2012 IBC Inspection of Fire-resistance Rated Walls

2012 IBC®
Inspection of Fire-resistance Rated Walls
Based on the 2012 International Building Code® (IBC®)

Accreditation

- The International Code Council has been accredited as an Authorized Provider by the International Association for Continuing Education and Training (IACET).
- As a result of their Authorized Provider accreditation status, ICC is authorized to offer IACET CEUs for its programs that qualify under the ANSI/IACET Standard.
- You will obtain full CEUs for this course, if you actively participate in the training activities and stay for the entire session. Evidence of this will be the sign out sheet.

Class Outline

- Introduction
  - Determining fire resistance
  - Test standards
  - Definitions
  - Alternate methods
- Type of Rated Walls
  - Five types of walls and their use
  - Differences between the various wall types
  - Marking and identification requirements

Class Outline (continued)

- Completing the protection
  - Penetrations
  - Joint systems
  - Opening protectives
  - Ducts and air transfer openings
Wall Assembly Fire Test

- ASTM E 119 Fire Test for Wall Assemblies

Assembly must:
- Sustain applied load.
- Have no passage of flame or gas hot enough to ignite cotton waste.
- Have average temperature rise on unexposed surface not more than 250°F (121°C) above initial temperature or more than 325°F (163°C) at any point.
- Have no water pass through during hose stream test.

Section 703.2.1 – Nonsymmetrical wall construction

Interior Walls:
- Nonsymmetrical wall construction to be tested with both faces exposed to the furnace, with the assigned fire-resistance rating based on the shortest duration of the two tests.
- Where the wall is tested with the least fire-resistant side exposed to the furnace, the wall need not be subjected to tests from the opposite side (if approved by building official).
Section 703.3 – Alternative methods for determining fire resistance

- The application of any alternative methods to be based on fire exposure and acceptance criteria specified in ASTM E 119 or UL 263.

Section 703.3 – Alternative methods for determining fire resistance

- The required fire-resistance of a building element is permitted to be established by any of the following methods or procedures:
  - Designs documented in approved sources.
  - Prescriptive designs per Section 721.
  - Calculations in accordance with Section 722.
  - Engineering analysis based upon a comparison with elements tested in accordance with ASTM E 119 or UL 263.
  - Alternative methods in accordance with Section 104.11.

Purpose of rated assemblies

FIRE RESISTANCE. That property of materials or their assemblies that prevents or retards the passage of excessive heat, hot gases or flames under conditions of use.

FIRE-RESISTANCE RATING. The period of time a building element, component or assembly maintains the ability to confine a fire, continues to perform a given structural function, or both, as determined by the tests, or the methods based on tests, prescribed in Section 703.

Purpose of rated assemblies

FIRE PROTECTION RATING. The period of time that an opening protective will maintain the ability to confine a fire as determined by tests prescribed in Section 715. Ratings are stated in hours or minutes.
Different Types of Fire-Resistance

The provisions of Chapter 7 address four major areas:

1. Structural fire-resistance, regulated primarily by Table 601.
2. Separation of adjacent building spaces through the use of fire-resistance-rated elements, such as fire walls, fire barriers and fire partitions.

Different Types of Fire-Protection

- Penetrations (Section 714)
- Joint Systems (Section 715)
- Opening Protectives (Section 716)
  - Includes doors and windows
- Ducts and Air Transfer Openings (Section 717)
  - Dampers

Different Type of Fire-Resistance (continued)

3. Separation of adjacent building spaces through the use of smoke-resistant construction, such as smoke barriers and smoke partitions.
4. Protection of adjacent buildings from fire spread through the use of fire-resistance-rated exterior walls.

Definitions

- Annular Space
- Building Element
- Ceiling Radiation Damper
- Combination Fire/Smoke Damper
- Draftstop
- F Rating
- Fire Barrier
- Fire Damper
- Fire Door Assembly
- Fire Partition
- Fire Protection Rating
- Fire Resistance
- Fire-resistance Rating
- Fire-resistant Joint System
Definitions (continued)

- Fire Separation Distance
- Firewall
- Fire Window Assembly
- Fireblocking
- Horizontal Assembly
- Joint
- Member Penetration
- Shaft
- Shaft Enclosure
- Smoke Barrier
- Smoke Compartment
- T Rating
- Through Penetration
- Primary Structural Frame
- Secondary members

Alternative Materials, Design and Methods of Construction

104.11 Alternative materials, design and methods of construction and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved.

Alternates are:
- Approved
- Complies with intent of the code
- Equivalent to code in:
  - Quality, Strength, Effectiveness, Fire-resistance, Durability and Safety

Guidelines on Fire Ratings of Archaic Materials and Assemblies – IEBC Chapter Resource A


Harmathy’s 10 Rules – See IEBC
Multiple Use Fire Assemblies

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.

