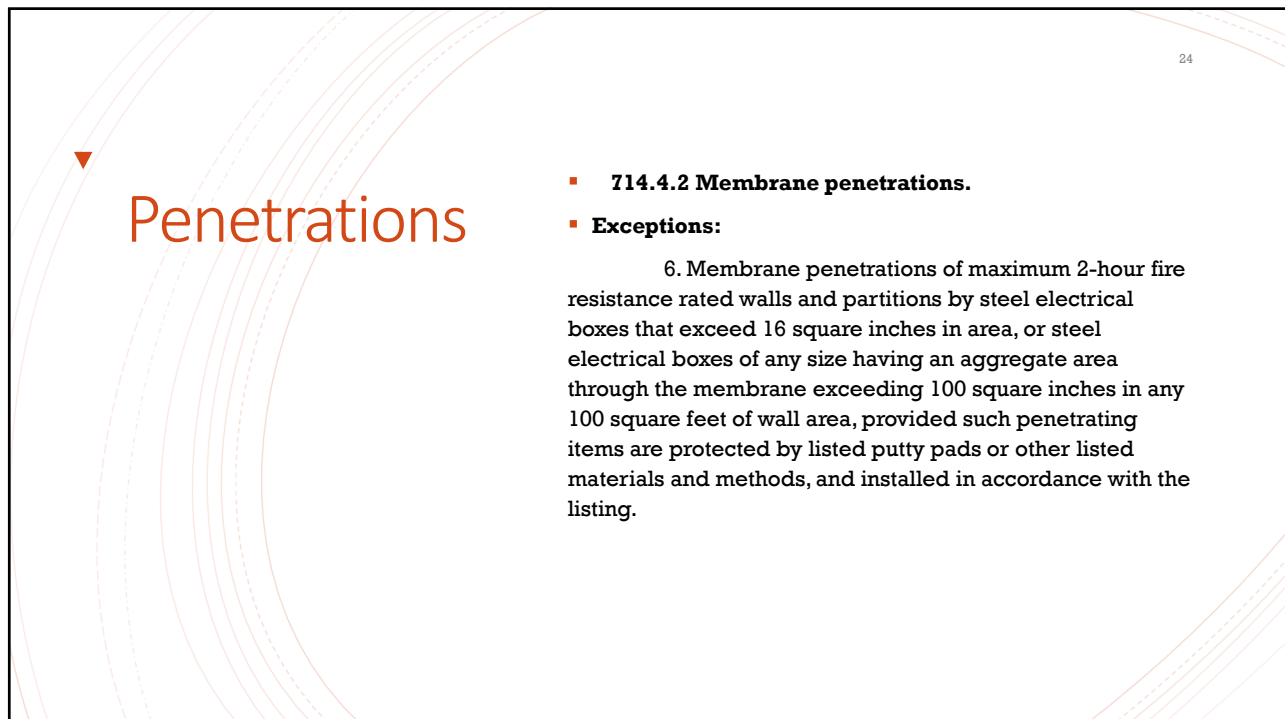
## Penetrations

- **714.4.2 Membrane penetrations.**
- **Exceptions:**
  4. Membrane penetrations by boxes other than electrical boxes, provided such penetrating items and the annular space between the wall membrane and the box, are protected by an approved membrane penetration firestop system installed as tested in accordance with ASTM E 814 or UL 1479, with a minimum positive pressure differential of 0.01 inch of water, and shall have an F and T rating of not less than the required fire-resistance rating of the wall penetrated and be installed in accordance with their listing.



## Penetrations

- **714.4.2 Membrane penetrations.**
- **Exceptions:**
  5. The annular space created by the penetration of an automatic sprinkler, provided it is covered by a metal escutcheon plate.



## Penetrations

- **714.4.2 Membrane penetrations.**
- **Exceptions:**
  6. Membrane penetrations of maximum 2-hour fire resistance rated walls and partitions by steel electrical boxes that exceed 16 square inches in area, or steel electrical boxes of any size having an aggregate area through the membrane exceeding 100 square inches in any 100 square feet of wall area, provided such penetrating items are protected by listed putty pads or other listed materials and methods, and installed in accordance with the listing.

Penetrations

- **714.4.3 Dissimilar materials.** Noncombustible penetrating items shall not connect to combustible items beyond the point of fire stopping unless it can be demonstrated that the fire-resistance integrity of the wall is maintained.

26

Penetrations

**714.5 Horizontal assemblies.** Penetrations of a fire-resistance-rated floor, floor/ceiling assembly or the ceiling membrane of a roof/ceiling assembly not required to be enclosed in a shaft by Section 712.1 shall be protected in accordance with Sections 714.5.1 through 714.5.4.

## Penetrations

- **714.5.1 Through penetrations.** Through penetrations of horizontal assemblies shall comply with Sections 714.5.1.1 through 714.5.1.2.

## Penetrations


- **714.5.1 Through penetrations.**

**Exceptions:**

1. Penetrations by steel, ferrous or copper conduits, pipes, tubes or vents or concrete or masonry items through a single fire-resistance-rated floor assembly where the annular space is protected with materials that prevent the passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E 119 or UL 263 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inch of water at the location of the penetration for the time period equivalent to the fire-resistance rating of the construction penetrated. Penetrating items with a maximum 6-inch nominal diameter shall not be limited to the penetration of a single fire-resistance-rated floor assembly, provided the aggregate area of the openings through the assembly does not exceed 144 square inches in any 100 square feet of floor area.

29

## Penetrations



- What is ferrous? A description indicating the presence of iron in metal. Ferrous metals include steel and pig iron and alloys of iron with other metals such as stainless steel.

## Penetrations

- **714.5.1 Through penetrations.**
- **Exceptions:**
  2. Penetrations in a single concrete floor by steel, ferrous or copper conduits, pipes, tubes or vents with a maximum 6-inch nominal diameter, provided the concrete, grout or mortar is installed the full thickness of the floor or the thickness required to maintain the fire resistance rating. The penetrating items shall not be limited to the penetration of a single concrete floor, provided the area of the opening through each floor does not exceed 144 square inches.

## Penetrations

- **714.5.1 Through penetrations.**
- **Exceptions:**
  3. Penetrations by listed electrical boxes of any material, provided such boxes have been tested for use in fire-resistance-rated assemblies and installed in accordance with the instructions included in the listing.

32

## Penetrations

- **714.5.1.1 Installation.** Through penetrations shall be protected using systems installed as tested in the approved fire-resistance rated assembly.

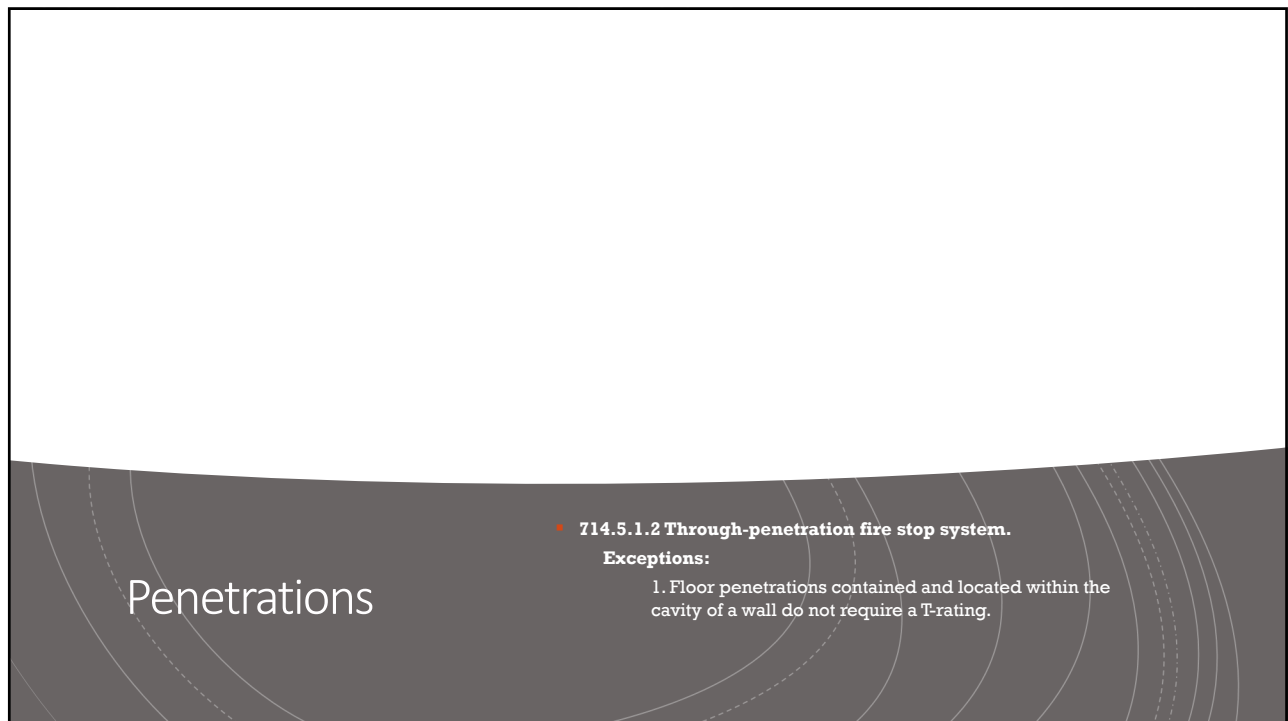




33

## Penetrations

- **714.5.1.2 Through-penetration fire stop system.** Through penetrations shall be protected by an approved through-penetration fire stop system installed and tested in accordance with ASTM E 814 or UL 1479, with a minimum positive pressure differential of 0.01 inch of water. The system shall have an F-rating/T-rating of not less than 1 hour but not less than the required rating of the floor penetrated.




## Penetrations

- **714.5.1.2 Through-penetration fire stop system.**  
**Exceptions:**
  1. Floor penetrations contained and located within the cavity of a wall do not require a T-rating.

