JC Code & Construction Consultants, Inc.

Advanced Training:

Fire Resistant Rated Construction

Welcome!

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Seminar Information

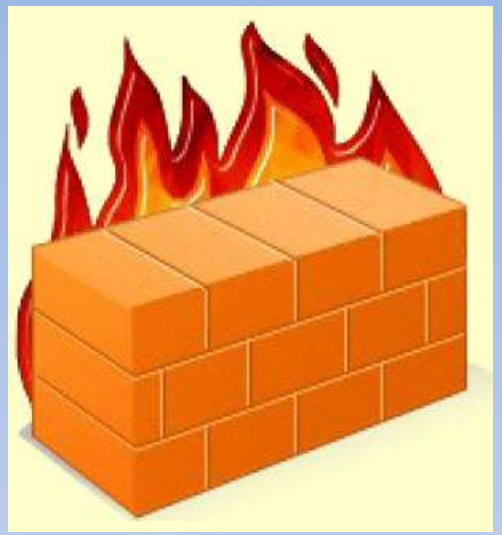
- Seminar Name:

Advanced Training: Fire Resistant Rated Construction

- Approval #'s: CILB: TBA
  BCAIB: TBA
  FBPE: TBA
- Instructor: John Farinelli, CBO, MCP, CFM, LEED AP
- Location:
- Date: , 2015
- Credit: 4.0 CE hours

Seminar Overview

- This seminar is designed to provide building code administrators, plans examiners, inspectors, design professionals and contractors with 4.0 hours of advanced building code training.
- This interactive, instructor led course is designed to provide participants with an in-depth discussion of the fire resistance rated construction requirements contained in Chapter 7 of the 5th Edition (2014) *Florida Building Code, Building Volume*.
- The requirements for fire partitions, fire barriers, fire walls, smoke partitions, smoke barriers, shaft enclosures, and rated horizontal assemblies are discussed.



Ch. 7 - Fire and Smoke Protection Features

PART I

Introduction

- Chapter 7 provides detailed requirements for fire-resistance rated construction, including structural members, walls, partitions and horizontal assemblies.
- Other portions of the code tell us when certain fire-resistance rated elements are required.
- Chapter 7 specifies how these elements are constructed, how openings in walls and partitions are protected, and how penetrations of such elements are protected.

Introduction

- Fire-resistance-rated construction is one form of fire protection in building design. It is often referred to as “passive protection.”
- Fire-resistance-rated building elements provide resistance to the advance of fire, as opposed to active fire protection systems, such as automatic sprinkler systems, which actively attempt to suppress a fire.

701 General

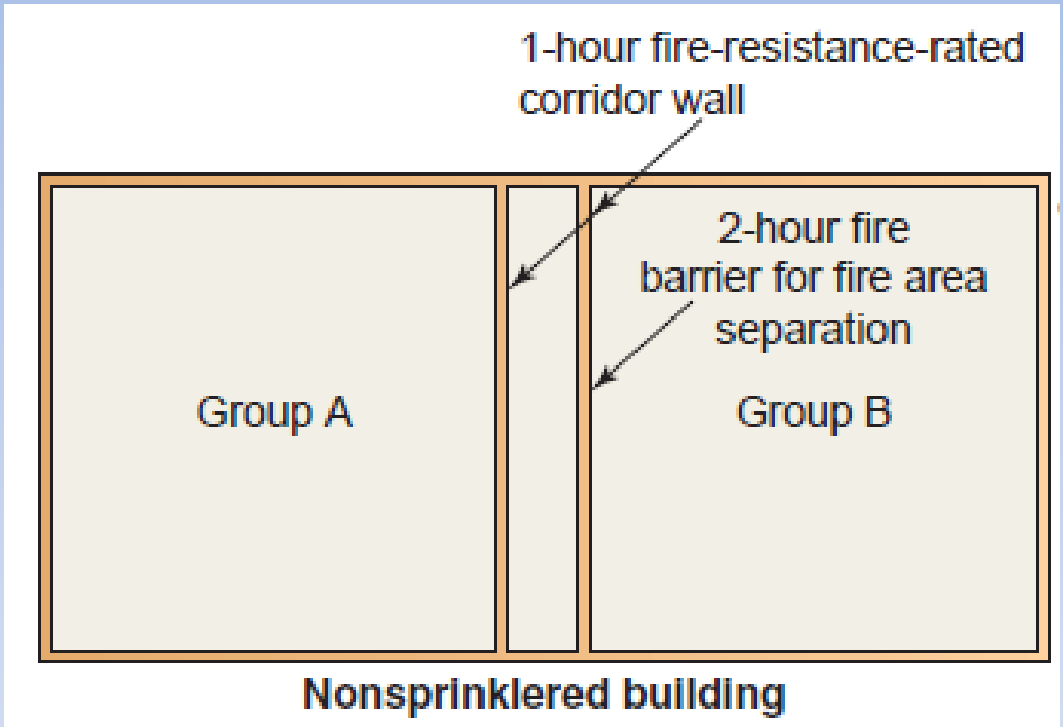
- **701.1 Scope.** The provisions of this chapter shall govern the materials, systems and assemblies used for structural *fire resistance* and fire-resistance-rated construction separation of adjacent spaces to safeguard against the spread of fire and smoke within a building and the spread of fire to or from buildings.

701 General

- **701.2 Multiple use fire assemblies.** Fire assemblies that serve multiple purposes in a building shall comply with all of the requirements that are applicable for each of the individual fire assemblies.

NEW to the 5th Edition FBCB.

701.2 Multiple Use Fire Assemblies



The code requires a 2 hr. separation between occupancies, but only a 1 hr. corridor separation requirement. The corridor may serve both occupancies.

Definitions

- **FIRE BARRIER.** A fire-resistance-rated wall assembly of materials designed to restrict the spread of fire in which continuity is maintained.
- **FIRE PARTITION.** A vertical assembly of materials designed to restrict the spread of fire in which openings are protected.

Definitions

- **FIRE WALL.** A fire-resistance-rated wall having protected openings, which restricts the spread of fire and extends continuously from the foundation to or through the roof, with sufficient structural stability under fire conditions to allow collapse of construction on either side without collapse of the wall.

Definitions

- **FIRE AREA.** The aggregate floor area enclosed and bounded by fire walls, *fire barriers*, *exterior walls* or *horizontal assemblies* of a building. Areas of the building not provided with surrounding walls shall be included in the fire area if such areas are included within the horizontal projection of the roof or floor next above.

Definitions

- **FIRE SEPARATION DISTANCE.** The distance measured from the building face to one of the following:

1. The closest interior *lot line*;
2. To the centerline of a street, an alley or *public way*; or
3. To an imaginary line between two buildings on the property.

- The distance shall be measured at right angles from the face of the wall.

703 Fire Resistance Ratings and Fire Tests

- **703.1 Scope.** Materials prescribed herein for *fire resistance* shall conform to the requirements of this chapter.

703.2 Fire Resistance Ratings

- The *fire-resistance rating* of building elements, components or assemblies shall be determined in accordance with the test procedures set forth in ASTM E 119 or UL 263 or in accordance with Section 703.3. Where materials, systems or devices that have not been tested as part of a fire-resistance-rated assembly are incorporated into the building element, component or assembly, sufficient data shall be made available to the *building official* to show that the required *fire-resistance rating* is not reduced. Materials and methods of construction used to protect joints and penetrations in fire-resistance-rated building elements, components or assemblies shall not reduce the required *fire-resistance rating*.

703 Fire Resistance Ratings and Fire Tests

- An ASTM E 119 or UL 263 fire test yields fire-resistance ratings for:
  - Structural assemblies.
  - Walls.
  - Horizontal assemblies (floor/ceilings and roof/ceilings).

703 Fire Resistance Ratings and Fire Tests

- Fire-tested assemblies must:
  - Resist passage of heat and hot gases.
  - Structural integrity during the test fire.
  - Have something left at the end of the test.

703 Fire Resistance Ratings and Fire Tests

- Fire-resistance-rated and/or smoke-resistant wall assemblies include:
  - Exterior walls
  - Fire walls
  - Fire barriers
  - Fire partitions
  - Smoke barriers
  - Smoke partitions

703 Fire Resistance Ratings and Fire Tests

- Provisions for wall assemblies address the following issues:
  - Fire-resistance rating
  - Continuity
  - Openings and penetrations
  - Type of materials
  - Structural robustness

703 Fire Resistance Ratings and Fire Tests

- In addition to walls, other building elements are regulated for fire-resistance and/or smoke-resistance
  - Shaft enclosures
  - Horizontal assemblies
  - Roof construction
  - Penetrations
  - Joint systems
  - Fire doors and fire shutters
  - Fire windows
  - Ducts and air transfer openings

703 Fire Resistance Ratings and Fire Tests

- Typical Wall Assemblies:
  - The materials commonly used for building construction are used for fire-resistance construction.
- Walls are composed of:
  - Cast-in-place concrete or precast concrete.
  - Masonry block walls.
  - Steel or wood stud wall construction.
- Acceptable assemblies are listed in FBCB Table 720.1(2).

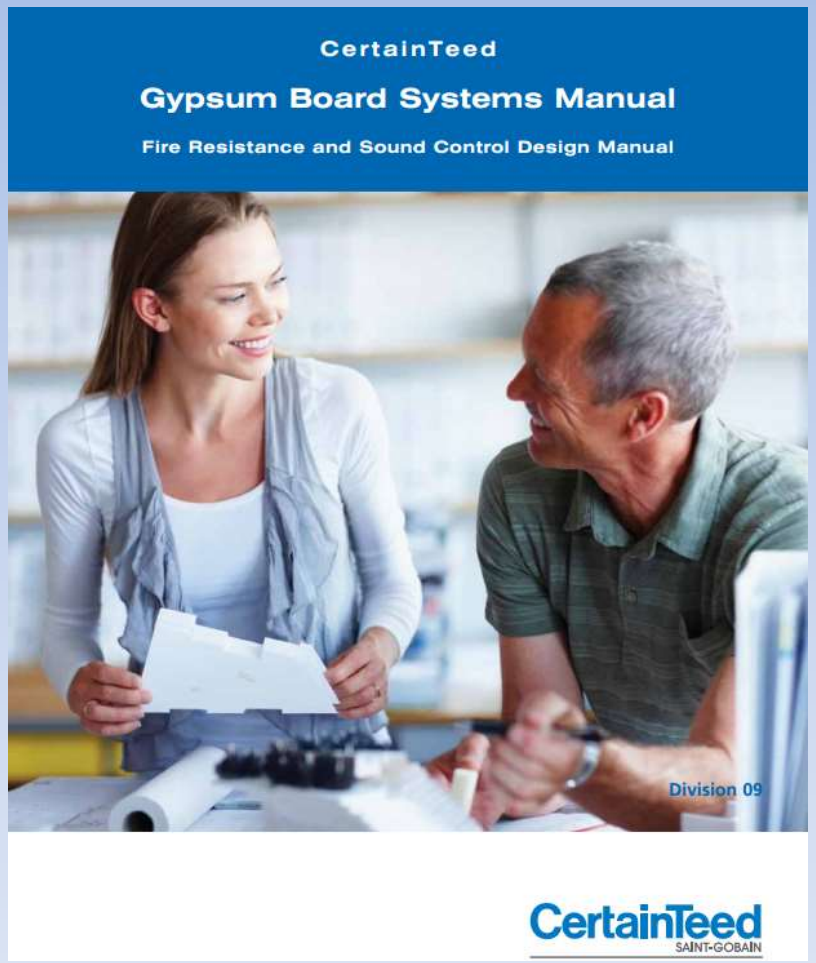
703.3 Alternative Methods For Determining Fire Resistance

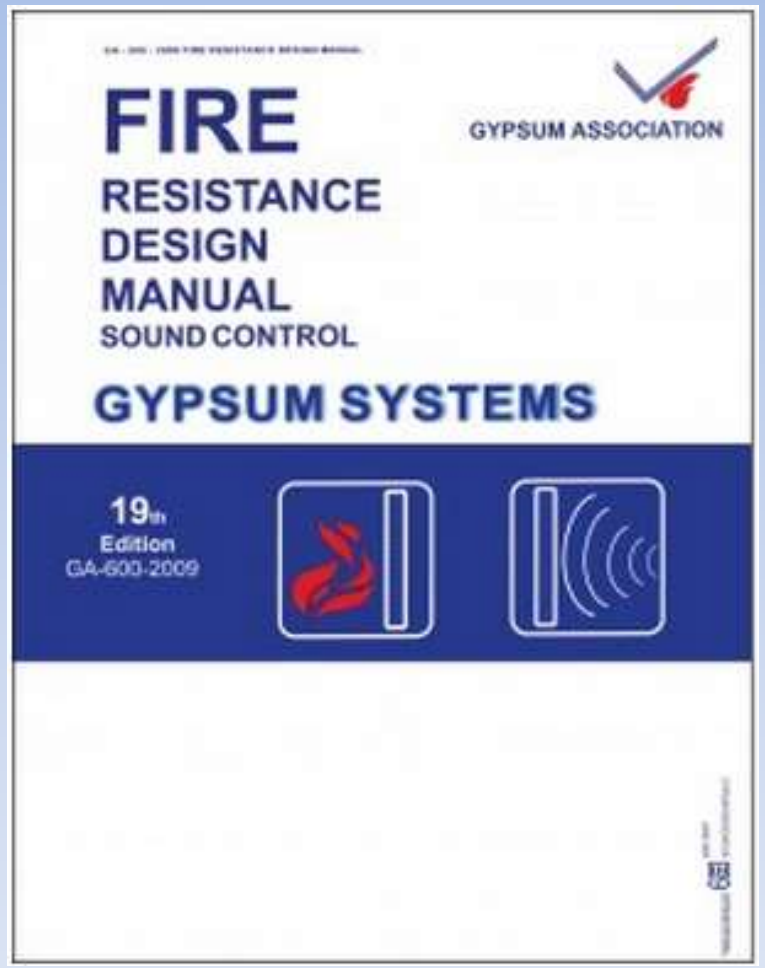
- The application of any of the alternative methods listed in this section shall be based on the fire exposure and acceptance criteria specified in ASTM E 119 or UL 263. The required *fire resistance* of a building element, component or assembly shall be permitted to be established by any of the following methods or procedures:

703.3 Alternative Methods For Determining Fire Resistance

1. Fire-resistance designs documented in sources.
2. Prescriptive designs of fire-resistance-rated building elements, components or assemblies as prescribed in Section 721.
3. Calculations in accordance with Section 722.
4. Engineering analysis based on a comparison of building element, component or assemblies designs having *fire-resistance ratings* as determined by the test procedures set forth in ASTM E 119 or UL 263.
5. Alternative protection methods as allowed by Section 104.11.

Fire Resistance Designs Documented In Sources





Generic Assembly

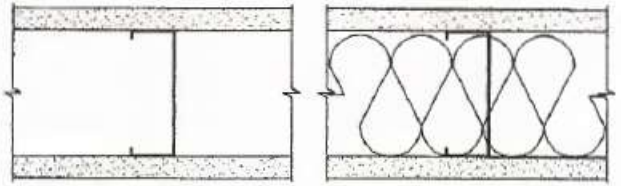
WALLS AND INTERIOR PARTITIONS, NONCOMBUSTIBLE

GA FILE NO. WP 1072 | **GENERIC** | **1 HOUR FIRE** | **45 to 49 STC SOUND**

GYPSUM WALLBOARD, STEEL STUDS

One layer 5/8" type X gypsum wallboard or gypsum veneer base applied parallel or at right angles to each side of 3 5/8" steel studs 24" o.c. with 1" Type S drywall screws 8" o.c. at vertical joints and 12" o.c. at floor and ceiling runners and intermediate studs.

Joints staggered 24" on each side and on opposite sides. Sound tested with 3 1/2" glass fiber friction fit in stud space. **(NLB)**



Thickness:	4 7/8 "
Limiting Height:	Refer to Section V
Approx. Weight:	6 psf
Fire Test:	See WP 1200 (FM WP-45, 6-19-68; OSU T-1770, 8-61; ULC 79T484, 79T500,79T497, 8-12-81, FM Design W415)
Sound Test:	NRCC 816-NV, 2-3-81

Proprietary Assembly

GA FILE NO. WP 1081 | **PROPRIETARY †** | **1 HOUR FIRE** | **45 to 49 STC SOUND**

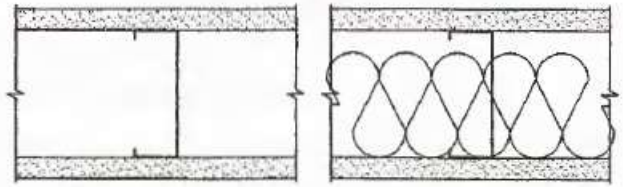
GYPSUM WALLBOARD, STEEL STUDS

One layer 5/8" proprietary type X gypsum wallboard applied parallel to each side of 3 5/8" steel studs 24" o.c. with 1" Type S drywall screws 8" o.c. at vertical joints and 12" o.c. at floor and ceiling runners and intermediate studs. Optional horizontal resilient channel 24" o.c applied to studs with one 1/2" Type S-12 pan head screw at each stud intersection.

Stagger joints 24" on each side and on opposite sides. Sound tested with 3" mineral fiber, 2.5 pcf, in stud space. **(NLB)**

PROPRIETARY GYPSUM BOARD

G-P Gypsum	-	5/8" GyProc® Fireguard®
Lafarge Gypsum	-	5/8" Firecheck®
United States Gypsum Company	-	5/8" SHEETROCK® Brand Abuse-Resistant Gypsum Panels



Thickness:	4 7/8"
Limiting Height:	Refer to Section V
Approx. Weight:	5 psf
Fire Test:	UL R1319, 94NK40598, 11-30-94, UL Design U465
Sound Test:	USG-960709, 7-18-96; RAL-TL99-103, 6-28-99; RAL-TL99-160, 9-3-99

703.4 Automatic Sprinklers

- Under the prescriptive fire resistance requirements of the *Florida Building Code*, the fire-resistance rating of a building element, component or assembly shall be established without the use of *automatic sprinklers* or any other fire suppression system being incorporated as part of the assembly tested in accordance with the fire exposure, procedures, and acceptance criteria specified in ASTM E 119 or UL 263. However, this section shall not prohibit or limit the duties and powers of the *building official* allowed by Sections 104.10 and 104.11.

703.7
Marking and Identification

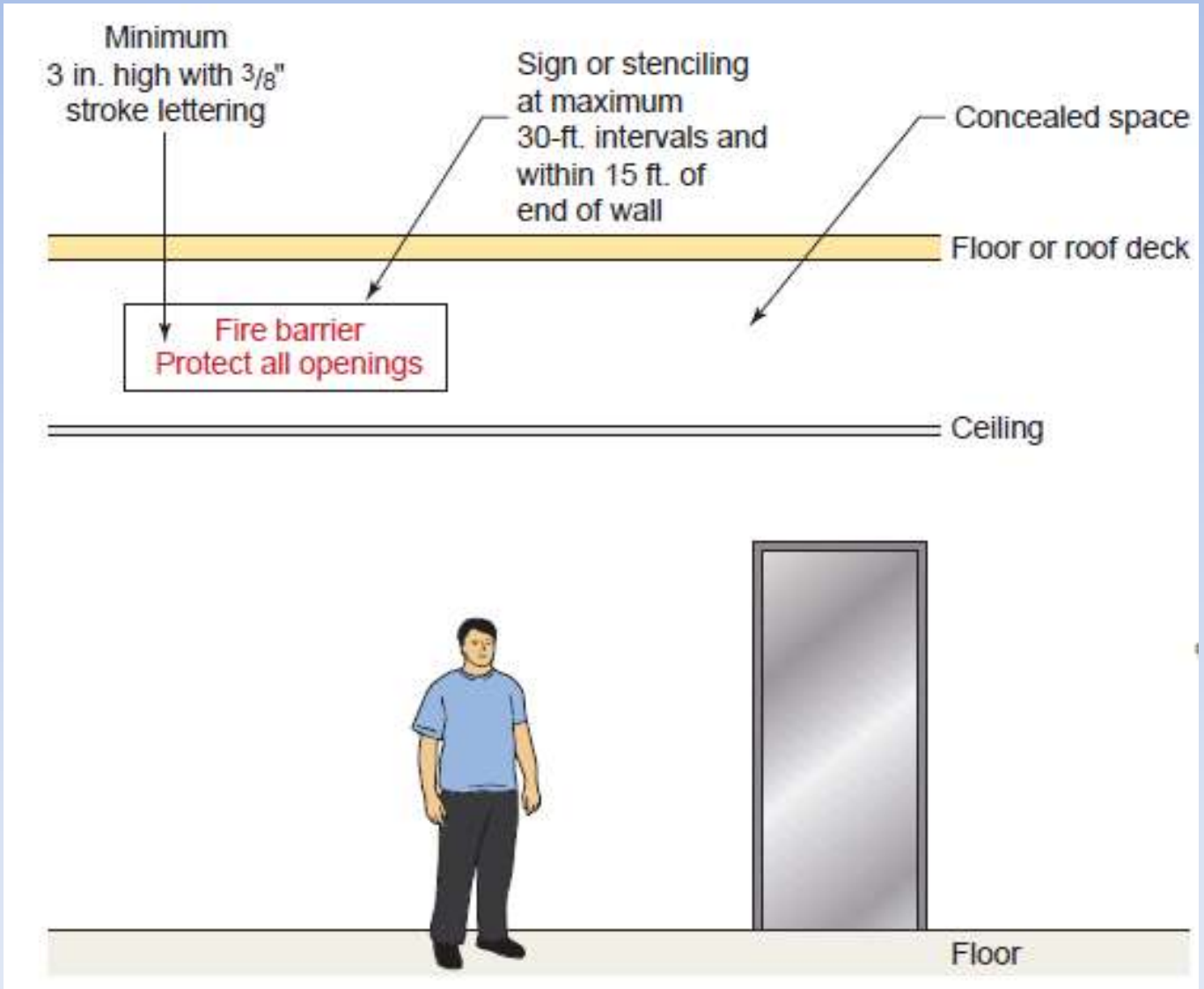
- *Fire walls*, *fire barriers*, *fire partitions*, *smoke barriers* and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling.
- Such identification shall:

703.7
Marking and Identification

1. Be located in accessible concealed floor, floor-ceiling or *attic* spaces;
2. Be located within 15 feet of the end of each wall and at intervals not exceeding 30 feet measured horizontally along the wall or partition; and
3. Include lettering not less than 3 inches in height with a minimum 3/8-inch stroke in a contrasting color incorporating the suggested wording: “FIRE AND/OR SMOKE BARRIER—PROTECT ALL OPENINGS” or other wording.

Exception: Walls in Group R-2 occupancies that do not have a removable decorative ceiling allowing access to the concealed space.

703.7
Marking and Identification



704 Fire Resistance Rating of Structural Members

- **704.1 Requirements.** The *fire-resistance ratings* of structural members and assemblies shall comply with this section and the requirements for the type of construction as specified in **Table 601**.
- The *fire-resistance ratings* shall not be less than the ratings required for the fire-resistance-rated assemblies supported by the structural members.

