Understanding and Applying Code Requirements for Firestopping

Ted Colwell

3M

Tim Mattox, Sr.
Specified Technologies Inc.

2017 BICSI Winter Conference & Exhibition
January 22-26 • Tampa, FL

International Firestop Council

-PRESENTATION CODE OF ETHICS-

The Representative, when speaking about firestopping technology and using language, information, presentations, logos, or any other communication means that could be reasonably likely to cause the recipient(s) of such information to believe that the communication represents an official IFC technical viewpoint, shall:

- Hold themselves out to the public with professionalism and sound ethics by conducting themselves in a way that reflects positively on IFC and the IFC members
- Clearly state their affiliation
- Identify their relationship with IFC
- Declare that they are presenting an official (unmodified) presentation prepared by IFC
- Indicate whether the presentation is at the official request of IFC
- This presentation will not highlight, focus or reference to a specific product of manufacturer

Seminar agenda

- **What is firestopping, and why is it required?**
- **Code Requirements - overview**

- **Penetration Firestop Systems**
- **Membrane penetrations**

- **Firestop installation options**
- **Engineering judgments**

- **Special inspection and special inspectors**

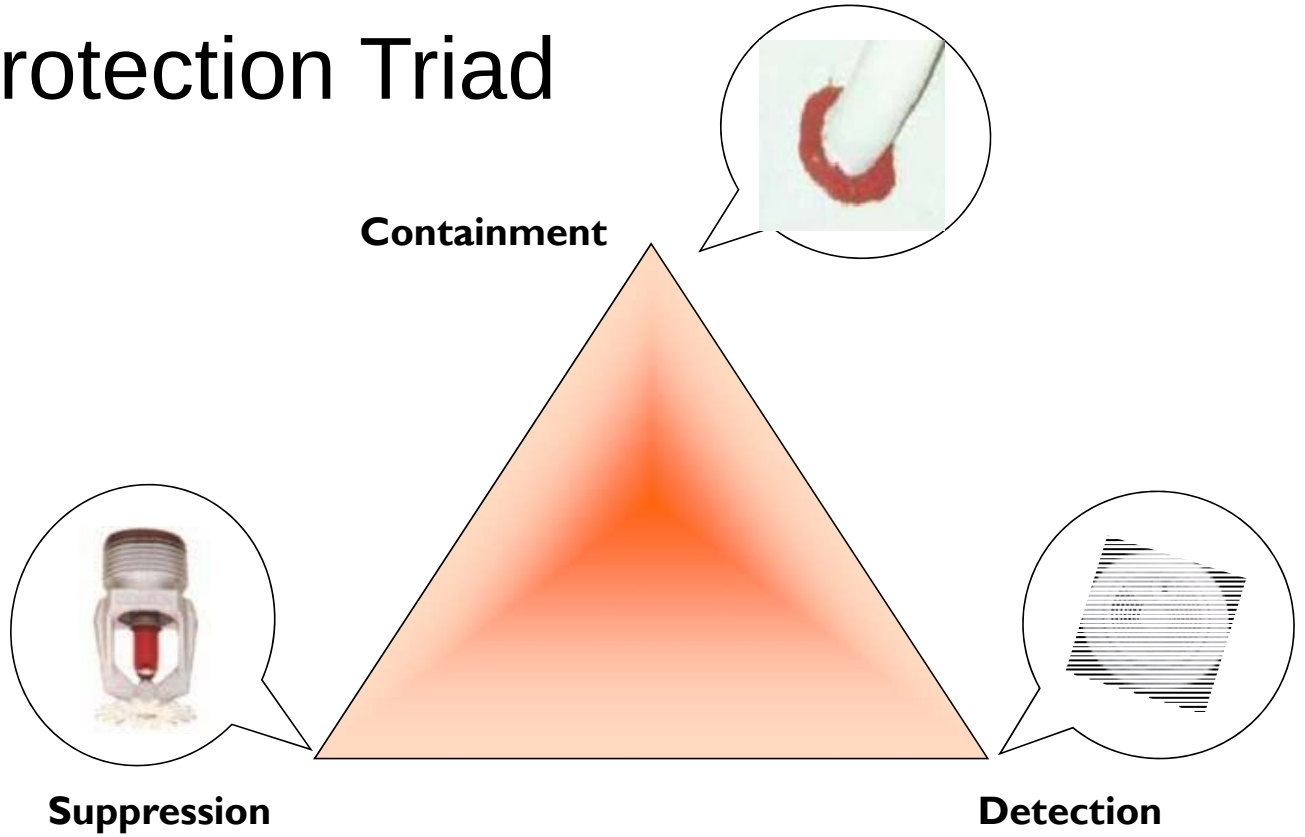
- **Plan review and inspection process recommendations**
- **Recognizing firestop installation problems**

Understanding the Concept of Balanced Fire Protection

Balanced Fire Protection

- An integrated system of fire and smoke protection elements in the construction environment composed of detection, suppression and containment features designed to provide an acceptable level of protection for people and property

Fire Protection Triad



What is the Function of a Balanced Fire Protection Design?

- Detectors are used to activate fire alarms and notify building occupants and emergency responders
- Sprinklers are designed to control small and medium fires and to prevent fire spread beyond the typical water supply design area of about 1,500 ft^2
- Compartmentation mitigates the spread of more severe but less frequent fires by limiting building areas, subdividing building with fire resistance rated construction, based on hourly ratings

IBC Balanced fire protection features

- Requires features that limit spread of fire and products of combustion:
  - Sprinkler systems and other suppression systems (control)
  - Fire rated horizontal and wall assemblies
  - Smoke barriers
  - Opening protection: doors, windows, shutters in paths of egress
  - Occupant egress requirements
  - Smoke management systems
  - Fire detection and alarm systems
  - Limitations on interior finishes and hazardous materials
  - Limited heights and areas
  - Fire rated tenant separations
  - Structural protection

Finding The Right Balance

Active Protection (Sprinklers and Alarms)

Passive Protection (Fire-resistive Assemblies)

What is the Leading Killer in Fires?

Smoke & Toxic Gases

Fire Statistics – Why We Must Contain Smoke and Toxic Gases

3/4 of all fire deaths are caused by smoke inhalation**.**

Source: Hall, Jr. John R. NFPA Fire Analysis & Research, Quincy, MA. “Burns, Toxic Gases, and other Hazards”.

Visibility: 47% of survivors caught in a fire could not see more than **12 feet**

Source: NFPA Fire Protection Handbook, 18th Ed. Table 1-1P. Pg.1-15.

Approximately **57%** of **people killed** in fires are **not in the room** of the fire’s origin

Source: NFPA Fire Protection Handbook, 18th Ed. Table 8-1P. Pg. 8-17.

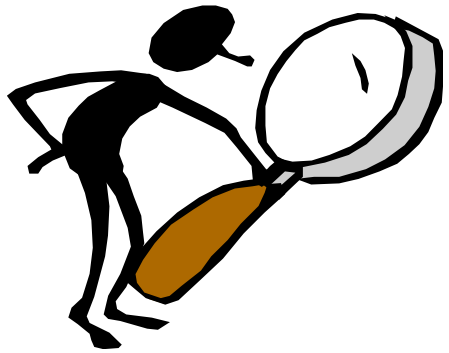
Smoke travels **120-420 feet per minute** under fire conditions

Source: Estimate based upon ceiling jet velocity calculations for typical ceiling heights and heat release rates.

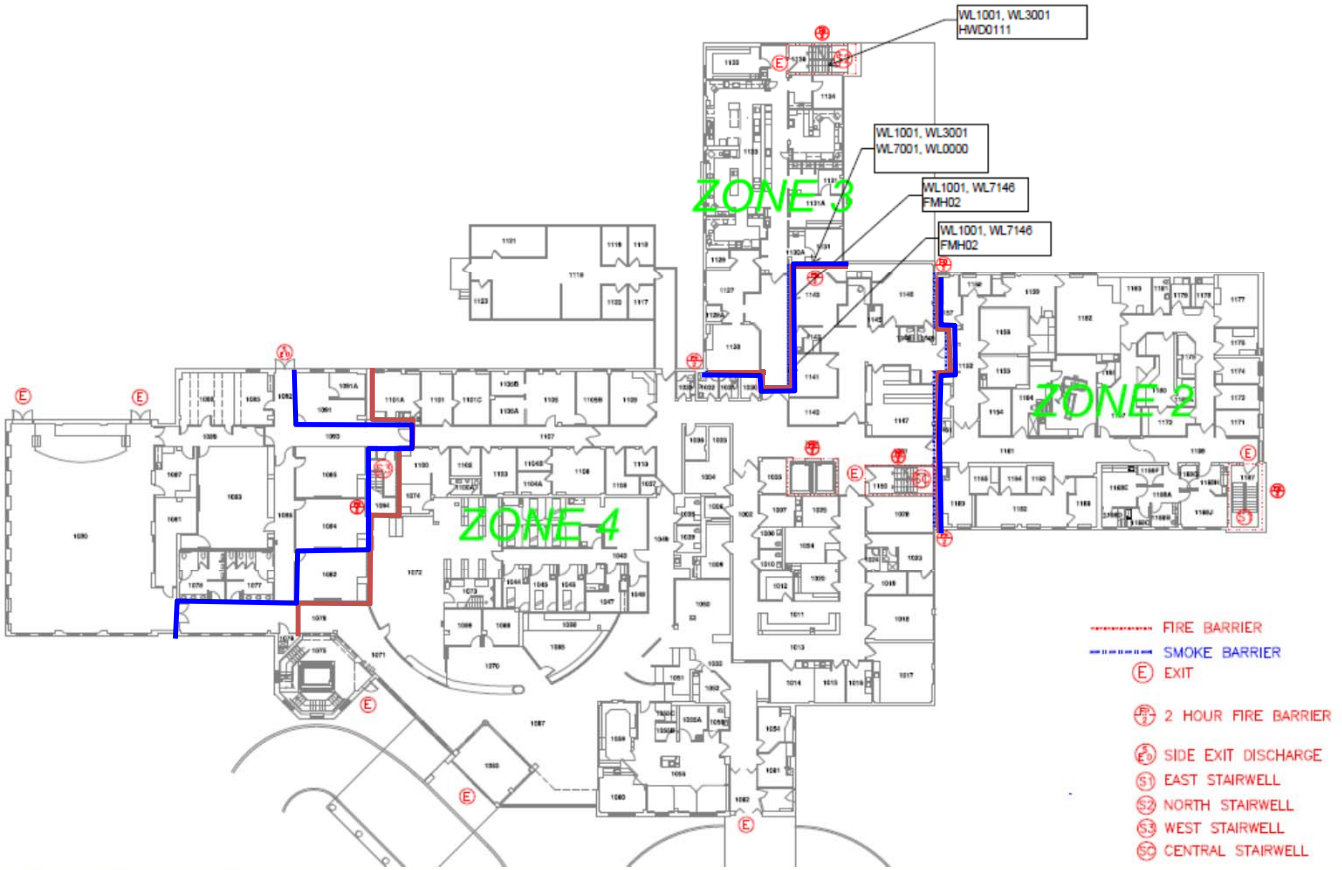
Containment In Construction

Containment in Construction

- Fire-resistance-rated assemblies
  - *Fire Walls*
  - *Fire Barriers*
  - *Fire Partitions*
  - *Smoke Barriers*
  - *Horizontal Assemblies*



- **Through- and Membrane-Penetrations**
- **Fire-resistant joint systems (i.e. construction joints and perimeter joints)**
- Opening protection (i.e. fire-rated doors and windows)
- Air ducts and air transfer openings (i.e. dampers)



Firestopping: IBC Definition

•An assemblage consisting of a fire-resistance-rated floor, floor/ceiling, or wall assembly,

+

•one or more penetrating items passing through the breaches in both sides of the assembly

+

•the materials or devices, or both, installed to resist the spread of fire through the assembly for a prescribed period of time.

Compare and contrast

- Firestopping
- Fireblocking
- Draftstopping

Large loss fires with inadequate compartmentation

1980 MGM Grand Hotel
84 Died – 679 Injured
Due to Smoke Propagation
(Prior to Firestop Requirements)

May 2001 - Taipei Office Building
Fire started on 3rd Floor
Spread and jumped to 26th Floor
(Unauthorized removal of fire walls and lack of perimeter barrier firestopping hampered fire containment)

First Interstate Bank Building
Los Angeles, 1988

Fire occurred on the 12th floor extending to 16th floor (62 story high-rise):

- "The lack of firestopping between the floor slabs and the skin permitted the fire to spread from floor to floor through this space. Fire was observed spreading through this area even before the glass and mullions failed."
- "The fire extended upward by…non-firestopped openings between the floor slab and the skin."
- "The vertical spread was also through poke-through, pipe recesses, and utility shafts."
- "The automatic sprinkler system was drained and building fire pumps shut off at time of fire."

Source: Chapman, Elmer F. "High-Rise: An Analysis," Fire Engineering", August 1988.

Rockefeller Centre
New York, 1996

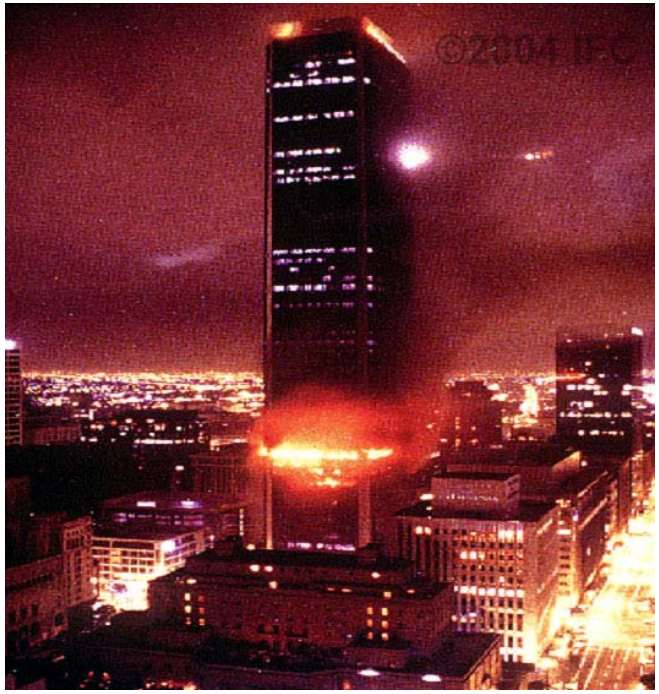
Fire occurred in the 5th floor electrical room:

- "Fire and smoke spread beyond the rooms involved due to a number of unprotected horizontal and vertical openings."
- "Based upon the NFPA's investigation and analysis of this fire, the following are considered significant contributing factors to the loss of property in this incident:
  - Unprotected vertical and horizontal penetrations. These openings allowed smoke to spread from beyond the electrical room and into the occupied areas."

Source: NFPA Fire Investigation Summary: "High Rise Fire Rockefeller Center"

Why is Firestopping Required?

- Mandated by the Codes
- Life safety and property protection
- Provide time for first responders to perform their duties
- Compartmentalize and prevent spread of flame and smoke through a structure during a fire



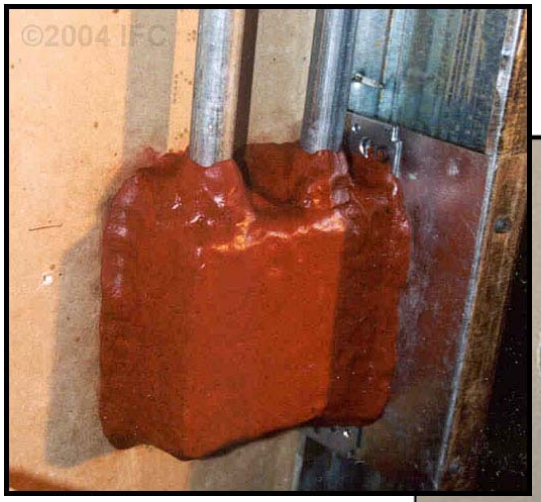
Containment In Construction

Where do the IBC (and NFPA 101) required firestopping?

Containment In Construction

Through-Penetrations

Containment In Construction



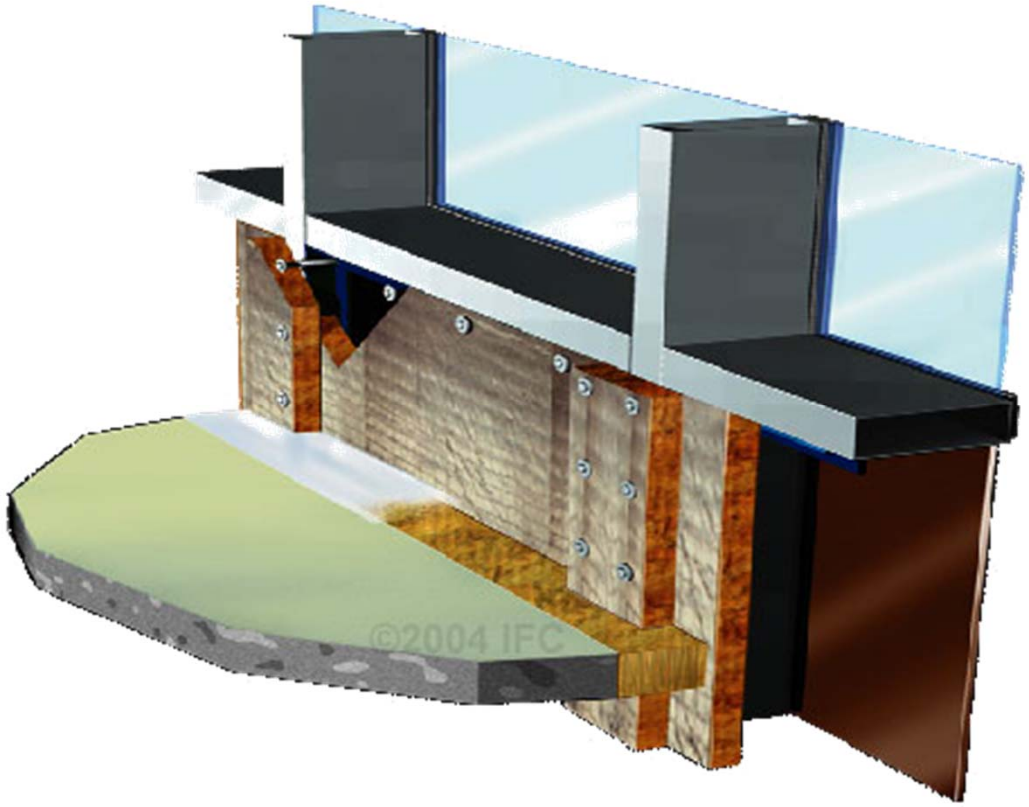
Membrane-Penetrations

Containment In Construction

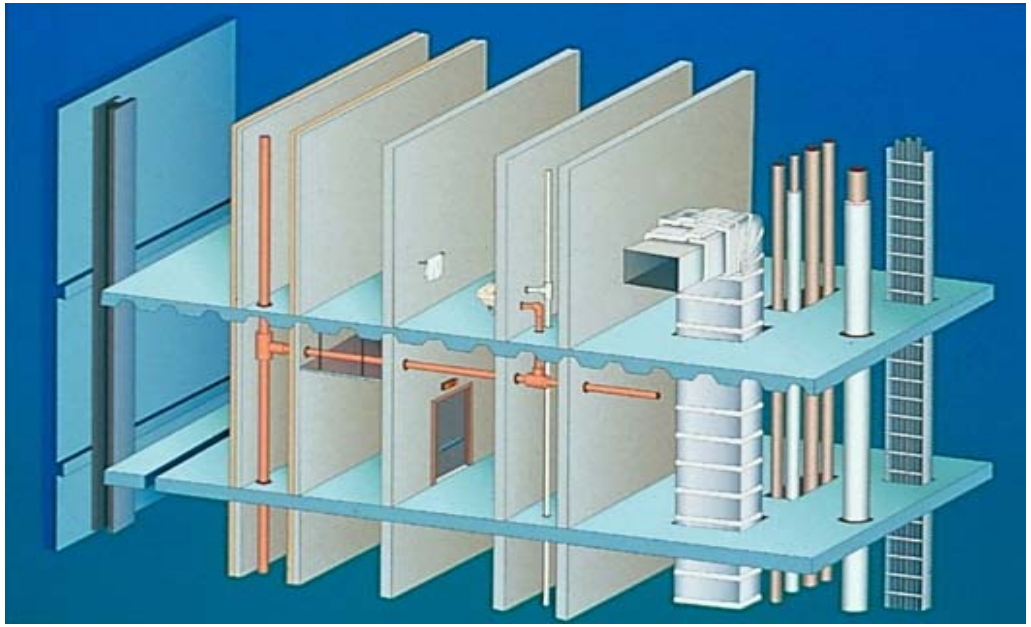
Construction Joints

Containment In Construction

Perimeter Containment



Firestopping needed in many Applications



Code Requirements - Firestopping

Code Requirements – Firestopping

Minimum requirements for New Construction & Maintenance

- –International Building Code – Chapter 7
  - •New Construction
- –International Fire Code – Chapter 7
  - •Existing Buildings
- –NFPA 101 – Chapter 8
  - •Health Care

FIRESTOP PROCESS

- Design/specification
- Plan Review
- Installation
- Inspection
- Maintenance

Firestop Code Requirements - IBC Submittals

- Code provisions provide clear direction for inclusion information on the plans.

  107.2.1 - Information on Construction Documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that it will conform to the provisions of this codes

  107.3.4.1-Deferred submittals. Deferral of any submittal items shall have the prior approval of the *building official. The registered design professional in responsible charge shall list the deferred submittals on the construction documents for review by the building official. Documents for deferred submittal items shall be submitted to the registered design professional … who shall review them and forward them to the building official … indicating they … have been reviewed and found to be in general conformance to the design of the building. The deferred submittal items shall not be installed until the deferred submittal documents have been approved by the building official.*

Firestop Code Requirements - IBC

Inspection

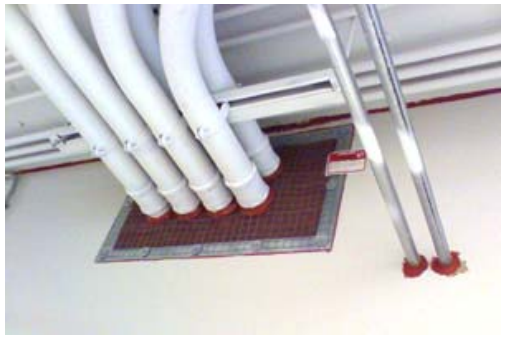
- 110.3.6 Protection of joints and penetrations in fire-resistance-rated assemblies, *smoke barriers and smoke partitions* shall not be concealed from view until inspected and *approved*.

Firestop Code Requirements - IBC

Through-Penetrations (walls)

- **Sections 714.3.1.2: <u>Through-Penetrations of Vertical Assemblies</u>**

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 <u>an F rating of not less than the required fire resistance rating of the wall penetrated</u>.



Through-Penetrations (floors)

- **Sections 714.4.1.2: <u>Through-Penetrations of Horizontal Assemblies</u>**

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 The system shall have **<u>an F rating/T rating</u>** <u>of not less than 1 hour but not less than the required rating of the floor penetrated.</u>

Exceptions to T-Rating only:

1. Floor penetrations contained and located within the cavity of a wall
2. Floor penetrations by floor drains, tub drains or shower drains contained and located within the concealed space of a horizontal assembly
3. Max 4-inch diameter penetrations directly into metal-enclosed electrical power switchgear.

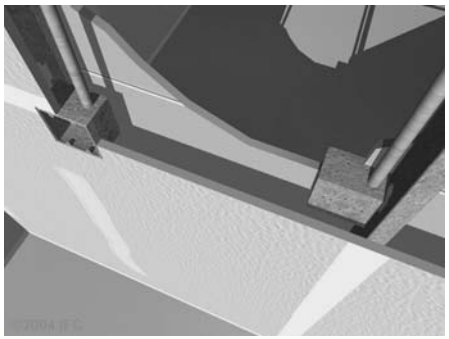
Firestop Code Requirements - IBC

Membrane Penetrations

- Sections 714.3.2: <u>Membrane Penetrations</u>

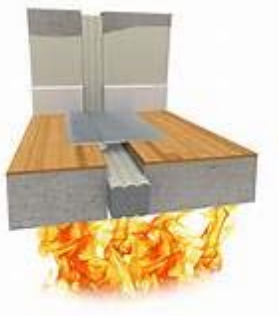
Membrane Penetrations shall comply with Section 714.3.1. Where walls or partitions are required to have a *fire-resistance rating,* recessed fixtures shall be installed such that the required fire-resistance will not be reduced.

  - Code Summary:
    - Membrane penetrations are firestopped at the wall membrane or surface, the same as through penetrations



Firestop Code Requirements - IBC

Joints



- Section 715.1: Fire Resistive Joint Systems

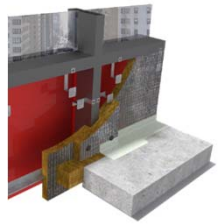
"Joints installed in or between fire-resistance rated walls, floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies shall be protected by an approved *fire-resistant joint system designed to resist the passage of* fire for a time period not less than the required *fire-resistance rating of the wall, floor or roof in or between which the system is* Installed."

Exceptions: Several specific exemptions exist e.g. walls permitted to have unprotected openings, floors within malls, etc..

Firestop Code Requirements - IBC

Perimeter Barriers

715.4 Exterior curtain wall/floor intersection. Where fire resistance-rated floor or floor/ceiling assemblies are required, voids created at the intersection of the exterior curtain wall assemblies and such floor assemblies shall be sealed with an *approved* system to prevent the interior spread of fire. Such systems shall be securely installed and tested in accordance with ASTM E 2307 to provide an *F rating* for a time period **not less than** the *fire-resistance rating* of the floor assembly. Height and fire-resistance requirements for curtain wall spandrels shall comply with Section 705.8.5. Exception…..