35

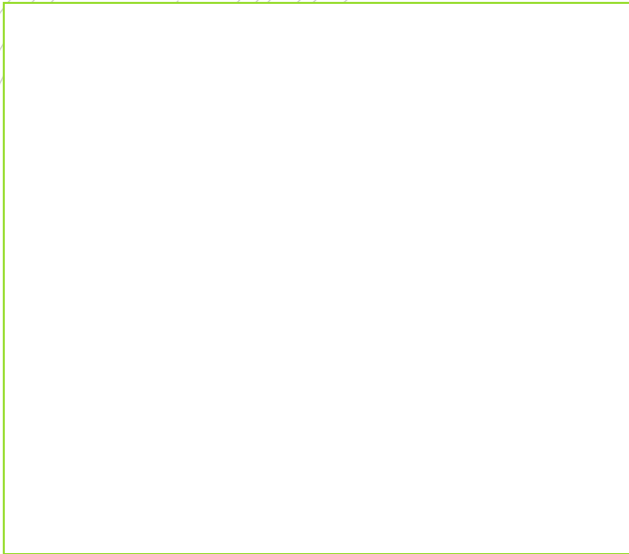
## Penetrations



- **714.5.1.2 Through-penetration fire stop system.**  
**Exceptions:**
  2. Floor penetrations by floor drains, tub drains or shower drains contained and located within the concealed space of a horizontal assembly do not require a T rating.

36

## Penetrations



- **714.5.1.2 Through-penetration fire stop system.**  
**Exceptions:**
  3. Floor penetrations of maximum 4-inch nominal diameter metal conduit or tubing penetrating directly into metal-enclosed electrical power switchgear do not require a T rating.

37

- **714.5.2 Membrane penetrations.** Penetrations of membranes that are part of a fire-resistance-rated horizontal assembly shall comply with Section 714.5.1.1 or 714.5.1.2. Where floor/ceiling assemblies are required to have a minimum 1-hour fire-resistance rating, recessed fixtures shall be installed such that the required fire resistance will not be reduced.

# Penetrations

# Penetrations

- **714.5.2 Membrane penetrations.**
  - Exceptions:
    1. Membrane penetrations by steel, ferrous or copper conduits, pipes, tubes or vents, or concrete or masonry items where the annular space is protected either in accordance with Section 714.5.1 or to prevent the free passage of flame and the products of combustion. The aggregate area of the openings through the membrane shall not exceed 100 square inches in any 100 square feet of ceiling area in assemblies tested without penetrations.
    2. Ceiling membrane penetrations of maximum 2-hour fire-resistance-rated horizontal assemblies by steel electrical boxes that do not exceed 16 square inches in area, provided the aggregate area of such penetrations does not exceed 100 square inches in any 100 square feet of ceiling area, and the annular space between the ceiling membrane and the box does not exceed 1/8 inch.

39

## Penetrations

- **714.5.2 Membrane penetrations.**
  - **Exceptions:**
    3. Membrane penetrations by electrical boxes of any size or type, which have been listed as part of an opening protective material system for use in horizontal assemblies and are installed in accordance with the instructions included in the listing.
    4. Membrane penetrations by listed electrical boxes of any material, provided such boxes have been tested for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the listing. The annular space between the ceiling membrane and the box shall not exceed 1/8 inch unless listed otherwise.

40

## Penetrations

- **714.5.2 Membrane penetrations.**
  - **Exceptions**
    5. The annular space created by the penetration of a fire sprinkler, provided it is covered by a metal escutcheon plate.

## Penetrations

- **714.5.2 Membrane penetrations.**

- **Exceptions:**

6. Noncombustible items that are cast into concrete building elements and that do not penetrate both top and bottom surfaces of the element.

7. The ceiling membrane of 1- and 2-hour fire resistance-rated horizontal assemblies is permitted to be interrupted with the double wood top plate of a fire-resistance-rated wall assembly that is sheathed with Type-X gypsum wallboard, provided that all penetrating items through the double top plates are protected in accordance with Section 714.5.1.1 or 714.5.1.2 and the ceiling membrane is tight to the top plates.

## Penetrations

- **Exceptions:**

8. Ceiling membrane penetrations by listed luminaires (light fixtures) or by luminaires protected with listed materials, which have been tested for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the listing.

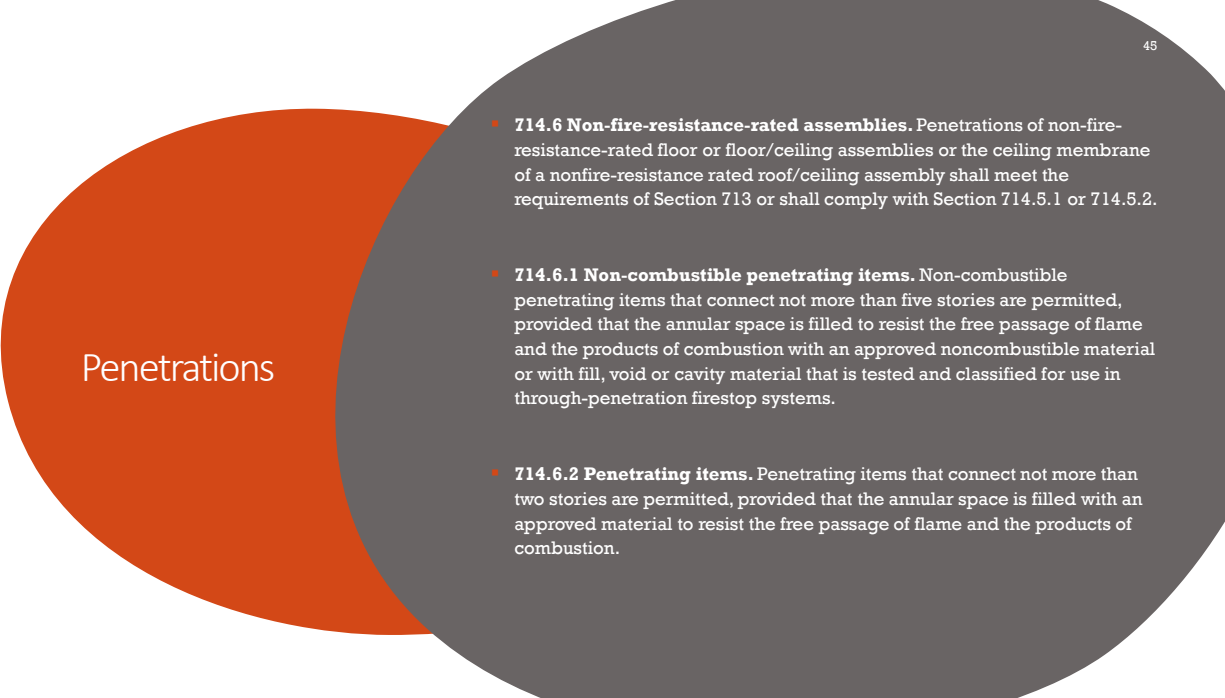
## Penetrations

**714.5.3 Dissimilar materials.** Noncombustible penetrating items shall not connect to combustible materials beyond the point of fire stopping unless it can be demonstrated that the fire-resistance integrity of the horizontal assembly is maintained.

## Penetrations

**714.5.4 Penetrations in smoke barriers.** Penetrations in smoke barriers shall be protected by an approved through penetration firestop system installed and tested in accordance with the requirements of UL 1479 for air leakage. The L rating of the system measured at 0.30 inch of water in both the ambient temperature and elevated temperature tests shall not exceed:


1. 5.0 cfm per square foot of penetration opening for each through-penetration firestop system; or
2. A total cumulative leakage of 50 cfm for any 100 square feet of wall area, or floor area.



45

- **714.6 Non-fire-resistance-rated assemblies.** Penetrations of non-fire-resistance-rated floor or floor/ceiling assemblies or the ceiling membrane of a nonfire-resistance rated roof/ceiling assembly shall meet the requirements of Section 713 or shall comply with Section 714.5.1 or 714.5.2.
- **714.6.1 Non-combustible penetrating items.** Non-combustible penetrating items that connect not more than five stories are permitted, provided that the annular space is filled to resist the free passage of flame and the products of combustion with an approved noncombustible material or with fill, void or cavity material that is tested and classified for use in through-penetration firestop systems.
- **714.6.2 Penetrating items.** Penetrating items that connect not more than two stories are permitted, provided that the annular space is filled with an approved material to resist the free passage of flame and the products of combustion.

Penetrations



46

**FIRE-RESISTANT  
JOINT SYSTEMS**

Section 715

47

## Fire-Resistant Joint Systems

**715.1 General.** Joints installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies shall be protected by an approved fire-resistant joint system designed to resist the passage of fire for a time period not less than the required fire-resistance rating of the wall, floor or roof in or between which it is installed. Fire-resistant joint systems shall be tested in accordance with Section 715.3.

48


## Fire-Resistant Joint Systems

▪ **715.1 General**

**Exception:** Fire-resistant joint systems shall not be required for joints in all of the following locations:

1. Floors within a single dwelling unit.
2. Floors where the joint is protected by a shaft enclosure in accordance with Section 713.
3. Floors within atriums where the space adjacent to the atrium is included in the volume of the atrium for smoke control purposes.
4. Floors within malls.






49

## Fire-Resistant Joint Systems

- **715.1 General**
  - Exception continued:**
  - 5. Floors and ramps within parking garages or structures constructed in accordance with Sections 406.5 and 406.6.
  - 6. Mezzanine floors.
  - 7. Walls that are permitted to have unprotected openings.
  - 8. Roofs where openings are permitted.
  - 9. Control joints not exceeding a maximum width of 0.625 inch and tested in accordance with ASTM E 119 or UL 263.
  - 10. The intersection of exterior curtain wall assemblies and the roof slab or roof deck.



50

## Fire-Resistant Joint Systems

- **715.1.1 Curtain wall assembly.** The void created at the intersection of a floor/ceiling assembly and an exterior curtain wall assembly shall be protected in accordance with Section 715.4.

## Fire-Resistant Joint Systems

- 715.2 Installation.** A fire-resistant joint system shall be securely installed in accordance with the manufacturer's installation instructions and the listing criteria in or on the joint for its entire length so as not to impair its ability to accommodate expected building movements and to resist the passage of fire and hot gases.