Table 601
Fire-Resistance Rating Requirements For Building Elements (Hours)

BUILDING ELEMENT	TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
	A	B	A[d]	B	A[d]	B	HT	A[d]	B
Primary structural frame[g] (see Section 202)	3[a]	2[a]	1	0	1	0	HT	1	0
Bearing walls									
Exterior[f, g]	3	2	1	0	2	2	2	1	0
Interior	3[a]	2[a]	1	0	1	0	1/HT	1	0
Nonbearing walls and partitions Exterior	See Table 602								
Nonbearing walls and partitions Interior[e]	0	0	0	0	0	0	See Section 602.4.6	0	0
Floor construction and associated secondary members (see Section 202)	2	2	1	0	1	0	HT	1	0
Roof construction and associated secondary members (see Section 202)	$1^{1}/_{2}$[b]	1[b,c]	1[b,c]	0[c]	1[b,c]	0	HT	1[b,c]	0

a. Roof supports: Fire-resistance ratings of primary structural frame and bearing walls are permitted to be reduced by 1 hour where supporting a roof only.

b. Except in Group F-1, H, M and S-1 occupancies, fire protection of structural members shall not be required, including protection of roof framing and decking where every part of the roof construction is 20 feet or more above any floor immediately below. Fire-retardant-treated wood members shall be allowed to be used for such unprotected members.

c. In all occupancies, heavy timber shall be allowed where a 1-hour or less fire-resistance rating is required.

d. An approved automatic sprinkler system in accordance with Section 903.3.1.1 shall be allowed to be substituted for 1-hour fire-resistance-rated construction, provided such system is not otherwise required by other provisions of the code or used for an allowable area increase in accordance with Section 506.3 or an allowable height increase in accordance with Section 504.2. The 1-hour substitution for the fire resistance of exterior walls shall not be permitted.

e. Not less than the fire-resistance rating required by other sections of this code.

f. Not less than the fire-resistance rating based on fire separation distance (see Table 602).

g. Not less than the fire-resistance rating as referenced in Section 704.10

As Defined

- **PRIMARY STRUCTURAL FRAME.** The primary structural frame shall include all of the following structural members:

1. The columns;
2. Structural members having direct connections to the columns, including girders, beams, trusses and spandrels;
3. Members of the floor construction and roof construction having direct connections to the columns; and
4. Bracing members that are essential to the vertical stability of the primary structural frame under gravity loading shall be considered part of the primary structural frame whether or not the bracing member carries gravity *loads.*

705 Exterior Walls

- **705.5 Fire-resistance ratings.** *Exterior walls* shall be fire resistance rated in accordance with Tables 601 and 602 and this section. The required *fire-resistance rating* of *exterior walls* with a *fire separation distance* of greater than 10 feet shall be rated for exposure to fire from the inside. The required *fire-resistance rating* of *exterior walls* with a *fire separation distance* of less than or equal to 10 feet shall be rated for exposure to fire from both sides.

705 Exterior Walls

- Exterior walls may be required to be rated because of the following:
  - Type of construction (bearing walls), as specified in Table 601.
  - Fire separation distance, as specified in Table 602.
  - Horizontal continuity at fire walls (706.5).
  - Exterior walls of vertical exit enclosures (1022.6).
  - Exterior walls adjacent to exterior exit stairways (1026.6).
  - Exterior walls adjacent to exterior areas for rescue assistance (1007.7).

TABLE 602
FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE

FIRE SEPARATION DISTANCE = X (feet)	TYPE OF CONSTRUCTION	OCCUPANCY GROUP H[f]	OCCUPANCY GROUP F-1, M, S-1[g]	OCCUPANCY GROUP A, B, E, F-2, I, R, S-2[g], U[b]
X < 5[c]	All	3	2	1
5 ≤ X < 10	IA Others	3 2	2 1	1 1
10 ≤ X < 30	IA, IB IIB, VB Others	2 1 1	1 0 1	1[d] 0 1[d]
X ≥ 30	All	0	0	0

For SI: 1 foot = 304.8 mm.

a. Load-bearing exterior walls shall also comply with the fire-resistance rating requirements of Table 601.

b. For special requirements for Group U occupancies, see Section 406.3.

c. See Section 706.1.1 for party walls.

d. Open parking garages complying with Section 406 shall not be required to have a fire-resistance rating.

e. The fire-resistance rating of an exterior wall is determined based upon the fire separation distance of the exterior wall and the story in which the wall is located.

f. For special requirements for Group H occupancies, see Section 415.5.

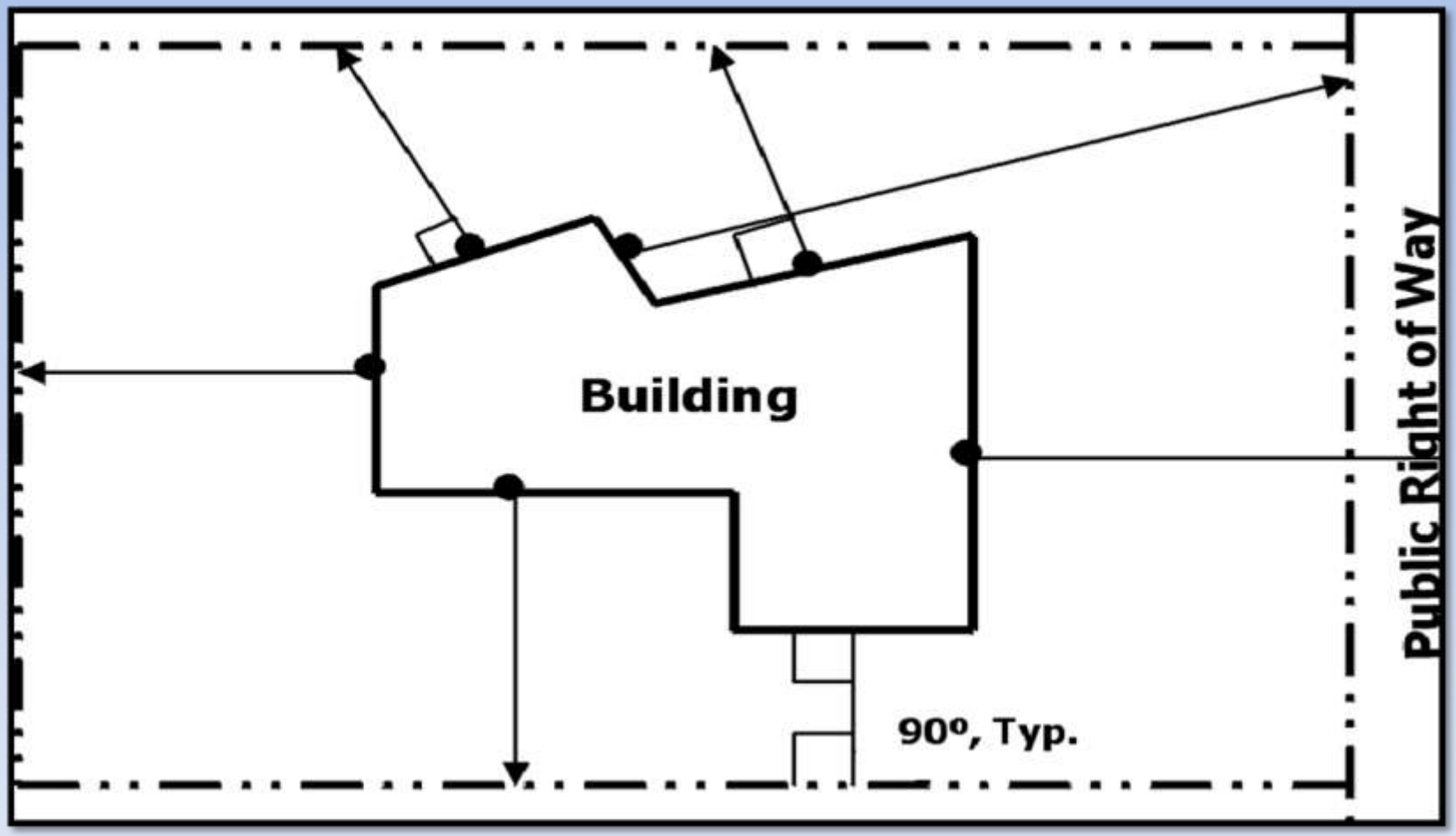
g. For special requirements for Group S aircraft hangars, see Section 412.4.1.

h. Where Table 705.8 permits nonbearing exterior walls with unlimited area of unprotected openings, the required fire-resistance rating for the exterior walls is 0 hours.

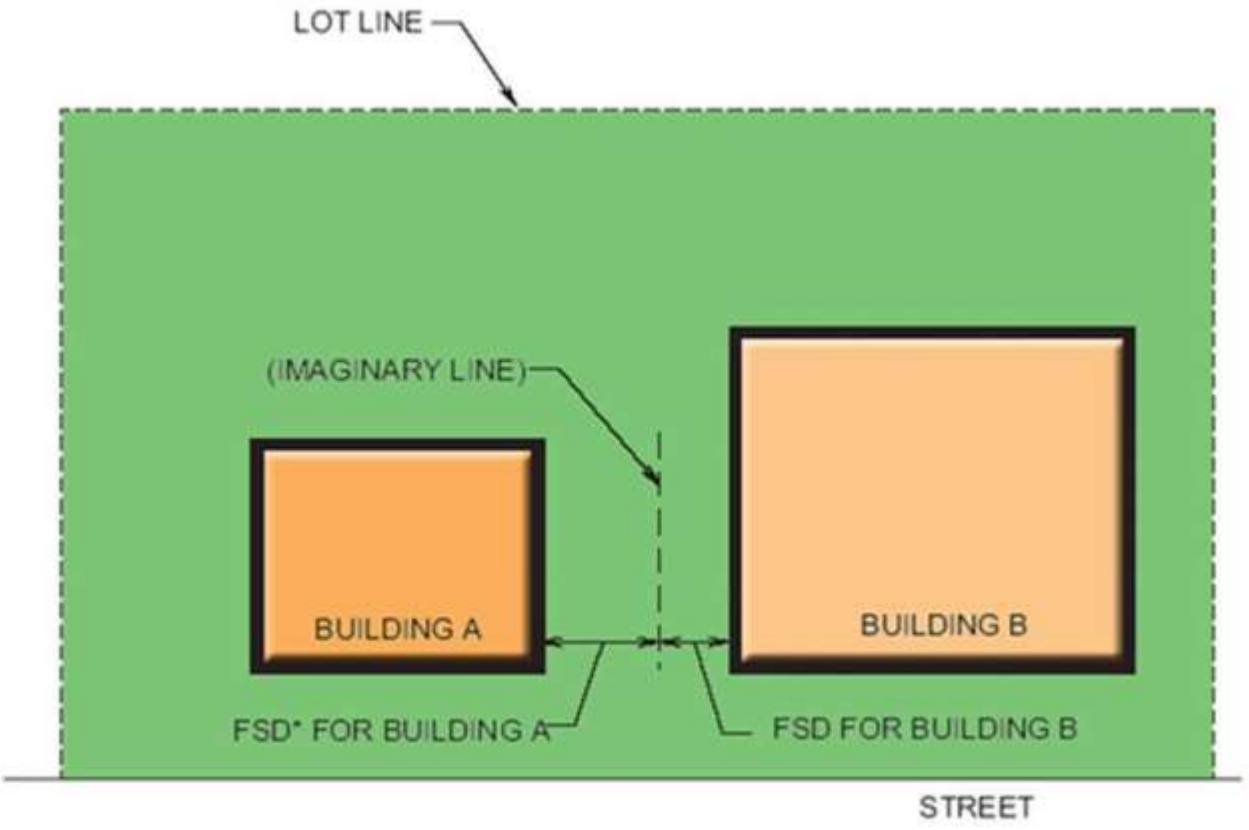
705 Exterior Walls

- Fire separation distance determines:
  - The required fire-resistance rating
- Fire separation distance is measured from each building face to the:
  - Closest interior lot line.
  - Centerline of a street.
  - Imaginary line between two buildings.

Measurement of Fire Separation Distance



Measurement of Fire Separation Distance



Measurement of Fire Separation Distance

- Exterior wall fire-resistance ratings
  - Exterior nonbearing walls shall comply with Table 602.
  - Exterior bearing walls shall comply with both Table 601 and 602.
  - < Less than 10 feet = the wall is rated against fire exposure from both the interior and exterior sides of the wall.
  - > Greater than 10 feet = wall is rated against fire exposure from the interior side of the wall only.

705 Exterior Walls

- **705.2 Projections.** Cornices, eave overhangs, exterior balconies and similar projections extending beyond the exterior wall shall conform to the requirements of this section and Section 1406. Exterior egress balconies and exterior exit stairways and ramps shall also comply with Sections 1019 and 1026, respectively.
- Projections shall not extend any closer to the line used to determine the fire separation distance than shown in **Table 705.2**.

Exception: Buildings on the same lot and considered as portions of one building in accordance with Section 705.3 are not required to comply with this section.

TABLE 705.2
Minimum Distance of Projection

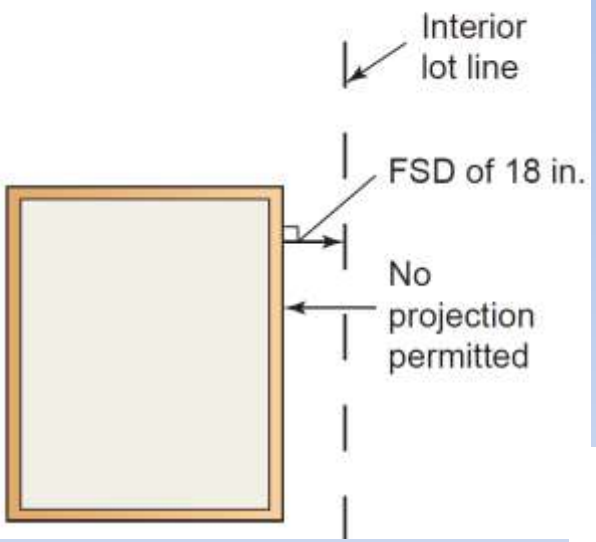
Fire Separation Distance (FSD)	Minimum Distance From Line Used To Determine FSD
0 feet to less than 2 feet	Projections not permitted
2 feet to less than 5 feet	24 inches
5 feet or greater	40 inches

Minimum Distance of Projection

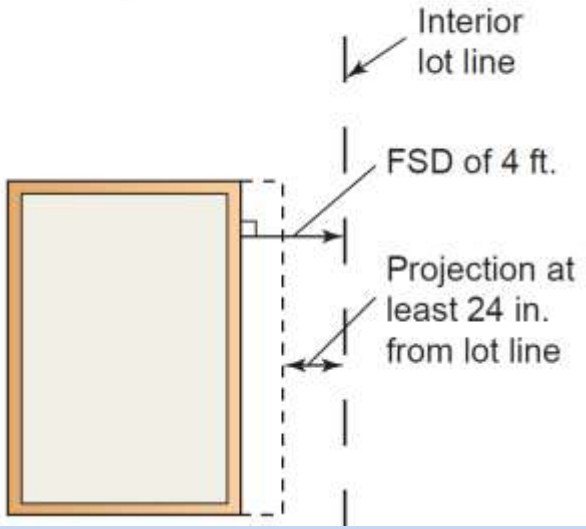
- Under these new limitations, no projections are permitted beyond the exterior wall where the wall has a fire separation distance of less than 2 feet.
- Where the exterior wall is located such that the fire separation distance is at least 2 feet, a projection is permitted but its extent is regulated.

Minimum Distance of Projection

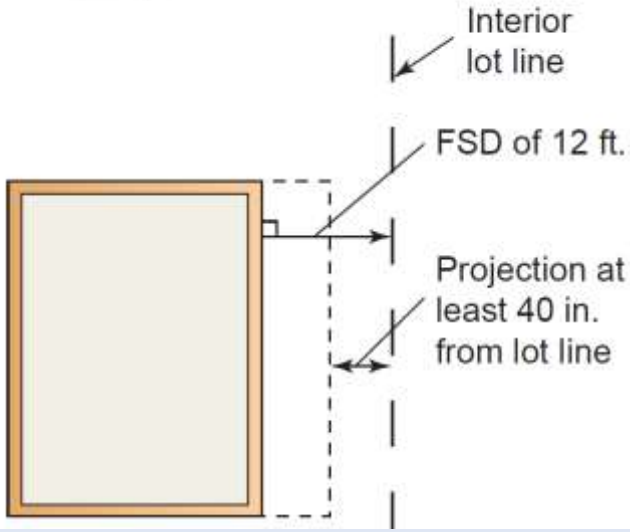
Example 1



Example 2



Example 3



705.8 Openings

- **705.8.1 Allowable area of openings.** The maximum area of unprotected and protected openings permitted in an *exterior wall* in any *story* of a building shall not exceed the percentages specified in **Table 705.8**.

Exceptions:

1. In other than Group H occupancies, unlimited unprotected openings are permitted in the first *story* above grade plane either:

1.1 Where the wall faces a street and has a *fire separation distance* of more than 15 feet; or

1.2. Where the wall faces an unoccupied space. The unoccupied space shall be on the same lot or dedicated for public use, shall not be less than 30 feet in width and shall have access from a street by a posted fire lane in accordance with the Florida Fire Prevention Code.

2. Buildings whose exterior bearing walls, exterior nonbearing walls and exterior primary structural frame are not required to be fire-resistance rated shall be permitted to have unlimited unprotected openings.

For Discussion

- Exception 2 is for openings in all exterior walls in all stories where Tables 601 and 602 do not require any exterior wall (bearing or nonbearing) or primary structural member to be fire-resistance rated.
- Therefore, this exception is only applicable to Type IIB and VB construction with an FSD of 10 feet or greater.
- This allows unlimited unprotected openings in Type IIB and VB construction for all exterior walls facing an FSD of 10 feet or more.

705.8 Openings

- Openings
  - Openings in exterior walls are regulated by **Table 705.8** based on fire separation distance, percentage of wall openings, and whether or not the building is fully sprinklered.
  - Where both protected and unprotected openings are used, the unity formula must be applied.

$$\frac{\text{Actual Unprotected}}{\text{Allowable Unprotected}} + \frac{\text{Actual Protected}}{\text{Allowable Protected}} \leq 1.0$$

Table 705.8
Maximum Area Of Exterior Wall Openings Based On Fire Separation Distance and Degree Of Opening Protection

FIRE SEPARATION DISTANCE (feet)	DEGREE OF OPENING PROTECTION	ALLOWABLE AREA[a]
0 to less than 3[b, c]	Unprotected, Nonsprinklered (UP, NS)	Not Permitted
	Unprotected, Sprinklered (UP, S)[i]	Not Permitted
	Protected (P)	Not Permitted
3 to less than 5[d, e]	Unprotected, Nonsprinklered (UP, NS)	Not Permitted
	Unprotected, Sprinklered (UP, S)[i]	15%
	Protected (P)	15%
5 to less than 10[e, f, j]	Unprotected, Nonsprinklered (UP, NS)	10%[h]
	Unprotected, Sprinklered (UP, S)[i]	25%
	Protected (P)	25%
10 to less than 15[e, f, g]	Unprotected, Nonsprinklered (UP, NS)	15%[h]
	Unprotected, Sprinklered (UP, S)[i]	45%
	Protected (P)	45%
15 to less than 20[f, g]	Unprotected, Nonsprinklered (UP, NS)	25%
	Unprotected, Sprinklered (UP, S)[i]	75%
	Protected (P)	75%
20 to less than 25[f, g]	Unprotected, Nonsprinklered (UP, NS)	45%
	Unprotected, Sprinklered (UP, S)[i]	No Limit
	Protected (P)	No Limit
25 to less than 30[f, g]	Unprotected, Nonsprinklered (UP, NS)	70%
	Unprotected, Sprinklered (UP, S)[i]	No Limit
	Protected (P)	No Limit
30 or greater	Unprotected, Nonsprinklered (UP, NS)	No Limit
	Unprotected, Sprinklered (UP, S)[i]	Not Required
	Protected (P)	Not Required

705.8.2 Protected Openings

- Where openings are required to be protected, *fire doors* and fire shutters shall comply with Section 716.5 and *fire window assemblies* shall comply with Section 716.6.
- **Exception:** Opening protectives are not required where the building is equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 and the exterior openings are protected by a water curtain using automatic sprinklers *approved* for that use.

705.8.3 Unprotected Openings

- Where unprotected openings are permitted, windows and doors shall be constructed of any *approved* materials.
- Glazing shall conform to the requirements of Chapters 24 and 26.

705.8.4 Mixed Openings

- Where both unprotected and protected openings are located in the *exterior wall* in any *story* of a building, the total area of openings shall be determined in accordance with the following:

705.8.4 Mixed Openings

$Ap/ap) + (Au/au) \leq 1$ where:

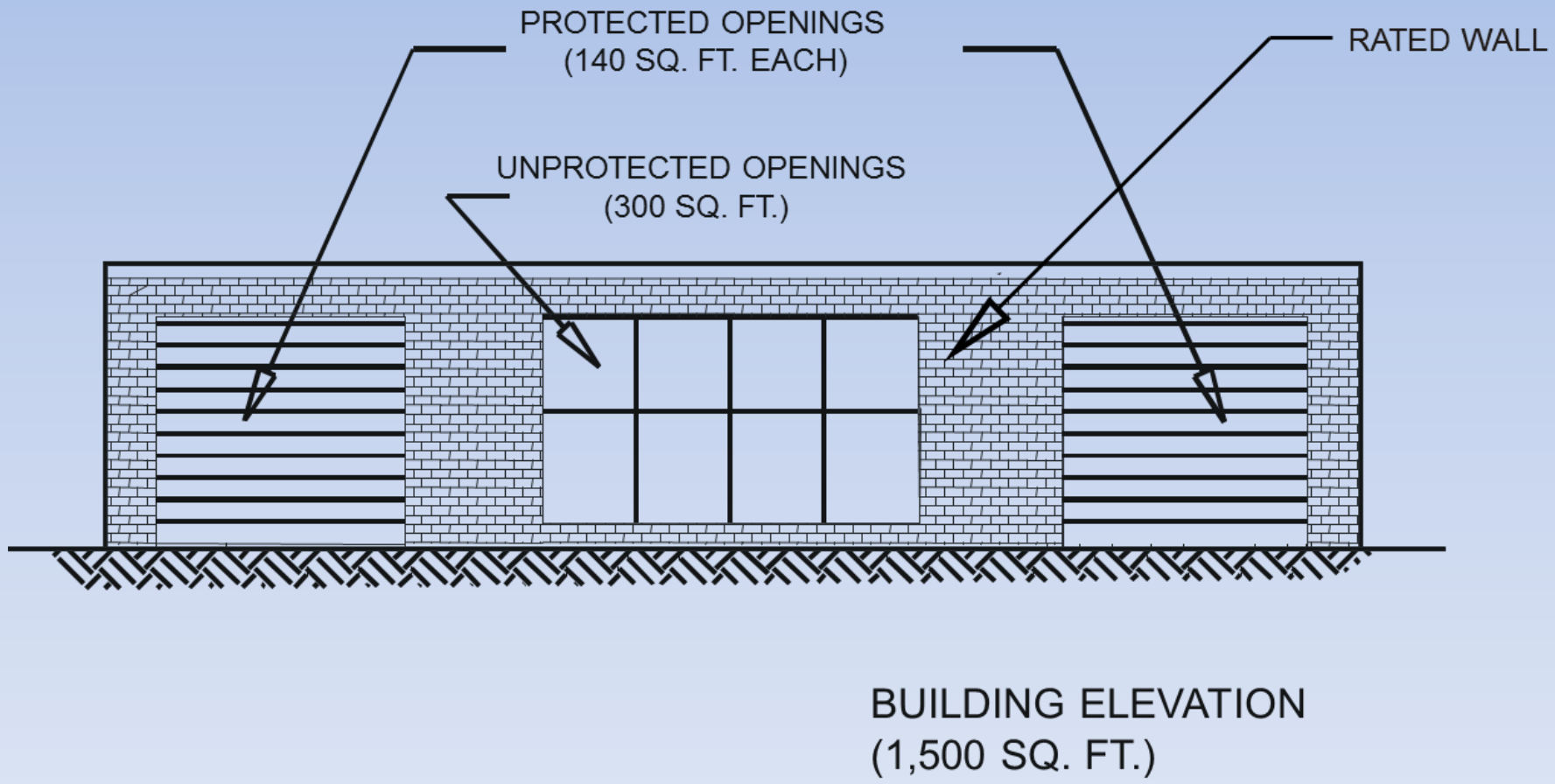
Ap = Actual area of protected openings, or the equivalent area of protected openings, *Ae* .

ap = Allowable area of protected openings.