Firestop Code Requirements - IBC

2012: 715.4.1 Exterior curtain wall/nonfire-resistance-rated floor assembly intersections. Voids created at the intersection of exterior curtain wall assemblies and nonfire-resistance-rated floor or floor/ceiling assemblies *shall be sealed with an approved material or system to retard the interior spread of fire and hot gases between stories.*

2015: 715.4.2 Exterior curtain wall/vertical fire barrier intersections. Voids created at the intersection of nonfire-resistance-rated exterior curtain wall assemblies and fire barriers shall be filled. *An approved material or system shall be used to fill the void and shall be securely installed* in or on the intersection for its entire length so as not to dislodge, loosen or otherwise impair its ability to *accommodate expected building movements and to retard the passage of fire and hot gases.*

Firestop Code Requirements

Special Inspections

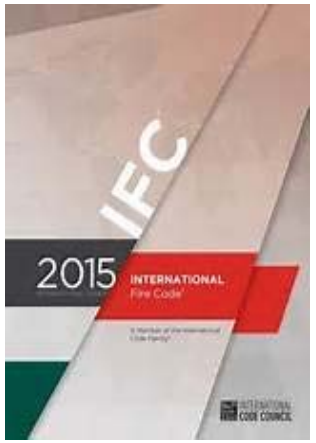
- 1705.17 Fire-resistant penetrations and joints. In high-rise buildings or in buildings assigned to *Risk Category III or IV* in accordance with Section 1604.5, special inspections for through-penetrations, membrane penetration firestops, fire-resistant joint systems, and perimeter fire barrier systems that are tested and listed

- ASTM standards required in 1705.17 for inspection procedures (E2174-04 and E2393-04)

Firestop Code Requirements – Fire Codes

Inspection during life of a building

- Fire codes govern the fire safety requirements of buildings throughout their lifespan
  - International Fire Code



International Fire Code (IFC)

Inspection during life of a building

- **703.1 Maintenance.** The required fire-resistance rating of fire-resistance-rated construction (including walls, firestops, shaft enclosures, partitions, smoke barriers, floors, fire-resistive coatings and sprayed fire-resistant materials applied to structural members and fire-resistant joint systems) shall be maintained.
- **2009**: Such elements shall be visually inspected by the owner annually and properly repaired, restored or replaced when damaged, altered, breached or penetrated.
- **2015: Records of inspections and repairs shall be maintained.**

Code Requirements - IBC

International Building Code
Test Standards

	IBC
Through Penetration	ASTM E814 UL 1479
Joints	UL 2079 ASTM E1966
Perimeter Barriers	ASTM E2307

IFC Video

- "CLOSE ENOUGH IS NOT GOOD ENOUGH": A Demonstration of Proper vs. Improper Firestopping

http://www.youtube.com/c/FirestopOrg

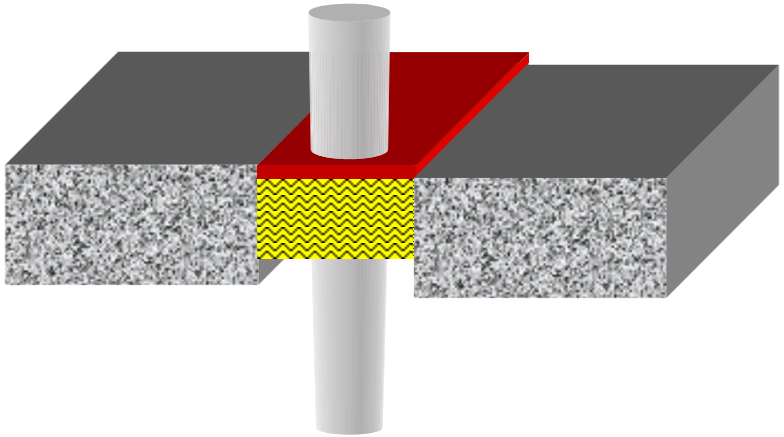
Penetration Firestop Systems

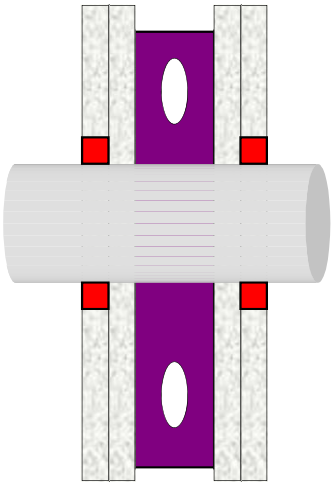
Penetration Firestop System

Consists of:

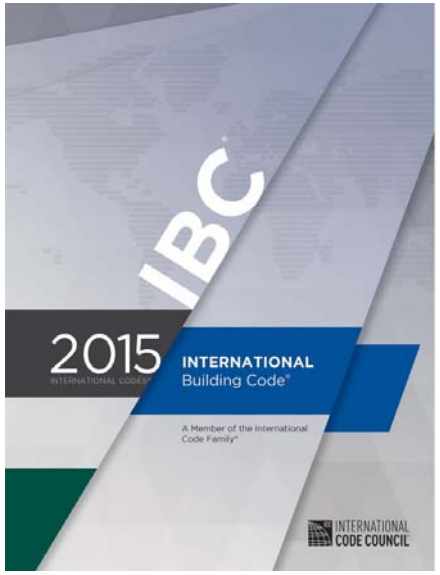
- Assembly being penetrated
- Penetrating item
- Fill, void or cavity materials (firestopping materials)

Three Components of Penetrations





Codes & Standards



Code Requirements
IBC 714.3 (wall assemblies)
IBC 714.4 (Horizontal assemblies)

- 714.3.1, 714.4.1 – Through penetration shall be protected by one of the following:
  - As tested as part of the entire wall assembly
  - As tested to ANSI/UL 1479 / ASTM E 814
- 714.3.1.2 – When tested to ANSI/UL 1479 or ASTM E 814, systems shall have F Rating equal to rating of wall penetrated
- 714.4.1.2 - …shall have an F rating and a T rating of not less than 1 hour but not less than the required rating of the floor penetrated."

Code Requirements Wall Assemblies Cont.

- 714.3.2 – Membrane penetration shall be protected as follows:
  - As specified in 713.3.1 (i.e. through penetrations)
  - Recessed fixtures shall be installed so as not to reduce the required fire resistance
  - Specific rules for outlet boxes…

Code Requirements Smoke Barriers

- 714.5 – Penetrations in smoke barriers shall have an L Rating at ambient and 400 °F per UL2079
  - Max 5.0 CFM / sq ft of opening, or
  - Max cumulative leakage of 50 cfm for all penetrations within any 100 square feet of wall or floor area

Sprinkler Pipe Considerations

Sprinkler Pipe Considerations

Metallic Sprinkler Pipe Penetrations:

- NFPA 13 Annular Space Limitations
  - If Pipe < 3.5” then annular = 1”
  - If pipe > 3.5” then annular = 2”
- Pipe Movement
  - Seismic Movement
  - Water-Hammer from Testing

Ratings

- F - Flame Occurrence
- T - Heat Transmission
- L - Leakage
- W - Water Leakage (Optional)

Conditions of Acceptance
F Rating

- Passage of Flame
- Hose Stream

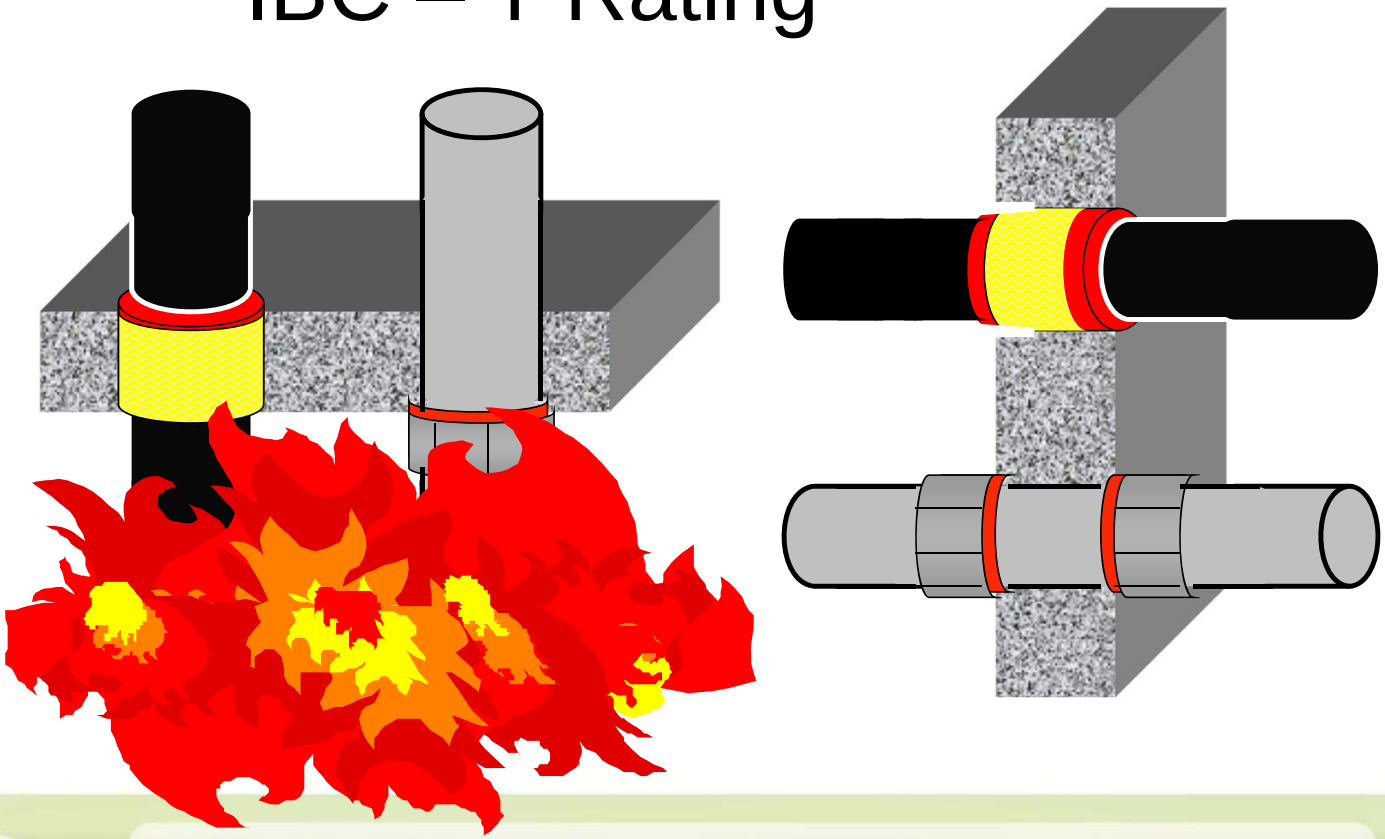
L (Air Leakage) Ratings

- L Rating methodology added to ANSI/UL 1479 in 1993
- Leakage determined at 0.3 in. WC
- Tested at Ambient and 400°F
- Results published in either CFM/Device or CFM per sq ft

Conditions of Acceptance
T-Rating

- No Passage of Flame
- Not to exceed 325°F Temperature Rise
- Code-mandated only for some floor penetrations

IBC – T Rating



IBC – T Rating

- Required for
  - through-penetrations of horizontal assemblies (with exceptions)
  - membrane penetrations by non-electrical boxes

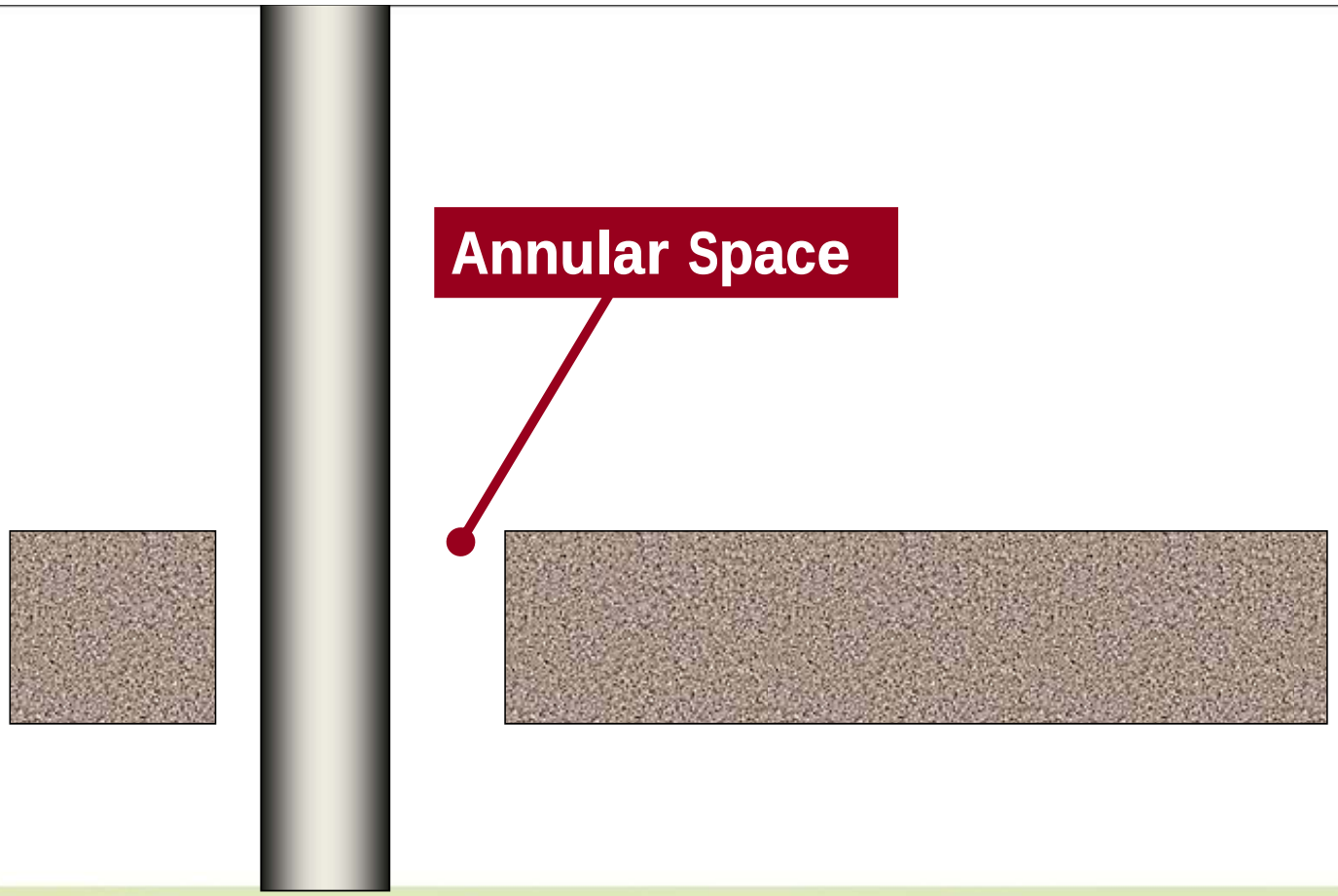
➔ T-rating never required by code for wall through-penetrations

- Methods for achieving a T Rating include:
  - Wrap metallic pipe with mineral wool or ceramic insulation
  - A listed device around metallic pipe that will cool pipe during a fire

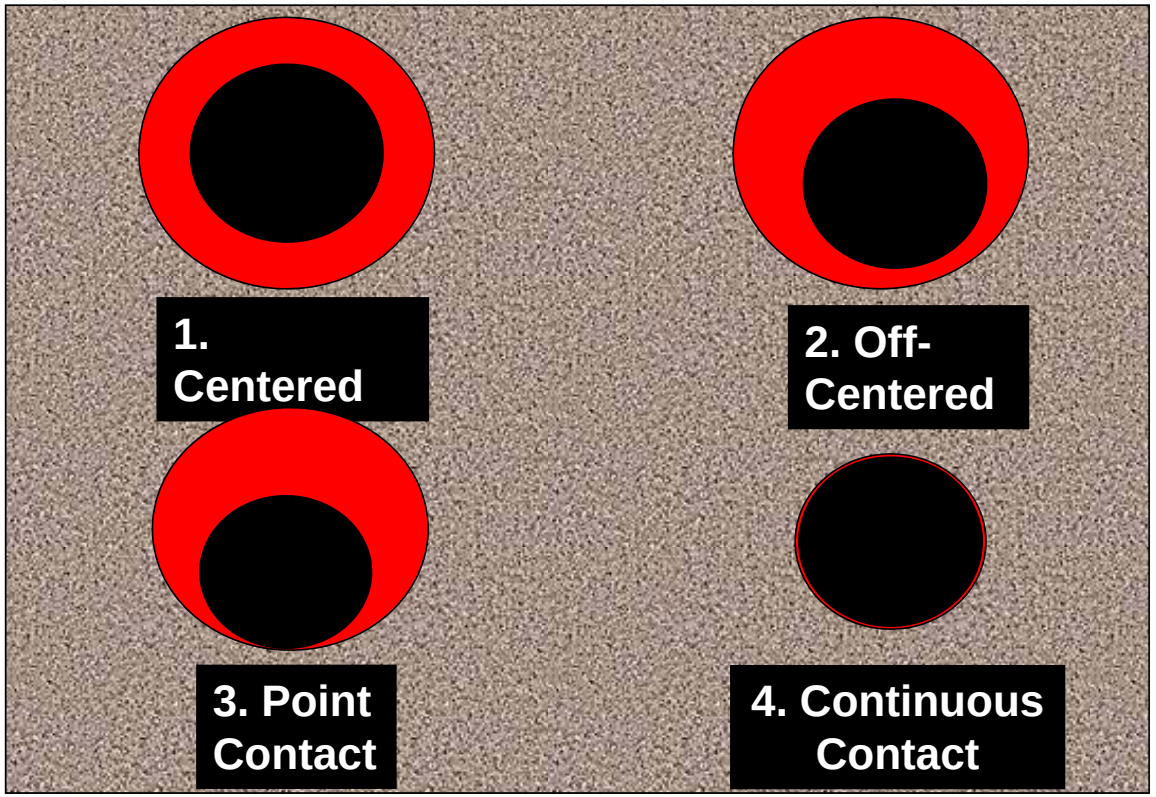
IBC – T Rating (Exceptions)

Exceptions to floor penetration T-Rating:

1. Floor penetrations contained and located within the cavity of a wall
2. Floor penetrations by floor drains, tub drains or shower drains contained and located within the concealed space of a horizontal assembly (IBC 2012)
3. Max 4-inch diameter penetrations directly into metal-enclosed electrical power switchgear. (IBC 2015)