## Fire-Resistant Joint Systems

- 715.3 Fire test criteria.** Fire-resistant joint systems shall be tested in accordance with the requirements of either ASTM E 1966 or UL 2079. Nonsymmetrical wall joint systems shall be tested with both faces exposed to the furnace, and the assigned fire-resistance rating shall be the shortest duration obtained from the two tests. When evidence is furnished to show that the wall was tested with the least fire-resistant side exposed to the furnace, subject to acceptance of the building official, the wall need not be subjected to tests from the opposite side.

**Exception:** For exterior walls with a horizontal fire separation distance greater than 10 feet, the joint system shall be required to be tested for interior fire exposure only.

For SFM regulated occupancies, the exception does not apply. See CBC Sec. 705.5

## Fire-Resistant Joint Systems

- **715.4 Exterior curtain wall/floor intersection.** Where fire resistance-rated floor or floor/ceiling assemblies are required, voids created at the intersection of the exterior curtain wall assemblies and such floor assemblies shall be sealed with an approved material or system to prevent the interior spread of fire. Such systems shall be securely installed and tested in accordance with ASTM E 2307 to provide an F rating for a time period at least equal to the fire-resistance rating of the floor assembly. Height and fire-resistance requirements for curtain wall spandrels shall comply with Section 705.8.5.

## Fire-Resistant Joint Systems

- **715.4 Exterior curtain wall/floor intersection.**  
**Exception:** Voids created at the intersection of the exterior curtain wall assemblies and such floor assemblies where the vision glass extends to the finished floor level shall be permitted to be sealed with an approved material to prevent the interior spread of fire. Such material shall be securely installed and capable of preventing the passage of flame and hot gases sufficient to ignite cotton waste where subjected to ASTM E 119 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inch of water column for the time period at least equal to the fire-resistance rating of the floor assembly.

55

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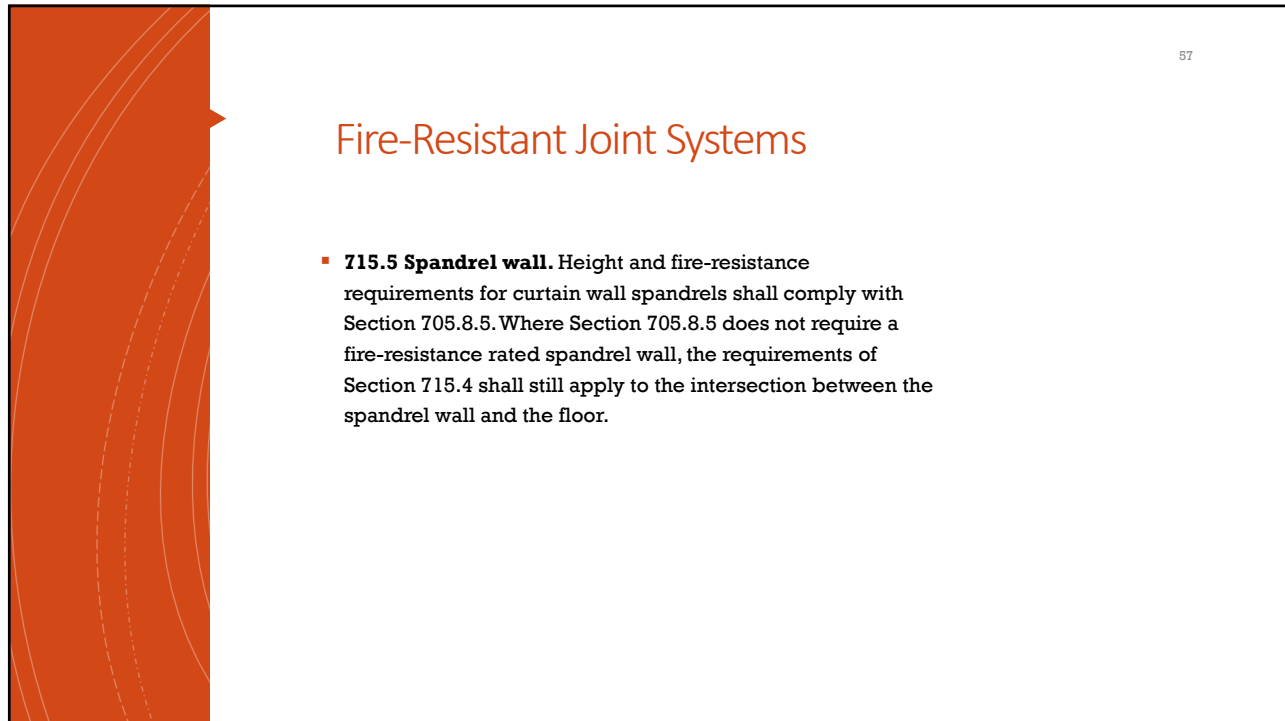
## Fire-Resistant Joint Systems

- **715.4.1 Exterior curtain wall/nonfire-resistance-rated floor assembly intersections.** Voids created at the intersection of exterior curtain wall assemblies and nonfire-resistance-rated floor or floor/ceiling assemblies shall be sealed with an approved material or system to retard the interior spread of fire and hot gases between stories.

56

## Fire-Resistant Joint Systems

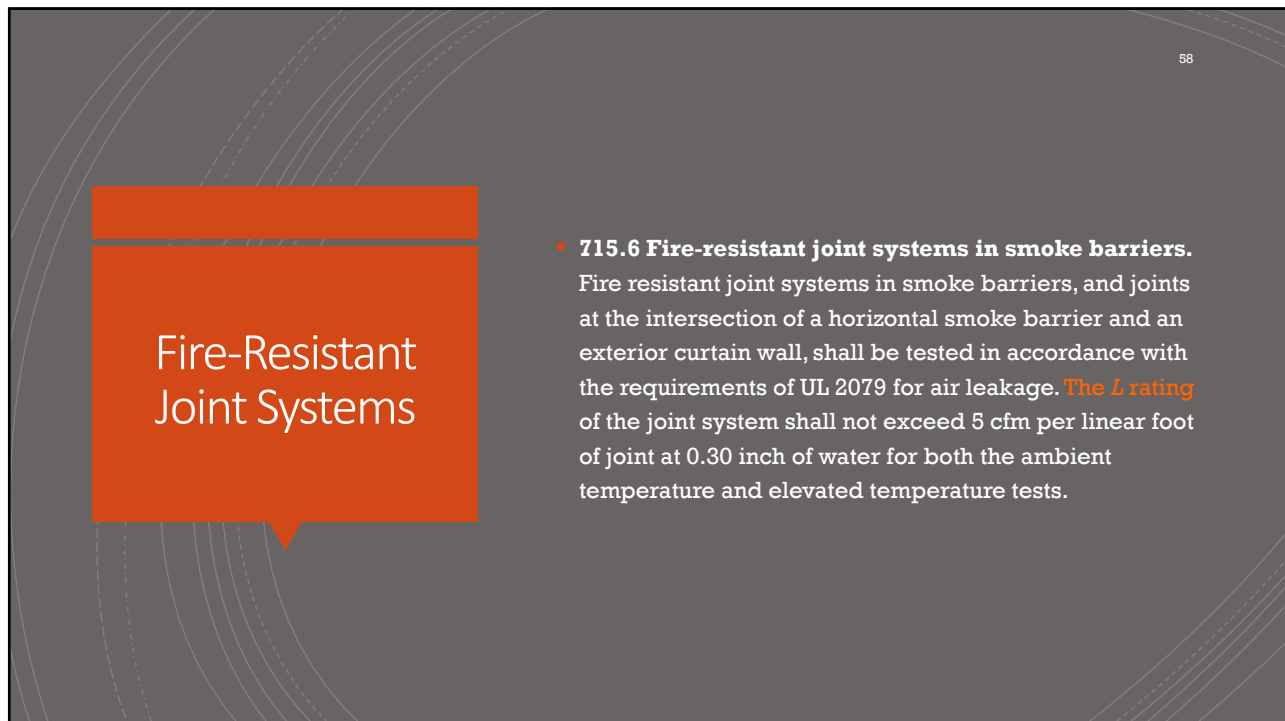
- **715.4.2 Exterior curtain wall/vertical fire barrier intersections.** Voids created at the intersection of nonfire-resistance-rated exterior curtain wall assemblies and fire barriers shall be filled. An approved material or system shall be used to fill the void and shall be securely installed in or on the intersection for its entire length so as not to dislodge, loosen or otherwise impair its ability to accommodate expected building movements and to retard the passage of fire and hot gases.