If it serves multiple purposes, must comply with all requirements.

Example: Fire barrier also serving as a corridor wall. Must meet fire barrier provisions and smoke and draft control provisions from corridors.

Types of Rated Walls

There are five types of fire-resistance rated walls
- Exterior walls (Section 705)
- Fire walls (Section 706)
- Fire barriers (Section 707)
- Fire partitions (Section 708)
- Smoke barriers (Section 709)

They each have different purposes and requirements

Definition

EXTERIOR WALL. A wall, bearing or nonbearing, that is used as an enclosing wall for a building, other than a fire wall, and that has a slope of 60 degrees (1.05 rad) or greater with the horizontal plane.
Definition

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.

Allows each portion to be considered as a separate building

Fire Barrier

Definition – Not much help

Used for:
- Shaft enclosures
- Stairway and ramp enclosures
- Exit passageways
- Horizontal exits
- Atrium enclosures
- Incidental uses
- Control areas
- Separated occupancies
- Fire areas

Fire Partitions

Definition – Not much help

Used for:
- Walls separating dwelling/sleeping units
- Walls separating tenant spaces in mall building
- Corridor walls
- Elevator lobby

Smoke barriers

SMOKE BARRIER. A continuous membrane, either vertical or horizontal, such as a wall, floor or ceiling assembly, that is designed and constructed to restrict the movement of smoke.

Required by:
- Underground buildings
- I-2 and I-3
- Ambulatory Care Facility
- Areas of refuge
- Smoke control systems
Primary Difference Between Various Walls

- The purpose they serve
- Continuity/construction requirements
- Amount and type of opening protection

Section 705: Exterior Walls

Exterior walls are regulated for fire resistance under these conditions:

- Type of construction requirements (Table 601).
- For exterior bearing walls
- Location on lot (Table 602).
- Other locations, including:
  - Horizontal continuity of fire walls.
  - Exterior areas for assisted rescue.
  - Egress courts.

Table 601

<table>
<thead>
<tr>
<th>BUILDING ELEMENT</th>
<th>TYPE I</th>
<th>TYPE II</th>
<th>TYPE III</th>
<th>TYPE IV</th>
<th>TYPE V</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>A'</td>
<td>B'</td>
<td>ST</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>A'</td>
<td>S</td>
<td>S'</td>
<td>HT</td>
</tr>
<tr>
<td>Primary structural frame(^1) (see Section 262)</td>
<td>3(^b)</td>
<td>2(^b)</td>
<td>1</td>
<td>0</td>
<td>1 (HT)</td>
</tr>
<tr>
<td>Bearing walls(^2) (interior)</td>
<td>3(^b)</td>
<td>2(^b)</td>
<td>1</td>
<td>1</td>
<td>0 (HT)</td>
</tr>
<tr>
<td>Nonbearing walls and partitions(^2) (interior)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nonbearing walls and partitions(^2) (exterior)</td>
<td>See Table 602</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floor construction and associated secondary members (see Section 263)</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1 (HT)</td>
</tr>
<tr>
<td>Roof construction and associated secondary members (see Section 265)</td>
<td>1(1/2)</td>
<td>1(1/2)</td>
<td>1(1/2)</td>
<td>0</td>
<td>0 (HT)</td>
</tr>
</tbody>
</table>
Table 602

### Exterior Wall – Fire-resistance ratings

Exterior walls shall be rated for exposure to fire from:
- Both sides where the separation distance is 10 feet or less.
- The inside where the fire separation distance exceeds 10 feet.
Section 705.8 – Openings

Maximum area of unprotected or protected openings located in an exterior wall is limited by Table 705.8.

- Values are the percentage of area of the exterior wall per story.
- Unlimited unprotected openings are permitted where an exterior wall does not require a fire-resistance rating in accordance with Table 602.

Where both protected and unprotected openings are located in an exterior wall of any story, the total area of openings are to comply with following formula:

\[
\frac{A_p}{a_p} + \frac{A_u}{a_u} \leq 1
\]

Where:

- \( A_p \) = Actual area of protected openings, or the equivalent area of protected openings, \( A_{eq} \).
- \( a_p \) = Allowable area of protected openings.
- \( A_u \) = Actual area of unprotected openings.
- \( a_u \) = Allowable area of unprotected openings.