Annular Space

Typical Annular Space

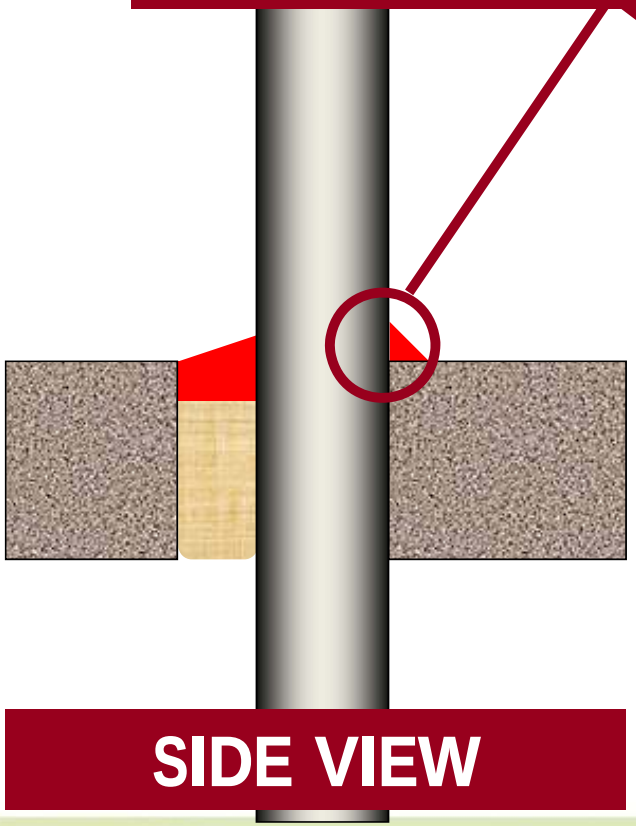


Sealant depth & location must be verified

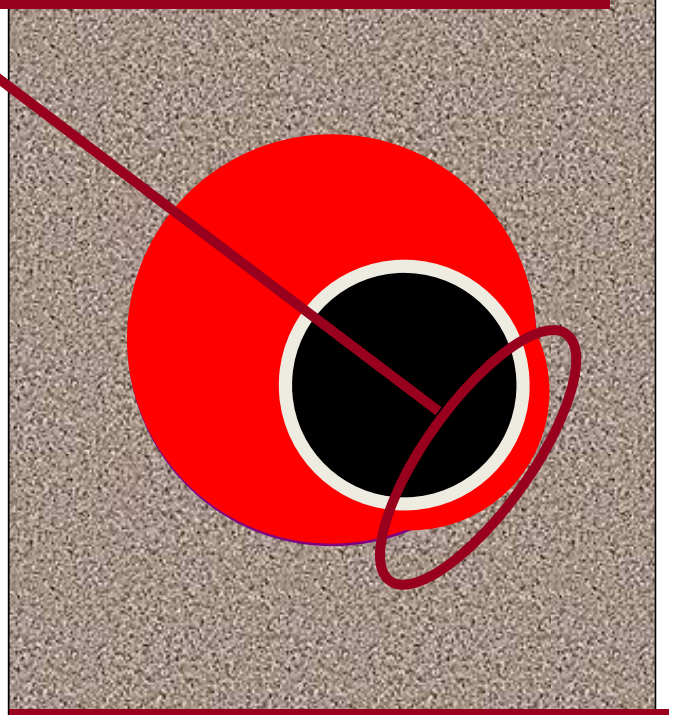
5/8” called for in Listed System

< 5/8” installed in the field

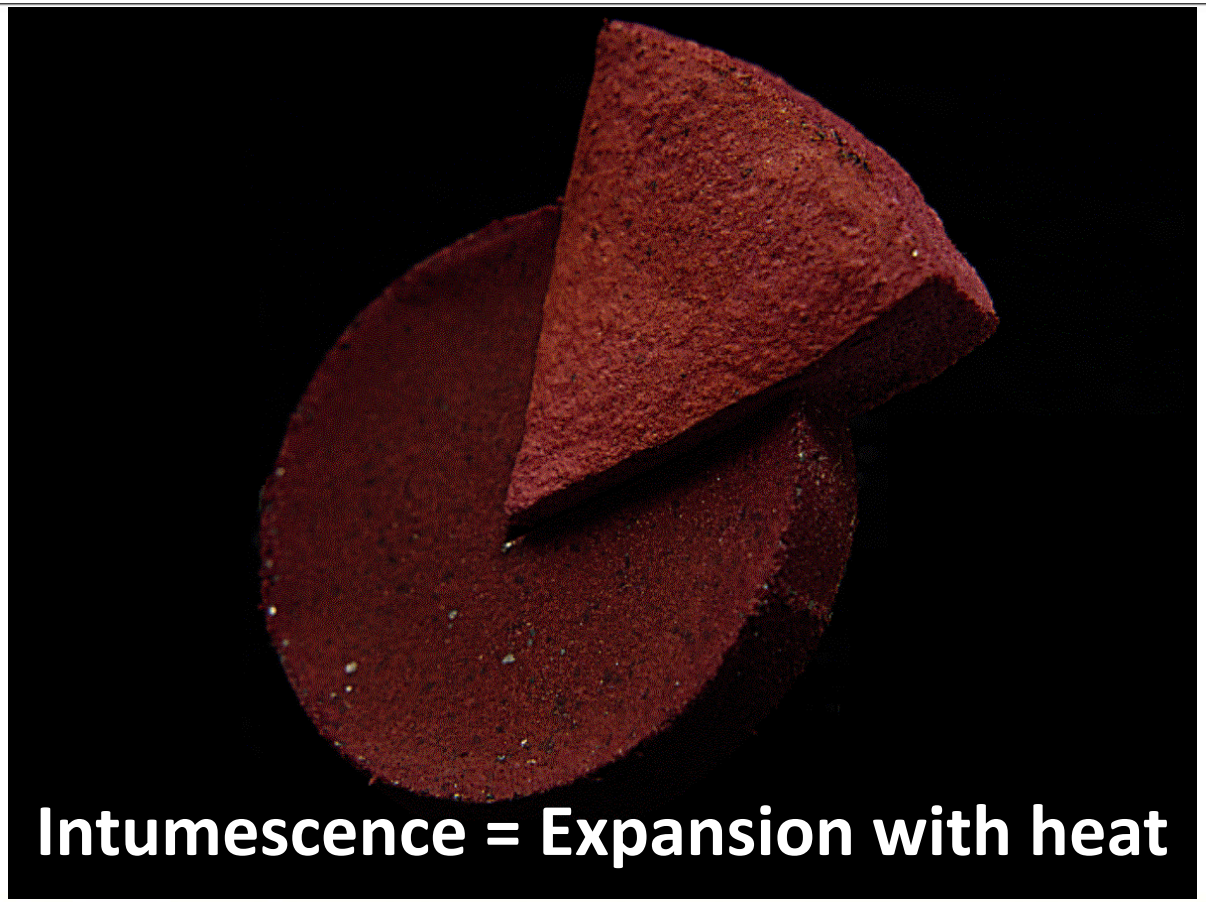
Crown Bead at Point Contact



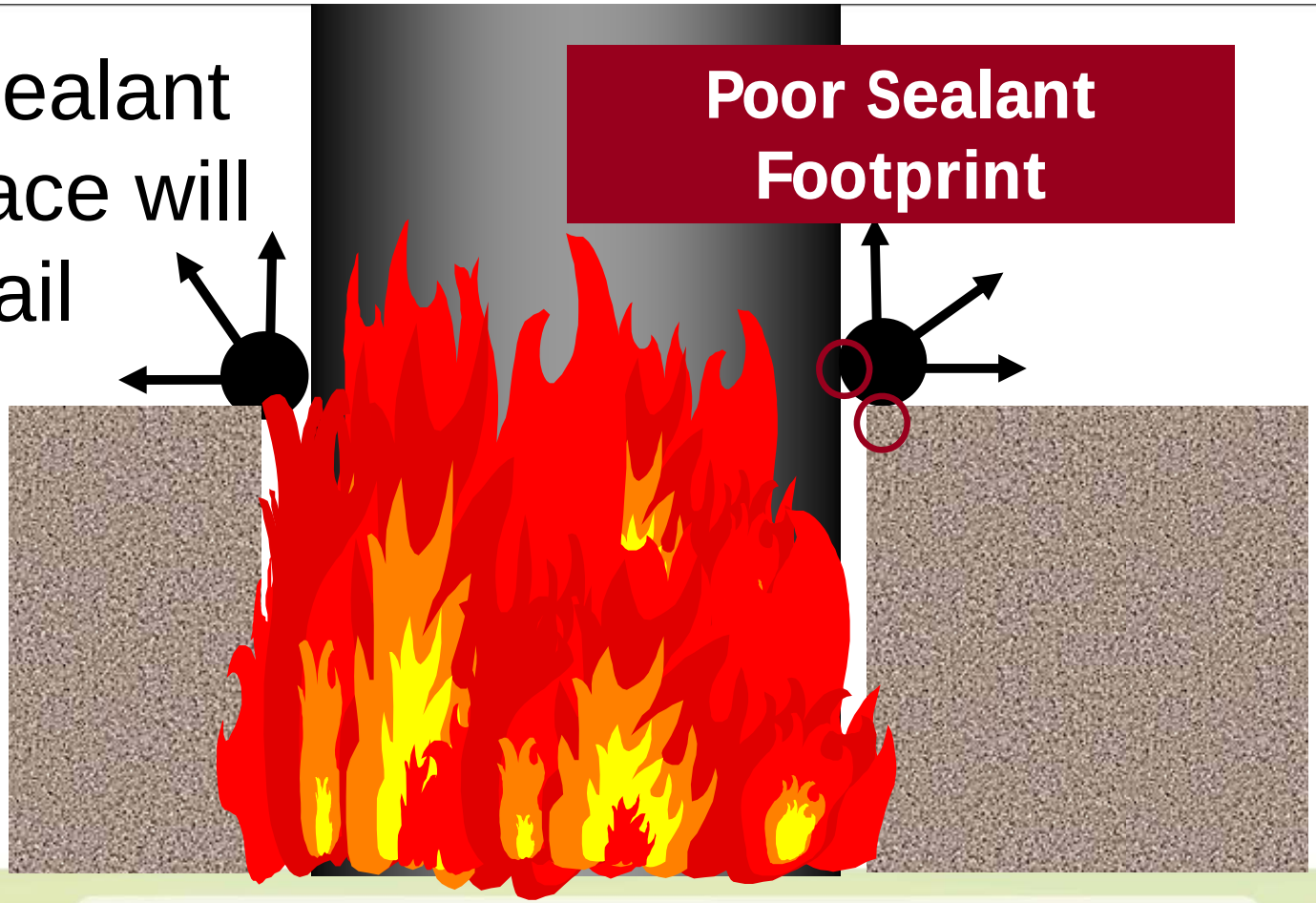
SIDE VIEW



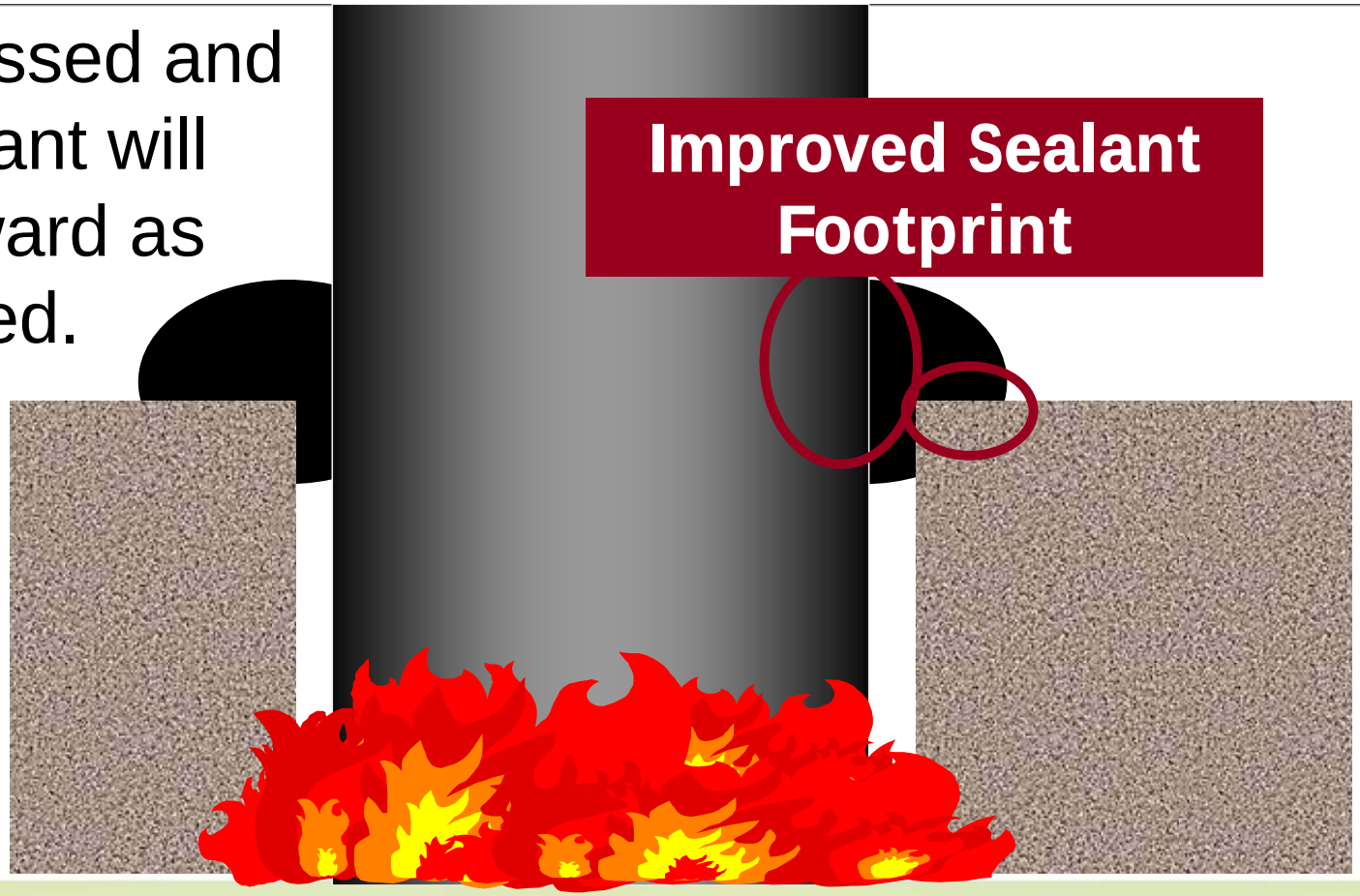
TOP VIEW


Intumescence = Expansion with heat

Untooled sealant on the surface will likely fail



Properly recessed and tooled sealant will expand inward as designed.



Properly Tooled Penetrations

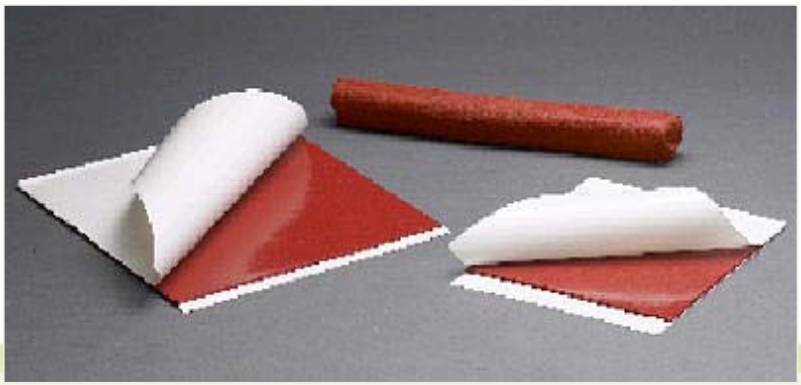
- The Firestop sealant must be well bonded to penetrating item and surrounding wall or floor
- Should always inspect both sides

Steel Collars and Intumescent Wrap Strips

- Intumescent sealant expands and fills the void
- The intumescent expands inwards to crush/collapse pipe

Firestop Putties

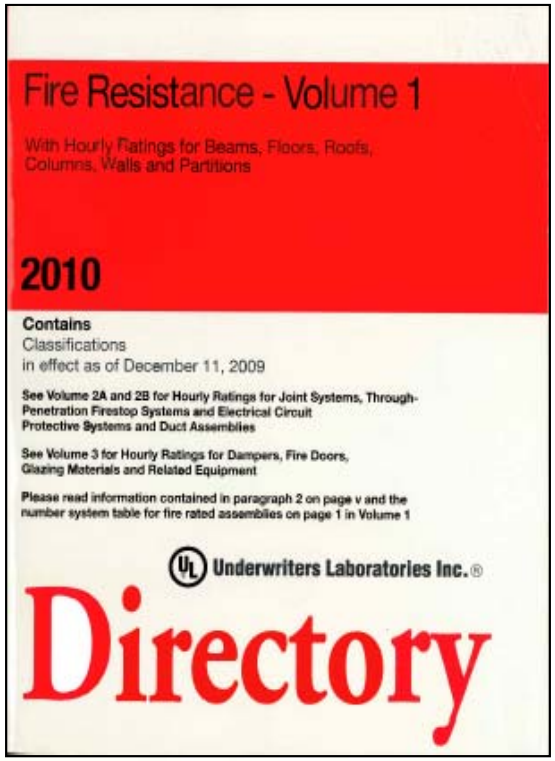
- Intumescent Putties
  - Hand moldable intumescent “putties

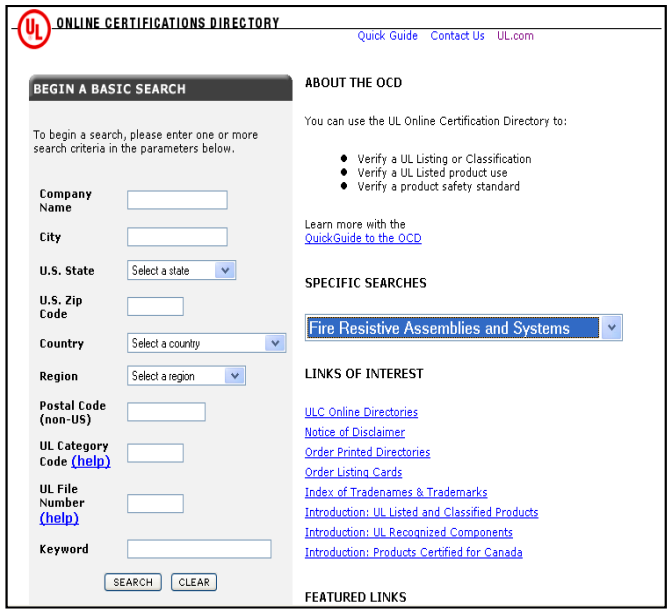


Verify that a Penetration Firestop System matches the application

Every tested and listed system has its own unique allowances, limits, requirements:
-Hourly fire rating
-Type of barrier
-Type of penetrant
-Min/Max Hole size
-Firestop product

Where Can I Find The Most Current Listings?





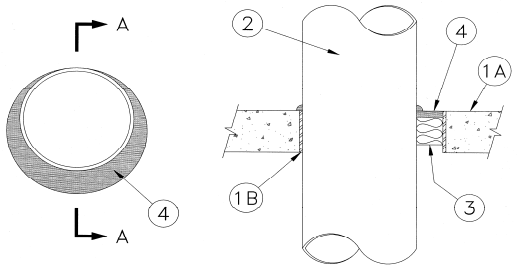
Identifying a matching firestop system

- What type of building assembly is requiring firestopping?
  - Floor or Wall
- What type of material is the building assembly
  - Concrete, CMU, Gypsum, Wood Frame
- What is the penetrating item(s)?
  - Metallic, Nonmetallic, Cables, Insulated, Construction Joints, etc.
- What are the specific descriptions regarding the penetrants?
  - Diameter, quantity, type of plastic, type & thickness of insulation, etc.
- What is the hourly rating you are looking for?
  - F Rating, T Rating
- Are there any special considerations?
  - Movement, Environmental exposure

- Are there any special considerations?
  - Movement, Environmental exposure

SYSTEM No. C-AJ-1379

F Ratings – 3 Hr
T Ratings – 0 Hr



SECTION 'A–A'

1A. Floor or Wall Assembly – Min 4-1/2 in. thick reinforced normal weight (150 pcf) concrete. Wall may also be constructed of any UL classified **Concrete Blocks***. Max diam of opening is 26-1/2 in.

See **Concrete Blocks** (CAZT) category in the Fire Resistance Rating Directory for names of manufacturers.

1B. Metallic Sleeve (optional) – Nom 16 in. (or smaller), Schedule 10 (or heavier) steel pipe sleeve, cast or grouted into floor or wall assembly.

2. Through Penetrants – One metallic pipe or tubing to be installed concentrically or eccentrically into opening such that the annular space between the pipe and the periphery of the opening is min 0 in. (point of contact) to max 2-1/2 in. Pipe to be firmly supported on both sides of opening. The following types and sizes of pipes may be used:

(a) Nom. 24 in. diam (or smaller) Schedule 30 (or heavier) steel or iron pipe.
(b) Nom. 4 in. diam (or smaller) electrical metallic tubing.

3. Packing Material – Mineral wool insulation of min 4 pcf firmly pressed into opening as a permanent form. Insulation material to be recessed by min depth of 1/2 in. from top surface of floor or both surfaces of wall.

4. Fill, Void, or Cavity Materials* – **Caulk** – Min 1/2 in. thickness of fill material applied within the annulus, flush with top surface of floor or both surfaces of wall. A min 1/4 in. crown of the caulking material shall be applied around the entire circumference of the pipe at the level of the floor surface or both wall surfaces.

Company ABC – SuperDuper Sealant

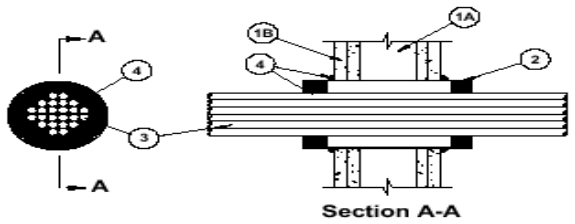
* Bearing the UL Classification Marking.

For the Contractor

UL Systems serve two roles:

1) Evidence of compliance

2) A set of build-instructions



Section A-A

System No. W-L-3132
F Ratings — 1 and 2 Hr (See Item 1)
T Ratings — 0 Hr

1. **Wall Assembly** — The 1 or 2 hr fire-rated gypsum wallboard/ stud wall assembly shall be constructed of the materials and in the manner described in the individual U300 or U400 Series Wall or Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   - **A. Studs** — Wall framing shall consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 3-5/8 in. wide and spaced 24 in. OC.
   - **B. Wallboard, Gypsum*** — 5/8 in. thick, 4 ft wide with square or tapered edges. The gypsum wallboard type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300 or U400 Series Designs in the UL Fire Resistance Directory. Max diam of opening is 4 in.

   The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.
2. **Steel Sleeve** — Nom 4 in. diam (or smaller) steel electrical metallic tubing (EMT) or Schedule 5 (or heavier) steel pipe friction-fit into wall assembly. Sleeve installed such that the ends project 1-1/2 to 2 in. beyond each side of the wall.
3. **Cables** — Aggregate cross-sectional area of cables in sleeve to be max 48 percent of the cross-sectional area of the sleeve. Tight bundle of cables to be centered within the steel sleeve. The annular space within the firestop system shall be a nom 1/2 in. Cables to be rigidly supported on both sides of the wall. Any combination of the following types and sizes of cables may be used:
   - **A.** Max 200 pair No. 24 AWG (or smaller) copper conductor cable with polyvinyl chloride (PVC) jacketing and insulation.
   - **B.** Max 3/C No. 2/0 AWC (or smaller) aluminum or copper conductor service entrance cable with PVC insulation and jacket.
   - **C.** Max 3/C No. 8 AWG (or smaller) nonmetallic sheathed (Romex) cable with copper conductors, PVC insulation and jacket.
   - **D.** Max 7/C No. 2/0 AWG (or smaller) multiconductor power and control cables with XLPE or PVC insulation and XLPE or PVC jacket.
   - **E.** Max RG59/U (or smaller) coaxial cable with fluorinated ethylene insulation and jacketing.
   - **F.** Max 62.5/48 fiber optic cable with PVC insulation and jacketing.
   - **G.** Max 4 pair No. 24 AWG (or smaller) copper conductor data cable with Hylar insulation and jacket.
4. **Fill, Void or Cavity Material*** — **Putty** — Min 1 in. thickness of fill material applied within annulus, flush with both ends of sleeve. A nom 1/4 in. diam continuous "rope" of putty shall be applied around the circumference of the steel sleeve at its egress from both sides of the wall.

   Specified Technologies Inc. — SpecSeal Putty
5. **Fill, Void or Cavity Material*** — **Sealant** — As an option to the "rope" of putty, a min 1/4 in. diam bead of sealant may applied at the gypsum wallboard/steel sleeve interface on both sides of the wall.

   Specified Technologies Inc. — SpecSeal Series 100 or Series LC Sealant

*Bearing the UL Classification Marking

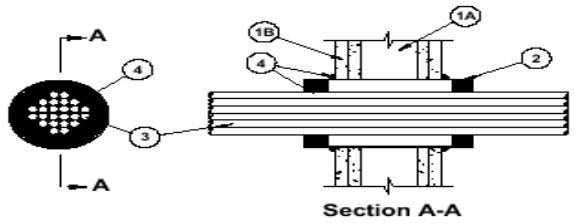
FOD-3256

For the Building / Fire Official

UL Systems serve two roles:

1) Evidence of compliance

2) Document by which to inspect



Section A-A

System No. W-L-3132
F Ratings — 1 and 2 Hr (See Item 1)
T Ratings — 0 Hr

1. **Wall Assembly** — The 1 or 2 hr fire-rated gypsum wallboard/ stud wall assembly shall be constructed of the materials and in the manner described in the individual U300 or U400 Series Wall or Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   - **A. Studs** — Wall framing shall consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 3-5/8 in. wide and spaced 24 in. OC.
   - **B. Wallboard, Gypsum*** — 5/8 in. thick, 4 ft wide with square or tapered edges. The gypsum wallboard type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300 or U400 Series Designs in the UL Fire Resistance Directory. Max diam of opening is 4 in.

   The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.
2. **Steel Sleeve** — Nom 4 in. diam (or smaller) steel electrical metallic tubing (EMT) or Schedule 5 (or heavier) steel pipe friction-fit into wall assembly. Sleeve installed such that the ends project 1-1/2 to 2 in. beyond each side of the wall.
3. **Cables** — Aggregate cross-sectional area of cables in sleeve to be max 48 percent of the cross-sectional area of the sleeve. Tight bundle of cables to be centered within the steel sleeve. The annular space within the firestop system shall be a nom 1/2 in. Cables to be rigidly supported on both sides of the wall. Any combination of the following types and sizes of cables may be used:
   - **A.** Max 200 pair No. 24 AWG (or smaller) copper conductor cable with polyvinyl chloride (PVC) jacketing and insulation.
   - **B.** Max 3/C No. 2/0 AWC (or smaller) aluminum or copper conductor service entrance cable with PVC insulation and jacket.
   - **C.** Max 3/C No. 8 AWG (or smaller) nonmetallic sheathed (Romex) cable with copper conductors, PVC insulation and jacket.
   - **D.** Max 7/C No. 2/0 AWG (or smaller) multiconductor power and control cables with XLPE or PVC insulation and XLPE or PVC jacket.
   - **E.** Max RG59/U (or smaller) coaxial cable with fluorinated ethylene insulation and jacketing.
   - **F.** Max 62.5/48 fiber optic cable with PVC insulation and jacketing.
   - **G.** Max 4 pair No. 24 AWG (or smaller) copper conductor data cable with Hylar insulation and jacket.
4. **Fill, Void or Cavity Material*** — **Putty** — Min 1 in. thickness of fill material applied within annulus, flush with both ends of sleeve. A nom 1/4 in. diam continuous "rope" of putty shall be applied around the circumference of the steel sleeve at its egress from both sides of the wall.

   Specified Technologies Inc. — SpecSeal Putty
5. **Fill, Void or Cavity Material*** — **Sealant** — As an option to the "rope" of putty, a min 1/4 in. diam bead of sealant may applied at the gypsum wallboard/steel sleeve interface on both sides of the wall.

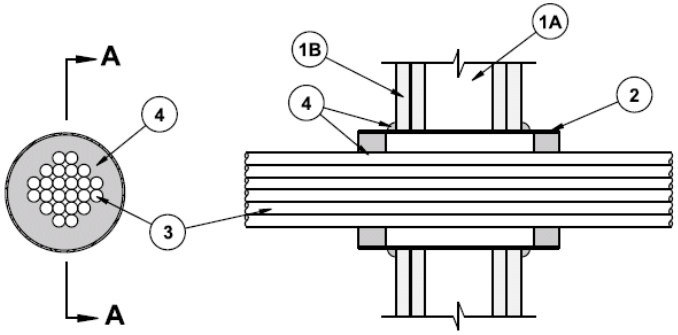
   Specified Technologies Inc. — SpecSeal Series 100 or Series LC Sealant

*Bearing the UL Classification Marking

FOD-3256

Adobe Acrobat Professional - [WL3132.pdf]

File Edit View Document Tools Advanced Window Help



Section A-A

System No. W-L-3132
F Ratings — 1 and 2 Hr (See Item 1)
T Rating — 0 Hr

1. **Wall Assembly** — The 1 or 2 hr fire-rated gypsum [illegible] assembly shall be constructed of the materials and in the manner described in the individual U300 or U400 Series Wall or Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Studs** — Wall framing shall consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 3-5/8 in. wide and spaced 24 in. OC.
   B. **Gypsum Board*** — 5/8 in. thick, 4 ft wide with square or tapered edges. The gypsum wallboard type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300 or U400 Series Designs in the UL Fire Resistance Directory. Max diam of opening is 4-1/2 in.

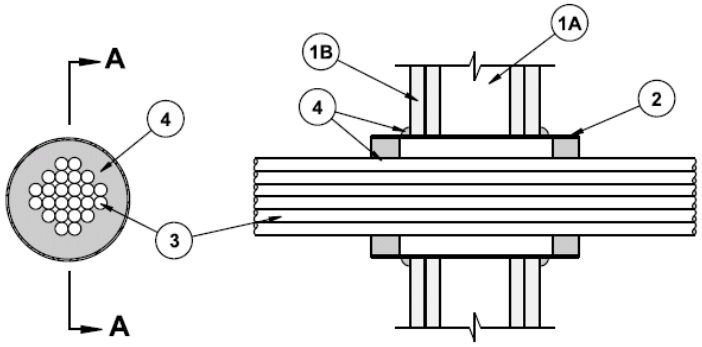
   The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.
2. **Steel Sleeve** — Nom 4 in. diam (or smaller) steel electrical metallic tubing (EMT) or Schedule 5 (or heavier) steel pipe friction-fit into wall assembly. Sleeve installed such that the ends project 1-1/2 to 2 in. beyond each side of the wall.
3. **Cables** — Aggregate cross-sectional area of cables in sleeve to be max 48 percent of the cross-sectional area of the sleeve. Tight bundle of cables to be centered within the steel sleeve. The annular space within the firestop system shall be a nom 1/2 in. Cables to be rigidly supported on both sides of the wall. Any combination of the following types and sizes of cables may be used:
   A. Max 200 pair No. AWG (or smaller) copper conductor cable with polyvinyl chloride (PVC) jacketing and insulation.

8.5 x 11 in

1 of 1

Adobe Acrobat Professional - [WL3132.pdf]

File Edit View Document Tools Advanced Window Help



Section A-A

System No. W-L-3132

F Ratings — 1 and 2 Hr (See Item 1)

T Rating — 0 Hr

1. **Wall Assembly** — The 1 or 2 hr fire-rated gypsum wallboard/ stud wall assembly shall be constructed of the materials and in the manner described in the individual U300 or U400 Series Wall or Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. **Studs** — Wall framing shall consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 3-5/8 in. wide and spaced 24 in. OC.
   B. **Gypsum Board*** — 5/8 in. thick, 4 ft wide with square or tapered edges. The gypsum wallboard type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300 or U400 Series Designs in the UL Fire Resistance Directory. Max diam of opening is 4-1/2 in.