57

## Fire-Resistant Joint Systems

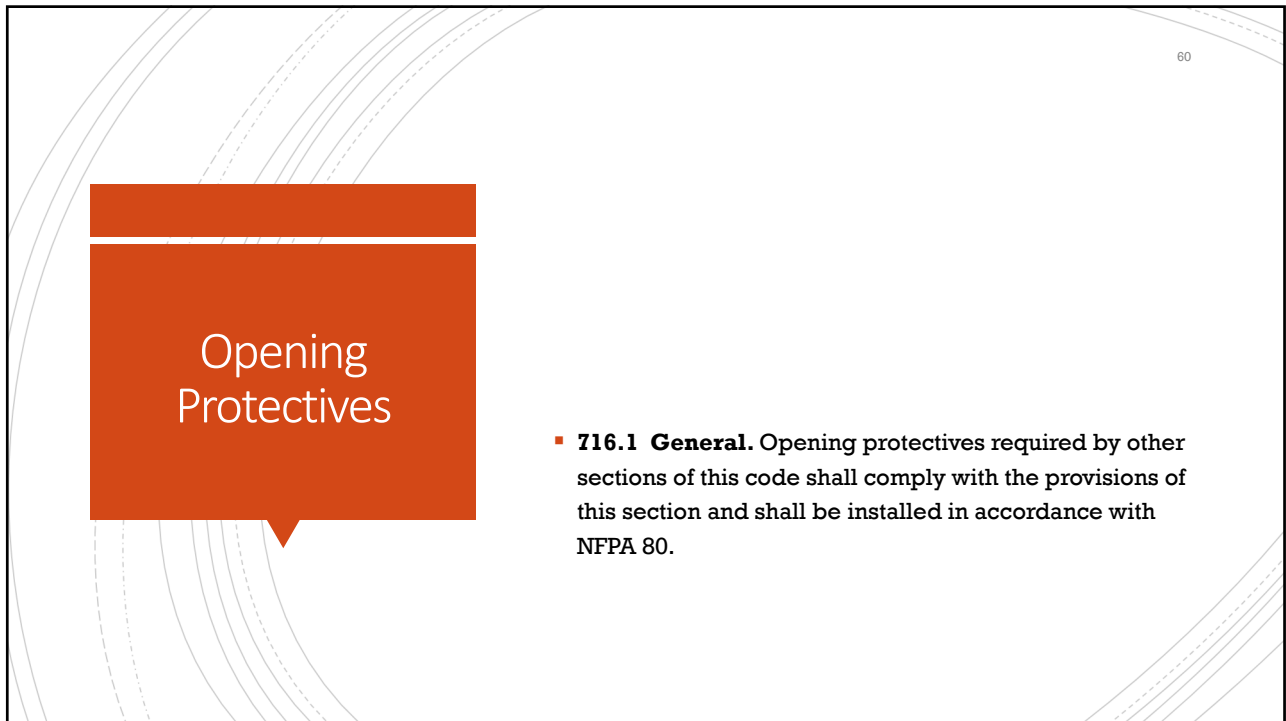
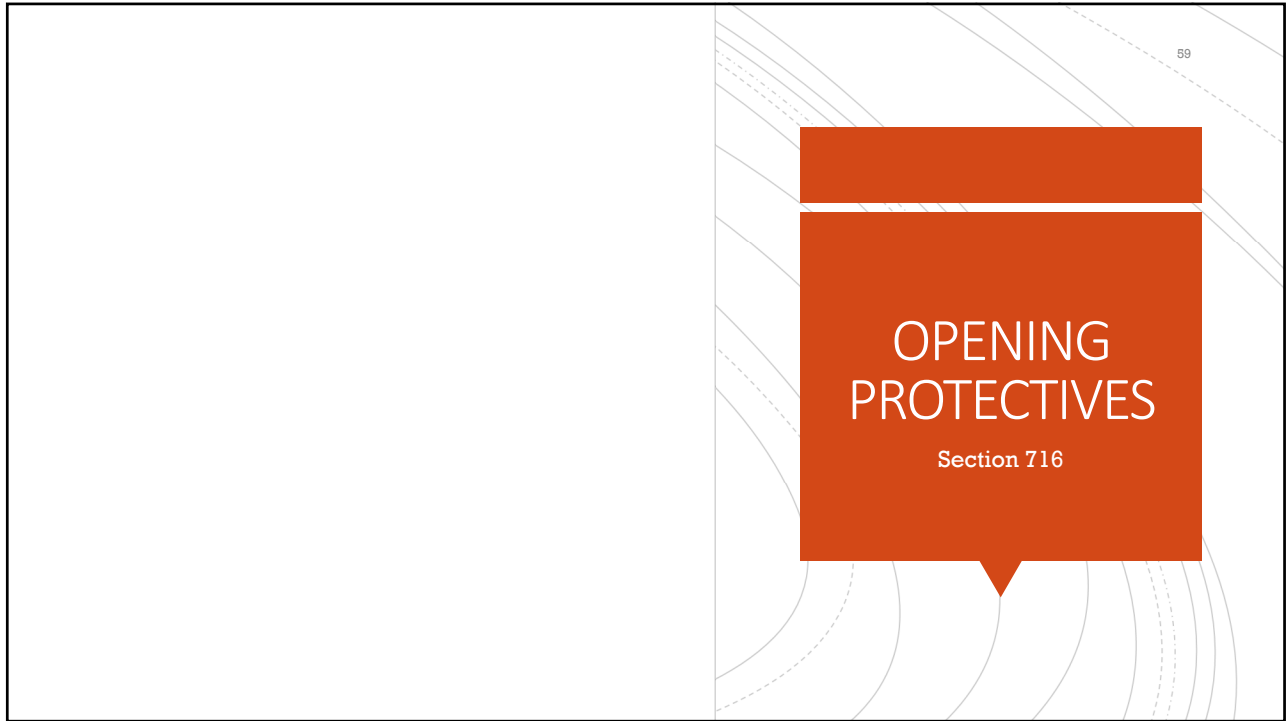
- **715.5 Spandrel wall.** Height and fire-resistance requirements for curtain wall spandrels shall comply with Section 705.8.5. Where Section 705.8.5 does not require a fire-resistance rated spandrel wall, the requirements of Section 715.4 shall still apply to the intersection between the spandrel wall and the floor.



58

## Fire-Resistant Joint Systems

- **715.6 Fire-resistant joint systems in smoke barriers.** Fire resistant joint systems in smoke barriers, and joints at the intersection of a horizontal smoke barrier and an exterior curtain wall, shall be tested in accordance with the requirements of UL 2079 for air leakage. The *L* rating of the joint system shall not exceed 5 cfm per linear foot of joint at 0.30 inch of water for both the ambient temperature and elevated temperature tests.



61

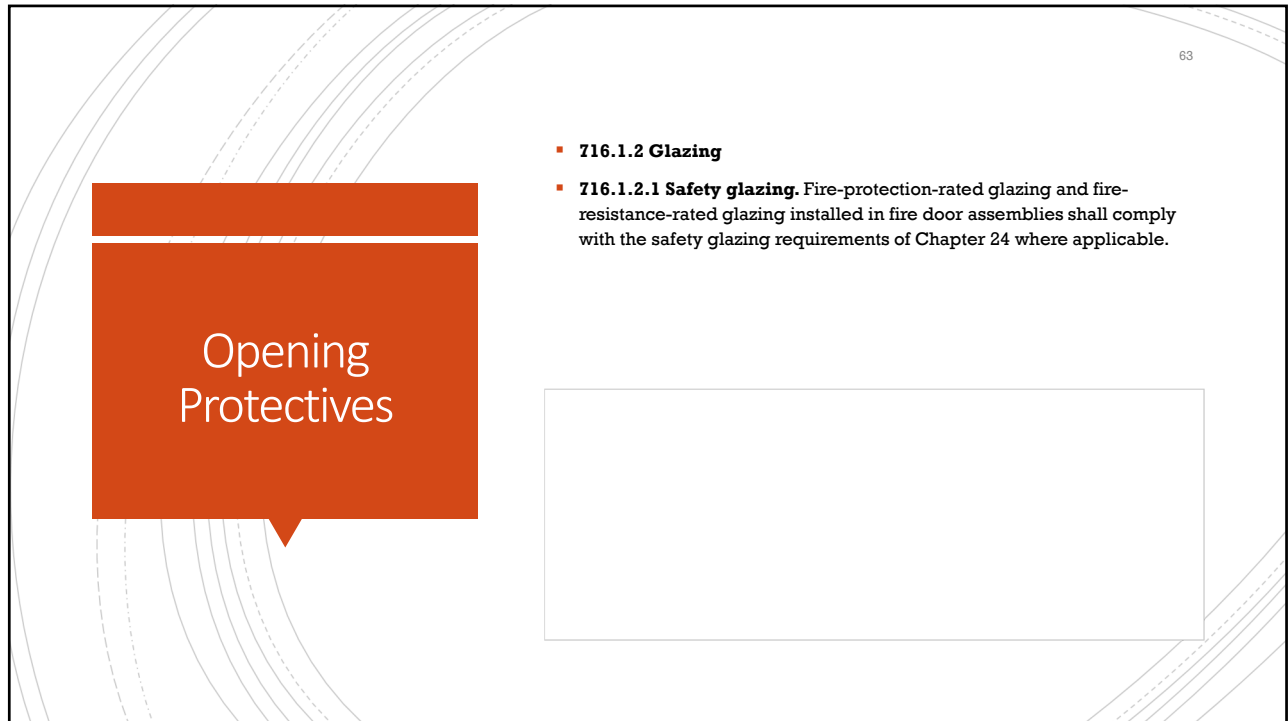
## Opening Protectives

- **716.1.1 Alternative methods for determining fire protection ratings.** The application of any of the alternative methods listed in this section shall be based on the fire exposure and acceptance criteria specified in NFPA 252, NFPA 257, UL 9, UL 10B or UL 10C. The required fire resistance of an opening protective shall be permitted to be established by any of the following methods or procedures:
  1. Designs documented in approved sources.
  2. Calculations performed in an approved manner.
  3. Engineering analysis based on a comparison of opening protective designs having fire-protection ratings as determined by the test procedures set forth in NFPA 252, NFPA 257, UL 9, UL 10B or UL 10C.
  4. Alternative protection methods as allowed by Section 104.11.

62

## Opening Protectives

- **716.1.2 Glazing.** Glazing used in fire door assemblies and fire window assemblies shall comply with this section in addition to the requirements of Sections 716.2 and 716.3, respectively.



63

Opening Protectives

- **716.1.2 Glazing**
- **716.1.2.1 Safety glazing.** Fire-protection-rated glazing and fire-resistance-rated glazing installed in fire door assemblies shall comply with the safety glazing requirements of Chapter 24 where applicable.

A large empty rectangular box is present on the right side of the slide.



64

Opening Protectives

- **Definitions:**
- **Fire Rated Glazing.** Glazing with either a fire-protection rating or a fire-resistance rating.
  - **Fire-protection rating:** Opening protectives  
NFPA 257 or UL 9 windows  
NFPA 252 or UL 10B or UL 10C doors
  - **Fire-resistance rating:** Building elements  
ASTM E119 or UL 263 wall test



65

Opening  
Protectives

- **716.1.2 Glazing**
- **716.1.2.2 Marking fire-rated glazing assemblies.** Fire-rated glazing assemblies shall be marked in accordance with Tables 716.1(1), 716.1(2), and 716.1(3).
- **716.1.2.2.1 Fire-rated glazing identification.** For fire-rated glazing, the label shall bear the identification required in Tables 716.1(1) and 716.1(2). “D” indicates that the glazing is permitted to be used in fire door assemblies and that the glazing meets the fire protection requirements of NFPA 252, UL 10B or UL 10C. “H” shall indicate that the glazing meets the hose stream requirements of NFPA 252, UL 10B or UL 10C. “T” shall indicate that the glazing meets the temperature requirements of Section 716.2.2.3.1. The placeholder “XXX” represents the fire-rating period, in minutes.