Au = Actual area of unprotected openings.

au = Allowable area of unprotected openings.

705.8 Openings



705.8.6 Vertical Exposure

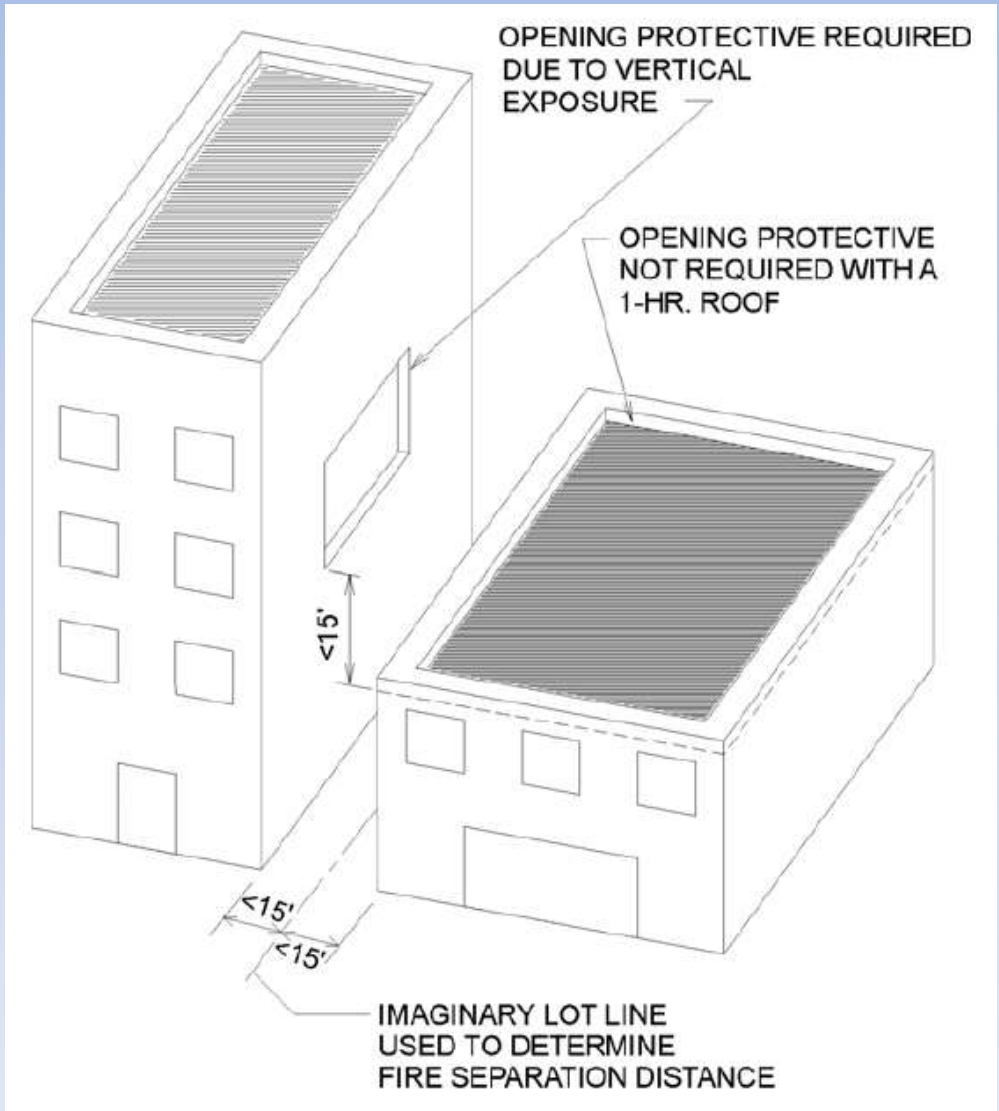
- For buildings on the same lot, opening protectives having a *fire protection rating* of not less than ¾ hour shall be provided in every opening that is less than 15 feet vertically above the roof of an adjacent building or structure based on assuming an imaginary line between them. The opening protectives are required where the *fire separation distance* between the imaginary line and the adjacent building or structure is less than 15 feet.

705.8.6 Vertical Exposure

Exceptions:

1. Opening protectives are not required where the roof assembly of the adjacent building or structure has a *fire-resistance rating* of not less than 1 hour for a minimum distance of 10 feet from the *exterior wall* facing the imaginary line and the entire length and span of the supporting elements for the fire-resistance-rated roof assembly has a *fire-resistance rating* of not less than 1 hour.
2. Buildings on the same lot and considered as portions of one building in accordance with Section 705.3 are not required to comply with Section 705.8.6.

705.8.6 Vertical Exposure



A Note About Parapet Walls

- Parapets and Parapet Construction
  - As a general rule, FBCB 705.11 states that exterior walls must be provided with minimum 30 inch parapets.
  - Parapets are not required where any of 6 certain conditions exist.

705
Exterior Wall Summary

Issue	Requirement
Required Fire-Resistance Rating	Type of construction: Table 601 for bearing walls Fire separation distance: Table 602
Required continuity	Foundation to 30” above roof (except as noted)
Openings	Amount of protected and unprotected openings based upon fire separation distance, Table 705.8
Types of materials	Noncombustible for Types I through IV construction
Robustness of structural system	If bearing for external forces, as required

706 Fire Walls

- **706.1 General.** Each portion of a building separated by one or more *fire walls* that comply with the provisions of this section shall be considered a separate building. The extent and location of such *fire walls* shall provide a complete separation
- Where a *fire wall* also separates occupancies that are required to be separated by a *fire barrier* wall, the most restrictive requirements of each separation shall apply.

706 Fire Walls

- A common wall used to:
  - Create separate buildings within a single structure.
  - Serve the same function as a fire barrier where used as a horizontal exit or for the separation of fire areas

706 Fire Walls

- **706.1.1 Party walls.** Any wall located on a *lot line* between adjacent buildings, which is used or adapted for joint service between the two buildings, shall be constructed as a *fire wall* in accordance with Section 706.
- Party walls shall be constructed without openings and shall create separate buildings.

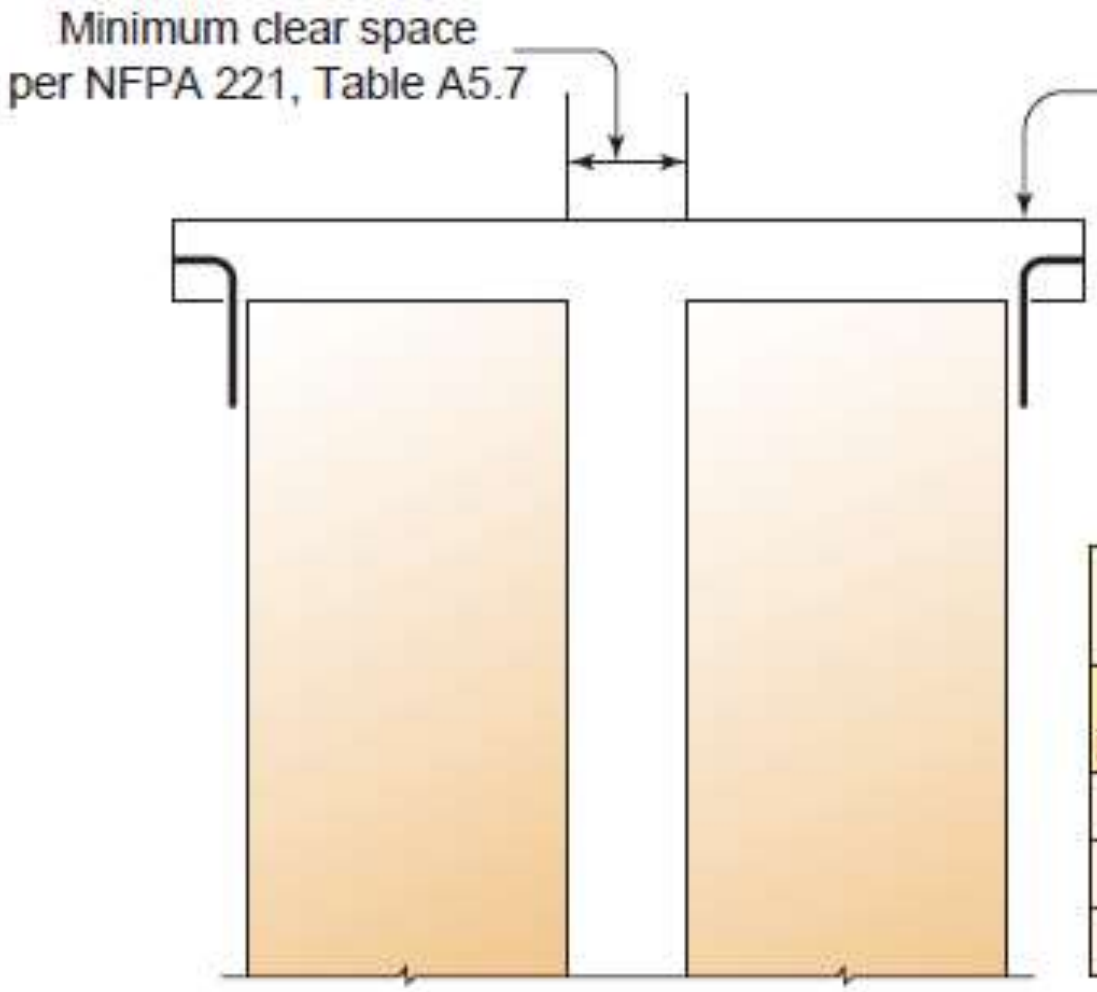
Exception: Openings in a party wall separating an *anchor building* and a mall shall be in accordance with Section 402.7.3.1.

706 Fire Walls

- **706.2 Structural stability.** Fire walls shall have sufficient structural stability under fire conditions to allow collapse of construction on either side without collapse of the wall for the duration of time indicated by the required *fire-resistance rating* or shall be constructed as double fire walls in accordance with NFPA 221.

NFPA 221: STANDARD FOR HIGH CHALLENGE FIRE WALLS, FIRE WALLS, AND FIRE BARRIER WALLS

Double Fire Wall



Minimum fire wall rating (in hours)	
Rating of individual walls	Total double wall rating
3	4
2	3
1	2

706 Fire Walls

- **706.3 Materials.** *Fire walls* shall be of any *approved* noncombustible materials.

Exception: Buildings of Type V construction.

706 Fire Walls

- **706.4 Fire-resistance rating.** *Fire walls* shall have a *fire resistance rating* of not less than that required by Table 706.4.

TABLE 706.4
FIRE WALL FIRE-RESISTANCE RATINGS

GROUP	FIRE-RESISTANCE RATING (hours)
A, B, E, H-4, I, R-1, R-2, U	3[a]
F-1, H-3[b], H-5, M, S-1	3
H-1, H-2	4[b]
F-2, S-2, R-3, R-4	2

a. In Type II or V construction, walls shall be permitted to have a 2-hour fire-resistance rating.
b. For Group H-1, H-2 or H-3 buildings, also see Sections 415.6 and 415.7.

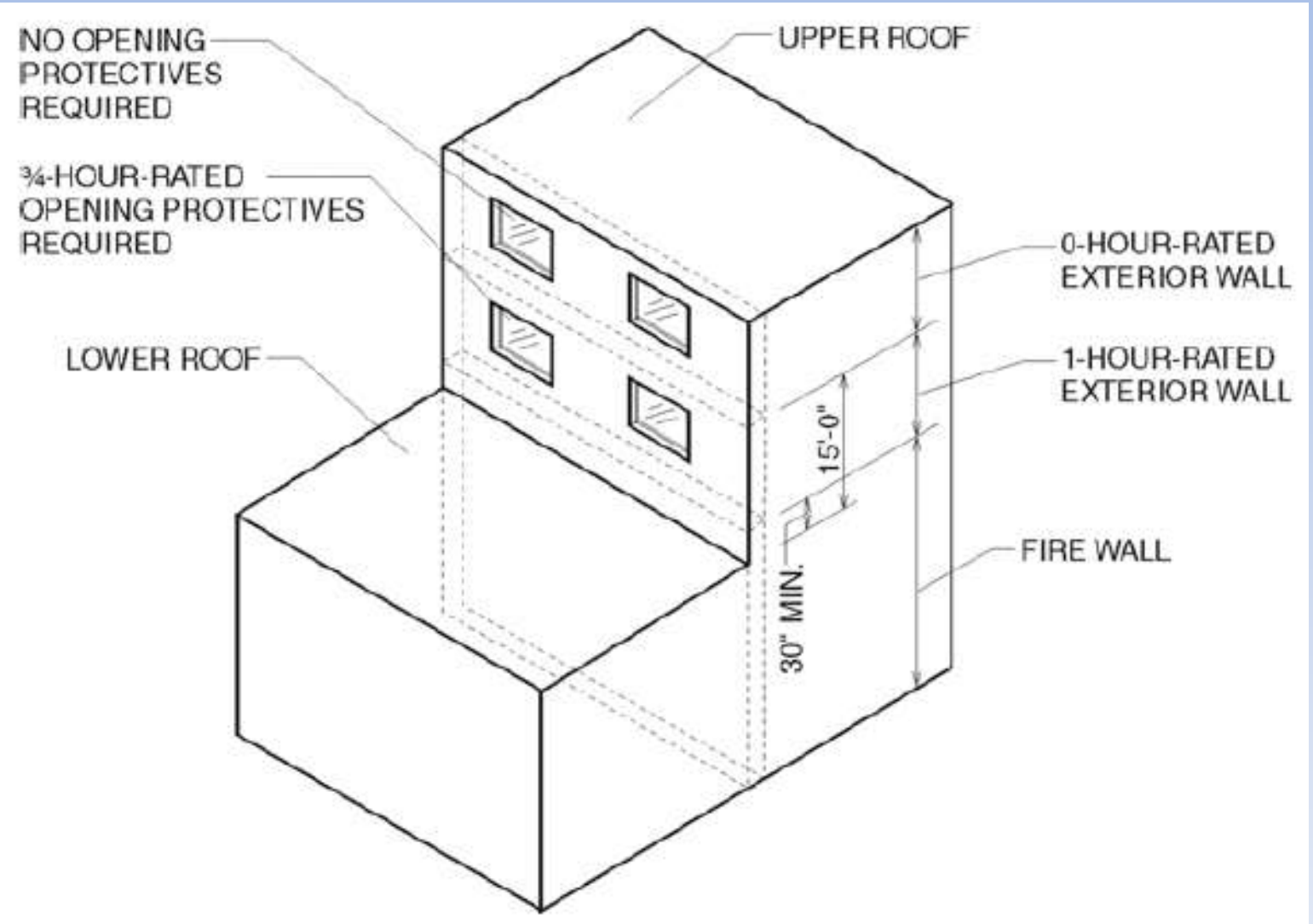
Continuity of Fire Walls

- Vertical continuity
  - Extend from exterior wall to exterior wall, plus 18 inch extensions.
- Horizontal continuity
  - Extends 30 inches above both adjacent roofs.
- 3 exceptions permit fire wall to terminate at wall and/or roof sheathing

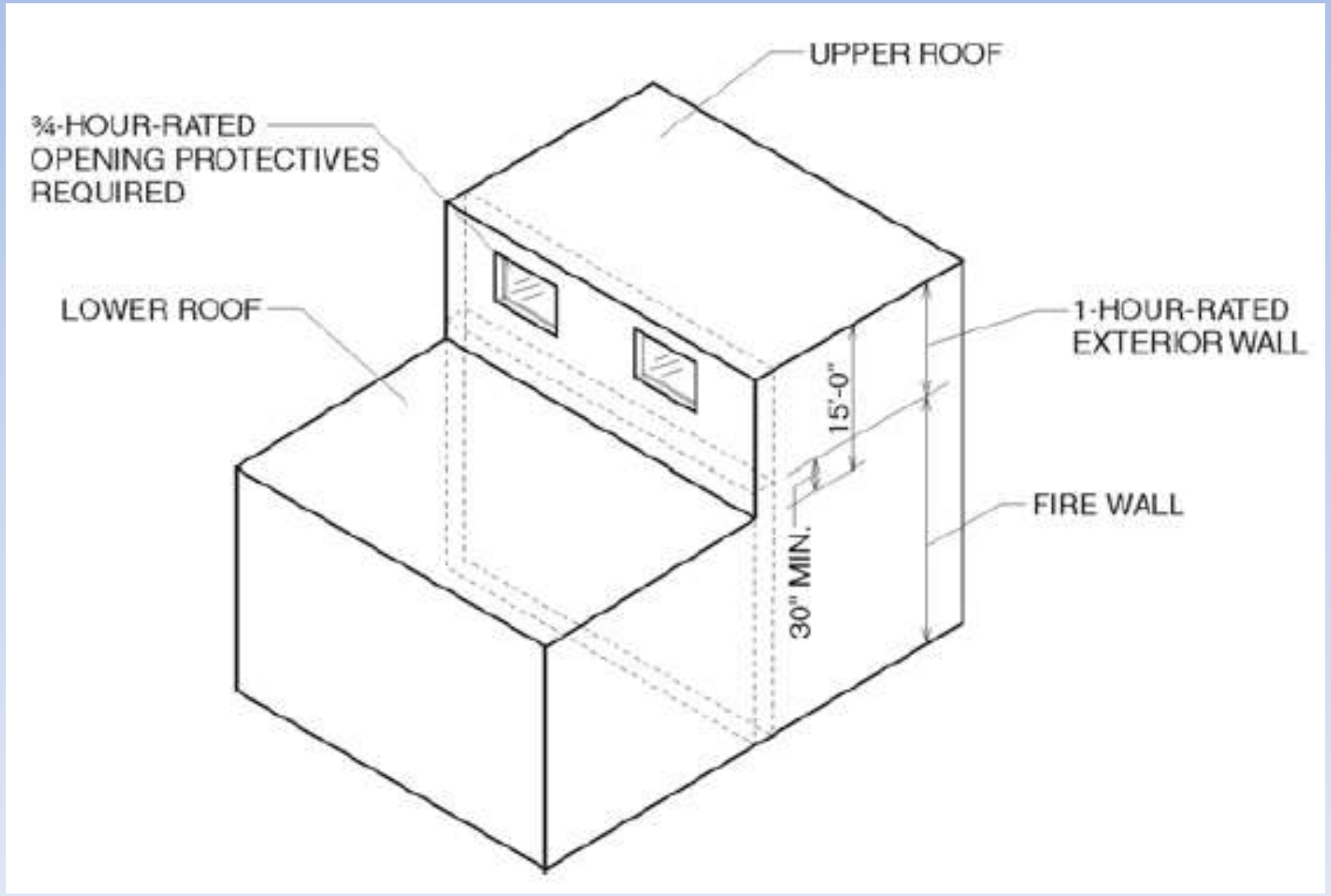
706.6.1 Stepped Buildings

- Where a *fire wall* serves as an *exterior wall* for a building and separates buildings having different roof levels, such wall shall terminate at a point not less than 30 inches above the lower roof level, provided the *exterior wall* for a height of 15 feet above the lower roof is not less than 1-hour fire-resistance rated construction from both sides with openings protected by fire assemblies having a *fire protection rating* of not less than ¾ hour.
- 2 Exceptions.