   The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.
2. **Steel Sleeve** — Nom 4 in. diam (or smaller) steel electrical metallic tubing (EMT) or Schedule 5 (or heavier) steel pipe friction-fit into wall assembly. Sleeve installed such that the ends project 1-1/2 to 2 in. beyond each side of the wall.
3. **Cables** — Aggregate cross-sectional area of cables in sleeve to be max 48 percent of the cross-sectional area of the sleeve. Tight bundle of cables to be centered within the steel sleeve. The annular space within the firestop system shall be a nom 1/2 in. Cables to be rigidly supported on both sides of the wall. Any combination of the following types and sizes of cables may be used:
   A. Max 200 pair No. AWG (or smaller) copper conductor cable with polyvinyl chloride (PVC) jacketing and insulation.

8.5 x 11 in

1 of 1

Through Penetration Firestop Systems

- Each firestop system contains specific construction features
- Many firestop systems contain various options and various ratings
- Must be followed exactly for rating to apply

Factors Affecting Penetrations

- Floor or wall construction type and thickness
- Size and shape of opening
- Size and type of penetrating item(s)
- Percent fill of cables
- Annular space
- Rating requirement
- Firestopping materials

Summary: Inspection of Penetrations

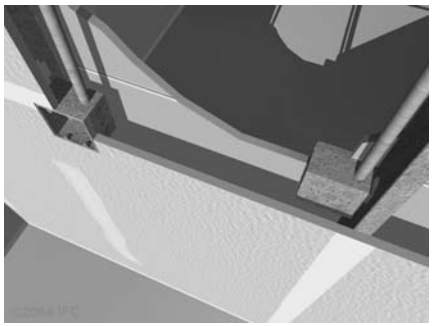
- Firestop system must be installed in accordance with the tested and listed system
- Rating of the system must match the required rating of assembly being penetrated
- Penetrating item and opening size must match the tested and listed system

Inspection of Penetrations Cont.

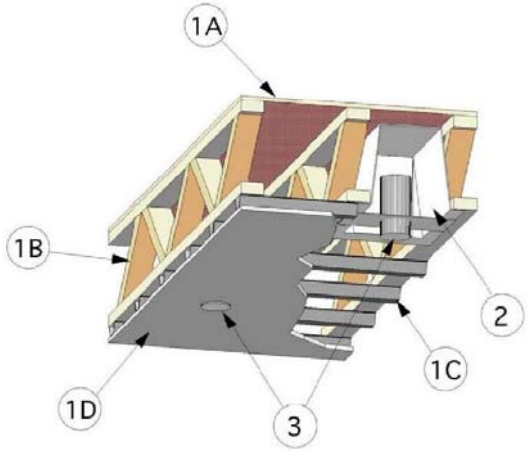
- Where required, packing material must be installed per the tested and listed system
- Required firestopping material must be installed per the tested and listed system
- Understand some sealants may shrink when installed and the amount of shrinkage may be in the listing (difference between wet thickness in listing, and dry thickness measured later on)

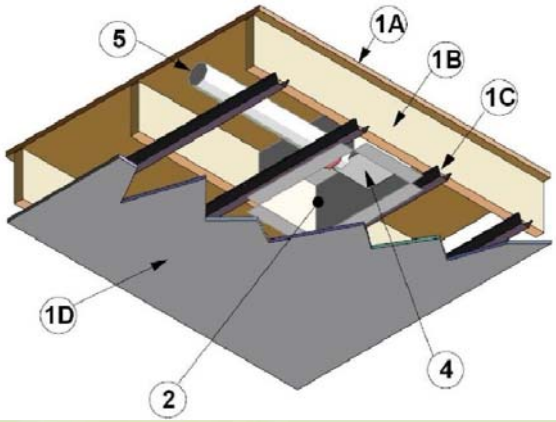
Membrane Penetrations

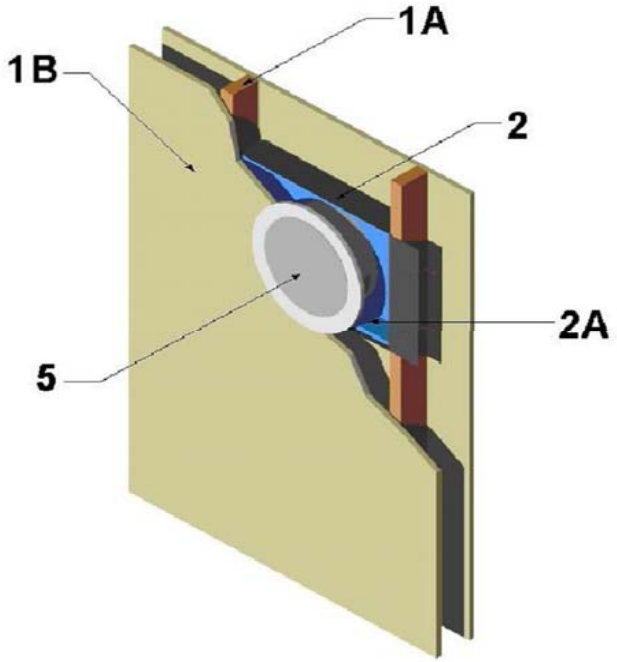
- Sections 714.3.2: Membrane Penetrations
  Membrane Penetrations shall comply with Section 714.3.1. Where walls or partitions are required to have a *fire-resistance rating, recessed* fixtures shall be installed such that the required fire-resistance will not be reduced.



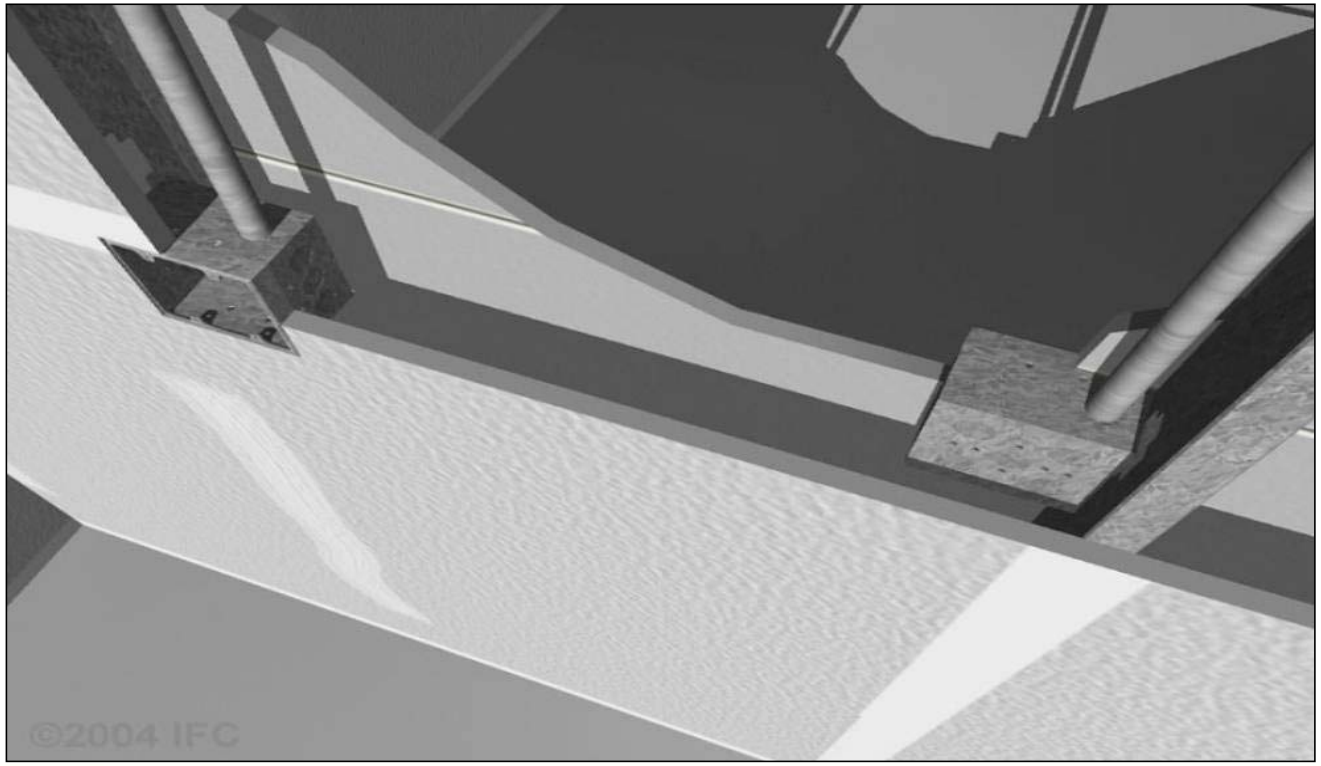
FIRE RATED
RECESSED FIXTURES



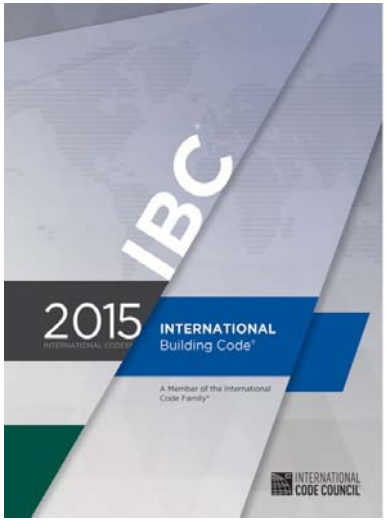




Electrical Membrane Penetrations



Codes & Standards



Code Requirements
Wall Assemblies

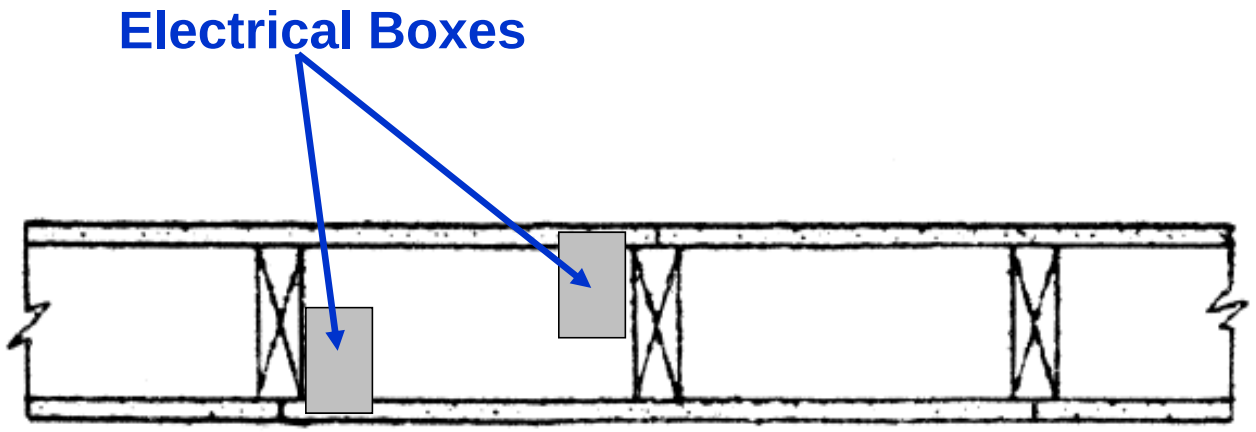
Membrane Penetrations

- 714.3.2 of the IBC
- Installed such that the required fire resistance will not be reduced:
  - Metallic boxes installed per limits in IBC
  - Nonmetallic boxes installed as tested and listed

Metallic Electrical
Outlet Boxes in Walls

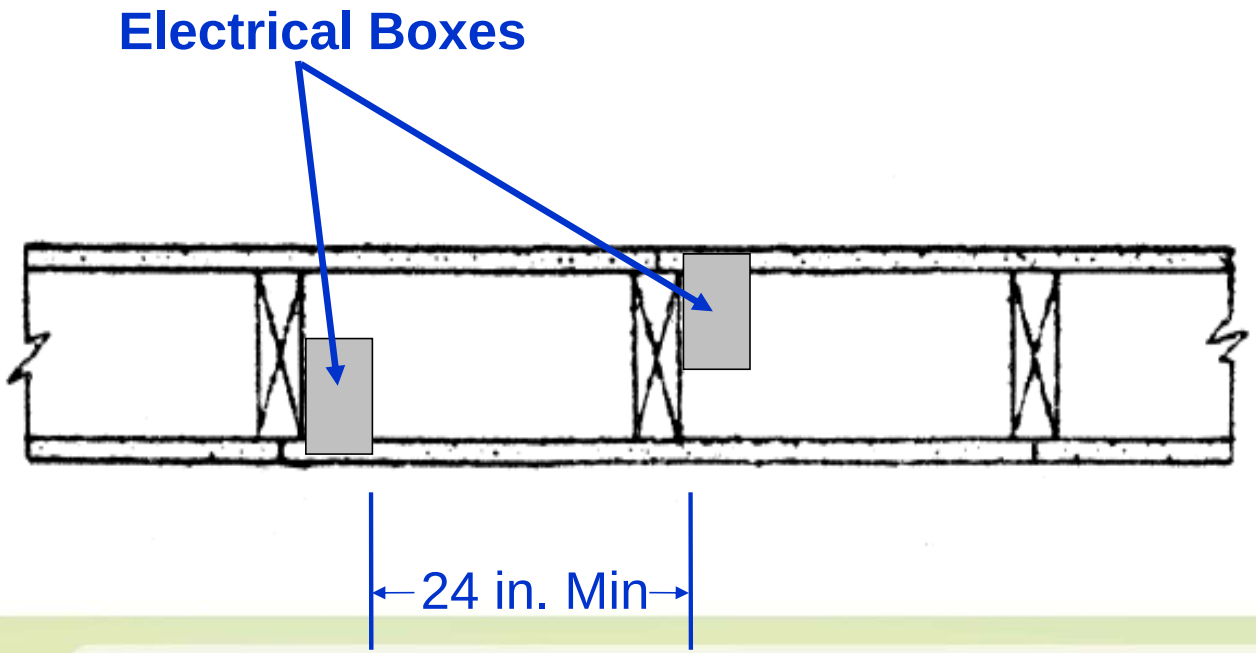
- Code allowance for Metallic boxes
  - Maximum 16 sq in. outlet box
  - Maximum 100 sq in. of opening on each side of wall per 100 sq ft of wall area
  - Maximum 1/8 in. annular space between wall membrane and box
  - Boxes on opposite sides of wall need to be either separated horizontally by minimum 24 in. or protected by some type of heat barrier

Metallic Electrical Boxes in Wall with Less than 24 in. Spacing



Non-Compliant

Metallic Electrical Boxes in Wall with Minimum 24 in. Spacing



Metallic Electrical Boxes in Walls Cont.

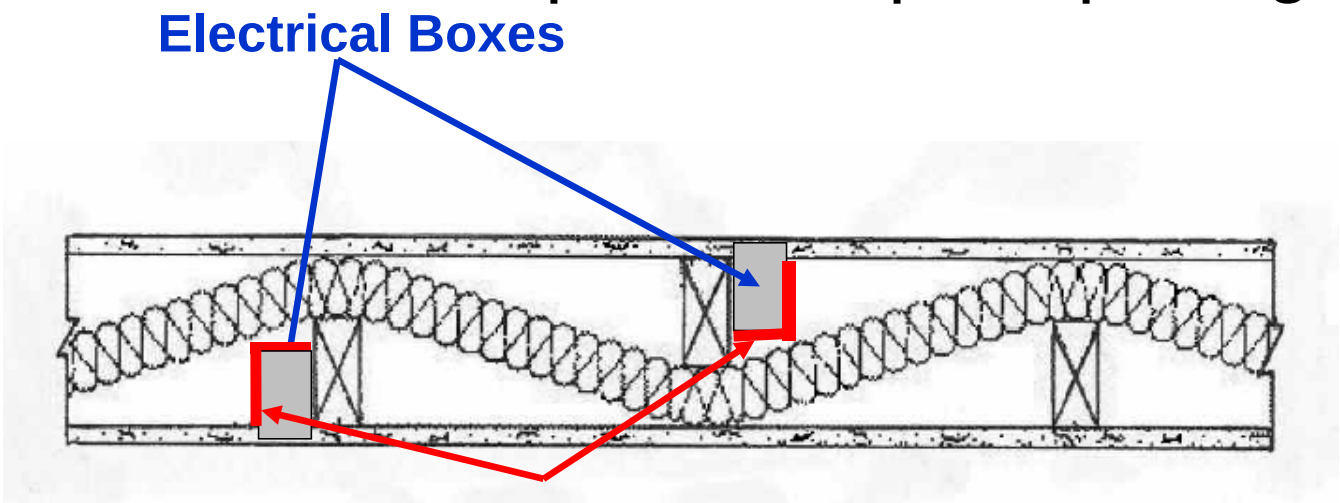
- Installation not complying with code limits (16 sq in, max 100 sq in/100 sq ft) shall be installed as tested and listed

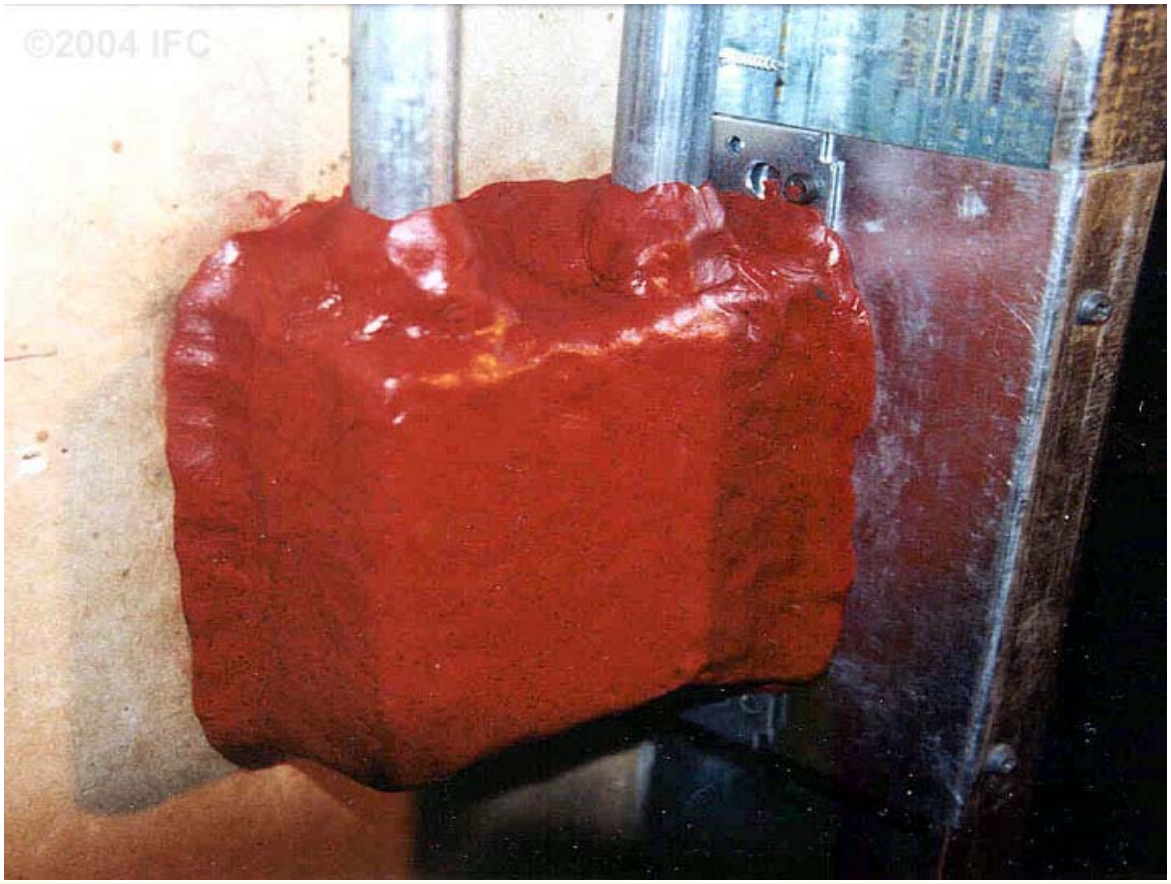
Utility Boxes

- Other, non-electrical boxes **Are Permitted** that:
  - are protected with a tested penetration firestop system, and
  - have an F and T rating equal to the required fire-resistance rating of the wall penetrated, and
  - are installed in accordance with their listing.
- Listed non-electrical boxes exist with inherent (listed) fire rating

Metallic Electrical Boxes in Staggered Stud Walls

➔ Protection required despite spacing




©2004 IFC

Nonmetallic Electrical Outlet Boxes in Walls

- Nonmetallic boxes installed as tested and listed
- Maximum 1/8 in. annular space between wall membrane and box
- Boxes on opposite sides of wall need to be either separated as specified in their listing or protected by some type of heat barrier

Recessed electrical boxes in walls: summary

- 4 possible challenges
  - Boxes on opposite sides of wall too close (24 inch rule)
    - Putty pads a solution
    - 2009 IBC requires stud cavities to be "individual noncommunicating stud cavities" for 24 inch separation to be acceptable

  - Boxes too big (> 16 sq. in.)
    - Putty pads a solution for boxes up to tested size limit (see CLIV listings)
  - Too many boxes in one small area (> 100 sq. in. per 100 sq ft of wall)
    - IBC 2015 allows "listed materials and methods" when this limit exceeded; putty pads commonly accepted
  - Non-metallic outlet boxes
    - Must use a specially tested/listed plastic box, within listing limits (may require a putty pad)

Metallic Electrical
Outlet Boxes in Ceilings

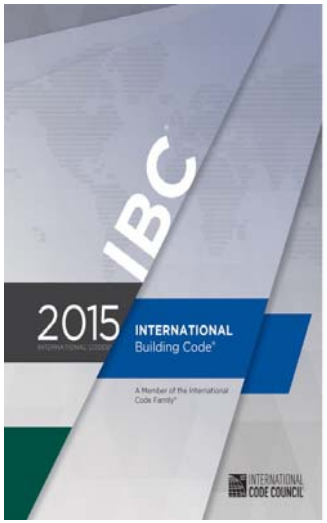
- Metallic boxes installed per code
  - Maximum 16 sq in. outlet box
  - Maximum 100 sq in. of opening per 100 sq ft of ceiling area
  - Maximum 1/8 in. annular space between ceiling membrane and box
- Installation not complying with these prescriptive requirements shall be protected by tested and listed solutions

Nonmetallic Electrical Outlet Boxes in Ceilings

- Nonmetallic boxes installed as tested and listed
- Maximum 1/8 in. annular space between ceiling membrane and box

Joint Systems

Codes & Standards



IBC - Definition

IBC Definition of JOINT

- The opening in or between adjacent assemblies that is created due to building tolerances, or is designed to allow independent movement of the building in any plane caused by thermal, seismic, wind or any other loading.

Building Code Requirements
Fire Resistive Joints

Section 715.1: Fire Resistive Joint Systems

•"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 the system is* Installed."

Exceptions: Several specific exemptions exist e.g. walls permitted to have unprotected openings, floors within malls, etc..