66

## Opening Protectives

- **716.1.2 Glazing**
- **716.1.2.2.2 Fire-protection-rated glazing identification.** For fire-protection-rated glazing, the label shall bear the following identification required in Tables 716.1(1) and 716.1(3): “OH – XXX.” “OH” indicates that the glazing meets both the fire protection and the hose-stream requirements of NFPA 257 or UL 9 and is permitted to be used in fire window openings. The placeholder “XXX” represents the fire-rating period, in minutes.

## Opening Protectives

- **716.1.2 Glazing**
- **716.1.2.2.3 Fire-resistance-rated glazing identification.**  
For fire-resistance-rated glazing, the label shall bear the identification required in Section 703.6 and Table 716.1.(1).

### 716.1.2 Glazing

TABLE 716.1(2)  
OPENING FIRE PROTECTION ASSEMBLIES, RATINGS AND MARKINGS

TYPE OF ASSEMBLY	REQUIRED WALL ASSEMBLY RATING (hours)	MINIMUM (FIRE DOOR) AND FIRE SHUTTERS ASSEMBLY RATING (hours)	DOOR VISION PANEL SIZE <sup>a</sup>	FIRE-RATED GLAZING MARKING DOOR VISION PANEL <sup>a</sup>	MINIMUM SIDELIGHT/TRANSOM ASSEMBLY RATING (hours)		FIRE-RATED GLAZING MARKING SIDELIGHT/TRANSOM PANEL	
					Fire protection	Fire resistance	Fire protection	Fire resistance
Fire walls and fire barriers having a required fire-resistance rating greater than 1 hour	4	3	See Note b	D-H-W-240	Not Permitted	4	Not Permitted	W-240
	3	3 <sup>a</sup>	See Note b	D-H-W-180	Not Permitted	3	Not Permitted	W-180
	2	1½	100 sq. in.	≤ 100 sq. in. = D-H-90 > 100 sq. in. = D-H-W-90	Not Permitted	2	Not Permitted	W-120
	1½	1½	100 sq. in.	≤ 100 sq. in. = D-H-90 > 100 sq. in. = D-H-W-90	Not Permitted	1½	Not Permitted	W-90
Enclosures for shafts, interior exit stairways and interior exit ramps.	2	1½	100 sq. in. <sup>c</sup>	≤ 100 sq. in. = D-H-90 > 100 sq. in. = D-H-T-W-90	Not Permitted	2	Not Permitted	W-120
Horizontal exits in fire walls <sup>d</sup>	4	3	100 sq. in.	≤ 100 sq. in. = D-H-180 > 100 sq. in. = D-H-W-240	Not Permitted	4	Not Permitted	W-240
	3	3 <sup>a</sup>	100 sq. in.	≤ 100 sq. in. = D-H-180 > 100 sq. in. = D-H-W-180	Not Permitted	3	Not Permitted	W-180
Fire barriers having a required fire-resistance rating of 1 hour: Enclosures for shafts, exit access stairways, exit access ramps, interior exit stairways and interior exit ramps; and exit passageway walls	1	1	100 sq. in.	≤ 100 sq. in. = D-H-60 > 100 sq. in. = D-H-T-W-60	Not Permitted	1	Not Permitted	W-60
<b>Fire protection</b>								
Other fire barriers	1	¾	Maximum size tested	D-H		¾	<b>I</b>	D-H
Fire partitions: Corridor walls	1	½ <sup>b</sup>	Maximum size tested	D-20		½ <sup>b</sup>		D-H-OH-45
	0.5	½ <sup>b</sup>	Maximum size tested	D-20		½		D-H-OH-20
Other fire partitions	1	¾	Maximum size tested	D-H-45		¾		D-H-45
	0.5	½	Maximum size tested	D-H-20		½		D-H-20

(continued)

### 716.1.2 Glazing

**TABLE 716.1(2)—continued  
OPENING FIRE PROTECTION ASSEMBLIES, RATINGS AND MARKINGS**

TYPE OF ASSEMBLY	REQUIRED WALL ASSEMBLY RATING (hours)	MINIMUM FIRE DOOR AND FIRE SHUTTER ASSEMBLY RATING (hours)	DOOR VISION PANEL SIZE <sup>a</sup>	FIRE-RATED GLAZING MARKING DOOR VISION PANELS <sup>a</sup>	MINIMUM SIDELIGHT/TRANSOM ASSEMBLY RATING (hours)		FIRE-RATED GLAZING MARKING SIDELIGHT/TRANSOM PANEL	
					Fire protection	Fire resistance	Fire protection	Fire resistance
Exterior walls	3	1½	100 sq. in. <sup>b</sup>	≤ 100 sq. in. = D-H-90 > 100 sq. in. = D-H-W-90	Not Permitted	3	Not Permitted	W-180
	2	1½	Maximum size tested	D-H-90 or D-H-W-90	1½	2	D-H-OH-90	W-120
	1	¾	Maximum size tested	D-H-45	¾		D-H-45	
Smoke barriers					Fire protection			
	1	½	Maximum size tested	D-20	¾		D-H-OH-45	

For SI: 1 square inch = 645.2 mm.

a. Two doors, each with a fire protection rating of 1½ hours, installed on opposite sides of the same opening in a fire wall, shall be deemed equivalent in fire protection rating to one 3-hour fire door.

b. Fire-resistance-rated glazing tested to ASTM E119 in accordance with Section 716.1.2.3 shall be permitted, in the maximum size tested.

c. Under the column heading "Fire-rated glazing marking door vision panel," W refers to the fire-resistance rating of the glazing, not the frame.

d. See Section 716.2.5.1.2.1.

e. See Section 716.1.2.2.1 and Table 716.1(1) for additional permitted markings.

f. Fire-protection-rated glazing is not permitted for barriers required by Section 1206 of the California Fire Code to enclose energy storage systems. Fire-resistance-rated glazing assemblies tested to ASTM E119 or UL 263, as specified in Section 716.1.2.3 shall be permitted.

**TABLE 716.1(3)  
FIRE WINDOW ASSEMBLY FIRE PROTECTION RATINGS**

TYPE OF WALL ASSEMBLY	REQUIRED WALL ASSEMBLY RATING (hours)	MINIMUM FIRE WINDOW ASSEMBLY RATING (hours)	FIRE-RATED GLAZING MARKING
Interior walls			
Fire walls	All	NP <sup>a</sup>	W-XXX <sup>b</sup>
Fire barriers	>1 1	NP <sup>a</sup> NP <sup>a</sup>	W-XXX <sup>b</sup> W-XXX <sup>b</sup>
Atrium separations (Section 707.3.6), Incidental use areas (Section 707.3.7), Mixed occupancy separations (Section 707.3.9)	1	¾ <sup>c</sup>	OH-45 or W-60
Fire partitions	1 0.5	¾ ½	OH-45 or W-60 OH-20 or W-30
Smoke barriers	1	¾	OH-45 or W-60
Exterior walls	>1 1 0.5	1½ ¾ ½	OH-90 or W-XXX <sup>b</sup> OH-45 or W-60 OH-20 or W-30
Party wall	All	NP	Not Applicable

NP = Not Permitted.


a. Not permitted except fire-resistance-rated glazing assemblies tested to ASTM E119 or UL 263, as specified in Section 716.1.2.3.

b. XXX = The fire rating duration period in minutes, which shall be equal to the fire-resistance rating required for the wall assembly.

c. Fire-protection-rated glazing is not permitted for fire barriers required by Section 1206 of the California Fire Code to enclose energy storage systems. Fire-resistance-rated glazing assemblies tested to ASTM E119 or UL 263, as specified in Section 716.1.2.3 shall be permitted.

71

## Opening Protectives



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

72

## Opening Protectives

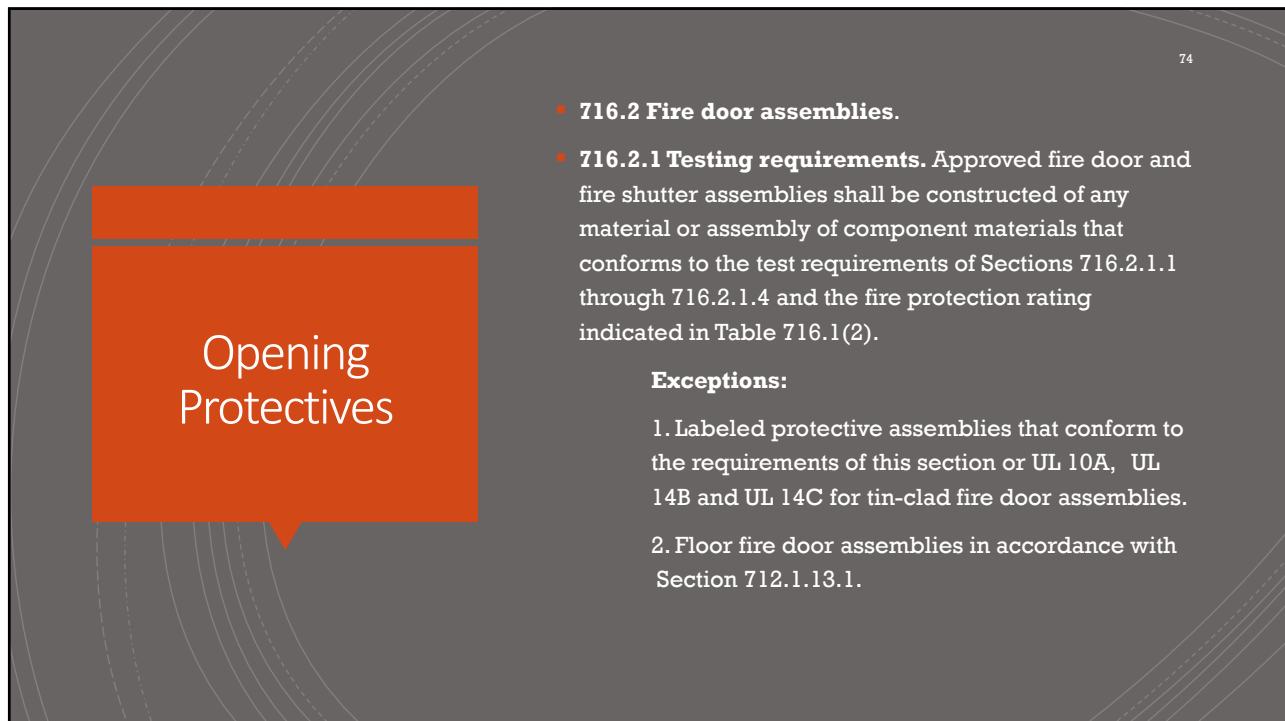
- **716.1.2 Glazing**
- **716.1.2.3 Fire-resistance-rated glazing.** Fire-resistance-rated glazing tested as part of a fire-resistance rated wall or floor/ceiling assembly in accordance with ASTM E119 or UL 263 and labeled in accordance with Section 703.6 shall not otherwise be required to comply with this section where used as part of a wall or floor/ceiling assembly.
- **716.1.2.3.1 Glazing in fire door and fire window assemblies.** Fire-resistance-rated glazing shall be permitted in fire door and fire window assemblies where tested and installed in accordance with their listings and where in compliance with the requirements of this section



73

## Opening Protectives

- **716.2 Fire door assemblies.** Fire door assemblies required by other sections of this code shall comply with the provisions of this section. Fire door frames with transom lights, sidelights or both shall be permitted in accordance with Section 716.2.5.4.