Vertical Separation of Openings

<table>
<thead>
<tr>
<th>FIRE SEPARATION DISTANCE (feet)</th>
<th>DEGREE OF OPENING PROTECTION</th>
<th>ALLOWABLE AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to less than 3' 6&quot;</td>
<td>Unprotected, Sprinklered (P)</td>
<td>Not Permitted</td>
</tr>
<tr>
<td>3' 6&quot; to 5' 4&quot;</td>
<td>Protected (P)</td>
<td>Not Permitted</td>
</tr>
<tr>
<td>5' 4&quot; to 10' 1&quot;</td>
<td>Unprotected, Sprinklered (P)</td>
<td>15%</td>
</tr>
<tr>
<td>10' 1&quot; to 15' 1&quot;</td>
<td>Protected (P)</td>
<td>25%</td>
</tr>
<tr>
<td>15' 1&quot; to 20'</td>
<td>Unprotected, Sprinklered (P)</td>
<td>45%</td>
</tr>
<tr>
<td>20' to 25'</td>
<td>Protected (P)</td>
<td>45%</td>
</tr>
<tr>
<td>25' to 30'</td>
<td>Protected (P)</td>
<td>45%</td>
</tr>
<tr>
<td>30' to 35'</td>
<td>Protected (P)</td>
<td>45%</td>
</tr>
<tr>
<td>35' to 40'</td>
<td>Protected (P)</td>
<td>45%</td>
</tr>
<tr>
<td>40' to 45'</td>
<td>Protected (P)</td>
<td>45%</td>
</tr>
</tbody>
</table>

(Partial Table)
Vertical Exposure – Section 705.8.6

- Applicable to buildings on the same lot. (Not at property lines)
- See Exceptions:
  - One-hour roof on lower building
  - Buildings considered as one building

Sections 705.11 and 705.11.1 – Parapets; Parapet construction

Parapets shall be provided on exterior walls of buildings:
- Same fire-resistance rating as the supporting wall.
- Side adjacent to roof surface to have noncombustible facing for uppermost 18 inches.
- Height above the roof surface to be at least 30 inches.

Section 705.11 – Exceptions 1-3

Parapets need not be provided on exterior walls of buildings where any of the following conditions exist:
1. The wall is not required to be fire-resistance rated in accordance with Table 602 because of fire separation distance.
2. The building has an area of not more than 1,000 square feet (93 m2) on any floor.
3. Walls that terminate at roofs of not less than 2-hour fire-resistance-rated construction or where the roof, including the deck and supporting construction, is constructed entirely of noncombustible materials.

Section 705.11 – Exception 6

Where the wall is permitted to have at least 25 percent unprotected openings based on fire separation distance in accordance with Table 705.8.
- For fully sprinklered buildings, this distance would be greater than 5 feet (1524 mm) or greater.
- For nonsprinklered buildings, this distance would be greater than 15 feet (4572 mm) or greater.
Section 706: Fire Walls

Fire Wall – Structural Stability
- Must allow for collapse of construction on either side without collapsing fire wall
- Code accepts NFPA 221 Double Fire Wall as an acceptable option

Fire Wall – Fire-Resistive Rating

NFPA 221 Option – Double Wall

<table>
<thead>
<tr>
<th>GROUP</th>
<th>FIRE-RESISTANCE RATING (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A, B, E, H-4, I, R-1, R-2, U</td>
<td>3a</td>
</tr>
<tr>
<td>F-1, H-3, H-5, M, S-1</td>
<td>3</td>
</tr>
<tr>
<td>H-1, H-2</td>
<td>4</td>
</tr>
<tr>
<td>F-2, S-2, R-3, R-4</td>
<td>2</td>
</tr>
</tbody>
</table>

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.
Section 706.5 – Horizontal continuity

- Fire walls shall extend a minimum of 18 inches beyond the exterior surface of exterior walls.
- Several exceptions allow for an alternative means of protection.

Section 706.5 – Exception 1
Terminate at the interior surface of combustible exterior sheathing or siding

Section 706.5 – Exception 2
Terminate at the interior surface of noncombustible exterior sheathing, siding or finish

Section 706.5 – Exception 3
Terminate at the interior surface of noncombustible exterior sheathing in sprinklered building
Section 706.5.1 – Exterior walls

Section 706.5.2 – Horizontal projecting elements

Section 706.5.1 – Exception 1
Section 706.5.2 – Exception 2

Section 706.5.2 – Exception 3

Section 706.6 – Vertical continuity

Section 706.6 – Exception 1
Section 706.6 – Exception 1

Roof Protection for Stepped Building

Section 706.6 – Exception 2

- Roof of same height
- Two-hour FW
- One-hour, 4 foot entire span span and supporting elements
- No roof openings within 4 ft of FW

For SI: 1 foot = 304.8 mm.