Building Code Requirements
IBC – Joints in Smoke Barriers

- must be designed and constructed to restrict the movement of smoke.
- rating used: L Rating
  - measurement of air leakage rate through a fire resistive joint system or penetration.
- 715.6 - Joints in smoke barriers shall have an L Rating not in excess of 5 cfm / lineal ft of opening

Building Code Requirements IBC – Joints

- 715.2 - Fire-resistant joint systems shall be securely installed in or on the joint for its entire length so as not to dislodge, loosen or otherwise impair its ability to accommodate expected building movements and to resist the passage of fire and hot gasses
- 715.3 - Joints shall be tested to ANSI/UL 2079 or ASTM E 1966”

Types of Joint Systems

- Floor-to-Floor (Expansion Joint)
- Floor-to-Wall (Edge of Slab)
- Head-of-Wall (Top of Wall)
- Wall-to-Wall (Vertical Control Joint)
- Bottom of Wall

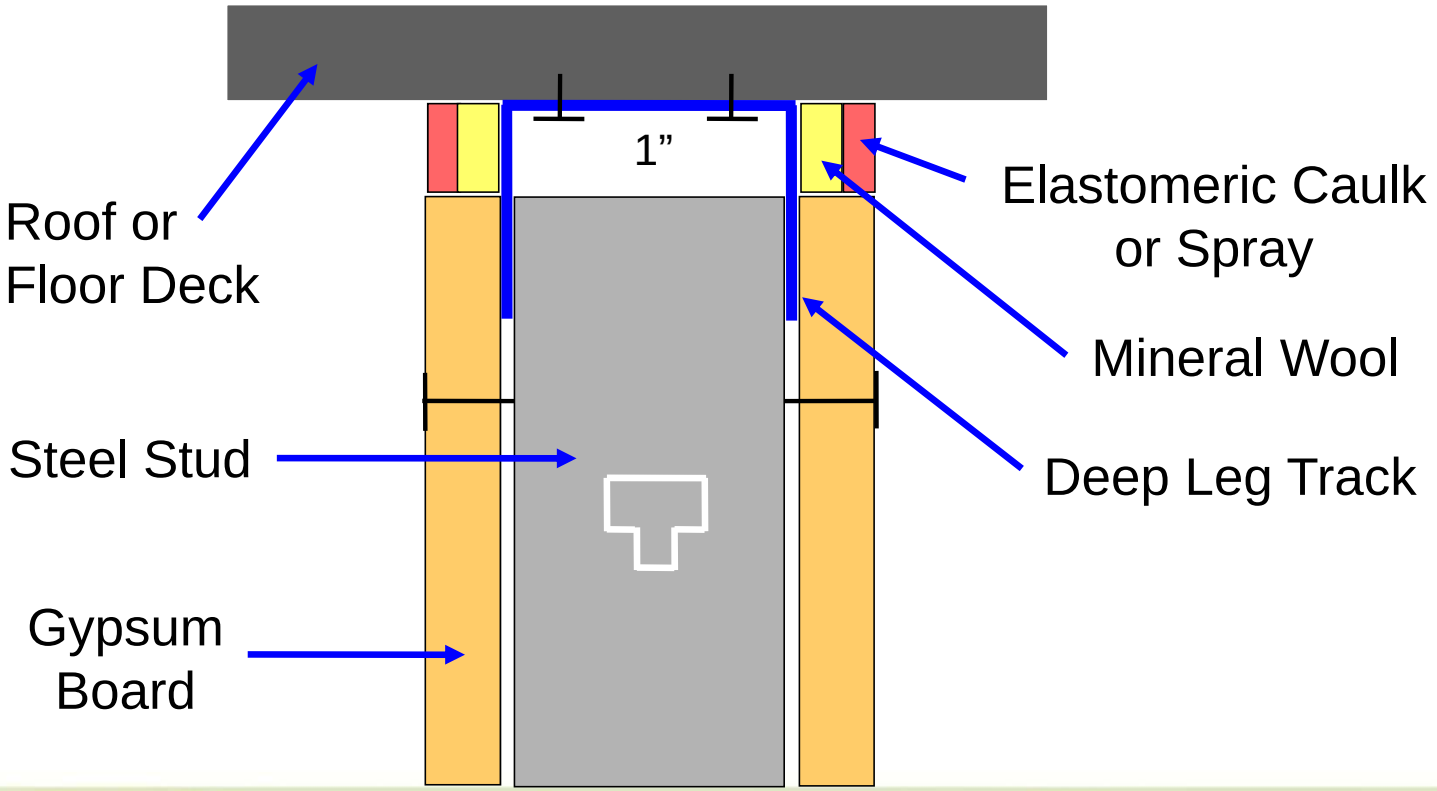
Categories of Fire-Resistive Joint systems

- Sealant Systems (Caulks)
- Sprayed /Elastomeric Membranes (Sprays)
- Mechanical Joints

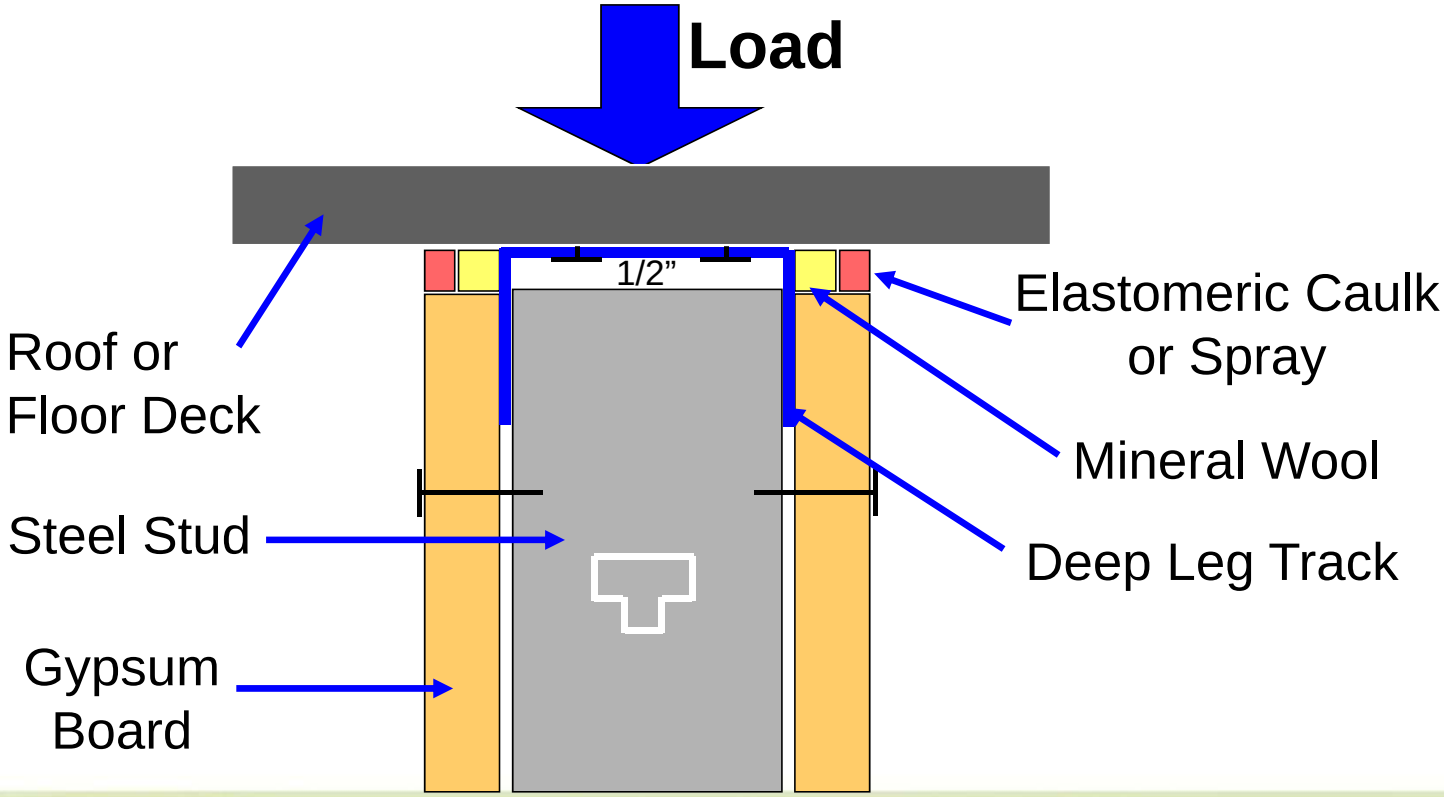
Construction Joint Terminology

- Nominal Joint Width
- Assembly Rating
- Movement
- Extension
- Compression
- Percent (%) Extension / Compression
- Mineral Wool Compression
- Sealant Depth

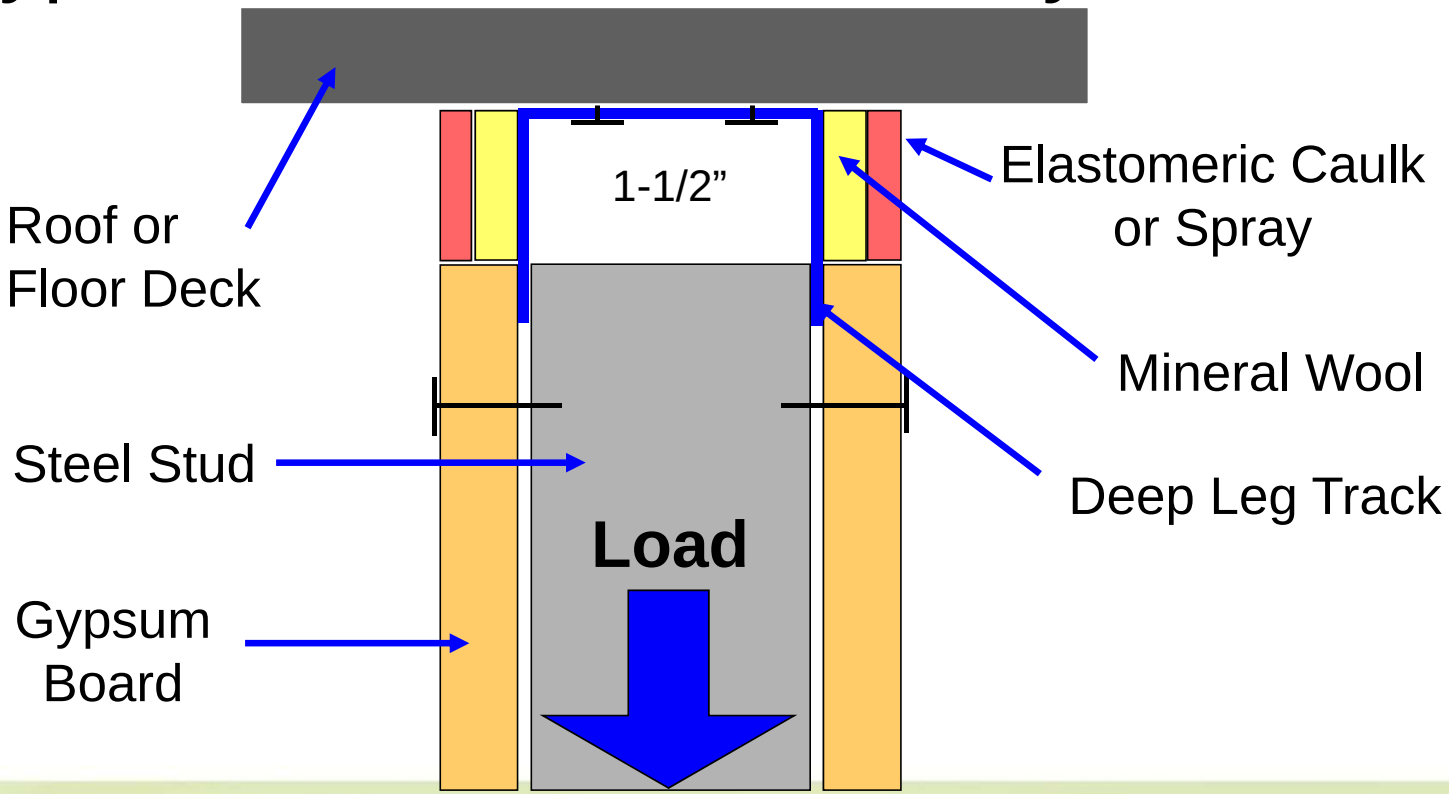
Typical Head of Wall Joint System With Nominal Joint Width



Typical Head of Wall Joint System



Typical Head of Wall Joint System



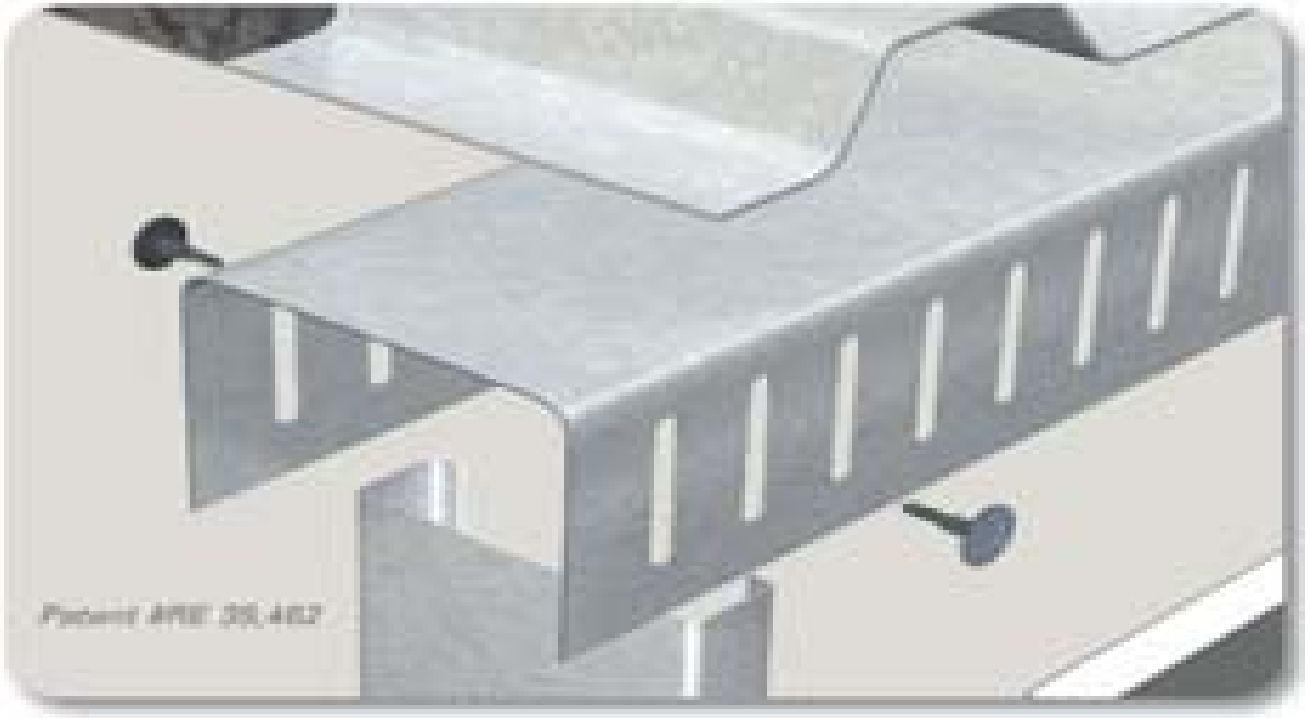
Head-of-Wall Spray Application

Flutes are stuffed with mineral wool or speed plugs per UL system.

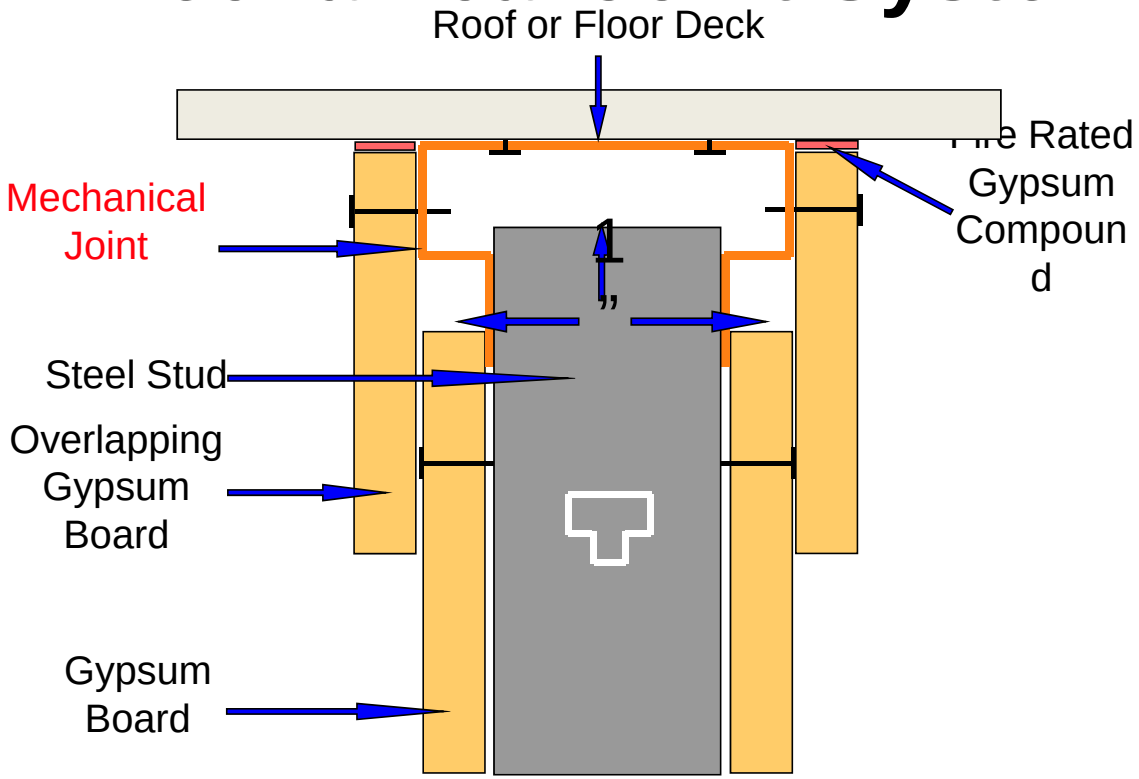
Remaining joint is stuffed with mineral wool or speed strips per UL system.

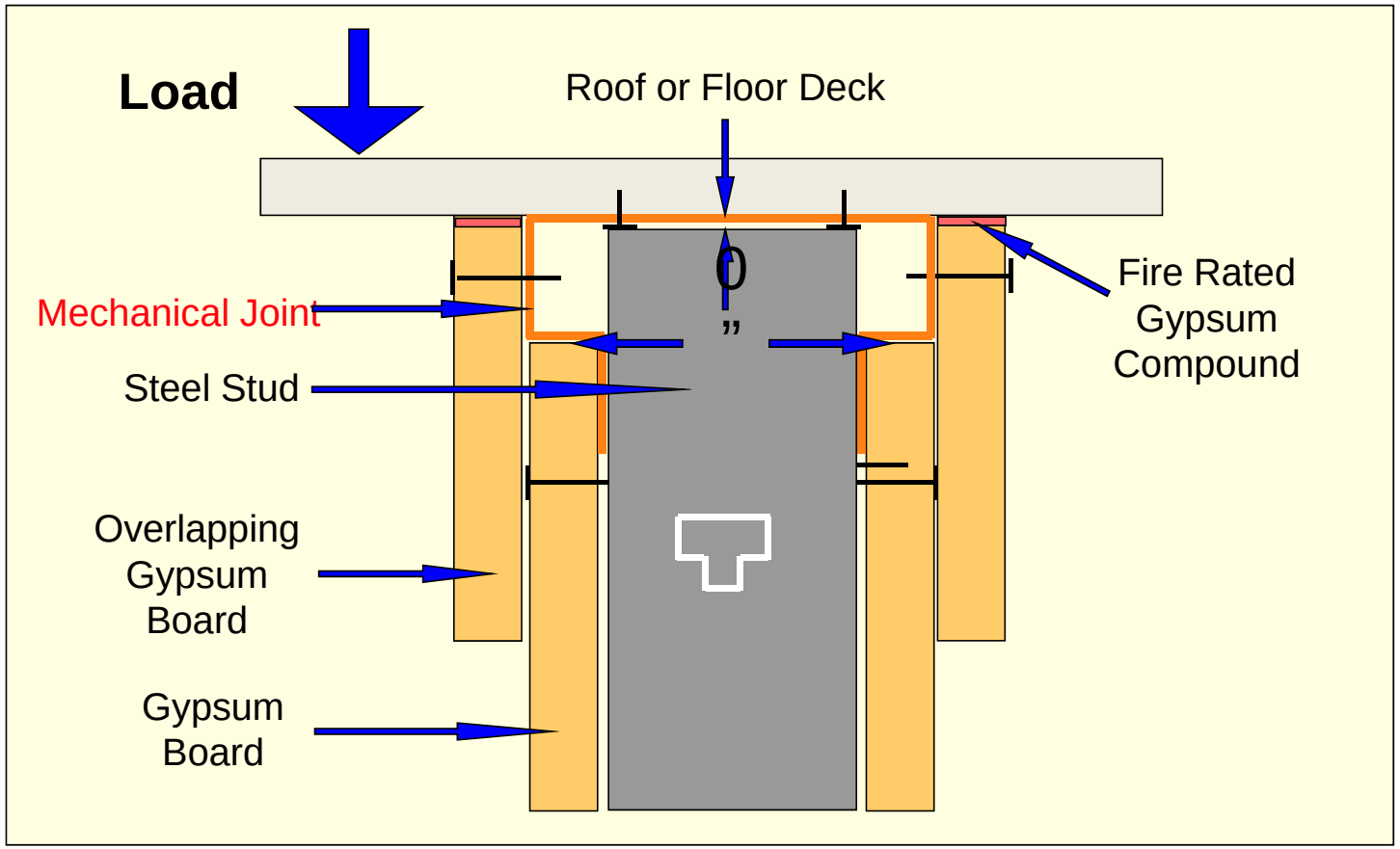
Firestop sealant is applied to both sides of wall per UL system.

Slotted Track System



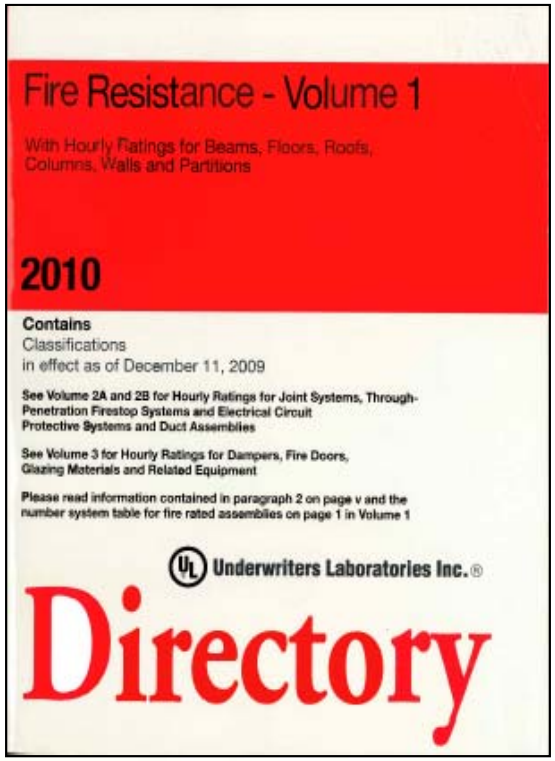
Mechanical Joint System

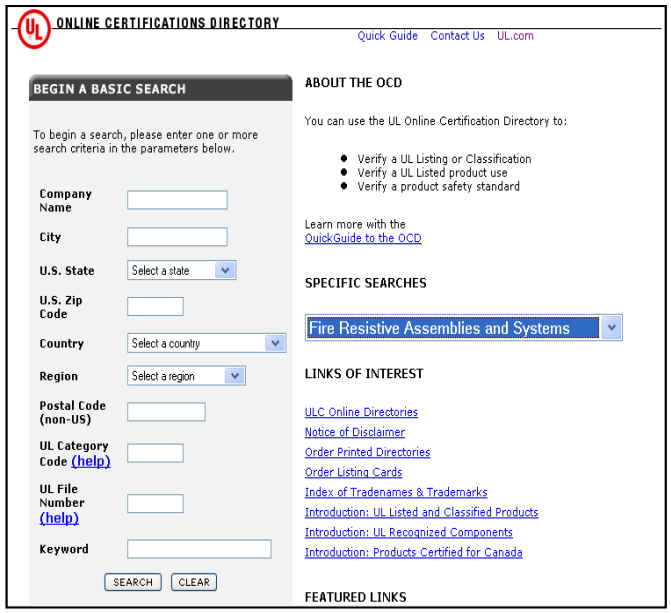



Load
Roof or Floor Deck
0"
Fire Rated
Gypsum
Compound
Mechanical Joint
Steel Stud
Overlapping
Gypsum
Board
Gypsum
Board

Cyclic Movement Between Minimum & Maximum Joint Widths

Where Can I Find The Most Current Listings?

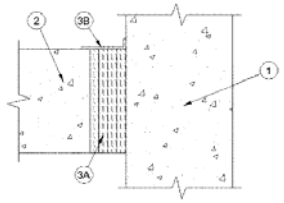




Evaluating a Fire-Resistive Joint System

System No. FW-D-0001

Assembly Rating - 1 Hr
L Rating at Ambient — Less than 1 CFM/Lin Ft
L Rating at 400 F — Less than 1 CFM/Lin Ft
Nominal Joint Width - 2 In.
Class II Movement Capabilities - 12.5% Compression or Extension



1. **Wall Assembly —** Min 4-1/2 in. thick reinforced lightweight or normal weight (100 - 150 pcf) structural concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***.

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Floor Assembly —** Min 2-1/2 in. thick reinforced lightweight or normal weight (100 - 150 pcf) structural concrete.

3. **Joint System —** Max separation between edge of floor and face of wall (at time of installation of joint system) is 2 in. The joint system is designed to accommodate a max 12.5 percent compression or extension from it's installed width. The joint system shall consist of the following:

A. **Forming Material*** — Min 4 pcf mineral wool batt insulation installed in joint opening as a permanent form. Pieces of batt cut to min width of 2-1/2 in. and installed edge-first into joint opening, parallel with joint direction, such that batt sections are compressed min 50 percent in thickness and that the compressed batt sections are flush with top surface of the floor. Adjoining lengths of batt to be tightly-butted with butted seams spaced min 24 in. apart along the length of the joint.

ROXUL INC — SAFE Mineral Wool

THERMAFIBER L L C — SAF Mineral Wool

B. **Fill, Void or Cavity Material* - Spray** — Min 1/8 in. wet thickness of fill material applied on top surface of floor to completely cover the mineral wool and overlap a min 1/2 in. onto concrete floor and side of wall.

ABC FIRESTOPPING CO. — SuperDuper Firestop Spray

*Bearing the UL Classification Mark

1. What type of building assemblies form the joint?
   - Floor/Floor, Floor/Wall, Wall/Wall, Top of Wall/Ceiling
2. What materials are the assemblies constructed from?
   - Concrete, CMU, Gypsum
3. What is the required hourly rating?
   - Assembly rating (1 – 4 hour)
4. What is the width of the joint (inches)?
5. How much movement is required?
   - Must accommodate building movement (% of joint size)
6. Are there any special considerations?
   - Unique construction condition, environmental exposure

UL Nomenclature

Navigating the UL Directory:

JOINT SYSTEMS (XHBN) **HW – D – 0060**

First Two Alpha Characters identify the type of joint system:

FF	=	Floor-to-Floor
WW	=	Wall-to-Wall
FW	=	Floor-to-Wall
HW	=	Head-of-Wall

UL Nomenclature Cont.

Navigating the UL Directory:

JOINT SYSTEMS (XHBN) **HW – D – 0060**

Third Alpha Character identifies the movement capabilities of the system:

D = Dynamic (movement capabilities)

S = Static (no movement capabilities)

UL Nomenclature Cont.

Navigating the UL Directory:

JOINT SYSTEMS (XHBN) **HW – D – 0060**

First Numeric Character identifies the nominal width of the linear opening:

0000 – 0999	= ≤ 2 in.
1000 – 1999	= > 2 in. and ≤ 6 in.
2000 – 2999	= > 6 in. and ≤ 12 in.
3000 – 3999	= > 12 in. and ≤ 24 in.
4000 – 4999	= > 24 in.