74

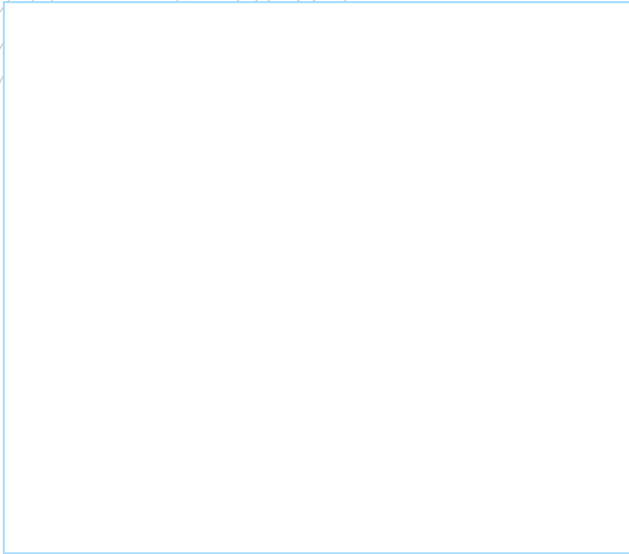
## Opening Protectives

- **716.2 Fire door assemblies.**
- **716.2.1 Testing requirements.** Approved fire door and fire shutter assemblies shall be constructed of any material or assembly of component materials that conforms to the test requirements of Sections 716.2.1.1 through 716.2.1.4 and the fire protection rating indicated in Table 716.1(2).

**Exceptions:**

1. Labeled protective assemblies that conform to the requirements of this section or UL 10A, UL 14B and UL 14C for tin-clad fire door assemblies.
2. Floor fire door assemblies in accordance with Section 712.1.13.1.


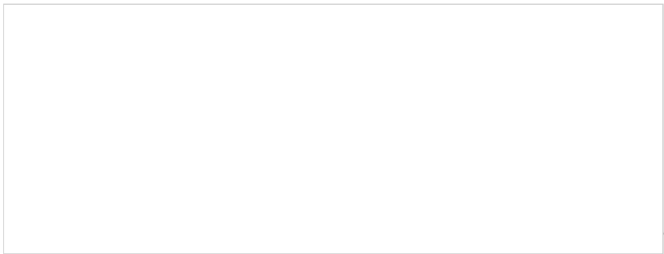
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## Opening Protectives

- **716.2 Fire door assemblies.**
- **716.2.1.1 Side-hinged or pivoted swinging doors.** Fire door assemblies with side-hinged and pivoted swinging doors shall be tested in accordance with NFPA 252 or UL 10C. For tests conducted in accordance with NFPA 252, the fire test shall be conducted using the positive pressure method specified in the standard.

76



## Opening Protectives

- **716.2 Fire door assemblies.**
- **716.2.1.2 Other types of assemblies.** Fire door assemblies with other types of doors, including swinging elevator doors, horizontal sliding fire doors, rolling steel fire doors, fire shutters, bottom- and side-hinged chute intake doors, and top-hinged chute discharge doors, shall be tested in accordance with NFPA 252 or UL 10B. For tests conducted in accordance with NFPA 252, the neutral pressure plane in the furnace shall be maintained as nearly equal to the atmospheric pressure as possible at the top of the door, as specified in the standard.

77

Opening Protectives

**716.2 Fire door assemblies.**

**716.2.1.3 Glazing in transoms lights and sidelights in corridors and smoke barriers.** Glazing material in any other part of the door assembly, including transom lights and sidelights, shall be tested in accordance with NFPA 257 or UL 9, including the hose stream test, in accordance with Section 716.3.1.1.

78

Opening Protectives

- **716.2 Fire door assemblies.**
- **716.2.1.4 Smoke and draft control.** Fire door assemblies that serve as smoke and draft control assemblies shall be tested in accordance with UL 1784.

79

## Opening Protectives

- **716.2 Fire door assemblies.**
- **716.2.2 Performance requirements.** Fire door assemblies shall be installed in the assemblies specified in Table 716.1(2) and shall comply with the fire protection rating specified.

80

## Opening Protectives

- **716.2 Fire door assemblies.**
- **716.2.2.1 Door assemblies in corridors and smoke barriers.** Fire door assemblies required to have a minimum fire protection rating of 20 minutes where located in corridor walls or smoke barrier walls having a fire resistance rating in accordance with Table 716.1(2) shall be tested in accordance with NFPA 252 or UL 10C without the hose stream test.
  - Exceptions:**
    1. Viewports that require a hole not larger than 1 inch in diameter through the door, have not less than a 0.25-inch-thick glass disc and the holder is of metal that will not melt out where subject to temperatures of 1,700°F (927°C).



81

**716.2 Fire door assemblies.**

**716.2.2.1 Door assemblies in corridors and smoke barriers.**

**Exceptions continued:**

I-

2. Corridor door assemblies in occupancies of Group I-2 and 2.1 in fully sprinklered buildings shall be in accordance with Section 407.3.1.
3. Unprotected openings shall be permitted for corridors in multitheater complexes where each motion picture auditorium has not fewer than one-half of its required exit or exit access doorways opening directly to the exterior or into an exit passageway.
4. Horizontal sliding doors in smoke barriers that comply with Sections 408.6 and 408.8.1 in occupancies in Group I-3.

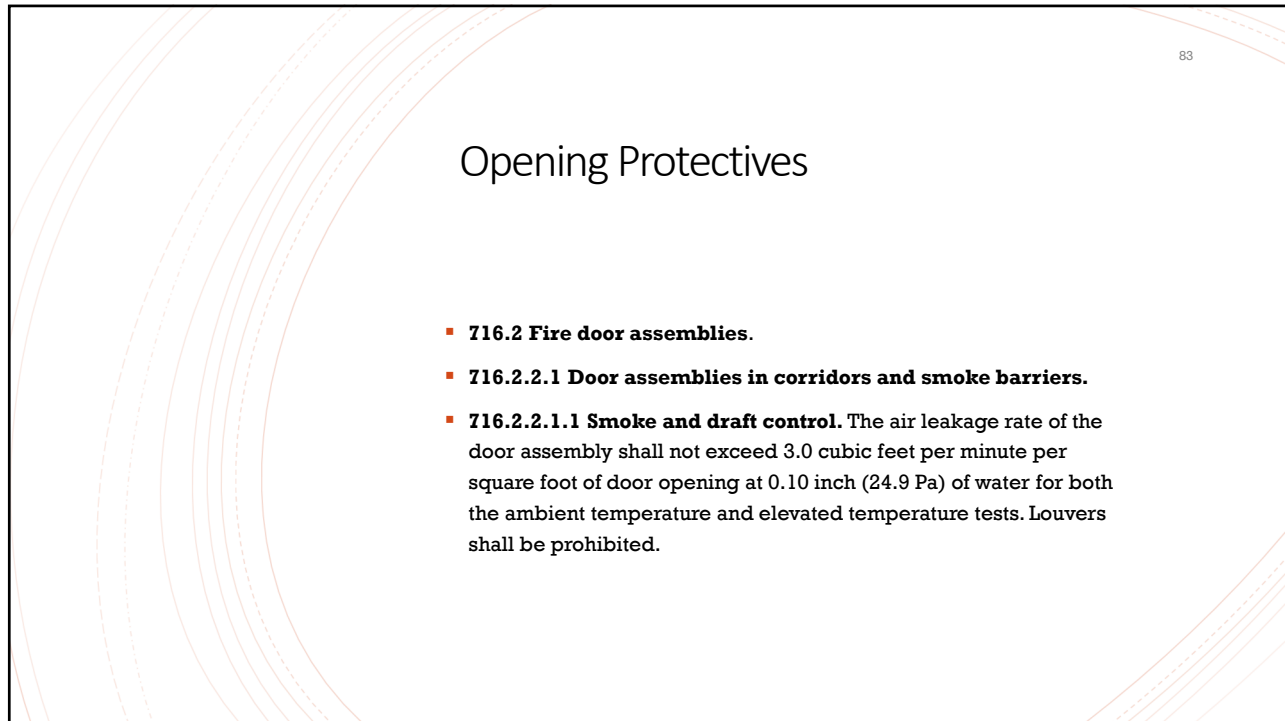
82

## Opening Protectives

- **716.2 Fire door assemblies.**
- **716.2.2.1 Door assemblies in corridors and smoke barriers.**