Section 706.6 – Exception 3

Minimum Class B roof covering
Noncombustible roof sheathing, deck or slab

Section 706.6 – Exception 4

- Building core of Type III, IV, or V construction.
- No roof openings occur within 4 feet of fire wall.
- Minimum Class B roof covering.
- For a minimum of 4 feet on each side of the fire wall, sheathing or deck constructed of FRT plywood or 1/4-inch Types gypsum board installed directly below sheathing or deck.

For SI: 1 foot = 304.8 mm.
Section 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.
  2. Openings are not limited to 156 square feet (11 m²) where both buildings are equipped throughout with an NFPA 13 automatic sprinkler system.

- Ducts and air openings may penetrate a fire wall (other than a party wall) provided they are protected in accordance with Sections 717.

Section 707: Fire Barriers

- Fire barriers are to extend from the top of the floor/ceiling assembly below to the underneath side of:
  - Floor slabs
  - Roof slabs
  - Floor sheathing of floor/ceiling assemblies
  - Roof sheathing of roof/ceiling assemblies
Section 707.5 – Continuity

Section 707.6 – Openings

- Openings in a fire barrier to be protected in accordance with Section 716.
- Openings shall be limited to:
  - Maximum aggregate width of 25 percent of wall length. (See exceptions)
  - 156 square feet per single opening. (See exceptions)
  - Additional limitations for exit enclosures and exit passageways.

Section 708: Fire Partitions

Section 708.4 – Fire Partition Continuity

For continuity purposes, there are two general options for terminating a fire partition.

1. The fire partition shall extend to the underside of the floor or roof sheathing/deck above, or
2. It shall extend to the ceiling portion of a fire-resistance rated floor/ceiling or roof/ceiling assembly.
Section 708.4 – Continuity

Continuity: To Deck/Sheathing

Extend to underneath side of roof deck (floor deck)

Start at foundation (floor deck)

Sleeping unit

Section 708.4 – Continuity

Continuity: To Ceiling of Horizontal Assembly

Extend to underneath side of fire-resistance-rated floor/ceiling or roof/ceiling assembly

Start at foundation (floor sheathing, slab or deck)

Section 708.4 – Continuity

Continuity: Combustible Construction

Fireblocking or draftstopping as required

Extend to underneath side of fire-resistance-rated floor/ceiling or roof/ceiling assembly

Dwelling Unit

Dwelling Unit

Section 708.4 – Exception 6

- Fireblocking or draftstopping is not required at the partition line in the buildings equipped with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2 AND the sprinklers are installed in combustible spaces
**Section 708.4 – Exception 2**

- Fire-resistance rated floor or roof
- Ceiling as required for a 1-hour floor or roof system
- Adjacent room
- Corridor

**Section 708.4 – Exception 3**

- Lid of corridor constructed as required for corridor walls
- Fire-resistant protection
- Adjacent room
- Corridor

**Section 709: Smoke Barriers**

- **Fire-resistance rating.** A minimum 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.
Section 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.
- Extension to outside wall is NOT required for elevator lobbies or areas of refuge that terminate at shafts or other smoke barriers.

Section 709.5 – Openings

- Openings in smoke barriers to comply with Section 716:
  - Minimum 20-minute fire-protection rating.
  - Meet requirements for a smoke and draft control door assembly tested in accordance with UL 1784.
You Have Got To Fix The Holes!

In order for the fire-resistance to be effective (and really work) you need to protect any openings into or through it.

- Penetrations
- Joint systems
- Opening protectives (doors and windows)
- Ducts and air transfer openings (dampers)

Types of Penetrations

- Through Penetration
- Membrane Penetration
Section 714 - Penetrations

Penetrations of fire-resistant assemblies can be protected by one of three basic methods:

- Tested as a part of the original fire-resistant assembly test
- Tested as a Penetration Firestop System – complying with ASTM E 714 or UL 1479
- Comply with one of the exceptions listed in Sections 714.3.1 or 714.3.2

Penetration Firestop Systems

- Review and understand definitions!
- Tested and listed as a system. Must be installed and used for walls and penetrants as tested.
- Required to have an “F” rating of not less than the fire-resistance rating of the wall. (Section 714.3.1.2)
- Required to have an “L” rating for penetrations in smoke barriers (Section 714.5)

Special Inspection – Section 1705.16

Special inspection of penetration firestops, joint systems and perimeter barrier systems is required in:

- High-rise buildings
- Buildings in Risk Category III or IV in accordance with Section 1604.5