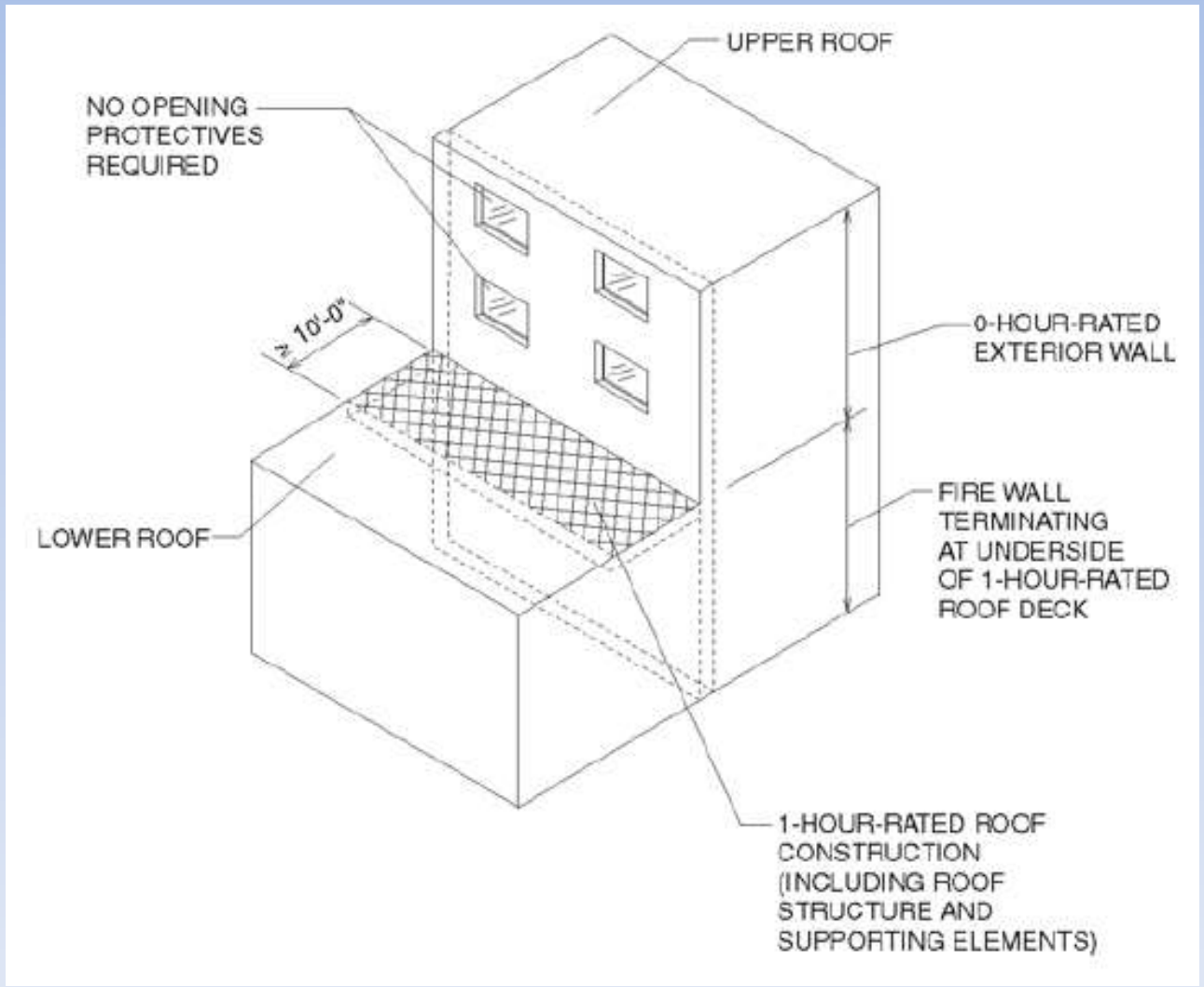
Fire Walls – Stepped Buildings (1)



Fire Walls – Stepped Buildings (2)



Fire Walls – Stepped Buildings (3)



706.8 Openings

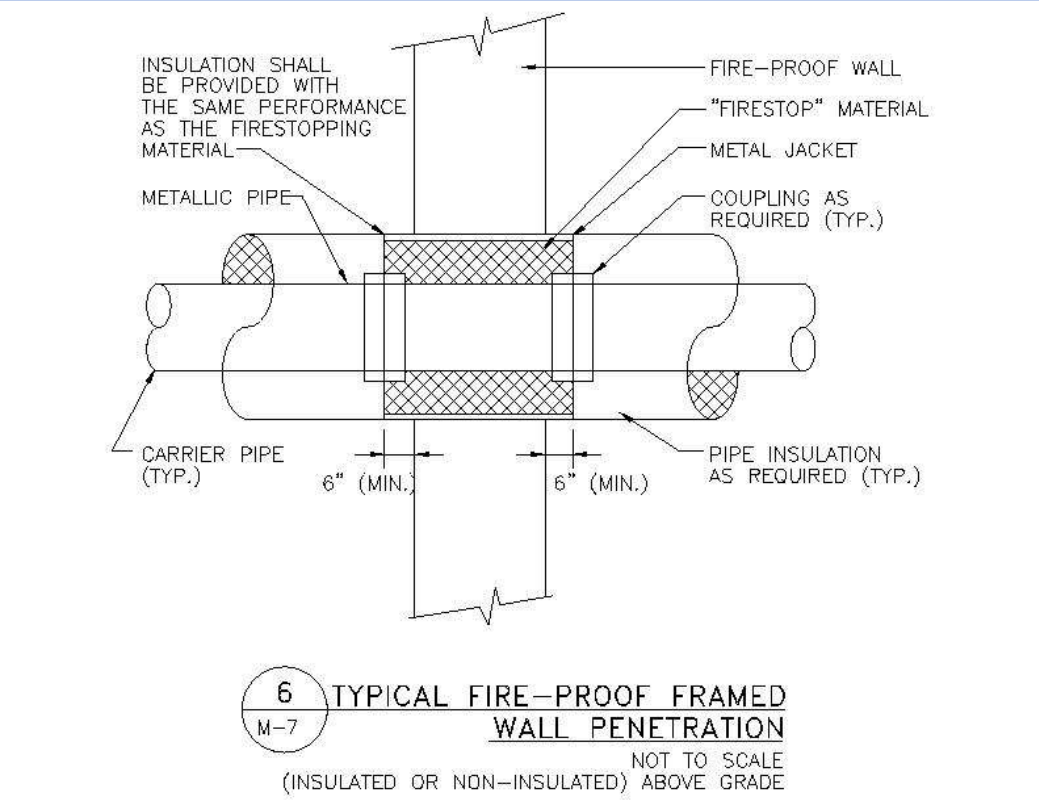
- Each opening through a *fire wall* shall be protected in accordance with Section 716.5 and shall not exceed 156 square feet. The aggregate width of openings at any floor level shall not exceed 25 percent of the length of the wall.

Exceptions:

1. Openings are not permitted in party walls constructed in accordance with Section 706.1.1.
2. Openings shall not be limited to 156 square feet where both buildings are equipped throughout with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1.

706.9 Penetrations

- Penetrations of *fire walls* shall comply with Section 714.



706.10 Joints

- Joints made in or between *fire walls* shall comply with Section 715.

706.11 Ducts and Air Transfer Openings

- Ducts and air transfer openings **shall not** penetrate *fire walls*.

Exception:

Penetrations by ducts and air transfer openings of *fire walls* that are not on a *lot line* shall be allowed provided the penetrations comply with Section 717. The size and aggregate width of all openings shall not exceed the limitations of Section 706.8.

706
Fire Wall Summary

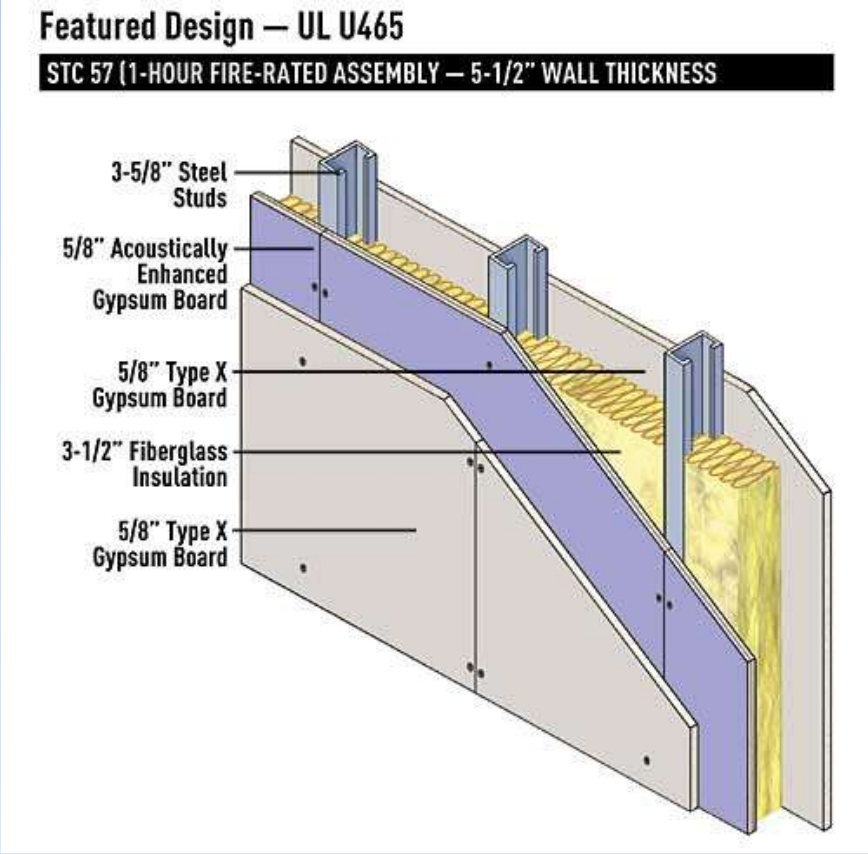
Issue	Requirement
Required fire-resistance rating	Based upon occupancy classifications of separated buildings or fire areas: Table 706.4
Required continuity	Foundation to 30” above roof (except as noted) Exterior wall to exterior wall plus 18” (except as noted)
Openings	Any single opening maximum 120 square feet; unless sprinklered Aggregate width not exceeding 25% of length of wall
Types of materials	Noncombustible for Types I through IV construction Combustible for Type V construction
Robustness of structural system	Bearing load for tributary loads, as required Allow structural collapse on either side without collapse of wall

707 Fire Barriers

- Fire barriers are used in the following applications:
  - Fire area separations
  - Mixed-occupancy separations
  - Incidental accessory occupancies
  - Exit enclosures
  - Shaft enclosures
  - Horizontal exits
  - Exit passageways
  - Atriums
  - Control areas

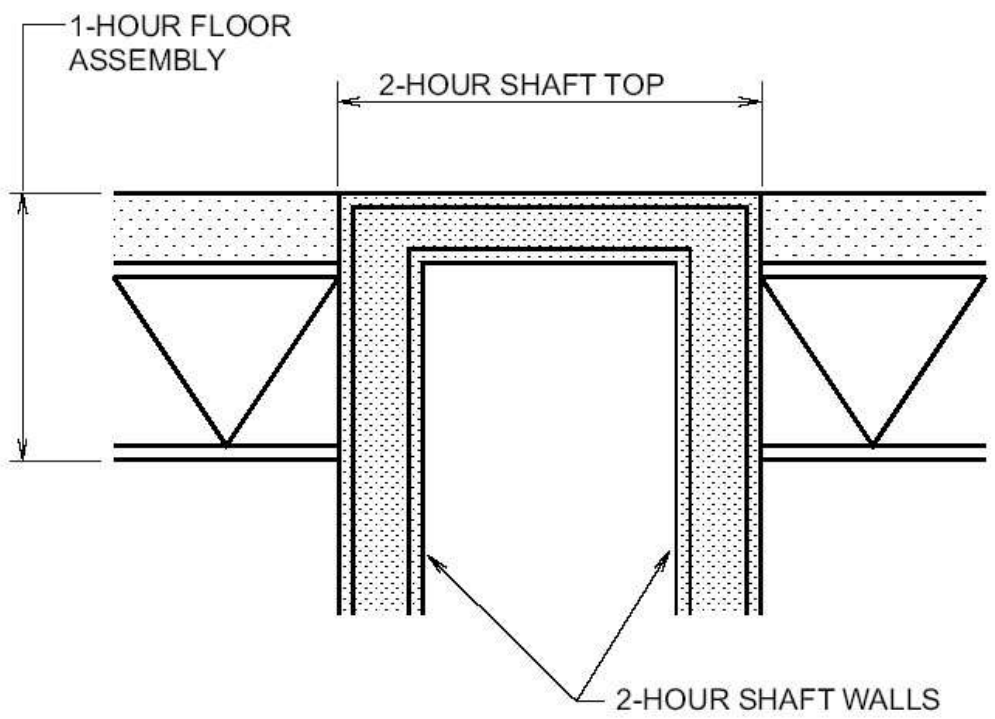
707.2 Materials

- *Fire barriers* shall be of materials permitted by the building type of construction.



707.3.1 Shaft Enclosures

- The *fire-resistance rating* of the *fire barrier* separating building areas from a shaft shall comply with Section 713.4.



Other Fire Barrier Uses…

- 707.3.2 Interior Exit Stairway And Ramp Construction
- 707.3.3 Enclosures For Exit Access Stairways
- 707.3.4 Exit Passageway
- 707.3.5 Horizontal Exit
- 707.3.6 Atriums
- 707.3.7 Incidental uses
- 707.3.8 Control areas
- 707.3.9 Separated Occupancies

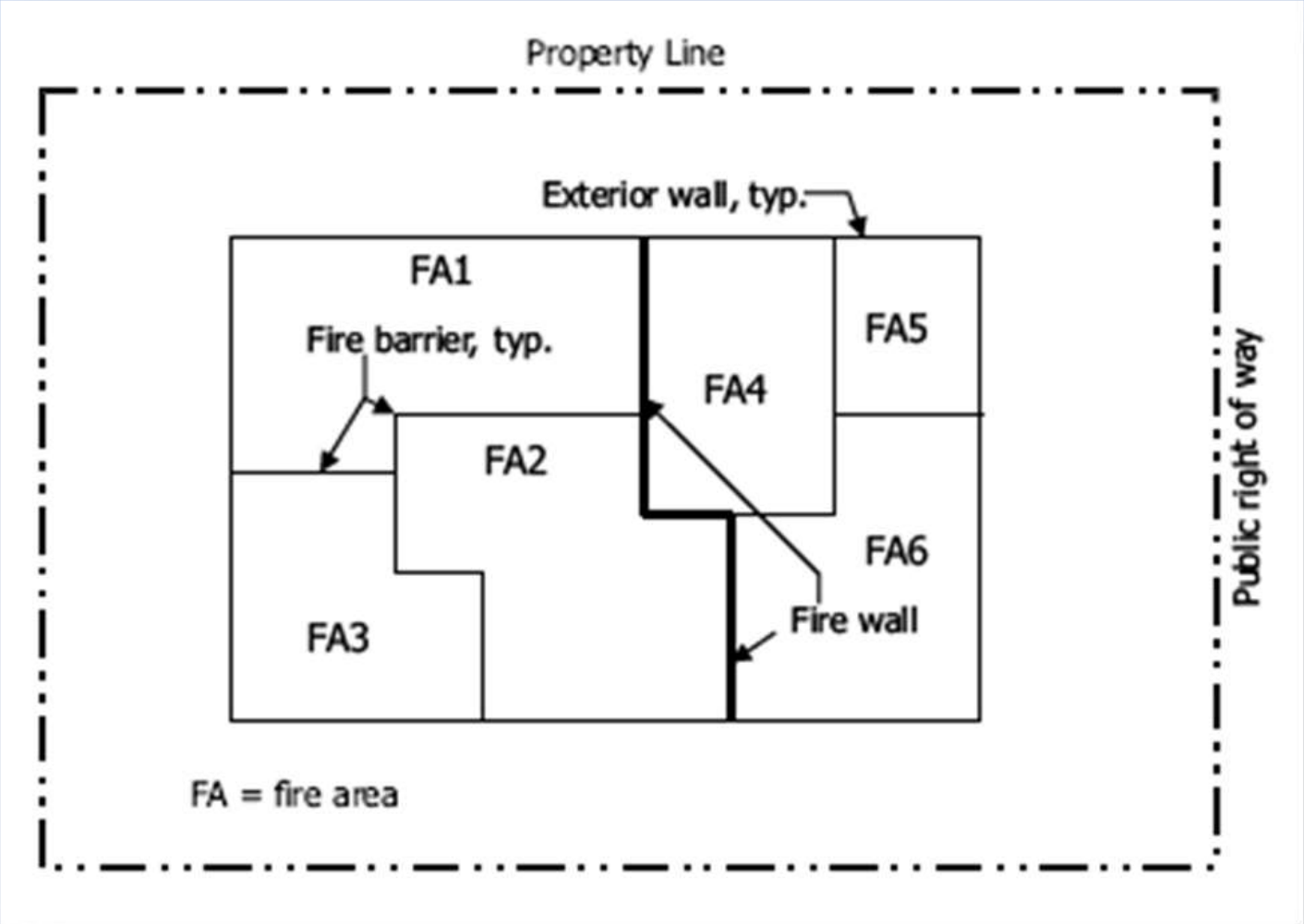
707 Fire Barriers

- **707.3.10 Fire areas.** The *fire barriers* or *horizontal assemblies*, or both, separating a single occupancy into different ***fire areas*** shall have a *fire-resistance rating* of not less than that indicated in **Table 707.3.10**.
- The *fire barriers* or *horizontal assemblies*, or both, separating *fire areas* of mixed occupancies shall have a *fire-resistance rating* of not less than the highest value indicated in **Table 707.3.10** for the occupancies under consideration.

As Defined

- **FIRE AREA.** The aggregate floor area enclosed and bounded by fire walls, *fire barriers*, *exterior walls* or *horizontal assemblies* of a building. Areas of the building not provided with surrounding walls shall be included in the fire area if such areas are included within the horizontal projection of the roof or floor next above.

Fire Area


Property Line
Exterior wall, typ.
FA1
Fire barrier, typ.
FA2
FA3
FA4
FA5
FA6
Fire wall
Public right of way
FA = fire area

Fire Area Example

Group M – 11,000 sq. ft. sales area w/ 3,000 sq. ft. roofed exterior sales area. Are fire sprinklers required?

A single group M fire area of 14,000 sq. ft. requires a fire sprinkler system.

No fire sprinklers are required if the wall separating the interior from the exterior is a complying 2-hour fire barrier (707.3.10).

Table 707.3.10 Fire-resistance Rating Requirements For Fire Barrier Assemblies or Horizontal Assemblies Between Fire Areas

OCCUPANCY GROUP	FIRE-RESISTANCE RATING (hours)
H-1, H-2	4
F-1, H-3, S-1	3
A, B, E, F-2, H-4, H-5, I, M, R, S-2	2
U	1

707.4 Exterior Walls

- Where exterior walls serve as a part of a required fire-resistance-rated shaft or stairway or ramp enclosure, or separation, such walls shall comply with the requirements of Section 705 for exterior walls and the fire resistance rated enclosure or separation requirements shall not apply.

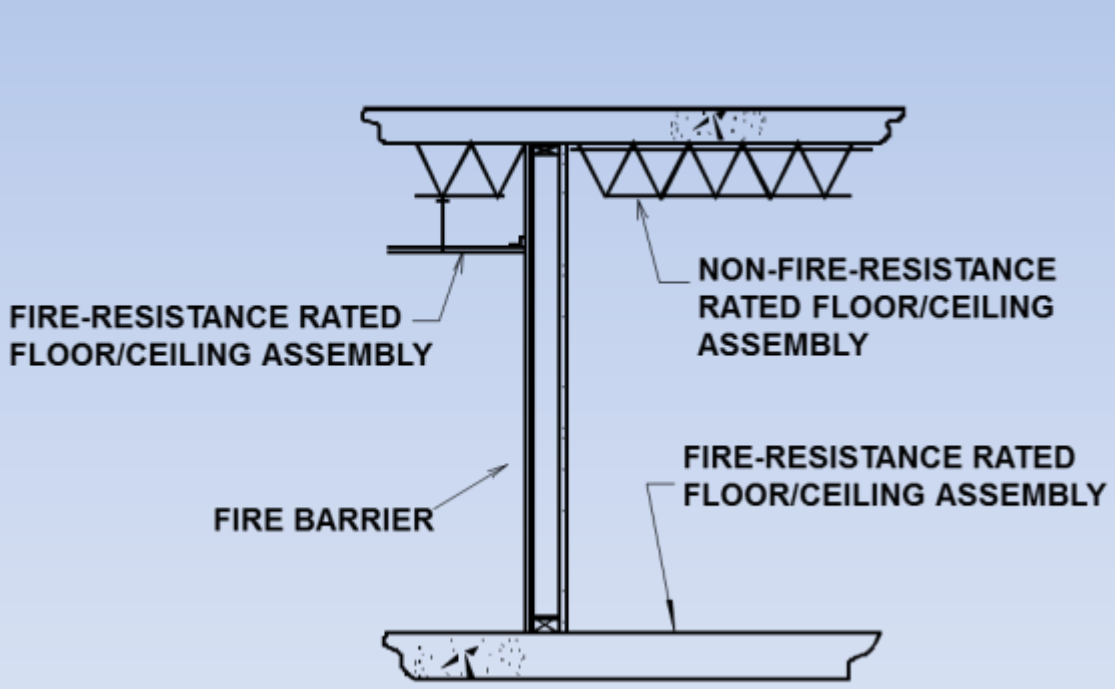
Exception:

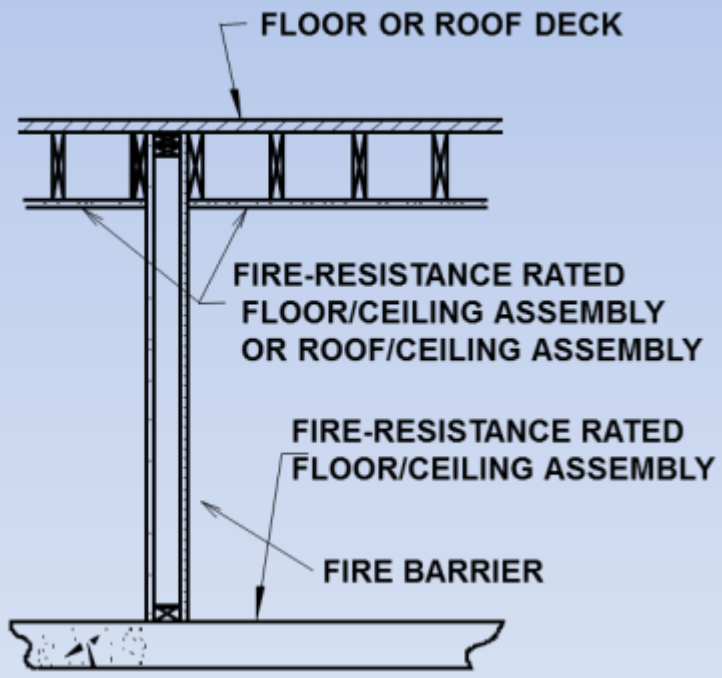
- Exterior walls required to be fire-resistance rated in accordance with Section 1019 for exterior egress balconies, Section 1022.7 for interior exit stairways and ramps and Section 1026.6 for exterior exit stairways and ramp.

707 Fire Barriers

- **707.5 Continuity.** *Fire barriers* shall extend from the top of the foundation or floor/ceiling assembly below to the underside of the floor or roof sheathing, slab or deck above and shall be securely attached thereto. Such *fire barriers* shall be continuous through concealed space, such as the space above a suspended ceiling. Joints and voids at intersections shall comply with Sections 707.8 and 707.9

Fire Barrier Continuity





707.5.1
Supporting Construction

- The supporting construction for a *fire barrier* shall be protected to afford the required *fire-resistance rating* of the *fire barrier* supported. Hollow vertical spaces within a *fire barrier* shall be fireblocked in accordance with Section 718.2 at every floor level.
- 4 Exceptions.

707.6 Openings

- Openings in a *fire barrier* shall be protected in accordance with Section 716. Openings shall be limited to a maximum aggregate width of 25 percent of the length of the wall, and the maximum area of any single opening shall not exceed 156 square feet. Openings in enclosures for exit access stairways and ramps, interior exit stairways and ramps and exit passageways shall also comply with Sections 1022.3 and 1023.5, respectively.
- 5 Exceptions.

707.7 Penetrations

- Penetrations of *fire barriers* shall comply with Section 714.

707.7.1
Prohibited Penetrations

- Penetrations into enclosures for *exit access* stairways, *exit access* ramps, interior *exit* stairways, interior *exit* ramps or an exit passageway shall be allowed only when permitted by Section 1009.3.1.5, 1022.5 or 1023.6, respectively.

Starts Here…

…Continues Down To The Landing…

…And Exits The Shaft Out the Landing Wall.

707.9 Voids At Intersections

- The voids created at the intersection of a *fire barrier* and a non-fire-resistance-rated roof assembly shall be filled. An approved material or system shall be used to fill the void, 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.