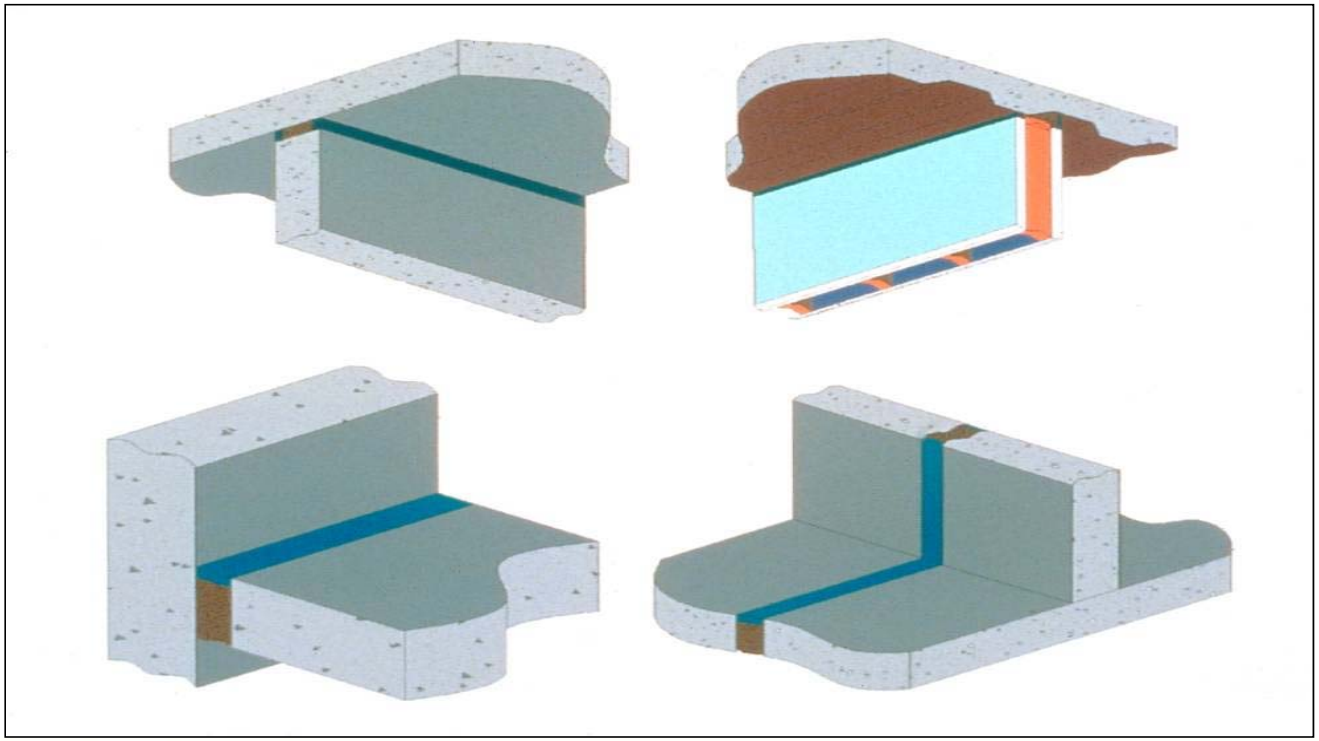
UL Nomenclature Cont.

Navigating the UL Directory:

JOINT SYSTEMS (XHBN) **HW – D – 0060**

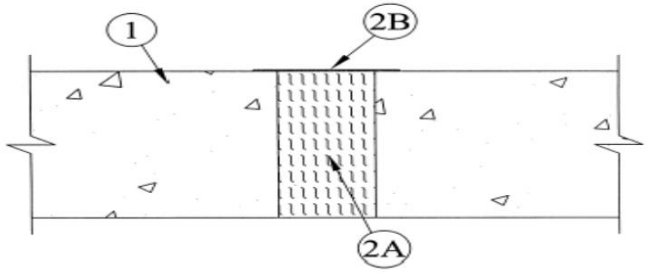
Second Through Fourth Numeric Characters
identify the individual system number

Joint Systems



Typical Floor-to-Floor System

System No. FF-D-0014
Assembly Rating - 4 HR
Nominal Joint Width - 2 IN.
Class II Movement Capabilities - 18.75% Compression or Extension



1. **Floor Assembly** - Min 6 in. thick steel-reinforced lightweight or normal weight (100-150 pcf) structural concrete.

2. **Joint System - Max width of joint (at time of installation of joint system) is 2 in. The joint system is designed to accommodate a max 18.75 percent compression or extension from its installed width.** The joint system shall consist of the following:

   A. **Forming Material*** - Min 4 pcf mineral wool batt insulation installed in joint opening as a permanent form. Batt cut to min width of 6 in. and installed edge-first into joint opening, parallel with joint direction, such that batt sections are compressed min 50 percent in thickness and such that the compressed batt sections are flush with the top surface of floor. Adjoining lengths of batt to be tightly butted with butted seams spaced min 48 in. apart along the length of the joint.

      Owens Corning - Paroc Safing Insulation
      Thermafiber LLC - Type SAF
      Rock Wool Manufacturing Company - Delta Safing Board

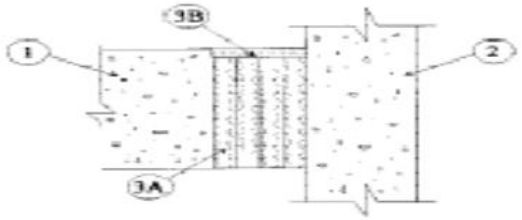
   B. **Fill, Void or Cavity Material*** - Min 1/16 in. dry (1/8 in. wet) thickness of fill material sprayed or brushed on top surface of floor to completely cover mineral wool and overlap a min of 1/2 in. onto concrete floor.

      Minnesota Mining Mfg. Co. - Firedam Spray

*Bearing the UL Classification Marking

Typical Floor-to-Wall System

System No. FW-D-1017
Assembly Rating — 2 Hr
Nominal Joint Width — 4 In.
Class II Movement Capabilities — 15.6% Compression or Extension

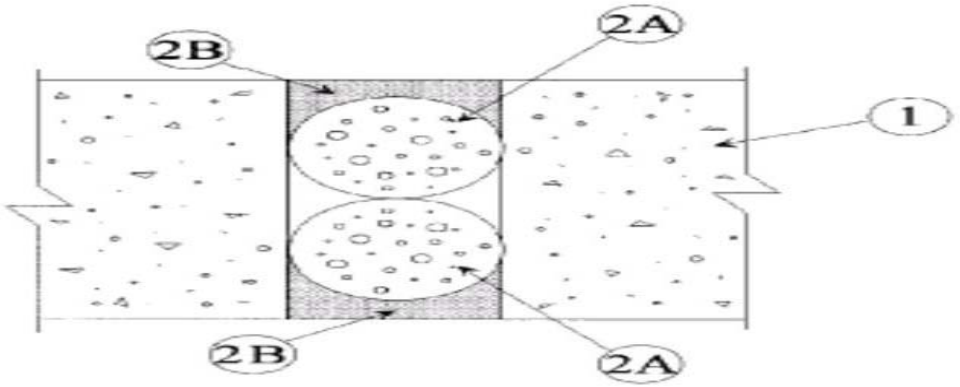


1. **Floor Assembly** — Min 4-1/2 in. thick steel-reinforced lightweight or normal weight (100-150 pcf) structural concrete.
2. **Wall Assembly** — Min 4-1/2 in. thick steel-reinforced lightweight or normal weight (100-150 pcf) structural concrete. Wall may also be constructed of any UL Classified **Concrete Blocks*** .
3. **Joint System — Max width of joint (at time of installation of joint system) is 2 in. The joint system is designed to accommodate a max 15.6 percent compression or extension from its installed width.** The joint system shall consist of the following:
   A. **Forming Material*** — Min 4.0 pcf mineral wool batt insulation installed in joint opening as a permanent form. Batt cut to min width of 4 in. and installed edge-first into joint opening, parallel with joint direction, such that batt sections are compressed min 50 percent in thickness and such that the compressed batt sections are recessed from the top surface of floor to accommodate the required thickness of fill material. Adjoining lengths of batt to be tightly-butted with butted seams spaced min 48 in. apart along the length of the joint.
      OWENS CORNING HT INC, DIV OF OWENS CORNING —Paroc Safing Insulation
      ROCK WOOL MANUFACTURING CO —Delta Safing Board
      THERMAFIBER L L C —Type SAF
   B. **Fill, Void or Cavity Material*** — Min 1/2 in. thickness of fill material applied within the joint, flush with top surface of floor.
      MINNESOTA MINING & MFG CO —FB 1003 SL

*Bearing the UL Classification Marking

Typical Wall-to-Wall System

System No. WW-S-0008
Assembly Rating—2 Hr
Joint Width—1 In. Max



1. Wall Assembly—Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) structural concrete. Wall may also be constructed of any UL Classified Concrete Blocks*.
   See Concrete Blocks (CAZT) category in the Fire Resistance Directory for names of manufacturers.
2. Joint System—Max width of joint is 1 in. The joint system shall consist of the following:
   A. Packing Material—Open cell polyurethane foam backer rod friction-fitted into joint opening on each side of wall assembly. Packing material to be recessed each surface of wall to accommodate the required thickness of fill material.
   B. Fill, Void or Cavity Material*—Min 1/2 in. thickness of fill material applied within the joint, flush with both surfaces of wall.
      Minnesota Mining & Mfg Co.—MPS-2+ or CP-25 WB+

*Bearing the UL Classification Marking

Plan Review of Joint Systems

- What type of joint is being protected?
- What is the required hourly rating?
- What is the width of the joint (nominal installed width)?
- How much movement is required?
- Is an L Rating required?
- Is submitted system consistent with the above requirements?

Recommended Joint System
Correction Notice

- Deflection is required to be installed with an approved joint system per Section 715 of the IBC. The assemblies need to be designed to allow joints to compress and extend with movement of structure while maintaining the fire-rating of the assemblies.
- Please clarify building deflection by listing the Maximum and Minimum building deflection movements to determine movement capabilities of assembly and identify listed assemblies for all joint systems.

Inspection of Joint Systems

- What type of building assemblies form the joint (type and thickness)?
- What materials are the assemblies constructed from?
- Are there any special considerations? (EJ's)

Joint Inspection Process

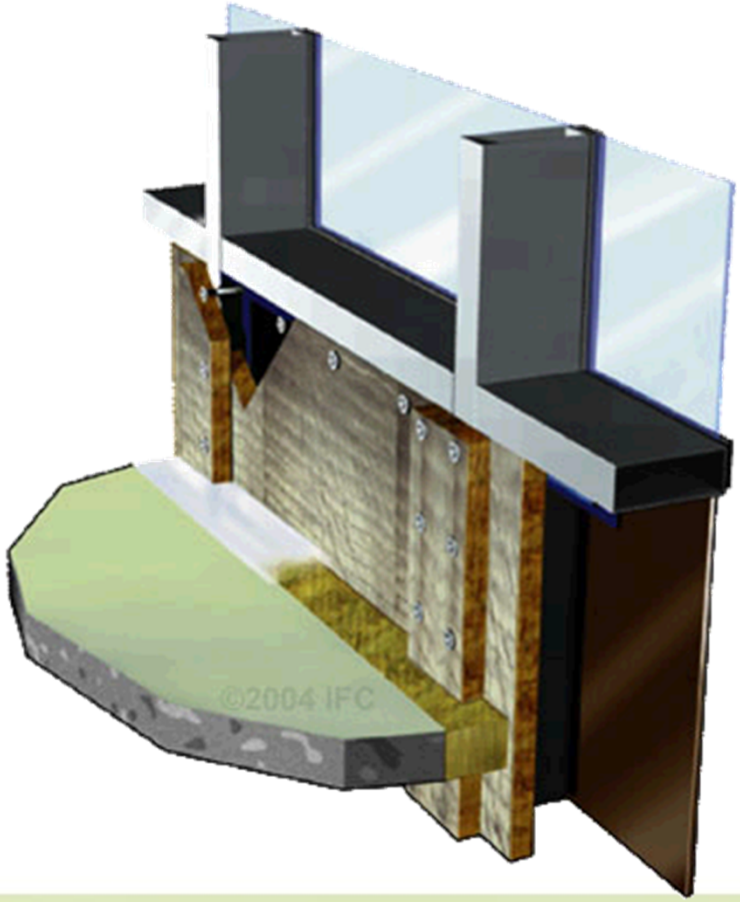
- Inspect joint systems during framing inspection
- Contractor to provide you with the UL listed assembly as shown / approved on the plans
- Confirm all joint systems will accommodate required movement
- For Mechanical Joints observe the ceiling runner for the UL label located on the side of the runner

Joint Systems - Summary

- Provide tested and listed systems that includes joint movement at Plan Review or before field inspection
- Joints must accommodate expected building movement
- Inspect some joint systems during framing inspection

Perimeter Fire Containment Systems

PATHS OF FIRE PROPAGATION

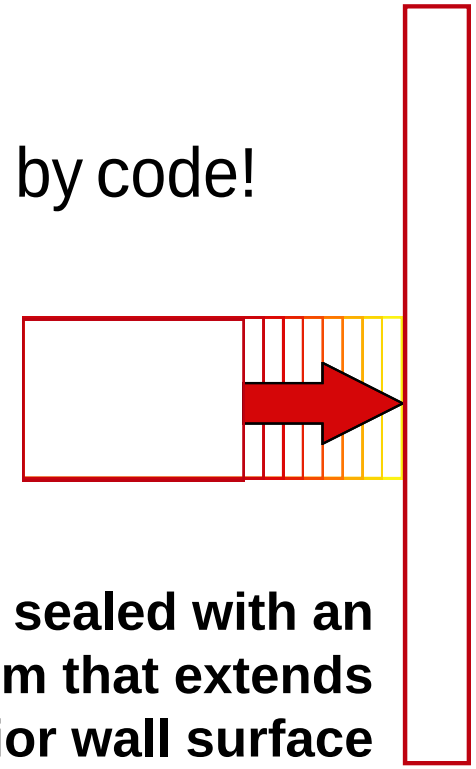


What is a Curtain Wall?

An exterior building wall which carries no roof or floor loads and consists of metal, glass or stone or any combination there of supported by a metal frame.

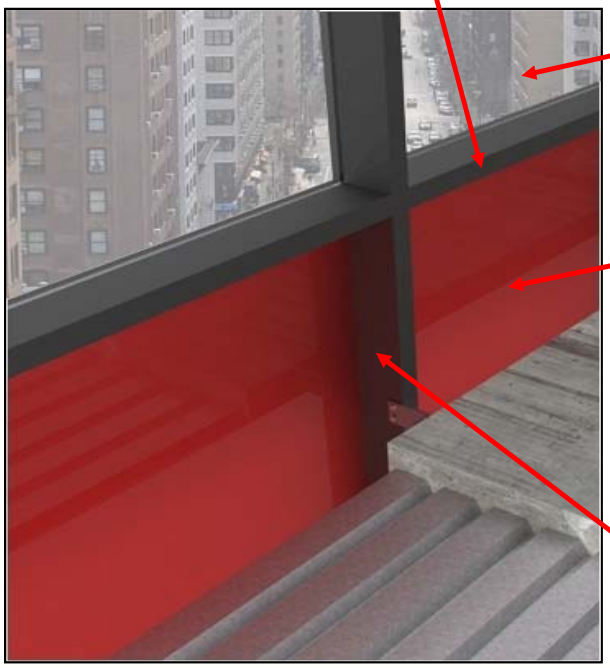
Extending the Rated Floor to the curtain wall...

Mandated by code!



The perimeter joint must be sealed with an approved material or system that extends this rating to the exterior wall surface

Common Terminology



How do the codes address the protection at the perimeter *?*

Preventing interior fire spread

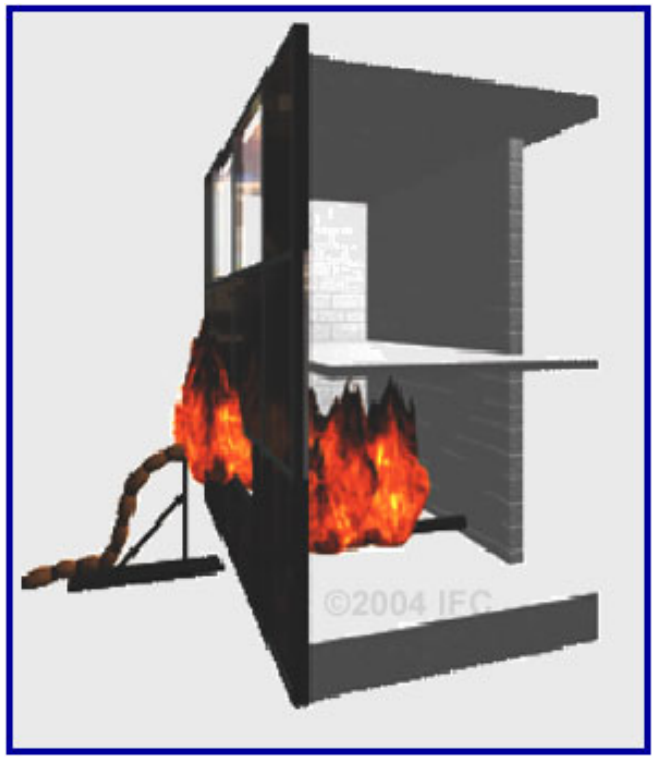
- Sections 715.4
- Exterior curtain wall/floor intersection. Void at edge of rated floor shall be sealed with an approved system, shall be securely installed and Tested to ASTM E 2307 for time period equal to rating of floor

Preventing exterior fire spread

- 705.8.5 – Vertical Separation of Openings -requires unprotected openings in exterior walls not separated horizontally by 5 ft to be:
  - Separated 3 ft minimum vertically by 1 hr wall, or
  - Separated 30 in. minimum horizontally by 1 hr flame barrier
  - These requirements waived if building is sprinklered and/or three stories of less
- Protects against “leap-frog” fire spread

Joint Movement Test

Movement Class	Min.# Of Cycles	Min. Cycling Rate (Cycles Minutes)
Class I (Thermal)	500	1
Class II (Wind Sway)	500	10
Class III (Seismic)	100	30

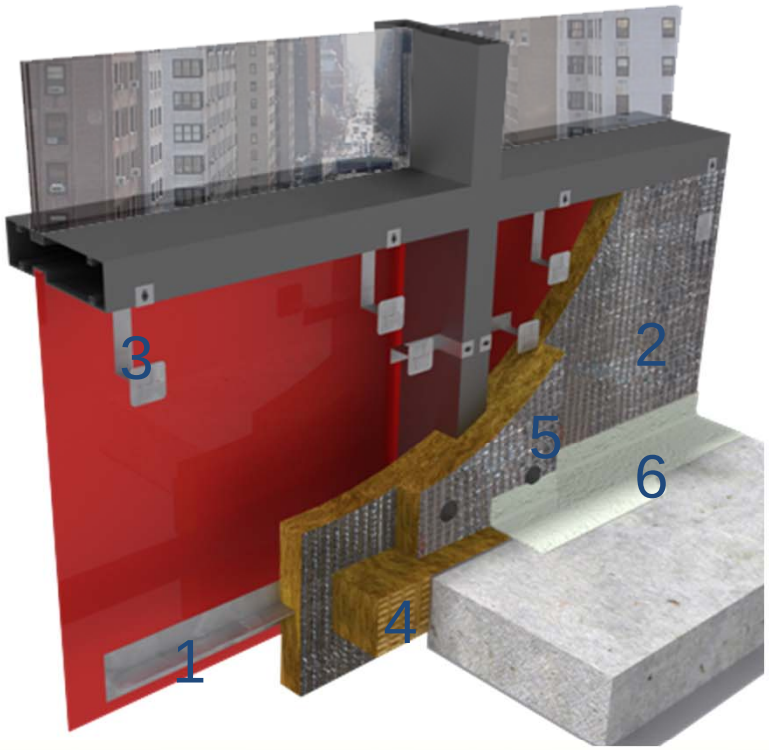


ASTM E2307

Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-Story Test Apparatus

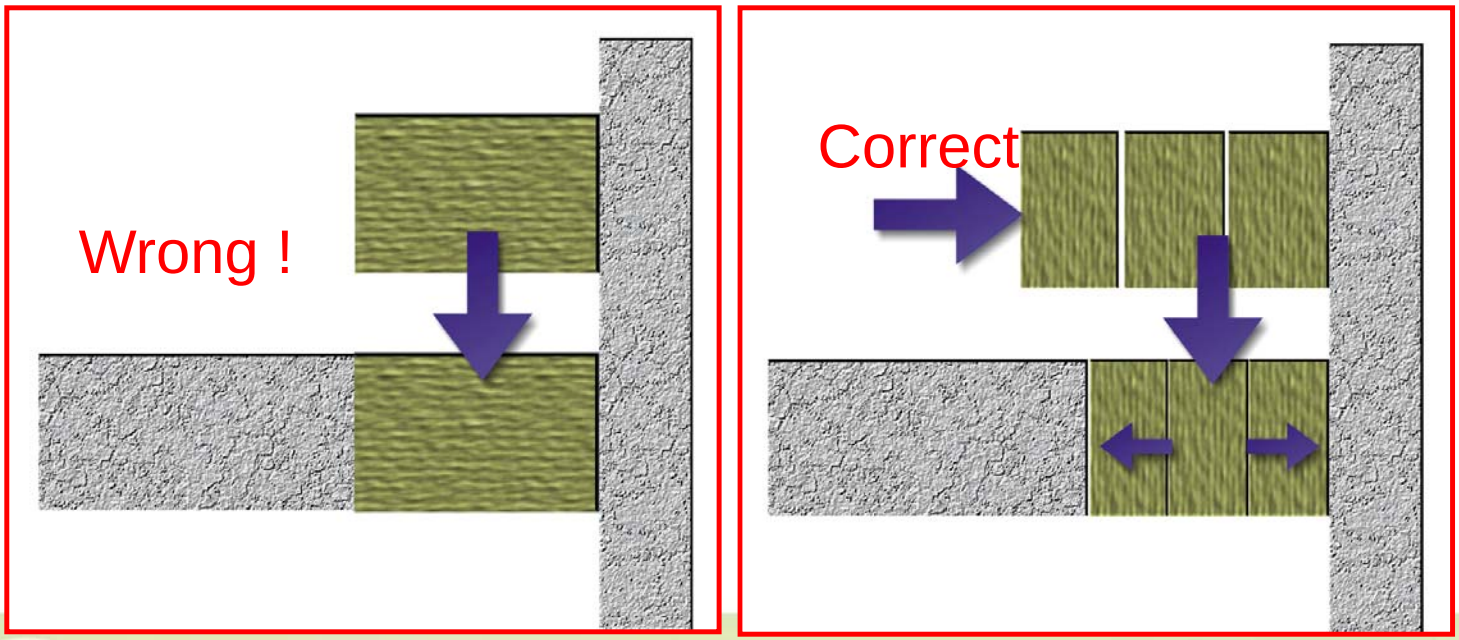
Curtain Wall Fire Containment Six Basic Design Principles

1. **Reinforcement Member**
2. **Mineral Wool Insulation**
3. **Mechanically Attached**
4. **Compression Fit Safing**
5. **Protect Mullions**
6. **Smoke Barrier**

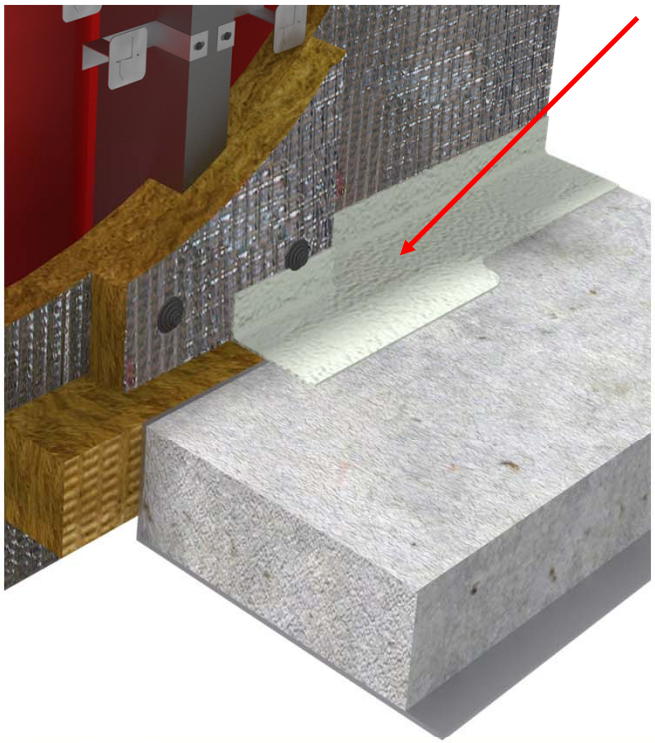


Typical Curtain Wall System

- To allow for movement between the slab and wall mineral wool must be inserted perpendicular to the joint and compressed to the proper %



Typical Curtain Wall System



Min. 1/8 in. wet thickness spray applied over mineral wool overlapping onto concrete floor and curtain wall assembly. See listed system for correct overlap and spray applied thickness

Evaluating a Perimeter Joint System

Design No. CEJ 301 P
PERIMETER FIRE BARRIER SYSTEM
T Rating – 1-1/4 hr
F-Rating – 2 hr
L-Rating at 5CFM/LF
Rated for ± 12.5% horizontal movement
Rated for ± 6.25% vertical shear movement

1. **CONCRETE FLOOR ASSEMBLY:** Two hour rated concrete floor assembly made from either lightweight or normal weight concrete with a density of 100-150 pcf, with a min. thickness of 4-1/2-in. at the joint face. Overall slab thickness may vary to accommodate various blockout depths (longitudinal recesses) formed in the concrete, to house the architectural cover plate. The blockout width may also vary without restriction.