Risk Category – Table 1604.5

<table>
<thead>
<tr>
<th>RISK CATEGORY</th>
<th>NATURE OF OCCUPANCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>III</td>
<td>Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to: buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 500.</td>
</tr>
<tr>
<td></td>
<td>Buildings and other structures containing elementary school, secondary school or day care facilities with an occupant load greater than 250.</td>
</tr>
<tr>
<td></td>
<td>Buildings and other structures containing adult education facilities, such as colleges and universities, with an occupant load greater than 750.</td>
</tr>
<tr>
<td></td>
<td>Group I-2 occupancies with an occupant load of 50 or more resident care recipients but not having surgery or emergency treatment facilities.</td>
</tr>
<tr>
<td></td>
<td>Group I-3 occupancies.</td>
</tr>
<tr>
<td></td>
<td>Any other occupancy with an occupant load greater than 5,000.</td>
</tr>
<tr>
<td></td>
<td>Power-generating stations, water treatment facilities for potable water, waste water treatment facilities and other public utility facilities not included in Risk Category IV.</td>
</tr>
<tr>
<td></td>
<td>Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that:</td>
</tr>
<tr>
<td></td>
<td>Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the International Fire Code, or</td>
</tr>
<tr>
<td></td>
<td>Are sufficient to pose a threat to the public if released.</td>
</tr>
</tbody>
</table>
Risk Category – Table 1604.5

<table>
<thead>
<tr>
<th>RISK CATEGORY</th>
<th>NATURE OF OCCUPANCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV</td>
<td>Buildings and other structures designated as essential facilities, including but not limited to:</td>
</tr>
<tr>
<td></td>
<td>• Group I-2 occupancies having surgery or emergency treatment facilities.</td>
</tr>
<tr>
<td></td>
<td>• Fire, rescue, ambulance and police stations and emergency vehicle garages.</td>
</tr>
<tr>
<td></td>
<td>• Designated earthquake, hurricane or other emergency shelters.</td>
</tr>
<tr>
<td></td>
<td>• Designated emergency preparedness, communications and operations centers and other facilities required for emergency response.</td>
</tr>
<tr>
<td></td>
<td>• Power-generating stations and other public utility facilities required as emergency backup facilities for Risk Category IV structures.</td>
</tr>
<tr>
<td></td>
<td>• Buildings and other structures containing quantities of highly toxic materials that:</td>
</tr>
<tr>
<td></td>
<td>† Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the International Fire Code; and</td>
</tr>
<tr>
<td></td>
<td>† Are sufficient to pose a threat to the public if released.</td>
</tr>
<tr>
<td></td>
<td>• Aviation control towers, air traffic control centers and emergency aircraft hangars.</td>
</tr>
<tr>
<td></td>
<td>• Buildings and other structures having critical national defense functions.</td>
</tr>
<tr>
<td></td>
<td>• Water storage facilities and pump structures required to maintain water pressure for fire suppression.</td>
</tr>
</tbody>
</table>

Section 714.3.1 – Exception 1

Annular space protection using concrete, grout or mortar is permitted in lieu of a listed firestop system where:

- Penetrating items are steel, ferrous or copper pipes, tubes or conduits.
- Walls are of concrete or masonry.
- Penetrating item a maximum of 6 inches in diameter.
- Area of wall opening limited to 144 square inches.
- Annular space protection is installed full thickness of the wall or that required to maintain fire-resistance rating.

Section 714.3.1 – Exception 2

- Annular space protection is permitted in lieu of a listed firestop system where material used to fill the annular space is shown to prevent the passage of flame and hot gases in accordance with ASTM E 119 or UL 263.

Section 714.3.2 – Exception 1

Membrane penetrations of steel electrical boxes may be made subject to the following conditions:

- Walls to be maximum 2 hours.
- Boxes to be a maximum of 16 square inches.
- Aggregate area of boxes not to exceed 100 square inches per 100 square feet of wall area.
- Annular space between the box and wall membrane is not to exceed 1/8 inch.
- Boxes on the opposite sides of a wall or partition to be adequately separated or protected (five methods available).
Section 714.3.2 – Exception 2

Membrane penetrations of listed electrical boxes of any material may be made subject to the following conditions:

- Boxes have been tested for use in a fire-resistance-rated assembly.
- Boxes are installed in accordance with their listing.
- Annular space between the box and wall membrane is not to exceed 1/8 inch.
- Boxes on the opposite sides of a wall or partition to be adequately separated or protected (four methods available).

Section 714.3.2 – Exceptions 3 and 4

Electrical boxes of any size or type are permitted as complying membrane penetrations provided they have been listed as part of a wall opening protective material system.

Section 714.3.2 – Exception 5

Membrane penetrations created by the penetration of an automatic sprinkler need not be protected by an approved firestop system provided the annular space is covered by a metal escutcheon plate.

- Exception is for a sprinkler, not for a line of sprinkler piping.