**Exceptions continued:**

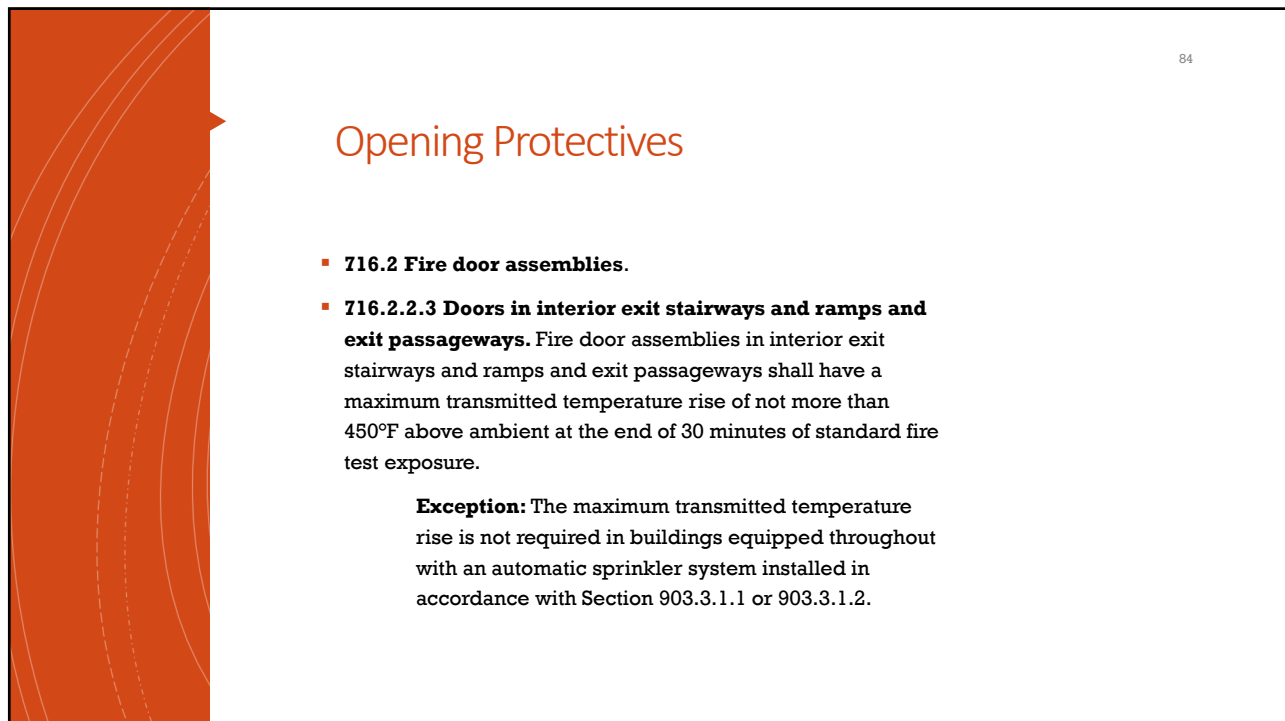
5. Group I-3 occupancy cell or room doors that have any of the following as integral parts of the rated door assembly:  
*Sidelights, Cuff Ports, Speaker Ports and open into a required exit corridor within a cell complex, medical suite, mental health suite, program office, family visiting area or complex control area.*
6. Safety room doors with a food pass with a lockable shutter, no more than 4 inches high, and located between 26 inches and 32 inches as measured from the bottom of the food pass to the floor.



83

## Opening Protectives

- **716.2 Fire door assemblies.**
- **716.2.2.1 Door assemblies in corridors and smoke barriers.**
- **716.2.2.1.1 Smoke and draft control.** The air leakage rate of the door assembly shall not exceed 3.0 cubic feet per minute per square foot of door opening at 0.10 inch (24.9 Pa) of water for both the ambient temperature and elevated temperature tests. Louvers shall be prohibited.



84

## Opening Protectives

- **716.2 Fire door assemblies.**
- **716.2.2.3 Doors in interior exit stairways and ramps and exit passageways.** Fire door assemblies in interior exit stairways and ramps and exit passageways shall have a maximum transmitted temperature rise of not more than 450°F above ambient at the end of 30 minutes of standard fire test exposure.  
**Exception:** The maximum transmitted temperature rise is not required in buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2.

85

## Opening Protectives

- **716.2 Fire door assemblies.**
- **716.2.2.3 Doors in interior exit stairways and ramps and exit passageways.**
- **716.2.2.3.1 Glazing in Doors.** Fire-protection-rated glazing in excess of 100 square inches is not permitted. Fire-resistance rated glazing in excess of 100 square inches shall be permitted in fire doors. Listed fire-resistance-rated glazing in a fire door shall have a maximum transmitted temperature rise in accordance with Section 716.2.2.3 when the fire door is tested in accordance with NFPA 252, UL 10B or UL 10C.

86

## Opening Protectives

- **716.2 Fire door assemblies.**
- **716.2.2.3.1 Glazing in doors in interior exit stairways and ramps and exit passageways.**

87

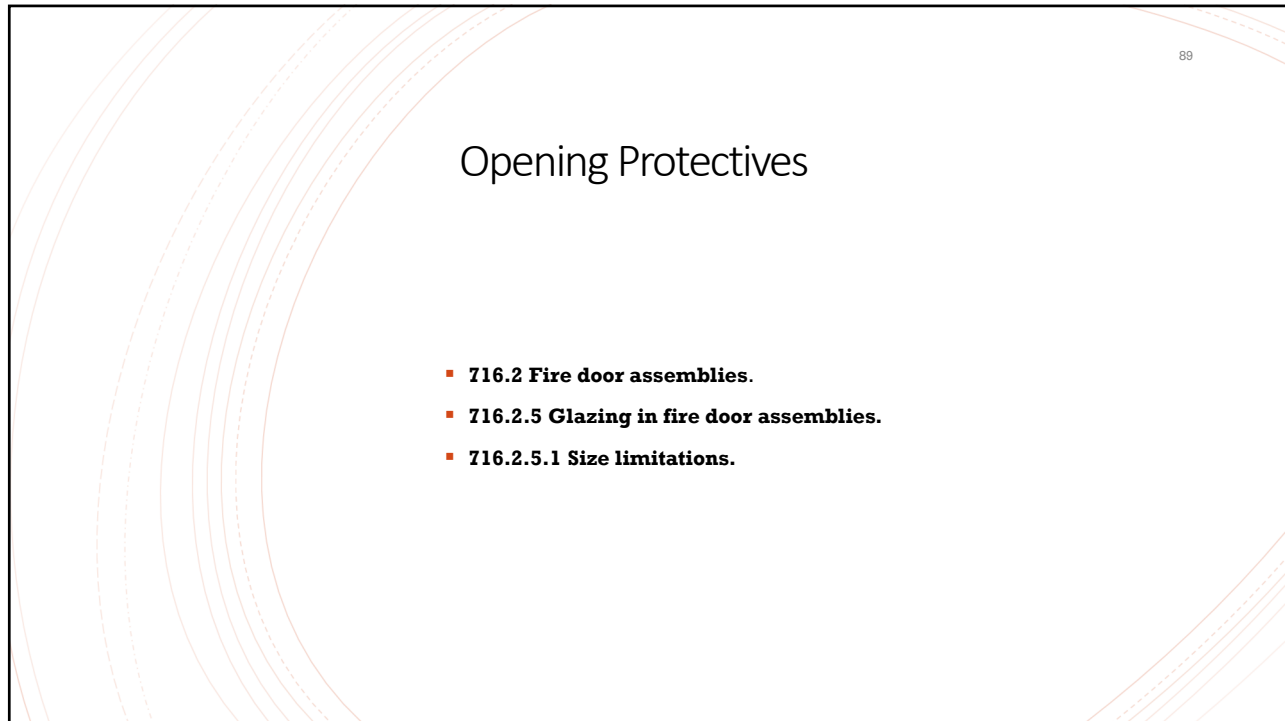
## Opening Protectives

- **716.2 Fire door assemblies.**
- **716.2.3 Fire doors.** Fire doors installed within a fire door assembly shall meet the fire rating indicated in Table 716.1(2).
- **716.2.4 Fire door frames.** Fire door frames installed as part of a fire door assembly shall meet the fire rating indicated in Table 716.1(2).

88

## Opening Protectives

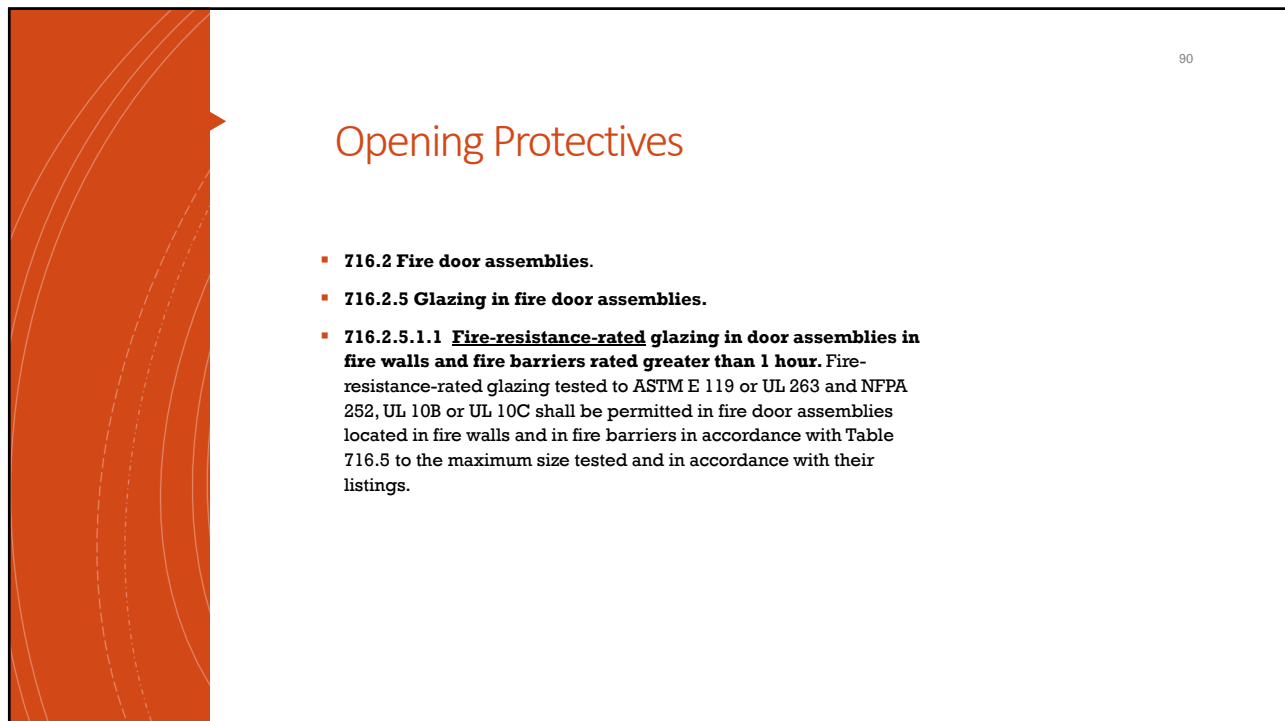
- **716.2 Fire door assemblies.**
- **716.2.5 Glazing in fire door assemblies.** Fire-rated glazing conforming to the opening protection requirements in Section 716.2.1 shall be permitted in fire door assemblies.
- **716.2.5.1 Size limitations.** Fire-resistance-rated glazing shall comply with the size limitations in Section 716.2.5.1.1. Fire-protection-rated glazing shall comply with the size limitations of NFPA 80, and as provided in Section 716.2.5.1.2.