707.10 Ducts and Air Transfer Openings

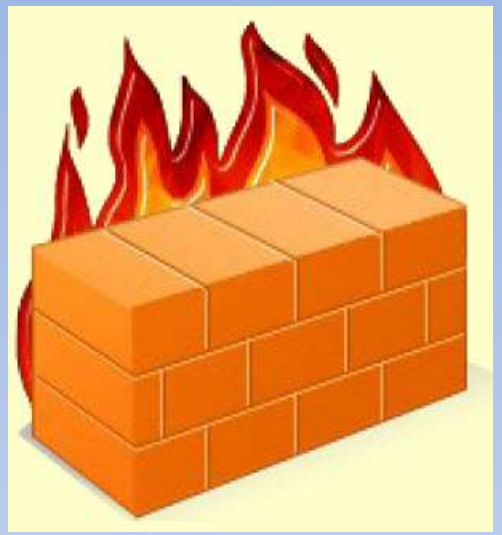
- Penetrations in a *fire barrier* by ducts and air transfer openings shall comply with Section 717.

Not Good…


highly flammable foam used at firewall penetrations
www.checkthishouse.com

707
Fire Barrier Summary

Issue	Requirement
Required Fire-Resistance Rating	Depends upon specific use
Required continuity	Floor/ceiling below to deck above through concealed spaces
Openings	General: Aggregate width <25% wall length; maximum size 156 sq. ft. (15 m^2) Specific: Rules based on use of barrier
Types of materials	As required for the type of construction
Robustness of structural system	If bearing, fire tested with load



Ch. 7 - Fire and Smoke Protection Features

PART II

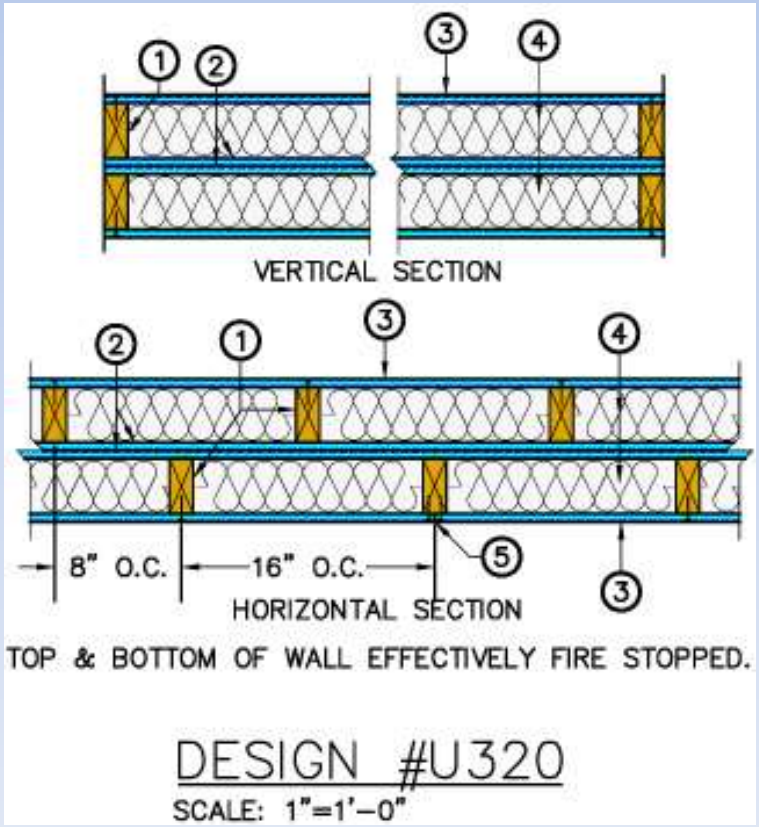
708 Fire Partitions

- **708.1 General.** The following wall assemblies shall comply with this section.

1. Walls separating *dwelling units* in the same building as required by Section 420.2.
2. Walls separating *sleeping units* in the same building as required by Section 420.2.
3. Walls separating tenant spaces in *covered and open mall buildings* as required by Section 402.4.2.1.
4. Corridor walls as required by Section 1018.1.
5. Elevator lobby separation as required by Section 713.14.1.

708.2 Materials

- The walls shall be of materials permitted by the building type of construction



708.3 Fire Resistance Rating

- Fire partitions shall have a *fire resistance rating* of not less than 1 hour.

Exceptions:

1. Corridor walls permitted to have a 1/2 hour *fire-resistance rating* by Table 1018.1.
2. *Dwelling unit* and *sleeping unit* separations in buildings of Type IIB, IIIB and VB construction shall have *fire-resistance ratings* of not less than ½ hour in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

Continuity

- Fire partitions must:
- Extend from the floor below to the underside of the floor/roof sheathing, slab or deck above, or to the fire-resistance-rated floor/ceiling or roof/ceiling assembly above and shall be securely attached.
- Be supported by fire-resistance-rated construction equivalent to the rating of the fire partition.

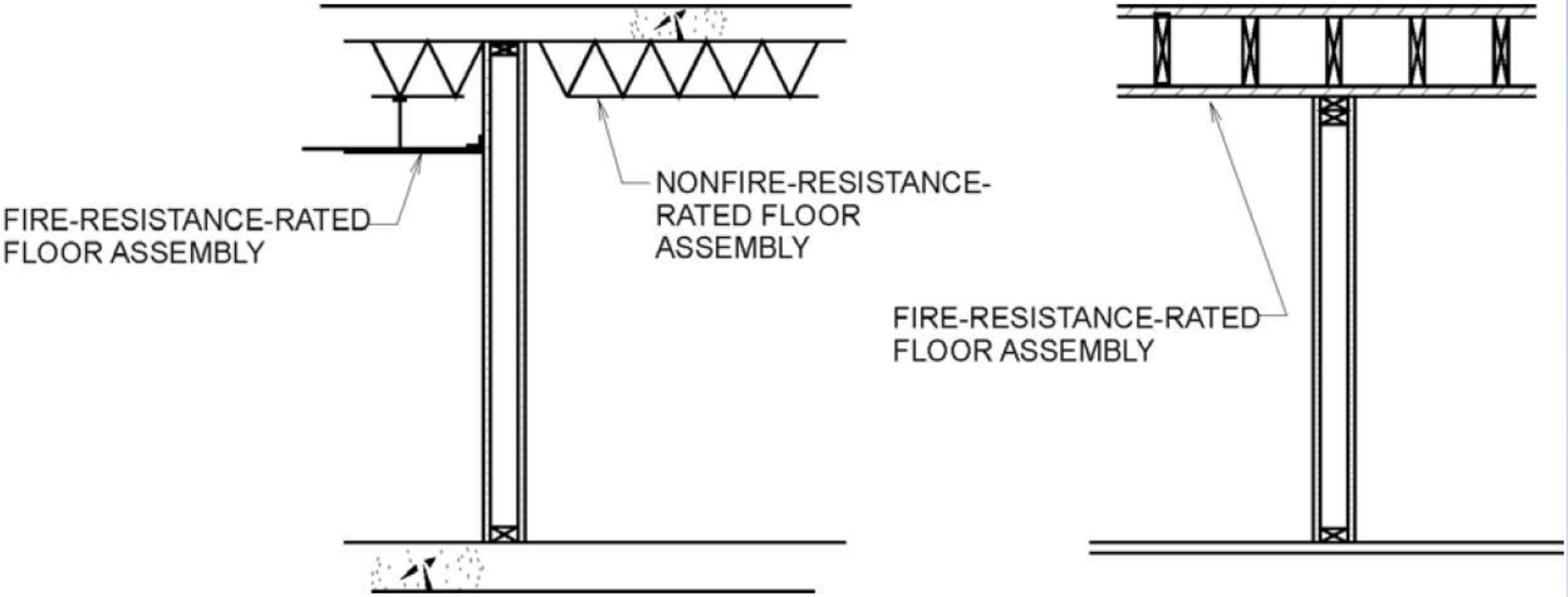
708.4 Continuity

- Fire partitions shall extend from the top of the foundation or floor/ceiling assembly below to the underside of the floor or roof sheathing, slab or deck above or to the fire-resistance-rated floor/ceiling or roof/ceiling assembly above, and shall be securely attached thereto. In combustible construction where the *fire partitions* are not required to be continuous to the sheathing, deck or slab, the space between the ceiling and the sheathing, deck or slab above shall be fireblocked or draftstopped in accordance with Sections 718.2 and 718.3 at the partition line.

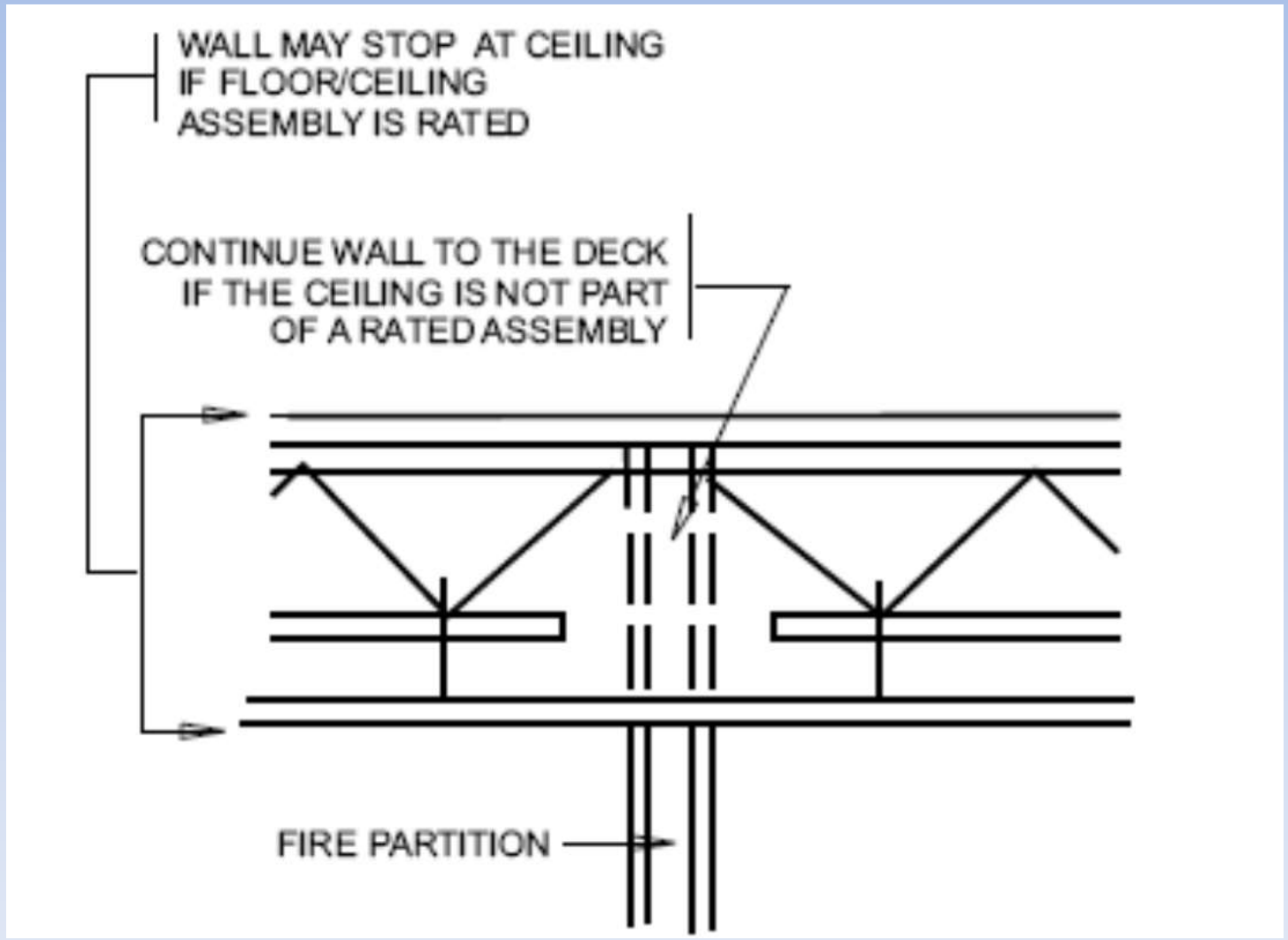
708.4 Continuity…continued

- The supporting construction shall be protected to afford the required *fire-resistance rating* of the wall supported, except for walls separating tenant spaces in *covered and open mall buildings*, walls separating *dwelling units*, walls separating *sleeping units* and *corridor* walls, in buildings of Type IIB, IIIB and VB construction.
- 6 Exceptions.

Continuity of Fire Partitions

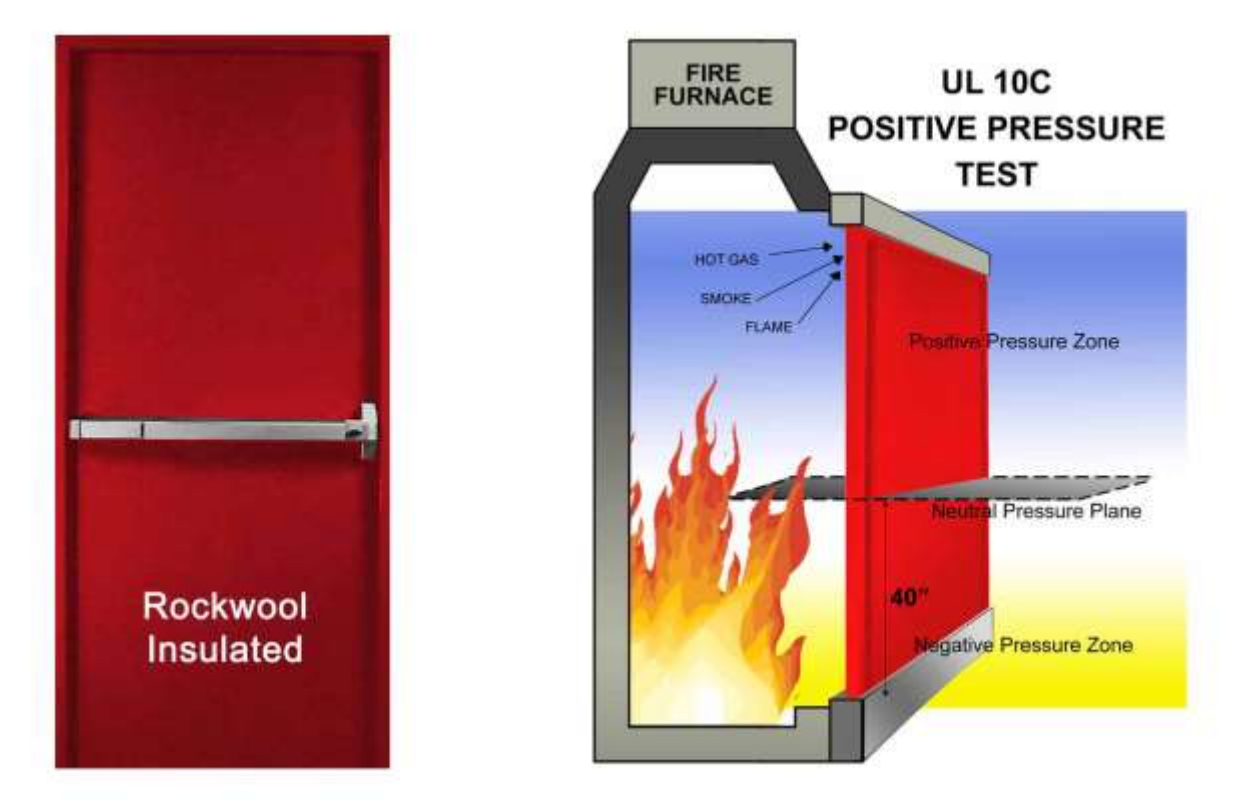


Continuity of Fire Partitions



708.6 Openings

- Openings in a *fire partition* shall be protected in accordance with Section 716.



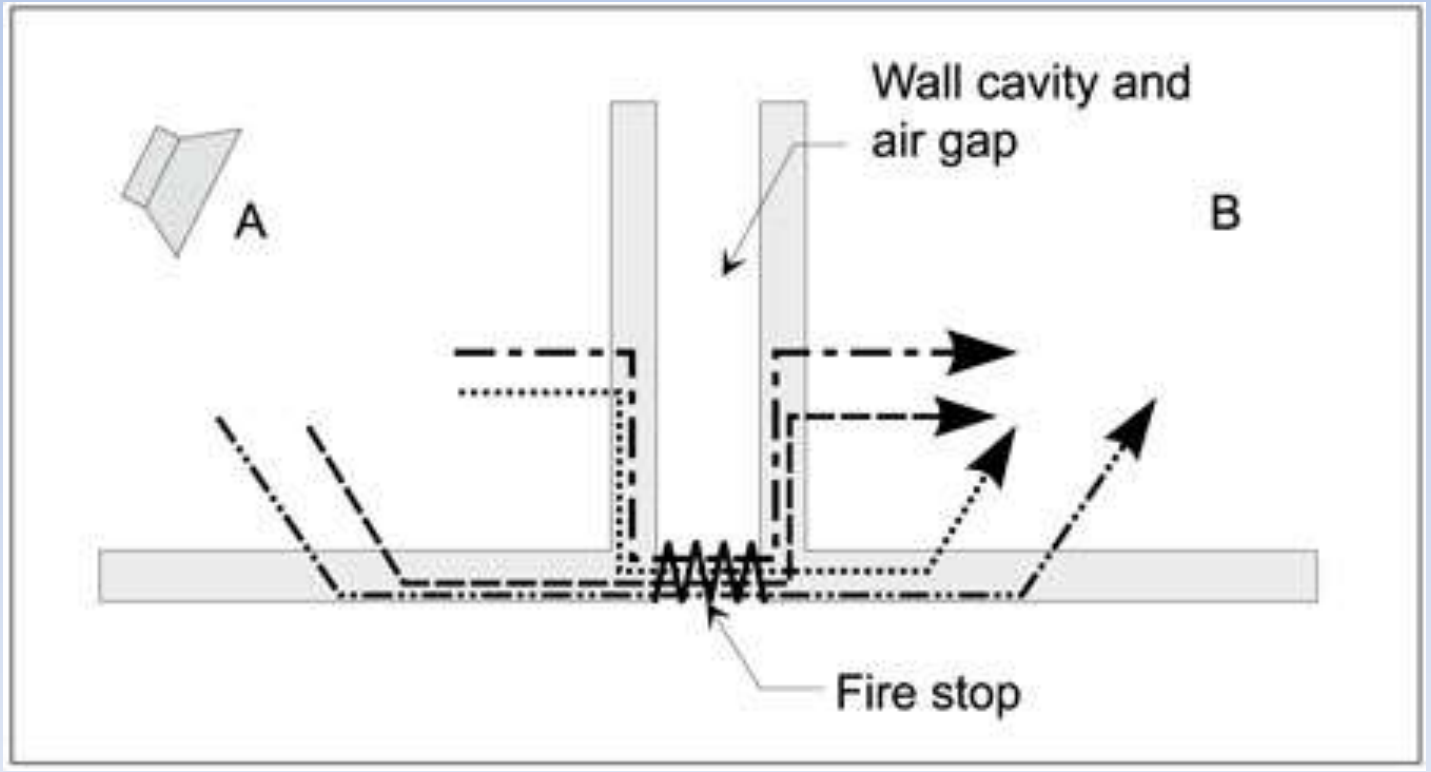
708.7 Penetrations

- Penetrations of *fire partitions* shall comply with Section 714.

This is the same as the penetration requirements for fire barriers. n 714.

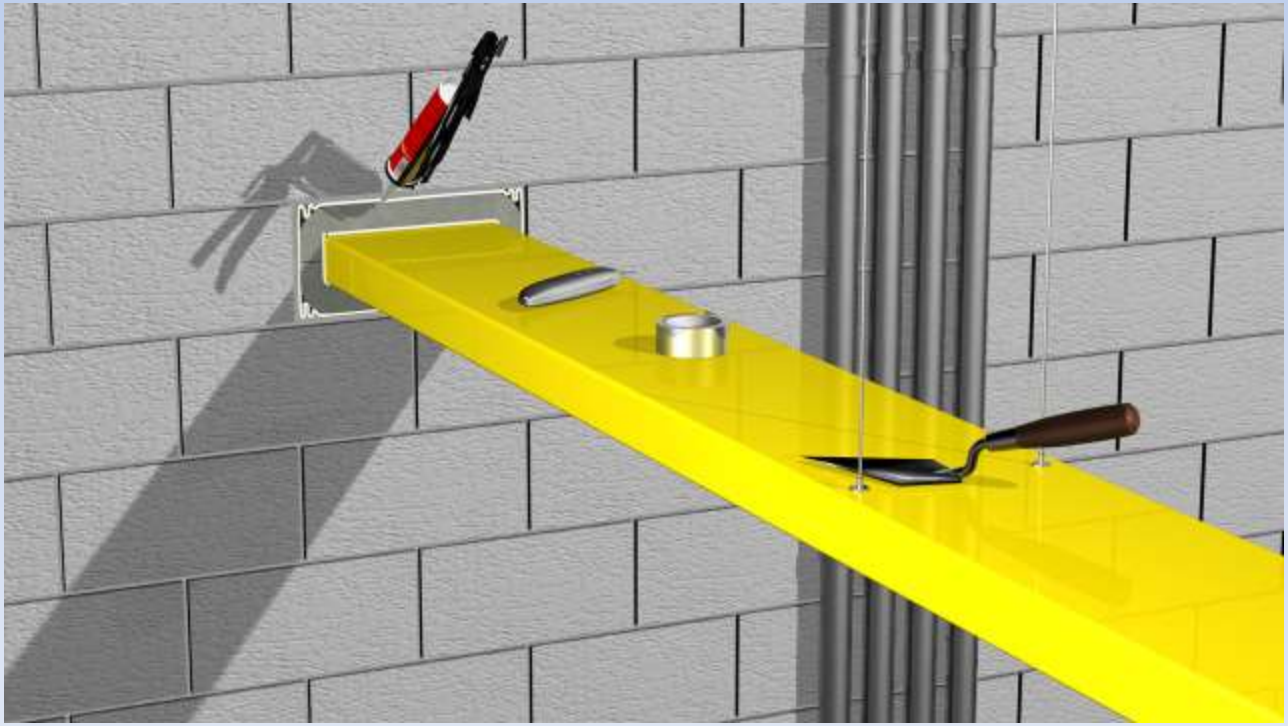
708.8 Joints

- Joints made in or between *fire partitions* shall comply with Section 715.



708.9 Ducts and Air Transfer Openings

- Penetrations in a *fire partition* by ducts and air transfer openings shall comply with Section 717.



708
Fire Partition Summary

Issue	Requirement
Required Fire-Resistance Rating	1 hour, with exceptions, depending on use. For corridors see Table 1018.1
Required continuity	Floor/ceiling below to deck above or tight to underside of fire-resistance rated floor/ceiling or roof/ceiling assembly. Supported by fire-resistance rated construction, except in corridors, tenant, and sleeping room separations in Types IIB, IIIB and VB construction
Openings	20 minutes for corridors, elevator lobbies and ½-hour walls 45 minutes for all others
Types of materials	As required for the type of construction
Robustness of structural system	If bearing, fire tested with load

709 Smoke Barriers

- Smoke barriers are typically used in the following applications:
  - Group I-2
  - Group I-3
  - Areas of refuge

709 Smoke Barriers

- **709.3 Fire-resistance rating.** A 1-hour *fire-resistance rating* is required for *smoke barriers*.