Section 714.3.3 – Dissimilar materials

- Noncombustible penetrating items shall not connect to combustible items beyond the point of firestopping.
Section 715 – Fire-Resistant Joint Systems

- This section regulates joints or linear openings created between building assemblies, which are sometimes referred to as head-of-wall, expansion or seismic joints.

- These joints are most often created where the structural design of a building necessitates a separation between building components in order to accommodate anticipated structural displacements caused by thermal expansion and contraction, seismic activity, wind or other loads.

Section 715.1 – Examples of Locations

Floors:
- Within a single dwelling unit
- Where the joint is protected by a shaft enclosure
- Within atriums
- Within malls
- Within open parking garages

Other locations:
- Walls permitted to have unprotected openings
- Roofs where openings are permitted
- Maximum 5/8-inch (15.9 mm) wide control joints (tested in accordance with ASTM E 119 or UL 263)

Section 715.1 – General

Joint assembly to provide degree of fire resistance equal to or higher than the floor or wall (9 exceptions)

Material or assembly securely installed so as not to dislodge, loosen or otherwise impair its ability to accommodate expected building movements and to resist the spread of fire and hot gases.

Section 715.1 – Exceptions

Fire-resistant joint systems are not required in the following locations:
Section 716 – Opening Protectives

This section regulates two types of opening protectives:
- fire door and shutter assemblies (716.5)
- fire-protection-rated glazing. (716.6)

Section 716.1 – General

Fire door and fire shutter assemblies shall be:
- Side hinged or pivoted.
- “Other doors” (fire shutters or swinging elevator doors).
- Corridor and smoke barrier doors.
- Tin clad doors.
- Floor fire doors.

Fire-protection-rated glazing permitted in:
- “Fire windows.”
- Glazing in door assemblies

Section 716.2 – Fire-resistance-rated glazing

Labeled fire-resistance-rated glazing tested as part of a fire-resistance-rated wall assembly, in accordance with ASTM E 119 or UL 263, is not required to comply with Section 716.

Fire Doors

Section 716.5
Table 716.5 Opening Fire Protection Assemblies, Rating and Markings

- This table lists the minimum fire protection ratings for fire doors relative to the nature and fire-resistance rating of the wall.
- Once the purpose and fire-resistance rating of the wall are identified, the minimum required fire protection rating of the door can be determined using the table.

Section 716.3 - Marking fire-rated glazing assemblies

<table>
<thead>
<tr>
<th>TABLE 716.2 MARKING FIRE-RATED GLAZING ASSEMBLIES</th>
<th>FIRE TEST STANDARDS</th>
<th>MARKING</th>
<th>MEANING</th>
<th>DESCRIPTION OF MARKING</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Society for Testing and Materials (ASTM) E 119 or UL 263</td>
<td>W</td>
<td>Meets wall assembly criteria</td>
<td></td>
<td></td>
</tr>
<tr>
<td>National Fire Protection Association (NFPA) 257 or UL 10B or UL 10C</td>
<td>OH</td>
<td>Meets fire window assembly criteria including the hose stream test</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>H</td>
<td>Meets fire door assembly criteria</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>T</td>
<td>Meets 45°F temperature rise criteria for 30 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>XXX</td>
<td>The time in minutes of the fire resistance or fire protection rating of the glazing assembly</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Section 716.5 – Fire door and shutter assemblies

Section 716.5.7.1 – Fire door labeling requirements
Glazing Material in Fire Door Assemblies

Review Table 716.5 and Section 716.5.8 for limitations on glazing in fire doors.

Provisions vary depending on:
- Fire-protection rated glazing or fire-resistance rated glazing
- Type and location of wall assembly
- Verify glazing is properly labeled (716.5.8.3)
- Comply with Safety Glazing provisions or an exception (716.5.8.4)

Section 716.5.8.3.1 – Identification

Section 716.5.9 – Door closing

- Fire doors shall be self-closing or automatic closing.
- Automatic-closing devices are required for certain locations. Example is cross-corridor doors installed in a:
  - Smoke-barrier wall in a Group I-2 occupancy (see Section 709.5, Exception).
  - Horizontal exit wall (see Section 1025.3).

Automatic Door closing

Where automatic-closing doors are installed activation by smoke detectors are required at 11 specific locations. See Section 716.5.9.3.