89

## Opening Protectives

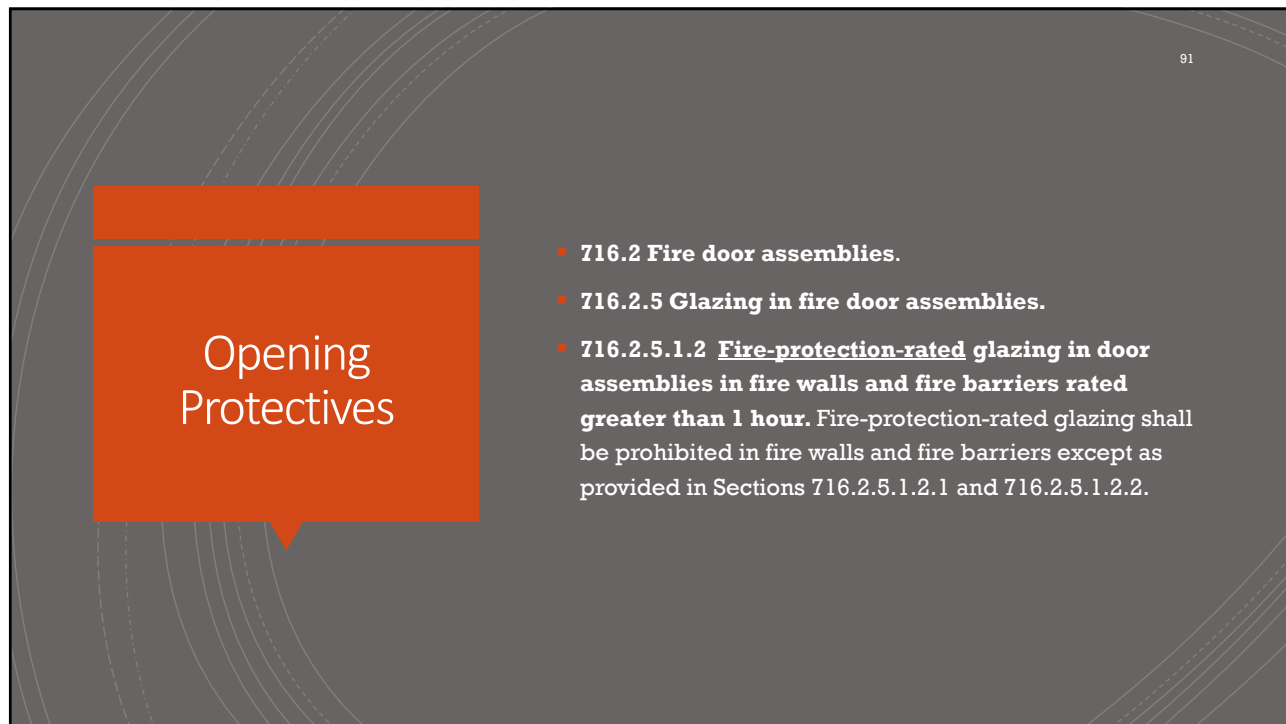
- **716.2 Fire door assemblies.**
- **716.2.5 Glazing in fire door assemblies.**
- **716.2.5.1 Size limitations.**



90

## Opening Protectives

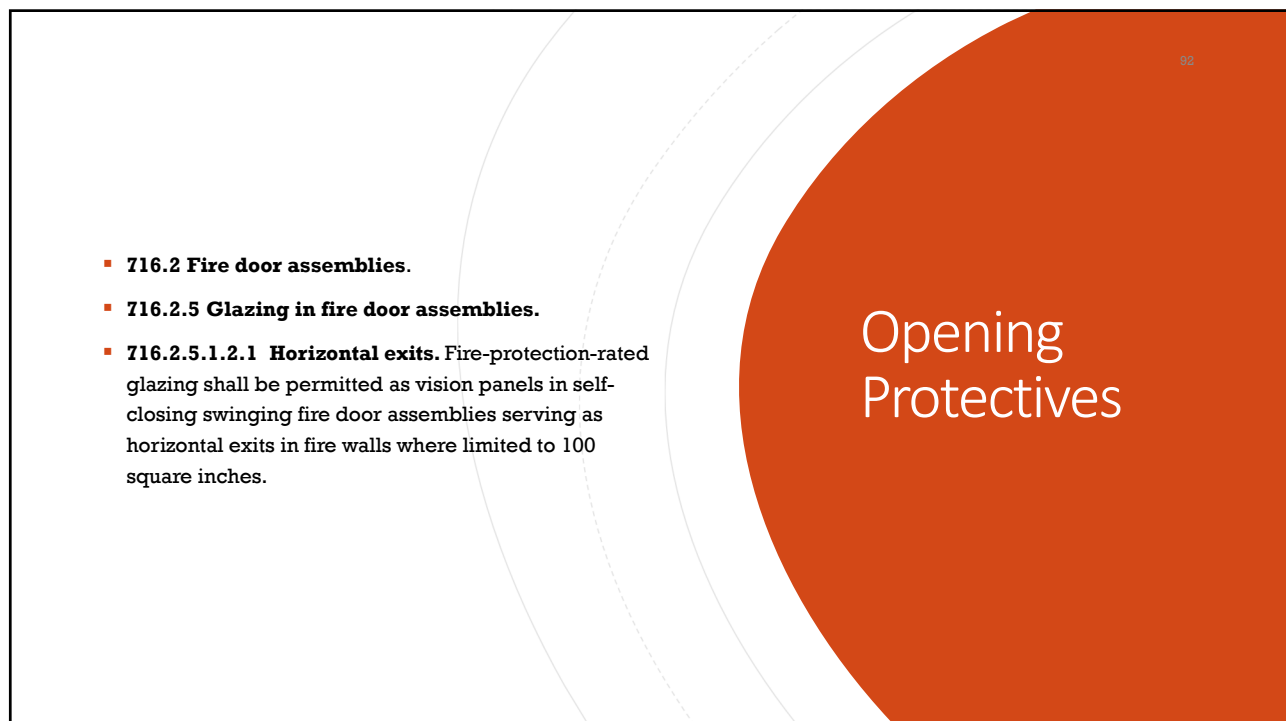
- **716.2 Fire door assemblies.**
- **716.2.5 Glazing in fire door assemblies.**
- **716.2.5.1.1 Fire-resistance-rated glazing in door assemblies in fire walls and fire barriers rated greater than 1 hour.** Fire-resistance-rated glazing tested to ASTM E 119 or UL 263 and NFPA 252, UL 10B or UL 10C shall be permitted in fire door assemblies located in fire walls and in fire barriers in accordance with Table 716.5 to the maximum size tested and in accordance with their listings.



91

Opening  
Protectives

- **716.2 Fire door assemblies.**
- **716.2.5 Glazing in fire door assemblies.**
- **716.2.5.1.2 Fire-protection-rated glazing in door assemblies in fire walls and fire barriers rated greater than 1 hour.** Fire-protection-rated glazing shall be prohibited in fire walls and fire barriers except as provided in Sections 716.2.5.1.2.1 and 716.2.5.1.2.2.



92


- **716.2 Fire door assemblies.**
- **716.2.5 Glazing in fire door assemblies.**
- **716.2.5.1.2.1 Horizontal exits.** Fire-protection-rated glazing shall be permitted as vision panels in self-closing swinging fire door assemblies serving as horizontal exits in fire walls where limited to 100 square inches.

Opening  
Protectives

93

## Opening Protectives

- **716.2 Fire door assemblies.**
- **716.2.5 Glazing in fire door assemblies.**
- **716.2.5.1.2.2 Fire barriers.** Fire-protection-rated glazing shall be permitted in *fire doors* having a 1-1/2-hour *fire protection rating* intended for installation in *fire barriers*, where limited to 100 square inches.



94

- **716.2 Fire door assemblies.**
- **716.2.5 Glazing in fire door assemblies.**
- **716.2.5.2 Elevator, stairway and ramp protectives.** Approved fire-protection-rated glazing used in fire door assemblies in elevator, stairways and ramp enclosures shall be so located as to furnish clear vision of the passageway or approach to the elevator, stairway or ramp.

## Opening Protectives




95

## Opening Protectives

**716.2 Fire door assemblies.**

**716.2.5 Glazing in fire door assemblies.**

**716.2.5.3 Glazing in door assemblies in corridors and smoke barriers.** In a 20-minute fire door assembly, the glazing material in the door itself shall have a minimum fire-protection-rated glazing of 20 minutes and shall be exempt from the hose stream test.



## Opening Protectives

- **716.2 Fire door assemblies.**
- **716.2.5 Glazing in fire door assemblies.**
- **716.2.5.4 Fire door frames with transom lights and sidelights.** Fire-protection-rated glazing shall be permitted in door frames with transom lights, sidelights or both, where a 3/4-hour fire protection rating or less is required and in 2-hour fire-resistance-rated exterior walls in accordance with Table 716.1(2). Fire door frames with transom lights, sidelights, or both, installed with fire-resistance-rated glazing tested as an assembly in accordance with ASTM E119 or UL 263 shall be permitted where a fire protection rating exceeding 3/4 hour is required in accordance with Table 716.1(2).




97

Opening  
Protectives

- 716.2.5.4 Fire door frames with transom lights and sidelights continued.
  - 716.2.5.4.1 Energy storage system separation.  
*Fire-protection-rated glazing shall not be permitted in fire door frames with transom lights and sidelights in fire barriers required by Section 1206 of the California Fire Code to enclose energy storage systems.*

98



Thank you!

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