Exception: *Smoke barriers* constructed of minimum 0.10-inch-thick (2.5 mm) steel in Group I-3 buildings.

709.2 Materials

- *Smoke barriers* shall be of materials permitted by the building type of construction.

709.3 Fire Resistance Rating

- A 1-hour *fire-resistance rating* is required for *smoke barriers*.

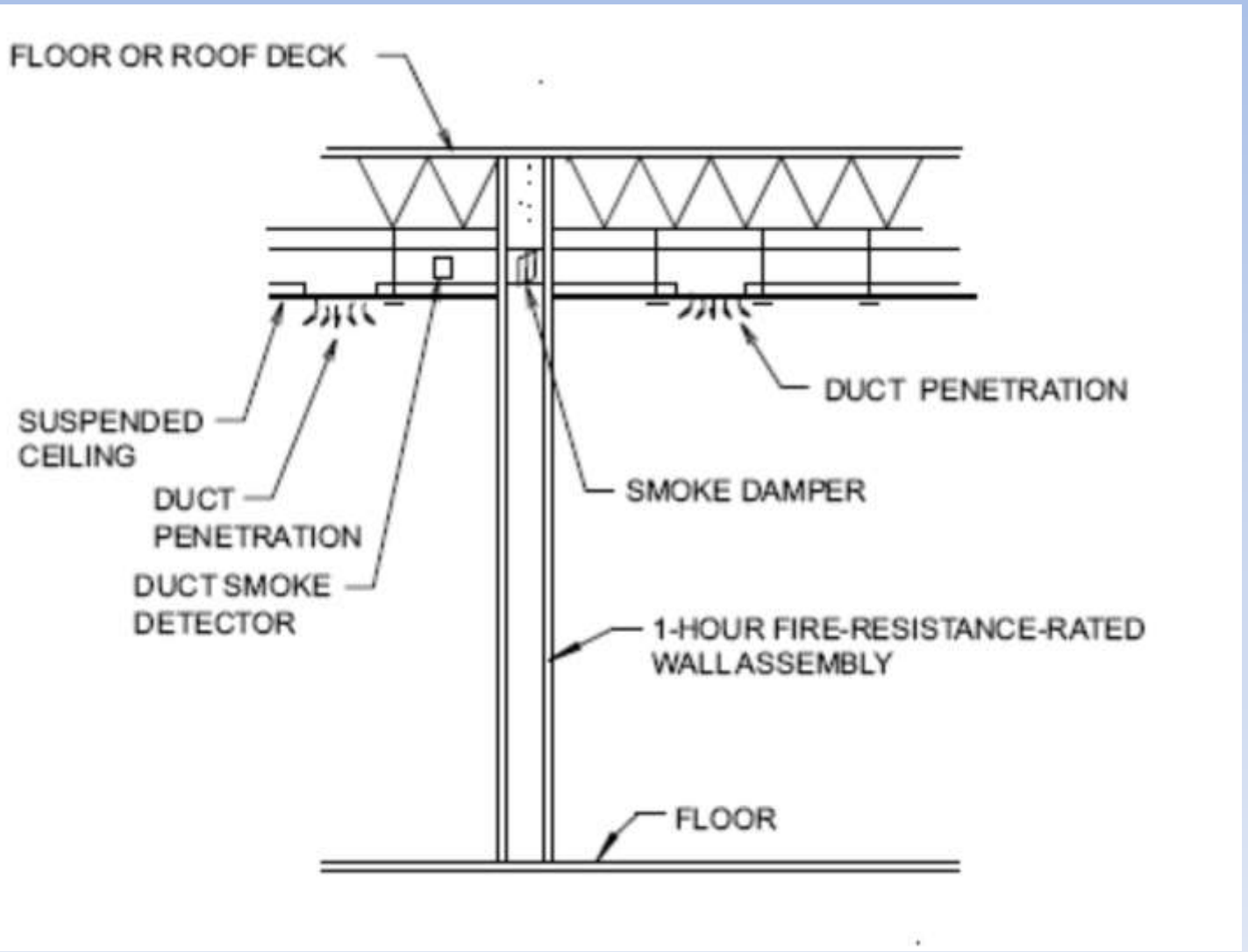
Exception:

Smoke barriers constructed of minimum 0.10-inch-thick steel in Group I-3 buildings.

709.4 Continuity

- *Smoke barriers* shall form an effective membrane continuous from outside wall to outside wall and from the top of the foundation or floor/ceiling assembly below to the underside of the floor or roof sheathing, deck or slab above, including continuity through concealed spaces, such as those found above suspended ceilings, and interstitial structural and mechanical spaces. The supporting construction shall be protected to afford the required *fire-resistance rating* of the wall or floor supported in buildings of other than Type IIB, IIIB or VB construction.
- 3 Exceptions.

709 Smoke Barriers



709.5 Openings

- Openings in a *smoke barrier* shall be protected in accordance with Section 716.
- 2 Exceptions (Group I-2 and ambulatory care)

709.6 Penetrations

- Penetrations of *smoke barriers* shall comply with Section 714.

Other Smoke Barrier Issues…

- **709.7 Joints.** Joints made in or between *smoke barriers* shall comply with Section 715.
- **709.8 Ducts and air transfer openings.** Penetrations in a *smoke barrier* by ducts and air transfer openings shall comply with Section 717.

709
Smoke Barrier Summary

Issue	Requirement
Required Fire-Resistance Rating (Section 710.3)	1-hour with the exception that construction of minimum 0.1" (2.5 mm) thick steel in Group I-3 buildings is allowed
Required continuity (Section 710.4)	Horizontal: Outside wall to outside wall Vertical: Floor to slab or deck above, continuous through interstitial spaces Supporting construction is required fire-resistance rating except in IIB, IIIB, and VB construction
Openings (Section 710.5)	20 minutes Smoke- and draft-controlled doors tested in accordance with UL 1784
Types of materials (Section 710.2)	As required for the type of construction
Robustness of structural system	If bearing, fire tested with load

710 Smoke Partitions

- **710.3 Fire-resistance rating.** Unless required elsewhere in the code, smoke partitions are not required to have a *fire resistance rating*.

710 Smoke Partitions

- **710.2 Materials.** The walls shall be of materials permitted by the building type of construction.
- **710.3 Fire-resistance rating.** Unless required elsewhere in the code, smoke partitions are not required to have a *fire resistance rating*.

710.4 Continuity

- Smoke partitions shall extend from the top of the foundation or floor below to the underside of the floor or roof sheathing, deck or slab above or to the underside of the ceiling above where the ceiling membrane is constructed to limit the transfer of smoke.

710 Smoke Partitions

- **710.5 Openings.** Openings in smoke partitions shall comply with Sections 710.5.1 and 710.5.2.
- **710.5.1 Windows.** Windows in smoke partitions shall be sealed to resist the free passage of smoke or be automatic closing upon detection of smoke.

710 Smoke Partitions

- **710.5.2 Doors.** Doors in smoke partitions shall comply with Sections 710.5.2.1 through 710.5.2.3.
- **710.5.2.1 Louvers.** Doors in smoke partitions shall not include louvers.

710.5.2.2 Smoke and Draft Control Doors

- Where required elsewhere in the code, doors in smoke partitions shall meet the requirements for a smoke and draft control door assembly tested in accordance with UL 1784. 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 test and the elevated temperature exposure test. Installation of smoke doors shall be in accordance with NFPA 105.

710.5.2.3 Self or Automatic Closing Doors

- Where required elsewhere in the code, doors in smoke partitions shall be self or automatic closing by smoke detection in accordance with Section 716.5.9.3.

710 Smoke Partitions

- **710.6 Penetrations.** The space around penetrating items shall be filled with an ***approved*** material to limit the free passage of smoke.
- **710.7 Joints.** Joints shall be filled with an *approved* material to limit the free passage of smoke.
- NOTE: There is no prescriptive requirement for a material used to seal penetrations in smoke partitions.

For Discussion

- There is no prescriptive requirement for a material used to seal penetrations in smoke partitions.
- The level of performance is not clearly established.
- The word “approved” indicates that the building official’s decision will determine what materials are required or accepted.

710.8 Ducts and Air Transfer Openings

- The space around a duct penetrating a smoke partition shall be filled with an *approved* material to limit the free passage of smoke. Air transfer openings in smoke partitions shall be provided with a *smoke damper* complying with Section 717.3.2.2.

Exception:

Where the installation of a *smoke damper* will interfere with the operation of a required smoke control system in accordance with Section 909, *approved* alternative protection shall be utilized.

710
Smoke Partition Summary

Issue	Requirements
Required fire-resistance rating	Not required (unless otherwise specifically called for).
Required continuity	Floor/ceiling below to deck above or tight to underside of ceiling membrane designed to limit passage of smoke.
Openings	Windows: Sealed to resist free passage of smoke. Doors: 1. No louvers. 2. Air leakage rated (UL 1784). 3. Self closing, or automatic closing by smoke detectors.
Types of materials	As required for the type of construction.
Robustness of structural systems	If bearing, fire tested with load.

711 Horizontal Assemblies

- Fire-resistance rating for floors:
  - Floor/ceiling assemblies are required to have the fire-resistance rating specified in Table 601.
  - Where the floor/ceiling assembly separates **two** occupancies in a mixed occupancy condition, the rating shall be in accordance with Table 508.4.

711 Horizontal Assemblies

- Fire-resistance rating for floors:
  - Where the floor/ceiling assembly separates a **single** occupancy or groups of occupancies into different fire areas, the rating shall be in accordance with Table 707.3.10.
  - Floor/ceiling assemblies separating dwelling units or sleeping units in Group R-1, R-2 or I-1 shall have a minimum 1-hour fire resistance rating.

711 Horizontal Assemblies

- Where there is no usable space below a 1-hour-rated floor assembly, the ceiling membrane may be omitted on the crawl space side.
- Unless specifically permitted, all floor/ceiling assemblies shall be continuous without openings, penetrations or joints. Fire-resistance-rated floor/ceiling assemblies shall be supported by construction having the same rating as the assembly supported.

711.1 General

- Floor and roof assemblies required to have a *fire-resistance rating* shall comply with this section.
- Non-fire resistance rated floor and roof assemblies shall comply with Section 714.4.2.

711.2 Materials

- The floor and roof assemblies shall be of materials permitted by the building type of construction

711.3 Fire Resistance Rating

- The *fire-resistance rating* of floor and roof assemblies shall not be less than that required by the building type of construction. Where the floor assembly separates **mixed occupancies**, the assembly shall have a *fire-resistance rating* of not less than that required by Section **508.4** based on the occupancies being separated. Where the floor assembly separates a **single occupancy** into different *fire areas*, the assembly shall have a *fire-resistance rating* of not less than that required by Section **707.3.10**.

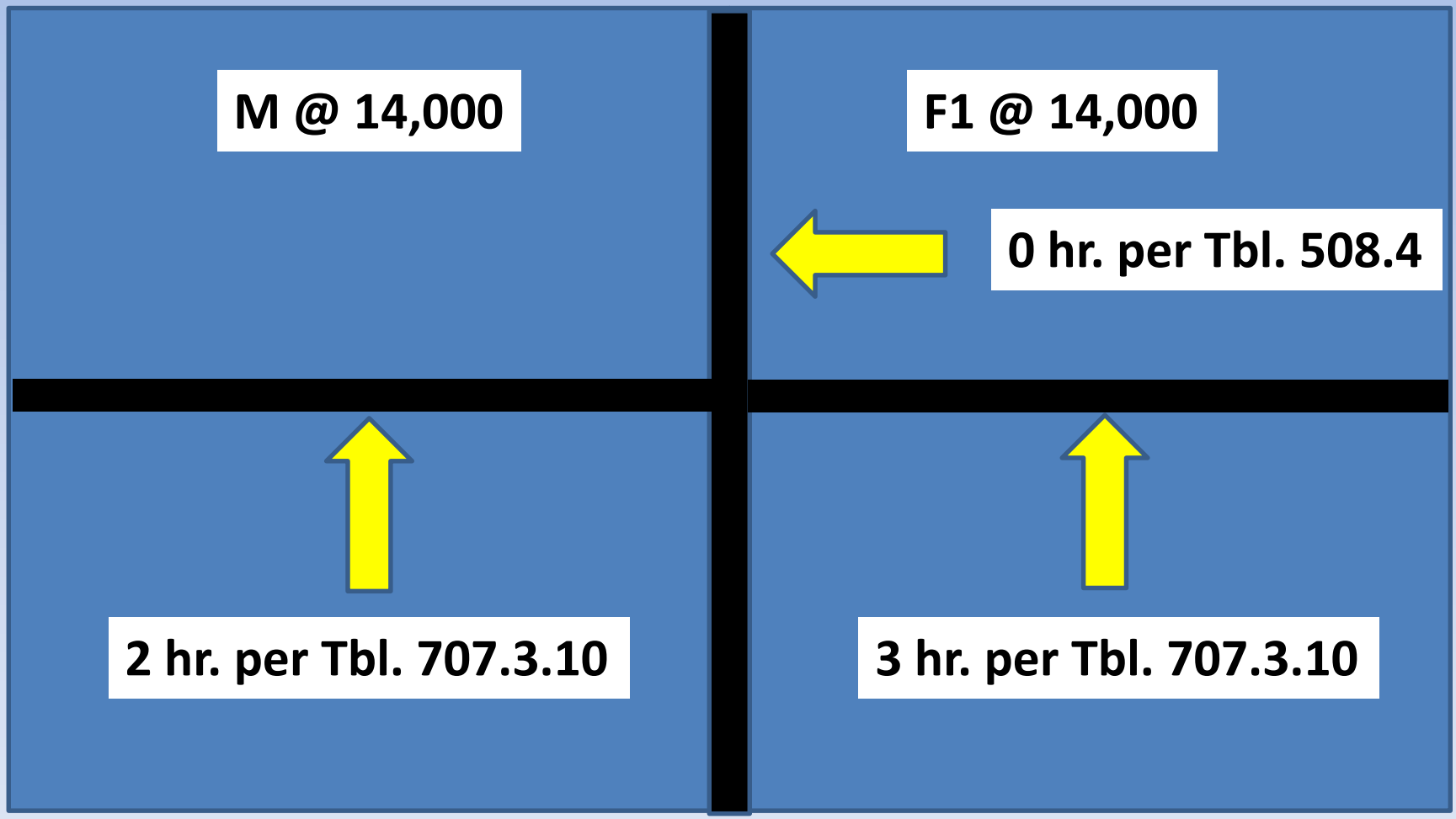
711.3 Fire Resistance Rating…continued

- *Horizontal assemblies* separating *dwelling units* in the same building and *horizontal assemblies* separating *sleeping units* in the same building shall be a minimum of 1-hour fire resistance rated construction.

Exception:

Dwelling unit and *sleeping unit* separations in buildings of Type IIB, IIIB and VB construction shall have *fire-resistance ratings* of not less than ½ hour in buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

Let's Take A Look…



Both Are Non-sprinkled w/ 12,000 sq. ft. FS Threshold

Table 508.4
Required Separation of Occupancies

OCCUPANCY	A, E		I-1, I-3, I-4		I-2		R[a]		F-2, S-2[b], U		B, F-1, M, S-1		H-1		H-2		H-3, H-4		H-5	
	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS
A, E	N	N	1	2	2	NP	1	2	N	1	1	2	NP	NP	3	4	2	3	2	NP
I-1, I-3, I-4	—	—	N	N	2	NP	1	NP	1	2	1	2	NP	NP	3	NP	2	NP	2	NP
I-2	—	—	—	—	N	N	2	NP	2	NP	2	NP	NP	NP	3	NP	2	NP	2	NP
R[a]	—	—	—	—	—	—	N	N	1[c]	2[c]	1	2	NP	NP	3	NP	2	NP	2	NP
F-2, S-2[b], U	—	—	—	—	—	—	—	—	N	N	1	2	NP	NP	3	4	2	3	2	NP
B, F-1, M, S-1	—	—	—	—	—	—	—	—	—	—	N	N	NP	NP	2	3	1	2	1	NP
H-1	—	—	—	—	—	—	—	—	—	—	—	—	N	NP	NP	NP	NP	NP	NP	NP
H-2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	N	NP	1	NP	1	NP
H-3, H-4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1[d]	NP	1	NP
H-5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	N	NP

Table 707.3.10 Fire-resistance Rating Requirements For Fire Barrier Assemblies or Horizontal Assemblies Between Fire Areas

OCCUPANCY GROUP	FIRE-RESISTANCE RATING (hours)
H-1, H-2	4
F-1, H-3, S-1	3
A, B, E, F-2, H-4, H-5, I, M, R, S-2	2
U	1

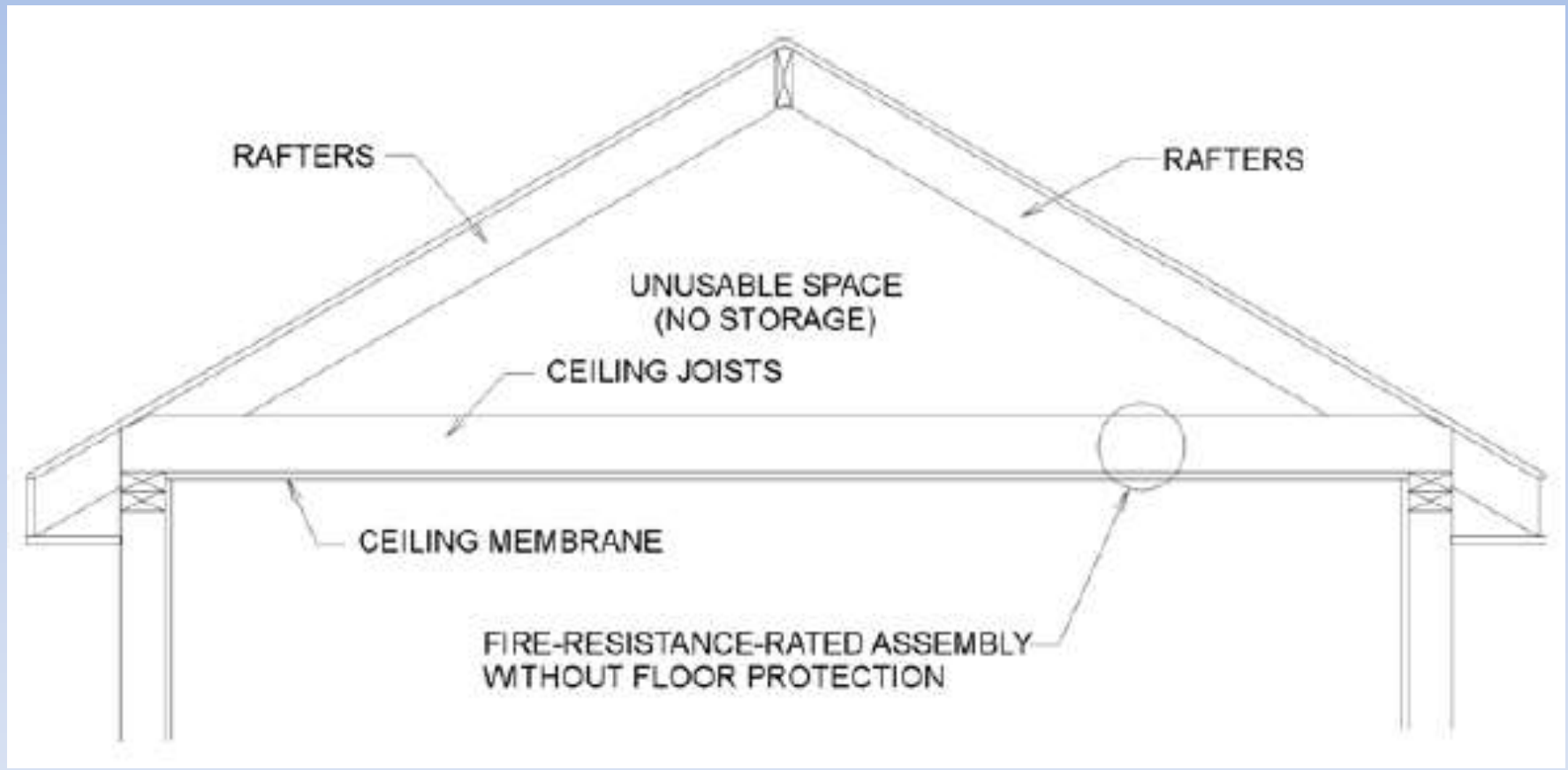
711.3.2 Access Doors

- Access doors shall be permitted in ceilings of fire-resistance-rated floor/ceiling and roof/ceiling assemblies provided such doors are tested in accordance with ASTM E 119 or UL 263 as horizontal assemblies and labeled by an *approved agency* for such purpose.

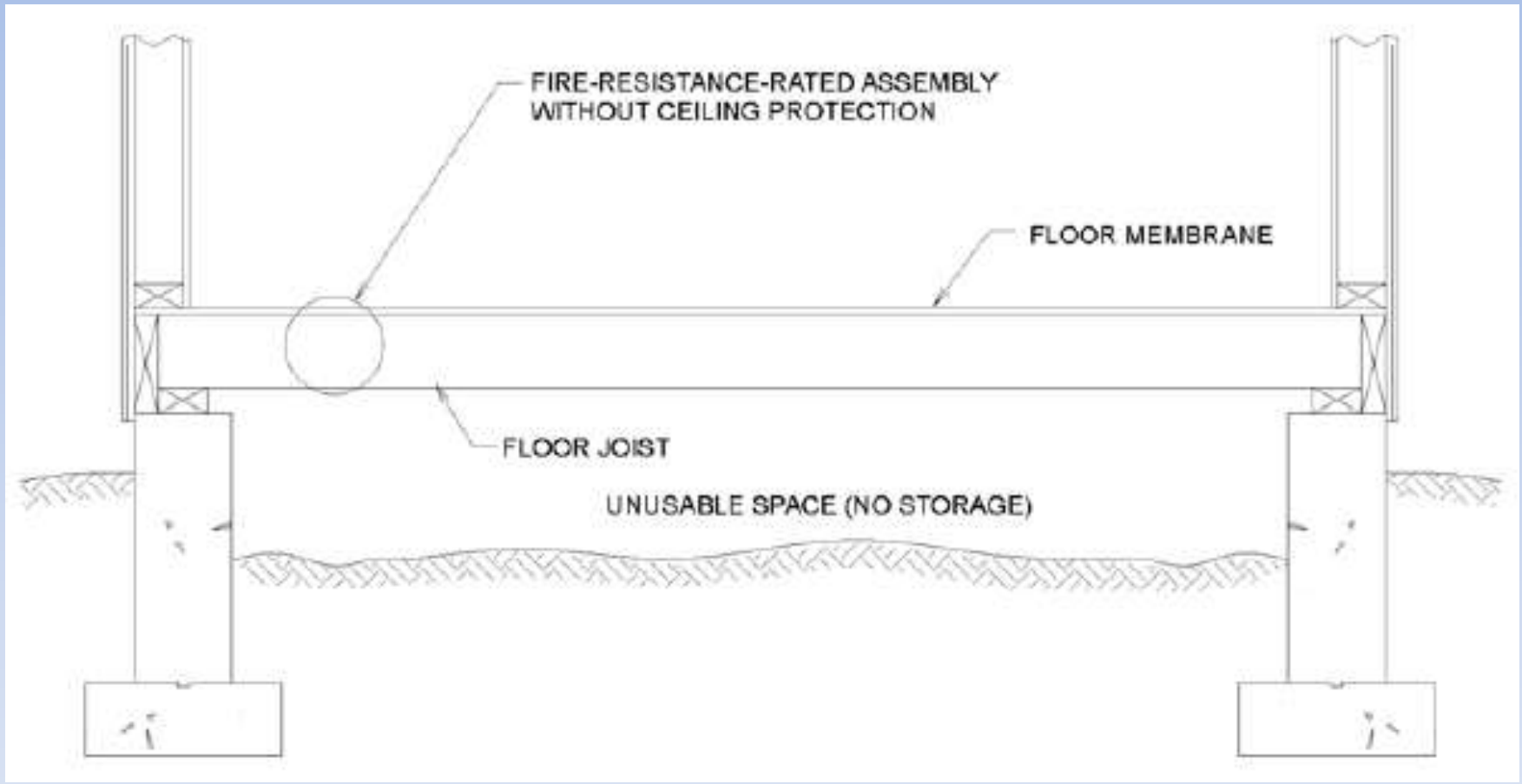
711.3.3 Unusable Space

- In 1-hour fire-resistance-rated floor assemblies, the ceiling membrane is not required to be installed over unusable crawl spaces.
- In 1-hour fire resistance rated roof assemblies, the floor membrane is not required to be installed where unusable *attic* space occurs above.