Note: Section 716.5.9.3 does not REQUIRE automatic closing devices at these locations, but regulates them if installed.
Fire-Protection Rated Glazing

Fire Window Assemblies

- Glazing in fire window assemblies shall comply with Section 716.6
- Remember fire-resistance-rated glazing is permitted in fire doors and fire window assemblies where tested and installed in accordance with the listing, but shall not otherwise be required to comply with Section 716. (Section 716.2)

Section 716.6 – Fire-protection-rated glazing

<table>
<thead>
<tr>
<th>TYPE OF WALL ASSEMBLY</th>
<th>REQUIRED WALL ASSEMBLY RATING (hours)</th>
<th>MINIMUM FIRE WINDOW ASSEMBLY RATING (hours)</th>
<th>FIRE PROTECTION RATED GLAZING RATINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barrier walls</td>
<td>All</td>
<td>NP*</td>
<td>W-XXX</td>
</tr>
<tr>
<td>Fire walls</td>
<td>All</td>
<td>NP*</td>
<td>W-XXX</td>
</tr>
<tr>
<td>Fire barriers</td>
<td>1</td>
<td>NP*</td>
<td>W-XXX</td>
</tr>
<tr>
<td>Incidental use areas</td>
<td>1</td>
<td>½</td>
<td>OR-45 or W-60</td>
</tr>
<tr>
<td>Mixed occupancy entries</td>
<td>1</td>
<td>½</td>
<td>OR-45 or W-60</td>
</tr>
<tr>
<td>Fire partitions</td>
<td>0.5</td>
<td>½</td>
<td>OR-20 or W-30</td>
</tr>
<tr>
<td>Smoke barriers</td>
<td>1</td>
<td>½</td>
<td>OR-45 or W-60</td>
</tr>
<tr>
<td>Exterior walls</td>
<td>1</td>
<td>½</td>
<td>OR-45 or W-60</td>
</tr>
<tr>
<td>Party wall</td>
<td>All</td>
<td>NP*</td>
<td>Not Applicable</td>
</tr>
</tbody>
</table>

NP* = Not Prescribed.
- Not provided except fire-resistance-rated glazing assemblies tested to ASTM E 119 or UL 263, as specified in Section 716.2.

Section 716.6.7 – Interior fire window assemblies

- 3/4 hour fire-protection-rated glazing used in fire window assemblies shall be limited to use in fire partitions and fire barriers where the fire-resistance rating of the wall assembly does not exceed 1 hour.
- 20 minute rating allowed in smoke barriers and fire partitions requiring 20 minute opening protection.
- The total aggregate window area shall not exceed 25 percent of the area of the common wall between any rooms.

Section 717: Ducts and Air Transfer Openings
Fire dampers, smoke dampers and combination fire/smoke dampers protect openings created by duct penetrations and air transfer openings in those fire-resistance-rated assemblies required to be protected.

Ducts that penetrate fire-resistant-rated assemblies and are not required to have fire dampers or smoke dampers shall comply with the provisions of Section 714.2 through 714.3.3 and are regulated as penetrations.

Section 717.3 – Damper testing, ratings and actuation

Dampers shall be listed, labeled and in compliance with the following standards:
- Fire dampers: UL 555.
- Smoke dampers: UL 555S.
- Combination fire/smoke dampers to comply with both UL 555 and 555S.
  - A “Corridor damper” is a specific type of combination damper used in a tunnel type corridor.

Damper Ratings – Section 717.3.2

<table>
<thead>
<tr>
<th>TABLE 717.3.2.1 FIRE DAMPER RATING</th>
<th>MINIMUM DAMPER RATING (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 3-hour fire-resistance-rated assemblies</td>
<td>1.5</td>
</tr>
<tr>
<td>3-hour or greater fire-resistance-rated assemblies</td>
<td>3</td>
</tr>
</tbody>
</table>

Smoke dampers shall be rated as follows:
- Leakage ratings shall be Class I or Class II
- Elevated temperature ratings shall not be less than 250°F

Section 717.4 – Access and identification

Fire and smoke dampers are to be provided with an approved means of access:
- Large enough to permit inspection and maintenance.
- Access points identified on exterior by label indicating type of damper.
- Access doors to be tight fitting and suitable for the duct construction.
- Access shall not affect integrity of fire-resistance rated assemblies.
Section 717.5 Where Dampers are Required

The type and location of dampers is specified in Section 717.5 based on the type of assembly it penetrates.

- Fire Walls (Section 717.5.1)
- Fire Barriers (Section 717.5.2)
- Shaft Enclosures (Section 717.5.3)
- Fire Partitions (Section 717.5.4)
- Smoke Barriers (Section 717.5.5)
- Exterior Walls (Section 717.5.6)

Section 717.5.1 – Fire walls

- Ducts and air transfer openings permitted in fire walls in accordance with Section 706.11 shall be protected with listed fire dampers installed in accordance with their listing.

- Where the fire wall serves as a horizontal exit, listed smoke dampers are also required at those points where any ducts or air transfer openings penetrate the fire wall.