2. **CURTAIN WALL ASSEMBLY:** The curtain wall assembly shall incorporate the following construction features:

A. Mounting Attachment: (Not shown) Attachment of the min. 1/4 in. plate steel curtain wall framing to the structural framing shall be according to the curtain wall manufacturer's instructions to allow vertical shear movement only. The mounting attachments to the floor slab shall be connected to the joint face of the floor slab, in accordance with the curtain wall manufacturer's instructions. Attachments are to be secured to each mullion in the perimeter joint protection region at a max. spacing of 60 in. o.c.

B. Aluminum Framing: Install I shaped mullions and transoms, sized according to the curtain wall system manufacturer's guidelines. Min. overall dimensions of mullion framing is 0.125 in. thick with a min. 5-1/2 in. height and a min. of 2-1/2 in. width of the extrusion. Min. overall dimensions of transom framing is 0.125 in. thick with a min. 2 in. height and a min. of 2 in. width of the extrusion. Mullions are to be spaced a min. 60 in. o.c. and transoms are to be spaced a min. 24 in. o.c. For the spandrel region, the lower transom must be placed a min. of 13-3/4 in. below the concrete floor (as measured from the underside of the floor to the top side of the transom) and the upper transom must be placed a minimum of 4-1/2 in. above the floor (as measured from the top surface of the floor to the underside of the transom) while maintaining the minimum 34 in. spandrel height.

C. Glass Panels: Glass panels shall be sized and installed to curtain wall framing according to the curtain wall system manufacturer's guidelines. Use a min. 1/4 in. thick clear, heatstrengthened (HS) glass or tempered glass with a max. width and height less than the aluminum framing o.c. spacing, which allows the glass to be secured between the notched shoulder of the aluminum framing and pressure bar. Panels are secured with a thermal break (rubber extrusion), pressure bar (aluminum extrusion), min. 1/4-20 x 5/8 in. long screws, and a snap face (aluminum extrusion).

D. Steel Hat Channels – Apply nominal 2- 1/2 in. wide by 7/8 in. deep, min. 24 GA. steel hat channels so that they span the space between mullions for the purpose of providing a retention system for the curtain wall insulation. The hat channels are to be applied, horizontally, at a maximum 3 in. above the lower transom and 3 in. below the upper transom of the spandrel area, and at maximum 24 in centers within the spandrel area. Additionally, a hat channel reinforcement is to be placed at the mid-depth of the perimeter joint protection as described in 2E. Both ends of each hat channel are to be secured to the vertical framing on both ends by cutting the channel and forming a min. 2 in. tab which is folded 90° for screw attachment to the vertical framing. Use min. No. 10 self-tapping screws for attachment.

E . Insulation Reinforcement: At the horizontal centerline of the perimeter joint protection, apply a hat channel (as described in 2D) that is secured to the vertical framing as described in 2D.

F. Impaling Pins: (Not Shown) Attach curtain wall insulation to the steel hat channel (2D) with min. 12 GA steel cup-head pins with a spacing of max 8 in. o.c. at the centerline of the channel. Pins should be sized in accordance with the curtain wall insulation thickness, to maintain a firm attachment to the hat channel. Pins shall be installed so that the interior face of the curtain wall insulation is flush with the interior face of the framing.

G. Curtain Wall Insulation: A non- 2 in. thick, 8pcf density mineral wool batt insulation**, faced on one side with aluminum foil scrim (vapor retarder) which faces the room interior, is installed to fill all cavities of the spandrel region between the framing. The batt is to be fitted tightly to the framing, and is secured to the framing with the steel hat channel (2D) and impaling pins (2F). All meeting edges of insulation are sealed with nom. 4-in. wide pressure sensitive aluminum foil faced tape centered over the junction so that approx. 2 in. of tape covers each edge of the adjacent insulation. The 24 in. wide batts shall be installed without vertical seams, spanning the full length between the vertical curtain wall framing members. Horizontal seams are to be placed a minimum 4-1/2 in. above the floor so that the width of the insulation in the perimeter joint region extends continuously to a point no less than 15-1/2 in. below the floor. The batt in the perimeter joint region is to be supported by at least one hat channel support (2D) above the floor line, in addition to the centerline perimeter joint insulation reinforcement channel (2E). Batt insulation shall fill the cavities of all "I" shaped mullions and transoms within the spandrel area. (**Listed with Omega Point Laboratories)

H. Framing Covers: Strips made of 2 in. thick by 8 in. wide, 8 pcf, mineral wool batt insulation, faced one side with aluminum foil scrim (vapor retarder) which faces the room interior, are centered over each vertical framing member and secured to the member with cup-head impaling pins spaced at max. 12 in. o.c. and onto the hat channel (2D) in accord with 2F. Framing covers do not pass through the perimeter joint treatment. They are butted to the top and bottom surfaces of the perimeter joint treatment.

I. Secure panels with a thermal break (thermal-set rubber extrusion), pressure bar (aluminum extrusion), 1/4-20 x 5/8 in. long screws, and a snap face (aluminum extrusion). The spandrel panels shall be insulated according to 2G.

3. PERIMETER JOINT PROTECTION: The perimeter joint (linear opening) shall not exceed an 8- in. nom. joint width (joint width at installation) and the perimeter joint treatment shall incorporate the following construction features:

A. Packing Material: Use a min. 4 in. thick, 4 pcf density, mineral wool** batt insulation installed with the fibers running parallel to the slab edge and curtain wall. The packing material shall be compressed 25% in the nominal joint width. Compress the batt insulation into the perimeter joint. If the Spray Coating (3B1) is used, ensure the top surface of the batt insulation is flush with the top surface of the concrete floor slab. If the Silicone Sealant (3B2) is used, ensure the top surface of the batt insulation is recessed 1/4 in. from the top surface of the concrete floor slab. Splices (butt joints) in the lengths of mineral wool batt insulation are to be tightly compressed together with min. compression of 0.25-in. per piece. Reference the Introduction to Fire Resistive Joint Systems Section of this Directory for more details on how to determine the cut width of the insulation to be installed in the nominal joint width, and how to determine the compressed percentage of a known insulation width installed in a known nominal joint width. (** Listed with Omega Point Laboratories)

B. Fill, Void or Cavity Material: Apply either Spray Coating (3B1) or Silicone Sealant (3B2) over the Packing Material (3A) as discussed below.

1. Spray Coating - Liquid is to be spray applied to cover the exposed surface of the mineral wool installed in the perimeter joint. Apply a min. wet film thickness of 1/8 in. and overlap the material a min. 1/2 in. onto the adjacent curtain wall assembly and concrete floor slab assembly. If the spraying process is stopped and the applied liquid cures to an elastomeric film before process is restarted, then overlap the edge of the cured material at least 1/8 in. with the spray. Reference Product Section of this Directory for more details about the Listed product.

Listed Manufacturer:
Grace Construction Products – Joint Sealant Spray
Flamesafe® FS3000 Series
Elastomeric Spray 2. Silicone Sealant - Applied to cover the exposed surface of the mineral wool installed in the perimeter joint. Apply sealant over the packing material to a minimum 1/4 in. thickness and finish flush with the top surface of the concrete floor slab. Reference Product Section of this Directory for more details about the Listed product.

Listed Manufacturer:
Grace Construction Products –
Firestopping Fire-Resistant Sealants
Flamesafe® Silicone Sealant

C. Support Clips: (Not Shown) Support clips are optional but recommended for installations subject to vertical shear movement. Standard Z-shaped clips are 20 GA galvanized steel with the following dimensions: 1 in. wide by 3 in. high with a 2 in. upper leg and 3 in. lower leg.

* Before testing, the spliced, test specimen was cycled 500 times according to ICBO ES AC 30 (Jan. 1997).

This Design Listing was created using the information outlined in the Introduction to the Fire-Resistant Joint Systems Section. Please refer to that introduction to complement the Design Listing.

1. What is the composition of the exterior wall?
   - Concrete panel, Spandrel Glass, Aluminum Panel, Brick Veneer, etc.
2. What supports the exterior wall?
   - Steel stud, aluminum mullions, etc.
3. What is the required hourly rating?
   - F rating (1 – 2 hour)
4. What is the joint width (inches)?
   - Measured from edge of slab to nearest point of curtain wall
5. How much movement is required?
   - Must accommodate building movement (% of joint size)
6. Are there any special considerations?
   - Unique construction condition, environmental exposure

UL Nomenclature Cont.

Navigating the UL Directory:

CW – D – 2005

PERIMETER FIRE CONTAINMENT SYSTEMS (XHDG)

Third Alpha Character identifies the movement capabilities of the system:

D = Dynamic (movement capabilities)

S = Static (no movement capabilities)

UL Nomenclature Cont.

Navigating the UL Directory:

CW – D – 2005

PERIMETER FIRE CONTAINMENT SYSTEMS (XHDG)

First Numeric Character identifies the nominal width of the linear opening:

0000 – 0999 = ≤ 2 in.

1000 – 1999 = > 2 in. and ≤ 6 in.

2000 – 2999 = > 6 in. and ≤ 12 in.

Inspection of Perimeter Fire Containment Systems

- Floor Assembly
- Curtain Wall Assembly
- Safing Materials
- Attachment methods
- Sealants

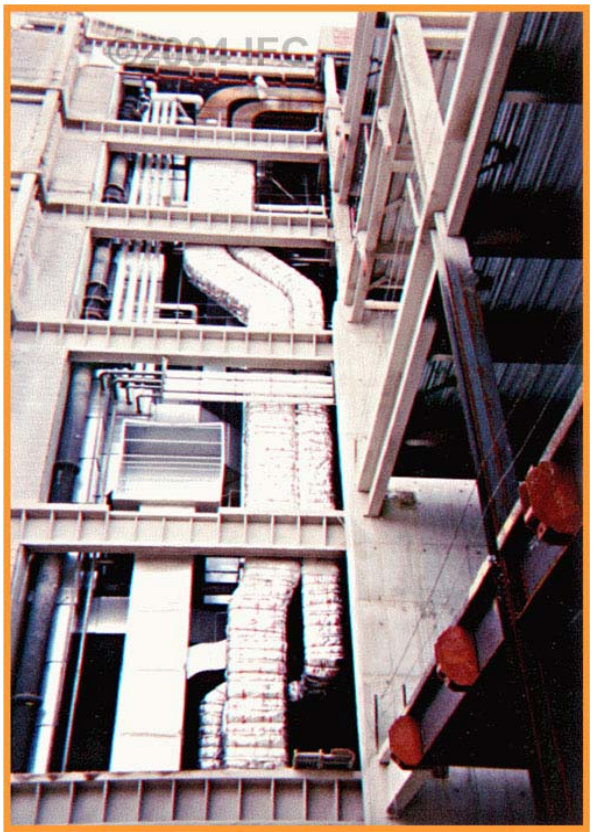
Inspection of
Perimeter Fire Containment Systems

- Inspected at rough inspection
- Does the size of joint fit within the guidelines of the tested assembly?
- Was the firestopping material installed to minimum depth and installed with the correct overlap onto both the insulation and the concrete floor?

Inspection of Perimeter Fire Containment cont.

- Is the installed mineral wool of the correct density specified in listing?
- Was the mineral wool installed to the correct compression and according to the correct orientation?

Duct Enclosure Systems



Fire Resistive Duct Enclosures

Traditional Drywall Shaft Enclosure

- Utilized “Type X” Drywall
- Utilizes Listed Shaft-Wall Designs
- Follow manufacturers instructions for horizontal assemblies

Fire Resistive Ducts and Duct Enclosures

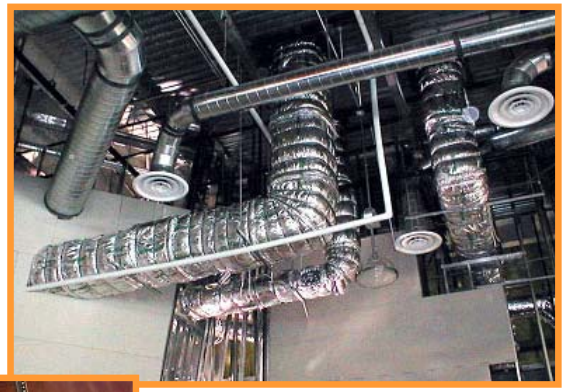
Alternatives* to traditional shaft enclosure construction include:

- Flexible Duct Wrap Enclosure Systems
- Board type Enclosure Systems
- Fire Rated Ductwork (enclosure built-in)
- Factory Built Duct with enclosure system built-in (pre-insulated)

*Alternative systems must be tested and laboratory listed to the requirements of the applicable building code.

Field Applied, Flexible Duct Wrap Enclosure Systems

- Offer design flexibility and space savings vs. traditional shaft enclosures
- Offer Zero clearance between the duct and the duct wrap
- Offer Zero clearance between the outside of the duct wrap and combustible construction
- Offer a margin of safety with high temperature fibers rated for extended exposure at/above 1800F
- Offer a system tested specifically for the application



Building Codes & Engineering Practice prohibit the use of dampers in many ducts

- Grease Ducts
- Stairwell Pressurization Ducts by design
- Hazardous Exhaust Ducts
- Dryer Exhaust Ducts
- Laundry and Refuse Chutes

In the absence of dampers, ducts need to either be “Fire Resistive Ducts” or protected by “Fire Resistive Duct Enclosures”

Fire Resistive Ducts and Duct Enclosure Systems are used to:

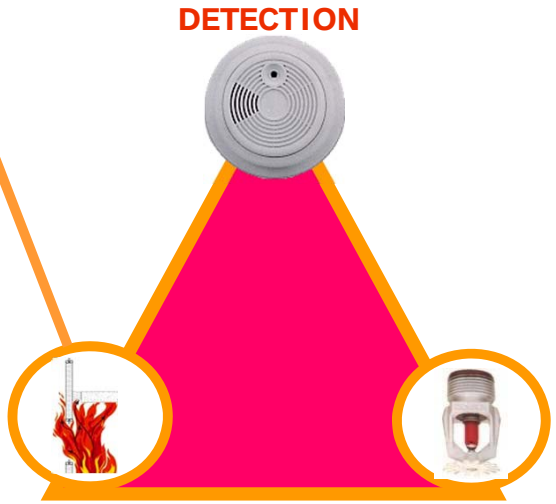
(1) Contain potential internal fires that might occur in ducts conveying hazardous / flammable materials (such as grease).

(2) Protect the stability and integrity of the duct when exposed to external fire

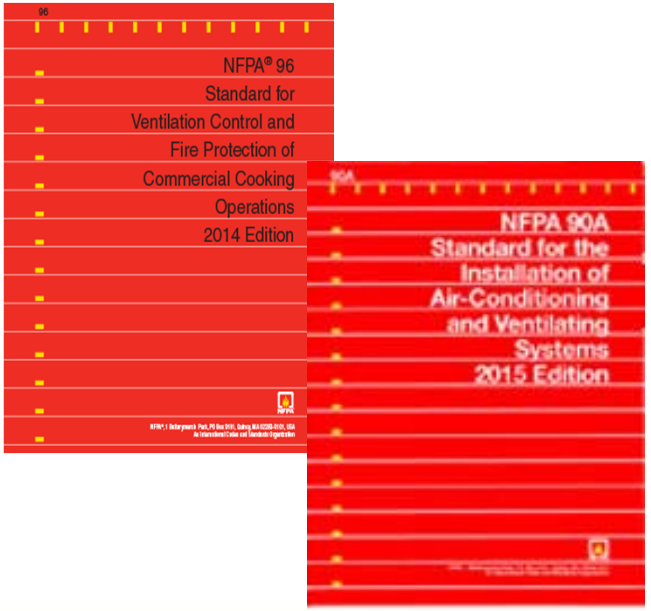
(3) Prevent the ignition of combustible materials inside the duct (grease) when exposed to an external fire.

(4) Prevent heat from igniting combustibles in adjacent compartments

The Three Elements of Life Safety



Code Requirements



Since 2006 IMC requires shaft enclosure for grease ducts that penetrate fire rated construction.

506.3.10 Grease duct enclosure. A grease duct serving a Type I hood that penetrates a ceiling, wall or floor shall be enclosed from the point of penetration to the outlet terminal [ ] Ducts shall be enclosed in accordance with the International Building Code requirements for shaft construction. [ ] Clearance from the duct to the interior surface of enclosures of combustible construction shall be not less than 18 inches (457 mm). Clearance from the duct to the interior surface of enclosures of noncombustible construction or gypsum wall board attached to noncombustible structures shall be not less than 6 inches (152 mm). The duct enclosure shall serve a single grease exhaust duct system and shall not contain any other ducts, piping, wiring or systems.

IMC allows systems tested to ASTM E 2336 as an alternative to “Shaft” construction.

506.3.10 Grease duct enclosure. - Exceptions:

1. The shaft enclosure provisions of this section shall not be required where a duct penetration is protected with a through-penetration firestop system classified in accordance with ASTM E 814 and having an "F" and "T“ rating equal to the fire-resistance rating of the assembly being penetrated and where the surface of the duct is continuously covered on all sides from the point at which the duct penetrates a ceiling, a wall or floor to the outlet terminal with a classified and labeled material, system, method of construction or product specifically evaluated for such purpose, in accordance with ASTM E 2336. Exposed duct wrap systems shall be protected where subject to physical damage.

NFPA 96 – Requires listing per ASTM E 2336 for field applied grease duct enclosure materials.

4.3 Field-Applied and Factory-Built Grease Duct Enclosures.

4.3.1 Field-applied grease duct enclosures shall be protected with a through-penetration firestop system classified in accordance with ASTM E 814 or UL 1479 having an “F” and “T” rating equal to the fire resistance rating of the assembly being penetrated.

4.3.1.1 The surface of the field fabricated grease duct shall be continuously covered on all sides from the point at which the duct enclosure penetrates a ceiling, wall, or floor to the outlet terminal.

4.3.1.2 The field-applied grease duct shall be listed in accordance with ASTM E 2336, and installed in accordance with the manufacturer’s instructions and the listing requirements.

IBC requires that Hazardous Production Materials have ventilation. HPM ducts that penetrate fire rated floors must be in a “shaft”.

415.8.2.6 Ventilation. Mechanical exhaust ventilation [ ] shall be provided throughout the portions of the fabrication area where HPM [Hazardous Production Materials] are used or stored. The exhaust air duct system of one fabrication area shall not connect to another duct system outside that fabrication area within the building.

A ventilation system shall be provided to capture and exhaust gases, fumes and vapors at workstations. [ ]

Exhaust ducts penetrating occupancy separations shall be contained in a shaft of equivalent fire-resistance-rated construction. Exhaust ducts shall not penetrate fire walls.

Fire dampers shall not be installed in exhaust ducts.

FIRESTOP INSTALLATION ALTERNATIVES

FIRESTOP INSTALLATION

- All Trades – "Person who pokes hole, fills hole"
- Multiple Contracts – To Firestop Contractors or Subs
- Single Source Firestop Contractor

FM 4991 Approved or UL Certified Contractor

- Programs that certify a company has the knowledge and quality control procedures to properly install firestopping
  - Min. 2 years in firestop installation business
  - Designated Responsible Individual (DRI) is formally tested by FM or UL at regular intervals
  - Documented and archived record keeping system for all installations
  - Must have an approved Quality Control Manual
    - Firestop Systems and Assemblies
    - Training

If Require an FM4991 or

UL Certified Contractor

- Experience – References
- Education with Firestop systems
- Certified or Accredited by manufacturers
- Insurance
- Licensed and bonded

Firestop Contractors International Association

- Contractors specializing in installation of firestop systems
- Understand firestopping requirements across all areas of construction
- Committed to providing consistent, high-quality installations
- Active in the advancement of the firestopping industry

Engineering Judgments:

- What are they?
- When are they acceptable?
- When are they not appropriate?
- What are the guidelines?

Engineering Judgments

- An Engineering Judgment is a letter or report issued by some knowledgeable party which evaluates the construction of some site-specific application which deviates from a tested design, system or assembly and concludes with a judgment of the applicable rating of that assembly

- Engineering Judgments are commonly called EJ's.

IBC References Justifying Engineering Judgments

- IBC 104.11 Alternative materials, design and methods of construction and equipment
- IBC 703.2 Fire-resistance ratings
- IBC 703.3 Alternative methods for determining fire resistance

Who Issues Engineering Judgments?

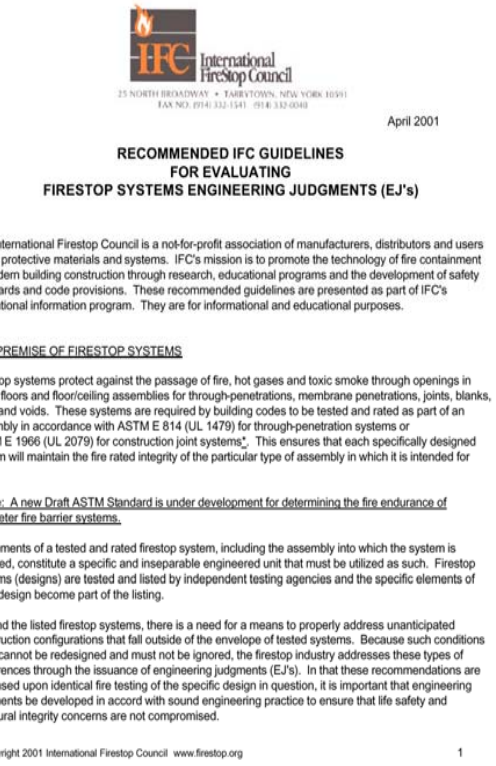
- Firestop manufacturer's qualified technical personnel, or
- Professional engineer, Fire protection engineer, Testing laboratory, in concert with the firestop manufacturer

- Must be acceptable to the Building Official or the AHJ

IFC Engineering Judgement Guidelines

– According to the International Firestop Council *"listed firestop systems can be broadened within the context of their originally tested and rated conditions through the careful and restricted application of accepted engineering principles and fire protection testing guidelines."*

– Download IFC Guidelines at: *www.**firestop**.org/**engineering-judgment-guidelines***



IFC International FireStop Council

25 NORTH BROADWAY • TARRYTOWN, NEW YORK 10591
FAX NO. (914) 332-1541 (914) 332-0040

April 2001

RECOMMENDED IFC GUIDELINES FOR EVALUATING FIRESTOP SYSTEMS ENGINEERING JUDGMENTS (EJ's)

The International Firestop Council is a not-for-profit association of manufacturers, distributors and users of fire protective materials and systems. IFC's mission is to promote the technology of fire containment in modern building construction through research, educational programs and the development of safety standards and code provisions. These recommended guidelines are presented as part of IFC's educational information program. They are for informational and educational purposes.

THE PREMISE OF FIRESTOP SYSTEMS

Firestop systems protect against the passage of fire, hot gases and toxic smoke through openings in walls, floors and floor/ceiling assemblies for through-penetrations, membrane penetrations, joints, blanks, gaps and voids. These systems are required by building codes to be tested and rated as part of an assembly in accordance with ASTM E 814 (UL 1479) for through-penetration systems or ASTM E 1966 (UL 2079) for construction joint systems*. This ensures that each specifically designed system will maintain the fire rated integrity of the particular type of assembly in which it is intended for use.

* Note: A new Draft ASTM Standard is under development for determining the fire endurance of perimeter fire barrier systems.

All elements of a tested and rated firestop system, including the assembly into which the system is installed, constitute a specific and inseparable engineered unit that must be utilized as such. Firestop systems (designs) are tested and listed by independent testing agencies and the specific elements of each design become part of the listing.

Beyond the listed firestop systems, there is a need for a means to properly address unanticipated construction configurations that fall outside of the envelope of tested systems. Because such conditions often cannot be redesigned and must not be ignored, the firestop industry addresses these types of occurrences through the issuance of engineering judgments (EJ's). In that these recommendations are not based upon identical fire testing of the specific design in question, it is important that engineering judgments be developed in accord with sound engineering practice to ensure that life safety and structural integrity concerns are not compromised.

FIRESTOP SPECIAL INSPECTIONS (IBC CHAPTER 17)

3rd party inspections mandatory as of 2012 IBC

Chapter 17: Special inspections and tests

1705.16 Fire-resistant penetrations and joints. In high-rise buildings or in buildings assigned to *Risk Category* III or IV in accordance with Section 1604.5, special inspections for through-penetrations, membrane penetration firestops, fire- resistant joint systems, and perimeter fire barrier systems that are tested and listed in accordance with Sections 714.3.1.2, 714.4.1.2, 715.3 and 715.4 shall be in accordance with Section
1705.16.1 or 1705.16.2.

- High-rise: A building with an occupied floor located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access.

Risk category III buildings IBC 1604.5

- Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to:
  - public assembly > 300 occupants.
  - elementary school, secondary school or day care > 250 occupants
  - adult education > 500 occupants
  - Group I-2 > 50 occupants, no surgery or emergency
  - Group I-3 (prisons, jails)
  - > 5,000 occupants
  - Power-generating stations, water treatment facilities for potable water, waste water treatment facilities and other public utility facilities not included in Risk Category IV.
  - Buildings/structures not included in Risk Category IV containing quantities of toxic or explosive materials that exceed certain thresholds and hazardous to public if released

OCCUPANT LOAD. The number of persons for which the *means of egress* of a building or portion thereof is designed.

Risk category IV buildings IBC 1604.5

- Buildings and other structures designated as essential facilities, including but not limited to:
  - Group I-2 occupancies having surgery or emergency treatment
  - Fire, rescue, ambulance and police stations and emergency vehicle garages.
  - Designated earthquake, hurricane or other emergency shelters.
  - Designated emergency preparedness, communications and operations centers and other facilities required for emergency response.
  - Power-generating stations and other public utility facilities required as emergency backup facilities for Risk Category IV structures.
  - Aviation control towers, air traffic control centers and emergency aircraft hangars.
  - Buildings and other structures having critical national defense functions.
  - Water storage facilities and pump structures required to maintain water pressure for fire suppression.
  - Buildings and other structures containing quantities of highly toxic materials that exceed certain thresholds and pose a threat to public if released

General inspection requirements: Who pays?