Unusable Space Above a Fire Resistance Rated Assembly



Unusable Space Below a Fire Resistance Rated Assembly



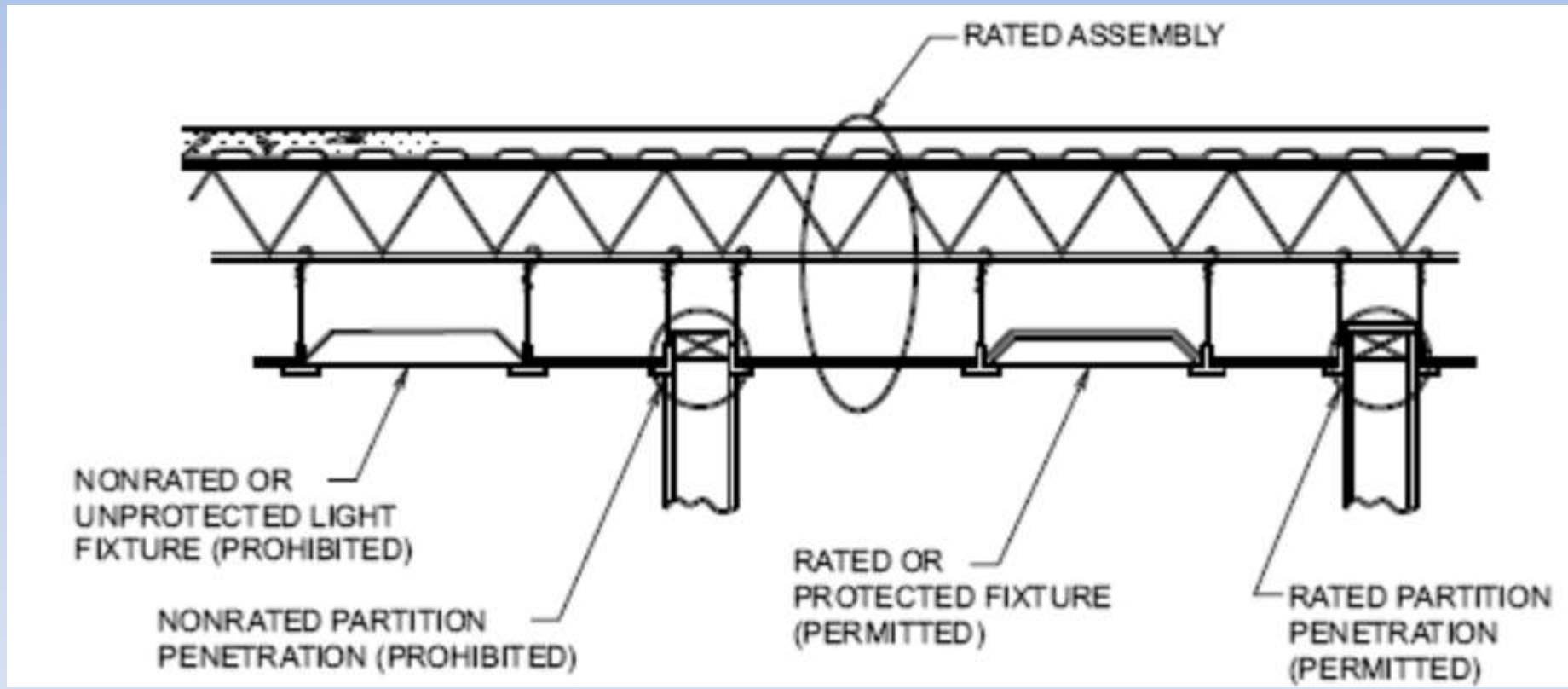
711.4 Continuity

- Assemblies shall be continuous without openings, penetrations or joints except as permitted by this section and Sections 712.1, 714.4, 715, 1009.3 and 1022.1.
- Skylights and other penetrations through a fire-resistance rated roof deck or slab are permitted to be unprotected, provided that the structural integrity of the fire-resistance-rated roof assembly is maintained.

711.4 Continuity

- Unprotected skylights shall not be permitted in roof assemblies required to be fire-resistance rated in accordance with Section 705.8.6. The supporting construction shall be protected to afford the required *fire resistance rating* of the *horizontal assembly* supported.
- 3 Exceptions.

Continuity of Fire Resistance Rated Floor/Ceiling Assembly



713 Shaft Enclosures

- **713.1 General.** The provisions of this section shall apply to shafts required to protect openings and penetrations through floor/ceiling and roof/ceiling assemblies. Exit access stairways and exit access ramps shall be protected in accordance with the applicable provisions of Section 1009. Interior exit stairways and interior exit ramps shall be protected in accordance with the requirements of Section 1022.

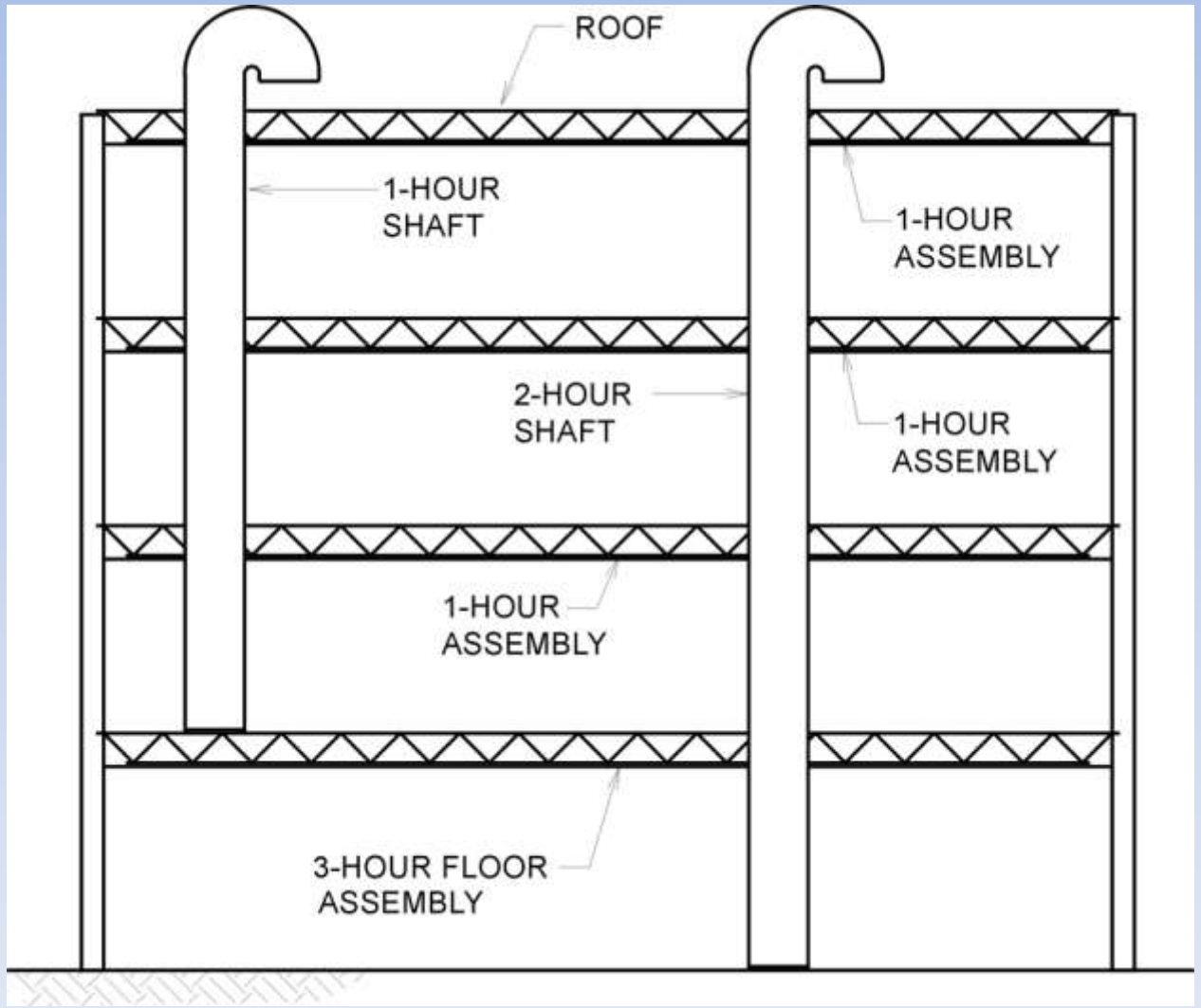
713 Shaft Enclosures

- **713.2 Construction.** Shaft enclosures shall be constructed as *fire barriers* in accordance with Section 707 or horizontal assemblies in accordance with Section 711, or both.

713.4 Fire Resistance Rating

- Shaft enclosures shall have a *fire-resistance rating* of not less than 2 hours where connecting four *stories* or more, and not less than 1 hour where connecting less than four *stories*. The number of *stories* connected by the shaft enclosure shall include any basements but not any *mezzanines*. Shaft enclosures shall have a *fire resistance rating* not less than the floor assembly penetrated, but need not exceed 2 hours. Shaft enclosures shall meet the requirements of Section 703.2.1.

713 Shaft Enclosures



Vertical Shaft Fire-Resistance Rating

713.5 Continuity

- Shaft enclosures shall be constructed as *fire barriers* in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both, and shall have continuity in accordance with Section 707.5 for *fire barriers* or Section 711.4 for *horizontal assemblies* as applicable.

713.6 Exterior Walls

- Where *exterior walls* serve as a part of a required shaft enclosure, such walls shall comply with the requirements of Section 705 for *exterior walls* and the fire resistance rated enclosure requirements shall not apply.

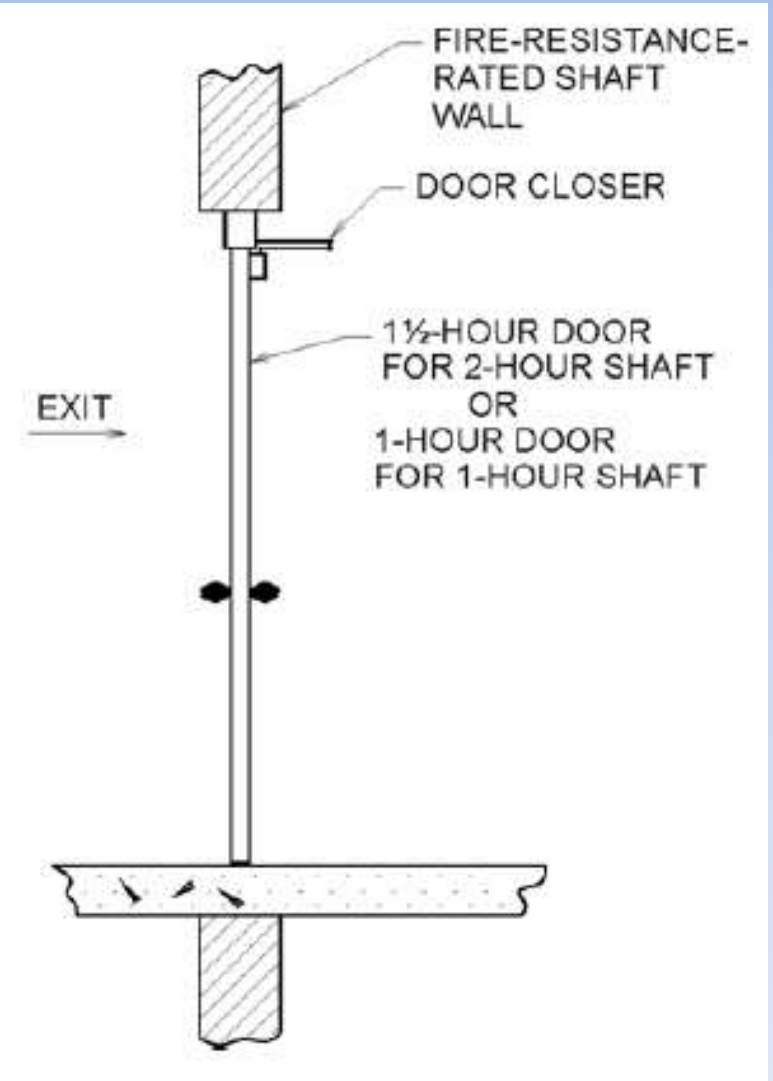
Exception:

Exterior walls required to be fire resistance rated in accordance with Section 1019.2 for exterior egress balconies, Section 1022.7 for interior *exit* stairways and ramps and Section 1026.6 for exterior *exit* stairways and ramps.

713.7 Openings

- Openings in a shaft enclosure shall be protected in accordance with Section 716 as required for *fire barriers*.
- Doors shall be self or automatic-closing by smoke detection in accordance with Section 716.5.9.3.

Protected Opening In Shaft Enclosure



713.7.1 Prohibited Openings

- Openings other than those necessary for the purpose of the shaft shall not be permitted in shaft enclosures.

713.8 Penetrations

- Penetrations in a shaft enclosure shall be protected in accordance with Section 714 as required for *fire barriers*. Structural elements, such as beams or joists, where protected in accordance with Section 714 shall be permitted to penetrate a shaft enclosure.

713.8.1
Prohibited Penetrations

- Penetrations other than those necessary for the purpose of the shaft shall not be permitted in shaft enclosures.

EMT Conduit Run Completely Through The Landings.

713.11 Enclosure at The Bottom

- Shafts that do not extend to the bottom of the building or structure shall comply with one of the following:

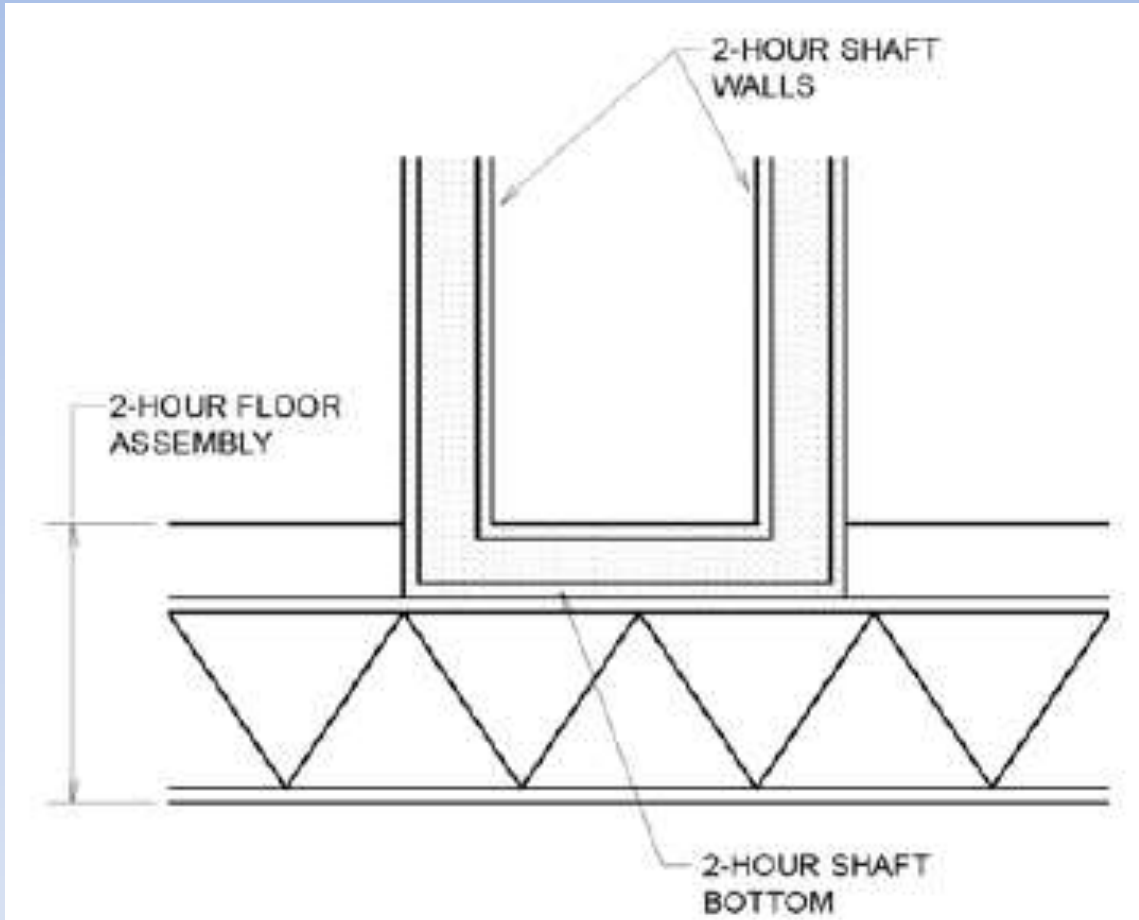
1. They shall be enclosed at the lowest level with construction of the same *fire-resistance rating* as the lowest floor through which the shaft passes, but not less than the rating required for the shaft enclosure.

713.11 Enclosure at The Bottom

2. They shall terminate in a room having a use related to the purpose of the shaft. The room shall be separated from the remainder of the building by *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. The *fire-resistance rating* and opening protectives shall be at least equal to the protection required for the shaft enclosure.
3. They shall be protected by *approved fire dampers* installed in accordance with their listing at the lowest floor level within the shaft enclosure.

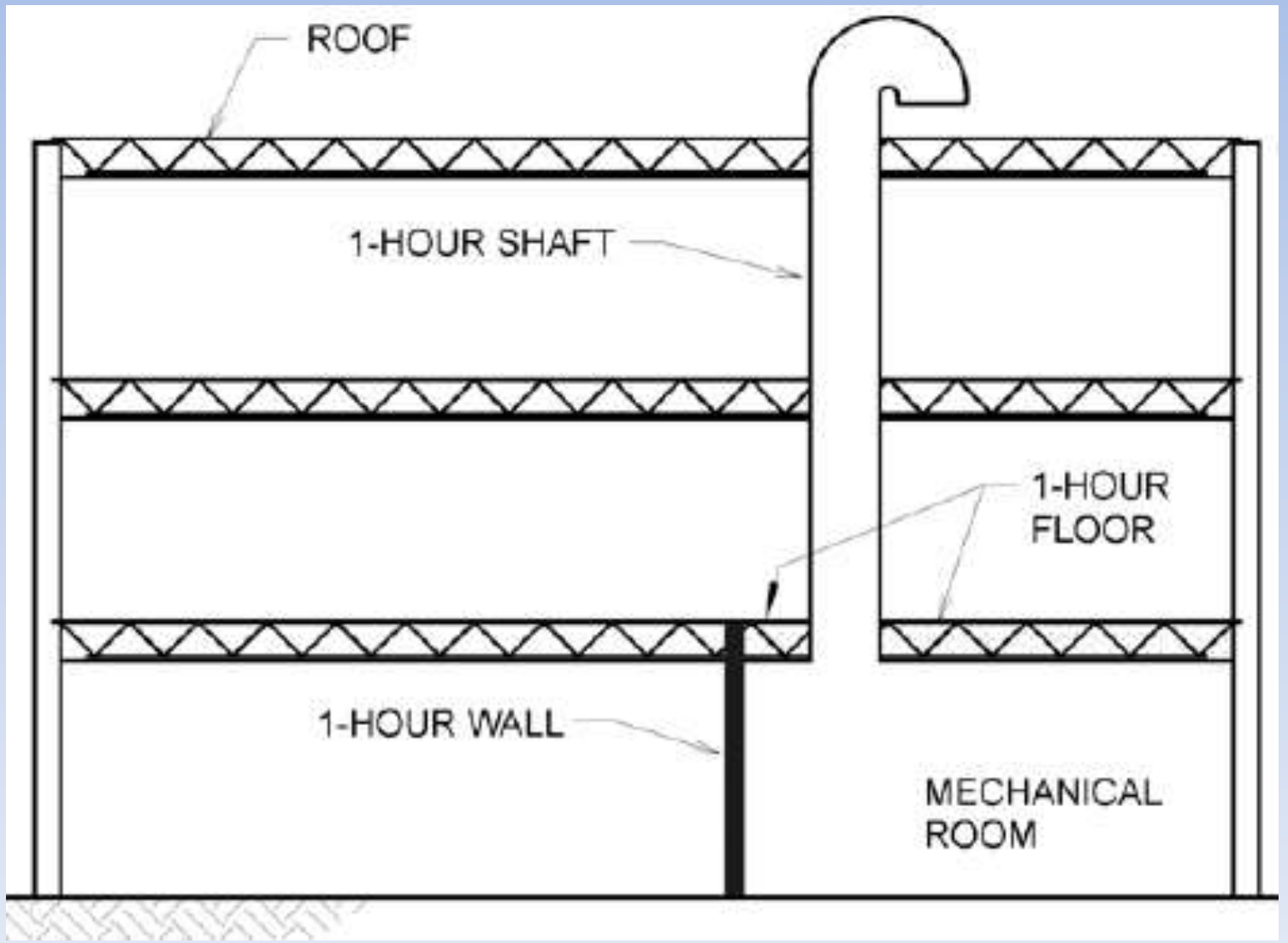
- 3 Exceptions.