Section 717.5.2 – Fire barriers

- Ducts and air transfer openings that penetrate fire barriers shall be protected with approved fire dampers installed in accordance with their listing.

- Ducts and air transfer openings shall not penetrate enclosures for stairways, ramps and exit passageways except as permitted by Sections 1022.4 and 1023.6, respectively.

Section 716.5.2 – Exceptions 1, 2 and 3

- Fire dampers are not required at penetrations of fire barriers where:
  1. Penetrations are tested in accordance with ASTM E 119 or UL 263 as part of the fire-resistance-rated assembly;
  2. Ducts are used as part of an approved smoke control system in accordance with Section 909; or
  3. Maximum 1-hour wall penetrated by a ducted HVAC system; in areas other than Group H or I; and the building is sprinklered.
Section 717.5.3 – Shaft enclosures

- Shaft enclosures that are permitted to be penetrated by ducts and air transfer openings shall be protected with approved fire and smoke dampers installed in accordance with their listing.

Section 717.5.3 – Exception 1

1. Fire dampers are not required at penetrations of shafts where:
   1.1 Steel exhaust subducts extend at least 22 inches vertically in exhaust shafts provided there is continuous airflow upward to the outside;
   1.2 Penetrations are tested in accordance with ASTM E 119 or UL 263 as part of the rated assembly;

Section 717.5.3 – Exception 1

1.3 Ducts are used as part of an approved smoke control system designed and installed in accordance with Section 909, and where the fire damper will interfere with the operation of the smoke control system; or

1.4 The penetrations are in parking garage exhaust or supply shafts that are separated from other building shafts by not less than 2-hour fire-resistance-rated construction.

Section 717.5.3 – Exception 2

- Exhaust fan at upper terminus, powered continuously
- Exhaust fan serving - Kitchen - Clothes dryer - Bathroom - Toilet room
- Firestopping at penetration
- Fire-resistance-rated shaft construction
- Penetrations of Shaft Enclosures
Section 717.5.3 – Exceptions 3 and 4

- Smoke dampers are not required at penetration of exhaust or supply shafts in parking garages that are separated from other building shafts by not less than 2-hour fire-resistance-rated construction.

- Smoke dampers are not required at penetrations of shafts where ducts are used as part of an approved mechanical smoke control system designed in accordance with Section 909 and where the smoke damper will interfere with the operation of the smoke control system.

Section 717.5.3 – Exception 5

- Fire dampers and combination fire/smoke dampers are not required in kitchen and clothes dryer exhaust systems installed in accordance with the IMC.

Section 717.5.4 – Fire partitions

- Ducts and air transfer openings that penetrate fire partitions shall be protected with listed fire dampers installed in accordance with their listing.

Section 717.5.4 – Exceptions

In occupancies other than Group H, fire dampers are not required where any of the following apply:

1. Corridor walls in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2 and the duct is protected as a through penetration in accordance with Section 714. (Notice this only exempts fire damper. Smoke damper is still required.)

2. Tenant partitions in covered mall buildings where the walls are not required by provisions elsewhere in the code to extend to the underside of the floor or roof deck above.
Section 717.5.4 – Exception

3. Duct systems of approved materials and the duct penetrating the wall meets all of the minimum requirements. (Subsections 3.1 - 3.6)

4. Wall is penetrated by a:
   - Ducted HVAC system;
   - In areas other than Group H or I; and
   - The building is sprinklered.

Section 717.5.4.1 – Corridors

Section 717.5.4.1 – Exceptions

- Smoke dampers are not required at the point a duct or air transfer opening penetrates a corridor where the:
  - Building is equipped with a smoke control system; or
  - Duct is constructed of steel not less than 0.019-inch (26 gage steel; 28 gage galvanized) in thickness and there are no openings serving the corridor.

Section 717.5.5 – Smoke barriers
Section 717.5.6 – Exterior Walls

- Ducts and air transfer openings in fire-resistance-rated exterior walls required to have protected openings in accordance with Section 705.10 shall be protected with listed fire dampers installed in accordance with their listing.

Damper Inspection Issues

- Dampers must be installed in accordance with their listing. Get and review manufacturer’s installation instructions.
- Verify access is provided per Section 717.4.
- Verify proper type of damper being used and is installed in the correct direction.
- Breakaway connections provided on ductwork.
- Proper gap and support brackets provided around damper. (See manufacturer’s instructions)

Closing Comment

It is only through the proper construction and protection of openings or penetrations that a fire-resistance rated assembly can do what it is intended to do.

If one aspect is done incorrectly it can compromise the integrity of the assembly and lead to it not doing its intended job.

So verify construction, continuity and protection of openings of all fire-resistance-rated walls.
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