Vertical Shafts - Bottom Enclosures Method 1



NOTE: 2-HOUR SHAFT IS TO BE SUPPORTED BY NO LESS THAN A 2-HOUR ASSEMBLY (SECTION 707.5)

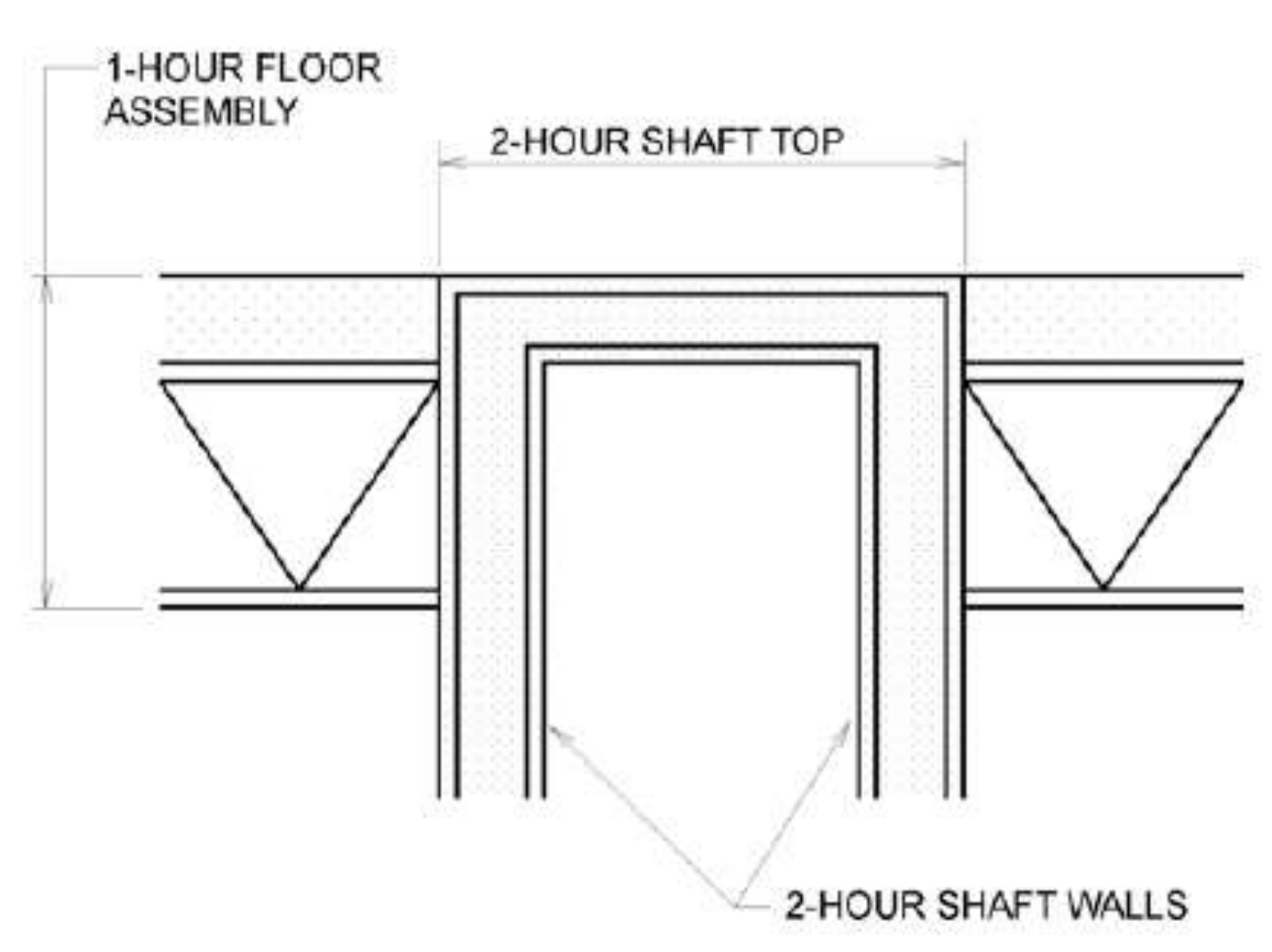
Vertical Shafts - Bottom Enclosure Room Method 2



713.12 Enclosure at Top

- A shaft enclosure that does not extend to the underside of the roof sheathing, deck or slab of the building shall be enclosed at the top with construction of the same *fire-resistance rating* as the topmost floor penetrated by the shaft, but not less than the *fire-resistance rating* required for the shaft enclosure.

Vertical Shafts – Top Enclosure At Floor



713.13.3 Refuse, Recycling and Laundry Chute Access Rooms

- Access openings for refuse, recycling and laundry chutes shall be located in rooms or compartments enclosed by not less than 1-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. Openings into the access rooms shall be protected by opening protectives having a *fire protection rating* of not less than ¾ hour. Doors shall be self or automatic closing upon the detection of smoke in accordance with Section 716.5.9.3.

713.14 Elevator, Dumbwaiter and Other Hoistways

- Elevator, dumbwaiter and other hoistway enclosures shall be constructed in accordance with Section 713 and Chapter 30.

714 Penetrations

- Penetrations of fire-resistance-rated walls, horizontal assemblies and nonfire-rated floor/ceiling assemblies shall be protected in accordance with Section 714.
  - Through penetrations
  - Membrane penetrations
- The minimum required rating of the penetration firestop system shall be not less than that of the wall or horizontal assembly that is being penetrated.

714 Penetrations

- **714.4.1.1 Through penetrations.** Through penetrations of fire-resistance-rated *horizontal assemblies* shall comply with Section 714.4.1.1.1 or 714.4.1.1.2.
- 3 Exceptions.

714 Penetrations

- **714.4.1.1.1 Installation.** *Through penetrations* shall be installed as tested in the *approved* fire-resistance rated assembly.

714 Penetrations

- **714.3.1.2 Through-penetration firestop system.** *Through penetrations* shall be protected by an *approved* 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 (2.49 Pa) of water and shall have an F rating of not less than the required *fire-resistance rating* of the wall penetrated.

714 Penetrations

- This demonstrates proper installation of through penetration firestopping.

714 Penetrations

- Here is an attempt to use an expansive foam insulation as packing material.
- Products with a high flame spread definitely would not be an approved packing material.

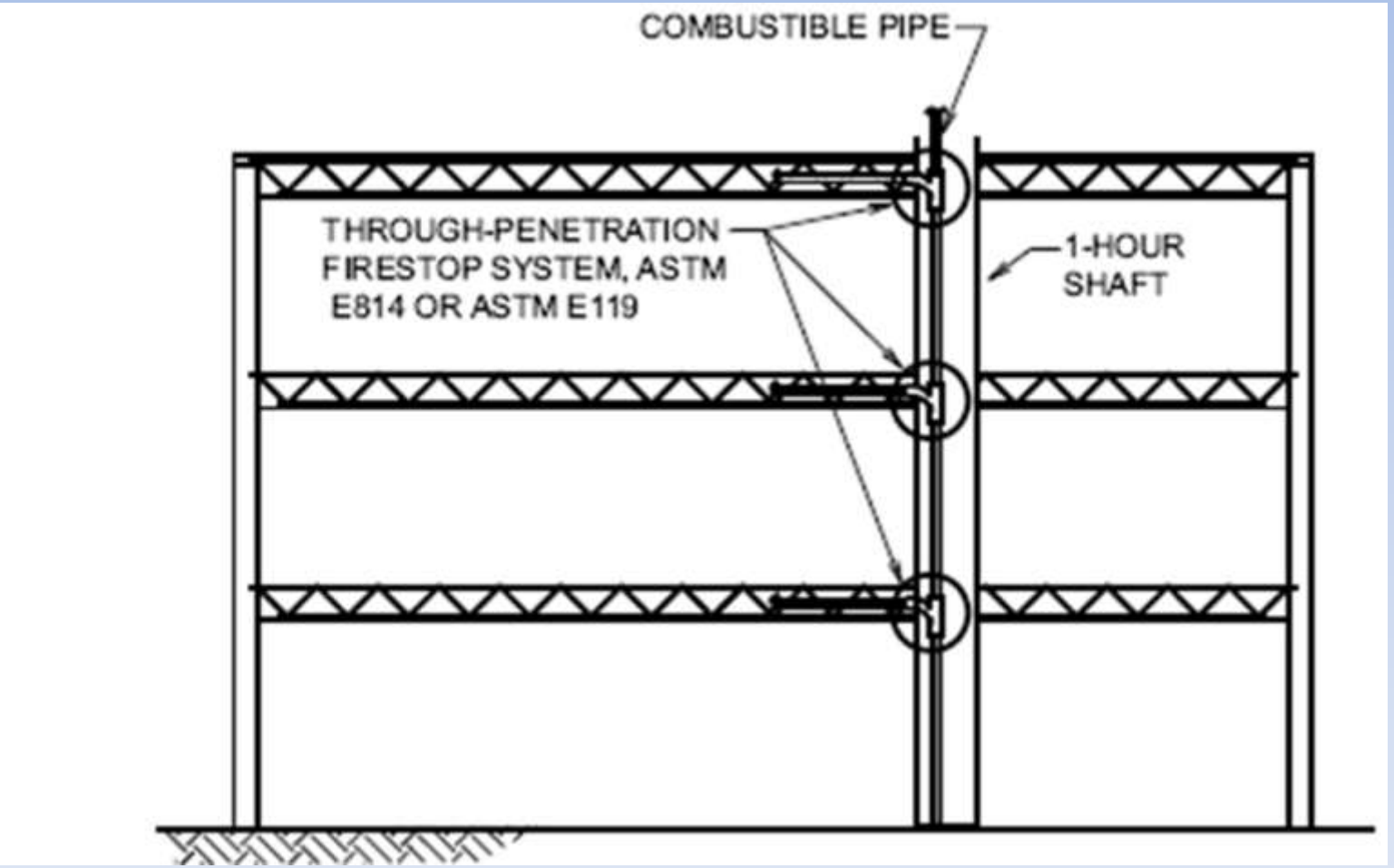
714 Penetrations

- This is an example of where the fire-caulking material has not been properly tooled as the material has not been evenly distributed around the opening.

714 Penetrations

Here are several items which have penetrated the head of wall joint with no protection of the opening that has been created.

Penetrations



714 Penetrations

- **714.3.2 Membrane penetrations.** Membrane penetrations shall comply with Section 714.3.1. 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.
- 5 Exceptions.

714 Penetrations

714 Penetrations

- **714.4.1.2 Membrane penetrations.** Penetrations of membranes that are part of a *horizontal assembly* shall comply with Section 714.4.1.1.1 or 714.4.1.1.2. Where floor/ceiling assemblies are required to have a *fire resistance rating*, recessed fixtures shall be installed such that the required *fire resistance* will not be reduced.
- 7 Exceptions.

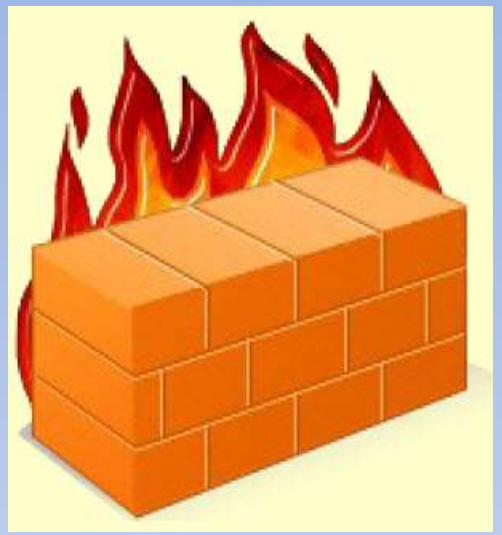
715
Fire Resistant Joint Systems

- Approved fire-resistant joint systems shall be used to protect joints in fire-resistance-rated walls, floors and roofs.
- A joint is defined as a “linear opening in or between adjacent fire-resistance-rated assemblies that is designed to allow independent movement of the building in any plane caused by thermal, seismic, wind or any other loading.”

715
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.
- 9 Exceptions.

715
Fire Resistant Joint Systems



Ch. 7 - Fire and Smoke Protection Features

PART III

716 Opening Protectives

- Generally considered as:
  - Fire doors.
  - Fire shutters.
  - Fire windows.
- Minimum fire-protection rating based on Table 716.5 (fire doors and shutters) and Table 716.6 (fire windows).
- Additional criteria for smoke and draft control assemblies.

TABLE 716.5
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	FIRE RATED GLAZING MARKING DOOR VISION PANEL[e]	MINIMUM SIDELIGHT/ TRANSOM ASSEMBLY RATING (hours)		FIRE-RATED GLAZING MARKING SIDELITE/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	Not Permitted	Not Permitted	Not Permitted	4	Not Permitted	W-240
	3	3[a]	Not Permitted	Not Permitted	Not Permitted	3	Not Permitted	W-180
	2	1 1/2	100 sq. in.[c]	≤100 sq.in. = D-H-90 >100 sq.in.= D-H-W-90	Not Permitted	2	Not Permitted	W-120
	1 1/2	1 1/2	100 sq. in.[c]	≤100 sq.in. = D-H-90 >100 sq.in.= D-H-W-90	Not Permitted	1 1/2	Not Permitted	W-90
Shaft, exit enclosures and exit passageway walls	2	1 1/2	100 sq. in.[c, d]	≤100 sq.in. = D-H-90 > 100 sq.in.= D-H-T-or D-H-T-W-90	Not Permitted	2	Not Permitted	W-120
Fire barriers having a required fire-resistance rating of 1 hour: Enclosures for shafts, exit access stairways, exit access ramps, interior exit stairways, interior exit ramps and exit passageway walls	1	1	100 sq. in.[c, d]	≤100 sq.in. = D-H-60 >100 sq.in.= D-H-T-60 or D-H-T-W-60	Not Permitted	1	Not Permitted	W-60

717
Ducts and Air Transfer Openings

- Dampers that are selectively mandated by the code include:
  - Fire dampers.
  - Smoke dampers.
  - Combination fire/smoke dampers.
  - Ceiling radiation dampers.
- Dampers are typically required in duct penetrations and air transfer openings of fire-resistance-rated wall assemblies.
- Dampers may also be used selectively in lieu of shaft enclosure protection where horizontal assemblies are penetrated.

Table 717.3.2.1
Fire Damper Rating

TYPE OF PENETRATION	MINIMUM DAMPER RATING (hours)
Less than 3-hour fire-resistance-rated assemblies	1.5
3-hour or greater fire-resistance-rated assemblies	3

721 Prescriptive Fire Resistance

- **721.1 General.** The provisions of this section contain prescriptive details of fire-resistance-rated building elements, components or assemblies. The materials of construction listed in Tables 721.1(1), 721.1(2), and 721.1(3) **shall be assumed** to have the *fire-resistance ratings* prescribed therein. Where materials that change the capacity for heat dissipation are incorporated into a fire-resistance-rated assembly, fire test results or other substantiating data shall be made available to the *building official* to show that the required fire-resistance-rating time period is not reduced.

Table 721.1(1)
Minimum Protection Of Structural Parts Based On Time Periods For Various Noncombustible Insulating Materials

STRUCTURAL PARTS TO BE PROTECTED	ITEM NUMBER	INSULATING MATERIAL USED	MINIMUM THICKNESS OF INSULATING MATERIAL FOR THE FOLLOWING FIRE-RESISTANCE PERIODS (inches)			
			4 hours	3 hours	2 hours	1 hour
1. Steel columns and all of primary trusses (continued)	1-1.1	Carbonate, lightweight and sand-lightweight aggregate concrete, members 6" × 6" or greater (not including sandstone, granite and siliceous gravel).[a]	$2^1/_2$	2	$1^1/_2$	1
	1-1.2	Carbonate, lightweight and sand-lightweight aggregate concrete, members 8" × 8" or greater (not including sandstone, granite and siliceous gravel).[a]	2	$1^1/_2$	1	1
	1-1.3	Carbonate, lightweight and sand-lightweight aggregate concrete, members 12" × 12" or greater (not including sandstone, granite and siliceous gravel).[a]	$1^1/_2$	1	1	1
	1-1.4	Siliceous aggregate concrete and concrete excluded in Item 1-1.1, members 6" × 6" or greater.[a]	3	2	$1^1/_2$	1
	1-1.5	Siliceous aggregate concrete and concrete excluded in Item 1-1.1, members 8" × 8" or greater.[a]	$2^1/_2$	2	1	1

Footnotes a through n.

Table 721.1(2)
Rated Fire-resistance Periods For Various Walls and Partitions

MATERIAL	ITEM NUMBER	CONSTRUCTION	MINIMUM FINISHED THICKNESS FACE-TO-FACE[b] (inches)			
			4 hours	3 hours	2 hours	1 hour
1. Brick of clay or shale	1-1.1	Solid brick of clay or shale[c].	6	4.9	3.8	2.7
	1-1.2	Hollow brick, not filled.	5.0	4.3	3.4	2.3
	1-1.3	Hollow brick unit wall, grout or filled with perlite vermiculite or expanded shale aggregate.	6.6	5.5	4.4	3.0
	1-2.1	4" nominal thick units at least 75 percent solid backed with a hat-shaped metal furring channel $^3/_4$" thick formed from 0.021" sheet metal attached to the brick wall on 24" centers with approved fasteners, and $^1/_2$" Type X gypsum wallboard attached to the metal furring strips with 1"-long Type S screws spaced 8" on center.	—	—	5[d]	—
2. Combination of clay brick and load-bearing hollow clay tile	2-1.1	4" solid brick and 4" tile (at least 40 percent solid).	—	8	—	—
	2-1.2	4" solid brick and 8" tile (at least 40 percent solid).	12	—	—	—
3. Concrete masonry units	3-1.1[f,g]	Expanded slag or pumice.	4.7	4.0	3.2	2.1
	3-1.2[f,g]	Expanded clay, shale or slate.	5.1	4.4	3.6	2.6
	3-1.3[f]	Limestone, cinders or air-cooled slag.	5.9	5.0	4.0	2.7
	3-1.4[f,g]	Calcareous or siliceous gravel.	6.2	5.3	4.2	2.8

Footnotes a through g.

Table 721.1(3)
Minimum Protection For Floor and Roof Systems

FLOOR OR ROOF CONSTRUCTION	ITEM NUMBER	CEILING CONSTRUCTION	THICKNESS OF FLOOR OR ROOF SLAB (inches)				MINIMUM THICKNESS OF CEILING (inches)			
			4 hours	3 hours	2 hours	1 hour	4 hours	3 hours	2 hours	1 hour
1. Siliceous aggregate concrete	1-1.1	Slab (no ceiling required). Minimum cover over nonprestressed reinforcement shall not be less than $^{3}/_{4}$" [b].	7.0	6.2	5.0	3.5	—	—	—	—
2. Carbonate aggregate concrete	2-1.1		6.6	5.7	4.6	3.2	—	—	—	—
3. Sand-lightweight concrete	3-1.1		5.4	4.6	3.8	2.7	—	—	—	—
4. Lightweight concrete	4-1.1		5.1	4.4	3.6	2.5	—	—	—	—

Footnotes a through q.

722 Calculated Fire Resistance

- **722.1 General.** The provisions of this section contain procedures by which the *fire resistance* of specific materials or combinations of materials is established by calculations. These procedures apply only to the information contained in this section and shall not be otherwise used. The calculated *fire resistance* of concrete, concrete masonry and clay masonry assemblies shall be permitted in accordance with ACI 216.1/TMS 0216. The calculated *fire resistance* of steel assemblies shall be permitted in accordance with Chapter 5 of ASCE 29. The calculated *fire resistance* of exposed wood members and wood decking shall be permitted in accordance with Chapter 16 of ANSI/AF&PA *National Design Specification for Wood Construction (NDS)*.

Table 722.2.1.4(2)
Time Assigned To Finish Materials on Fire-exposed Side Of Wall

FINISH DESCRIPTION	TIME (minutes)
Gypsum wallboard	
$^3/_8$ inch	10
$^1/_2$ inch	15
$^5/_8$ inch	20
2 layers of $^3/_8$ inch	25
1 layer $^3/_8$ inch, 1 layer $^1/_2$ inch	35
2 layers $^1/_2$ inch	40
Type X gypsum wallboard	
$^1/_2$ inch	25
$^5/_8$ inch	40
Portland cement-sand plaster applied directly to concrete masonry	See Note a
Portland cement-sand plaster on metal lath	
$^3/_4$ inch	20
$^7/_8$ inch	25
1 inch	30
Gypsum sand plaster on $^3/_8$-inch gypsum lath	
$^1/_2$ inch	35
$^5/_8$ inch	40
$^3/_4$ inch	50
Gypsum sand plaster on metal lath	
$^3/_4$ inch	50
$^7/_8$ inch	60
1 inch	80

722.6.2.2
Time Assigned To Membranes

- Table 722.6.2(1) indicates the time assigned to membranes on the fire-exposed side.

Table 722.6.2(1)
Time Assigned To Wallboard Membranes

DESCRIPTION OF FINISH	TIME[e] (minutes)
3/8-inch wood structural panel bonded with exterior glue	5
15/32-inch wood structural panel bonded with exterior glue	10
19/32-inch wood structural panel bonded with exterior glue	15
3/8-inch gypsum wallboard	10
1/2-inch gypsum wallboard	15
5/8-inch gypsum wallboard	30
1/2-inch Type X gypsum wallboard	25
5/8-inch Type X gypsum wallboard	40
Double 3/8-inch gypsum wallboard	25
1/2-inch + 3/8-inch gypsum wallboard	35
Double 1/2-inch gypsum wallboard	40

722.6.2.3 Exterior Walls

- For an exterior wall with a *fire separation distance* greater than 10 feet, the wall is assigned a rating dependent on the interior membrane and the framing as described in **Tables 722.6.2(1)** and **722.6.2(2**). The membrane on the outside of the non fire-exposed side of exterior walls with a *fire separation distance* greater than 10 feet may consist of sheathing, sheathing paper and siding as described in **Table 722.6.2(3)**.

Table 722.6.2(2)
Time Assigned For Contribution of Wood Frame

DESCRIPTION	TIME ASSIGNED TO FRAME (minutes)
Wood studs 16 inches o.c.	20
Wood floor and roof joists 16 inches o.c.	10

For SI: 1 inch = 25.4 mm.

a. This table does not apply to studs or joists spaced more than 16 inches o.c.

b. All studs shall be nominal 2 × 4 and all joists shall have a nominal thickness of at least 2 inches.

c. Allowable spans for joists shall be determined in accordance with Sections 2308.8, 2308.10.2 and 2308.10.3.

Table 722.6.2(3)
Membrane on Exterior Face of Wood Stud Walls

SHEATHING	PAPER	EXTERIOR FINISH
$^5/_8$-inch T & G lumber $^5/_{16}$-inch exterior glue wood structural panel $^1/_2$-inch gypsum wallboard $^5/_8$-inch gypsum wallboard $^1/_2$-inch fiberboard	Sheathing paper	Lumber siding Wood shingles and shakes $^1/_4$-inch wood structural panels-exterior type $^1/_4$-inch hardboard Metal siding Stucco on metal lath Masonry veneer Vinyl siding
None	—	$^3/_8$-inch exterior-grade wood structural panels

For SI: 1 pound/cubic foot = 16.0185 kg/m^2.

a. Any combination of sheathing, paper and exterior finish is permitted.

End of Presentation

Thank you for your participation!

QUESTIONS??

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