1704.2 Special inspections. Where application is made for construction as described in this section, the owner or the *registered design professional in responsible charge* acting as the owner's agent shall employ one or more *approved agencies* to perform inspections during construction on the types of work listed under Section 1705. These inspections are in addition to the inspections identified in Section 110.

General inspection requirements: Inspector qualifications

1704.2.1 Special inspector qualifications.

The special inspector shall provide written documentation to the building official demonstrating his or her competence and relevant experience or training. Experience or training shall be considered relevant when the documented experience or training is related in complexity to the same type of *special inspection* activities for projects of similar complexity and material qualities. These qualifications are in addition to qualifications specified in other sections of this code.

The *registered design professional in responsible charge* and engineers of record involved in the design of the project are permitted to act as the *approved agency* and their personnel are permitted to act as the special inspector for the work designed by them, provided they qualify as special inspectors.

How is the inspection conducted?

1705.16.1 Penetration firestops. Inspections of penetration firestop systems that are tested and listed in accordance with Sections 714.3.1.2 and 714.4.1.2 shall be conducted by an approved inspection agency in accordance with ASTM E 2174.

1705.16.2 Fire-resistant joint systems. Inspection of fire-resistant joint systems that are tested and listed in accordance with Sections 715.3 and 715.4 shall be conducted by an approved inspection agency in accordance with ASTM E 2393.

The special inspection process

- Statistical sampling
- Verify materials prior to installation
- Verify against listed systems and/or EJs
- Verify that ALL firestops installed

ASTM E2174: *Standard Practice for On-Site Inspection of Installed Fire Stops*

- For each “type” of firestop being installed:
  - Witness 10% of Installations, or
    Destructive Testing on 2% of Installations

ASTM E2393, Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers

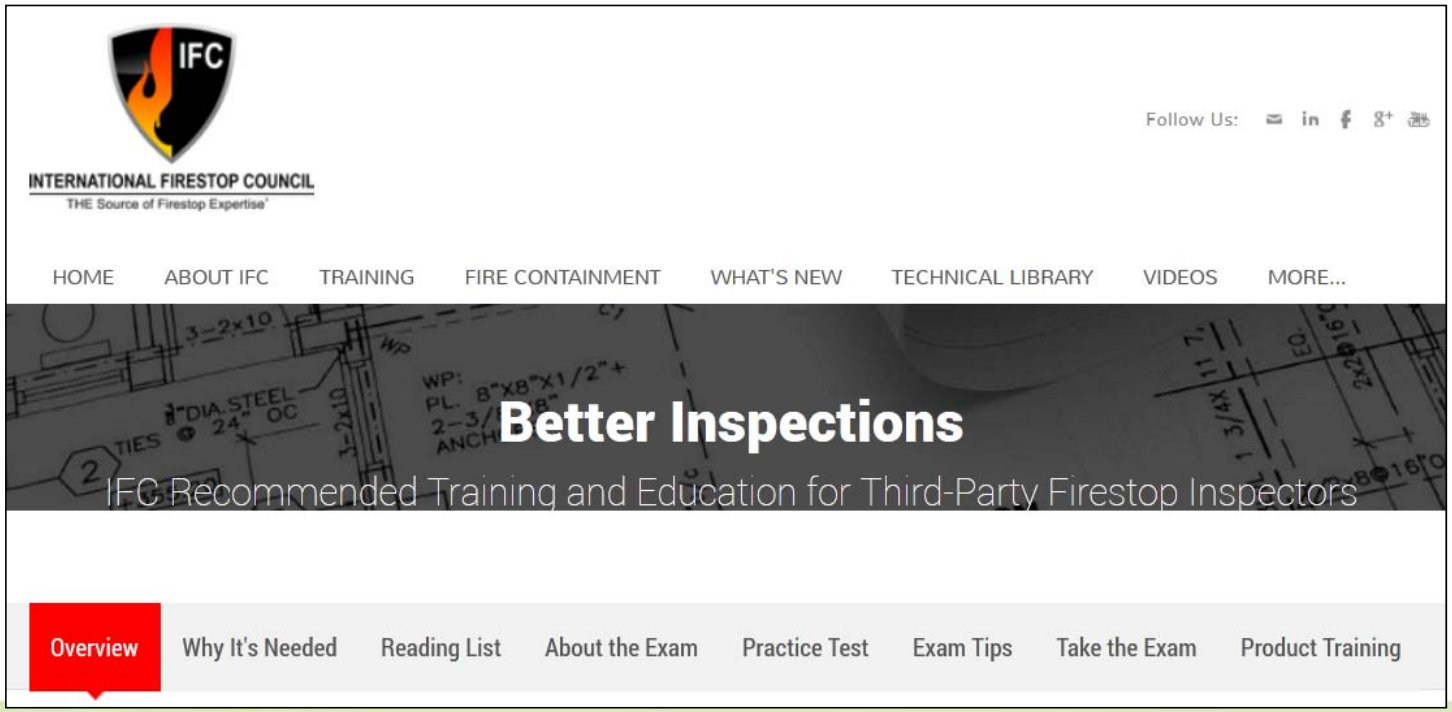
- For each “type” of fire resistive joint system being installed:
  - Witness 5% of linear feet being installed, or
    Destructive (or disassembly) testing on 1 ft. per every 500 ft.

ASTM E 2174 and ASTM E 2393 Conflict of Interest prohibition

- The Inspectors shall be completely independent of, and divested from the installer, contractor, manufacturer, or supplier of any material being inspected
- The Inspector shall not be a competitor of the installer, contractor, manufacturer, or supplier of any material being inspected .

EDUCATION FOR THIRD-PARTY FIRESTOP INSPECTORS:
IFC INSPECTOR TRAINING

Firestop special inspection training can be found at www.firestop.org/inspection



IFC Education Program Overview

- Typical 1-day class is insufficient for a special inspector
- Comprehensive study material from multiple authoritative sources
- Only firestop inspector exam developed and written by
  - 3rd Party Firestop Inspectors
  - Manufacturers that develop the technology and test the firestop systems
  - Scientists and engineers experienced in firestop technology
- All reading curriculum relevant to firestop inspectors
- Online curriculum at no cost*

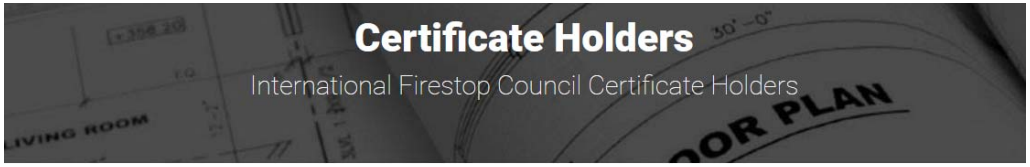
* ASTM inspection standards must be purchased from ASTM

IFC Education Program Overview (cont.)

- Reading list of linked documents and videos
- Optional online exam (test.com)
  - Free practice test
- Passing the exam = certificate of achievement
  - Space to record hands-on product training from 4 IFC-member firestop manufacturers
- AHJs:
  Ask inspectors for their IFC education program certificate!

Verifying whether someone has passed the IFC inspector exam

- www.firestop.org/certificate-holders
  - Premier certificate holders: additional hands-on product training



Certificate Holders

Intertek IQP Program
Qualified Firestop Inspector

IQP

- **I**ntertek
- **Q**ualified
- **P**ersonnel

Intertek

IQP Differentiator

	• Experienced Inspector/Installer	• Association Trained	Intertek
Industry Experience	X	X	X
Formalized Training		X	X
Required Retesting		X	X
Regular Quality Audits			X
Inspector Network			X
Backing of Intertek			X

IQP Programs

Fire Door Inspectors

Raceway Installers

Field Inspectors

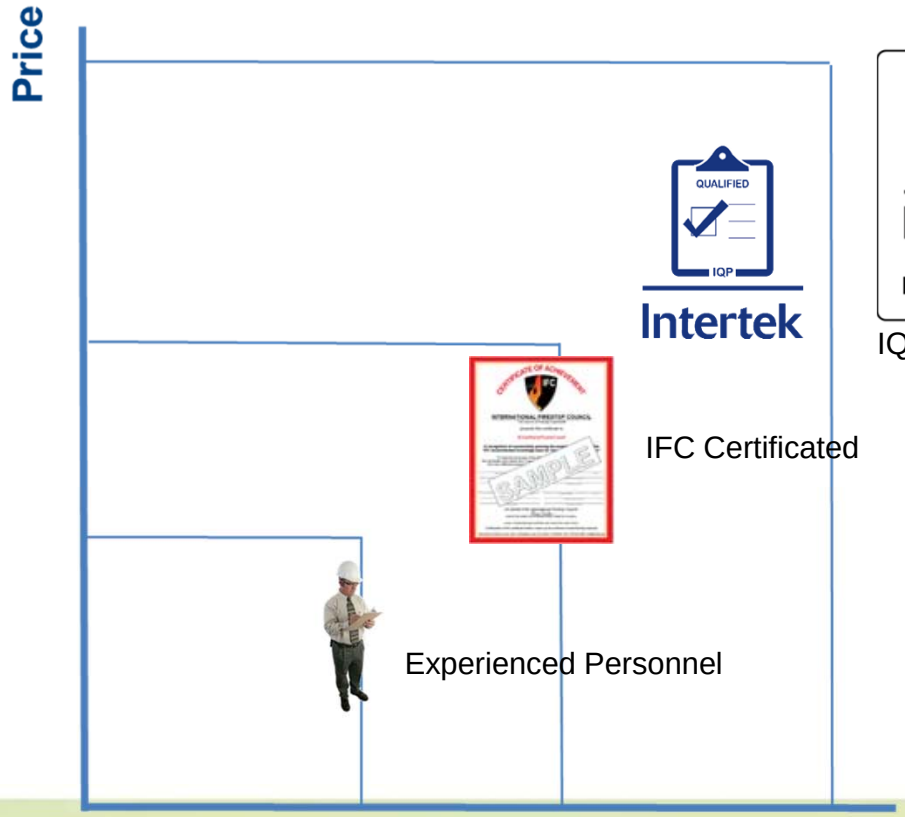
Intertek Programs

ATI Programs

Association Programs

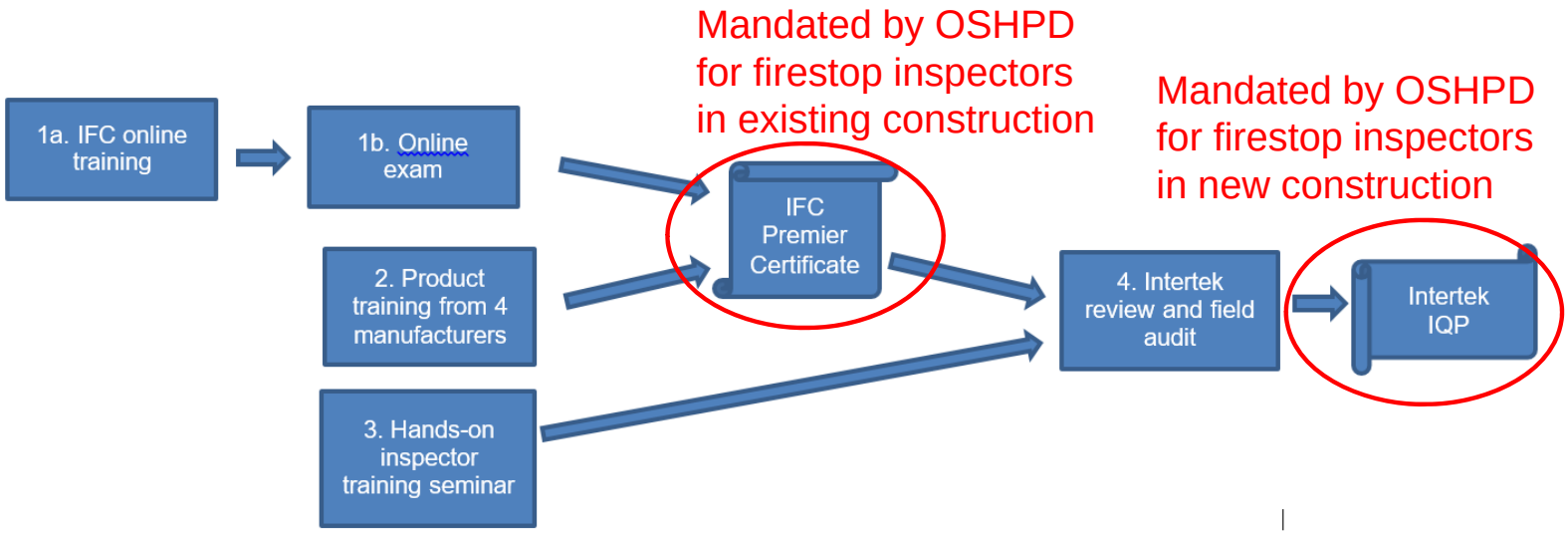
- The IQP Program is an umbrella program to encapsulate all personnel programs under one name to help bring unity to the market and to AHJs, facility managers, building owners, etc.

IQP Differentiated: Firestop Inspectors



IQP Firestop Inspector

Understanding IFC inspector training elements



Special inspections summary

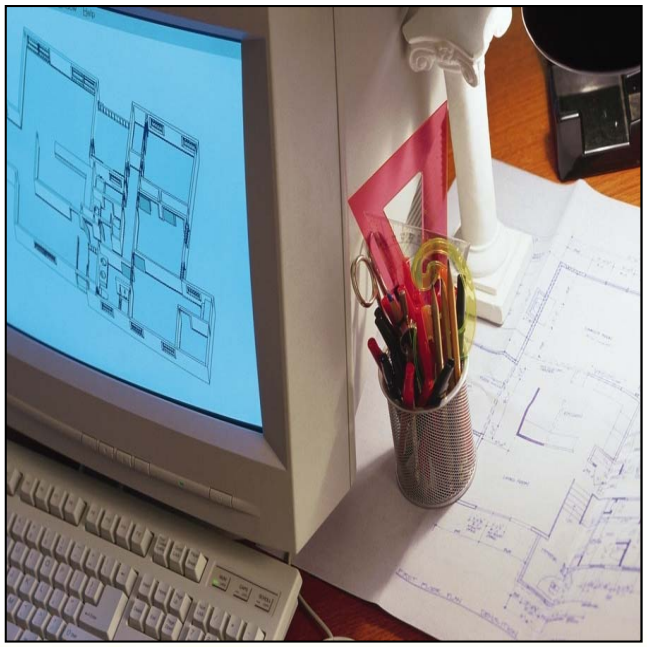
- 2012 IBC makes firestop special inspection mandatory for high-rises
  and Risk Category III and IV buildings
- Special inspector shall provide written documentation to the building official demonstrating his or her competence and relevant experience or training
- Property owner pays for the inspection
- Inspection per ASTM E2173, E2393
- IFC program provides both education and needed written documentation

AHJ Plan Review and Inspection Process recommendations

Pre-Construction Meeting

- Review Design Drawings Submittals
- Obtain Pre-Approved Engineering Judgments
- Establish inspection guidelines and expectations
- Review qualifications/experience of firestop installers
- Schedule firestop Inspections

PROCESS
Building Department Submittals



- 107.2.1 - … Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that it will conform to the provisions of this code

PROCESS
Plans Examination/Review

- Firestop systems details should be included on the plans and specifications (Project Documents)
- Recommended to have all firestop Details reproduced, including the system number for firestop applications on the plans

PROCESS
Plans Examination/Review Cont.

- For unique conditions have policy for Engineering Judgments
- The structural engineer should specify amount of movement required for all joints
- Consider requiring special inspection for firestopping on large projects
- Require or encouraging use of Firestop Qualified Contractor

Firestop Systems
Recommended Correction Notice

- All firestop systems for fire rated construction need to be reproduced on the plans as tested by an approved testing laboratory. If an engineering judgment is needed, it must be noted on the plans and this system must be approved by the Building Official.
- The above information must be provided for the field inspectors.

Inspection Practices for Firestopping

- Inspections typically done by AHJ, but may be inspected by approved agency or individual
- Require construction documents that detail all firestop locations and systems
- During framing inspection observe that joints are installed in manner that required movement can be achieved

Inspection Practices for Firestopping Cont.

- Observe the products, empty containers or boxes for label with name, description and approved testing agency
- Have your inspection tools such as a flashlight, coring device, wire, tape measure and other appropriate tools
- General Contractor should understands that you may require a ladder or lift

Inspection Practices for Firestopping Cont.

- Verify firestopping was installed in accordance with the published system
- Verify who did installation of systems to determine reasonable verification
- When necessary destructive evaluation will be made on various types of systems
- During inspection have firestop contractor follow-up to repair systems after destructive testing

Inspection Practices for Firestopping Cont.

- What to do if firestopping is not acceptable:
  - Notify ALL effected persons of deficiencies in a timely manner.
  - If firestop system is repaired the manufacturers need to recommend proper procedures and methods
  - Will require more inspections to verify compliance
  - Observe firestop contractor re-doing the faulty installation.
  - May need to “Stop Work” on part of the project
  - Re-inspect when appropriate and thank personnel effected by the delay of the project.

This is what code calls for...

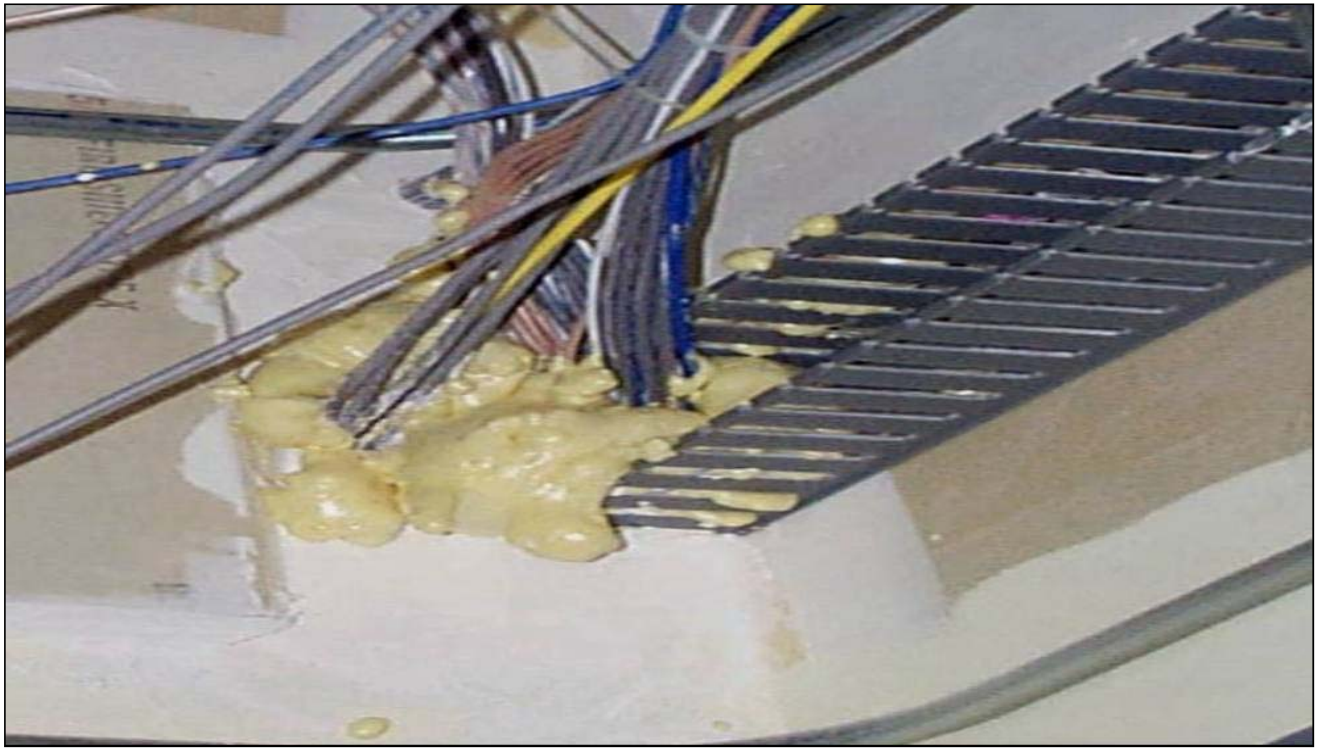
And this is what you often receive !!!

Discussion: How can each of these challenges be solved?

- Firestop system details are hardly ever on plans
- Code Officials generally do not ask for copies of approved firestop systems
- Tested/Listed systems rarely installed correctly
- Joints are generally not inspected during the framing inspection and installed to provide movement
- Engineering judgments are being used when there are tested and listed systems available
- Firestopping considered beneath contractors
- Most users are untrained
- No Licensed firestop contractors

Improper Firestop Installations

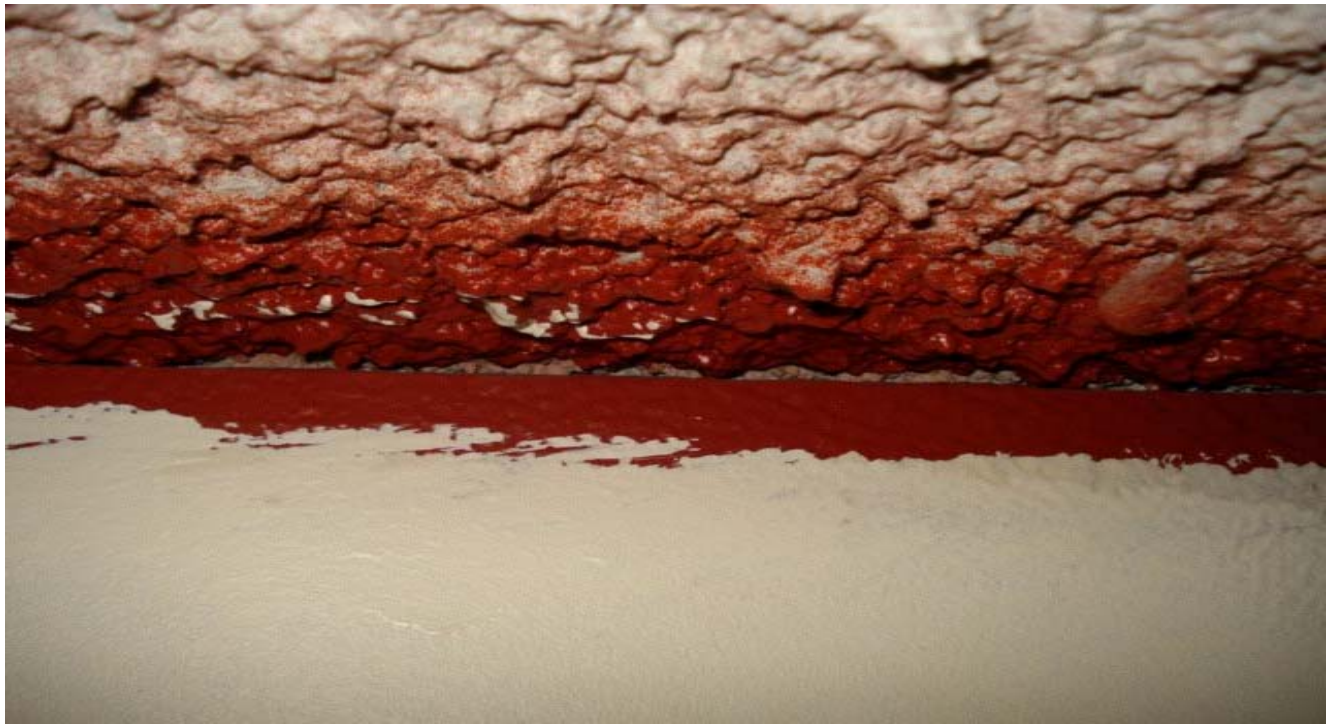
Improper Firestop Installations



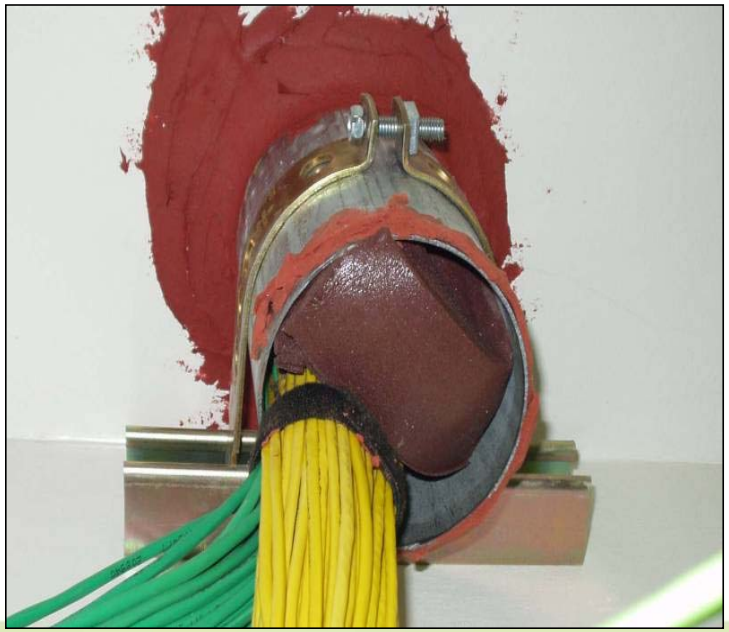
Improper Firestop Installations

Improper Firestop Installations

Improper Firestop Installations



Improper Firestop Installations

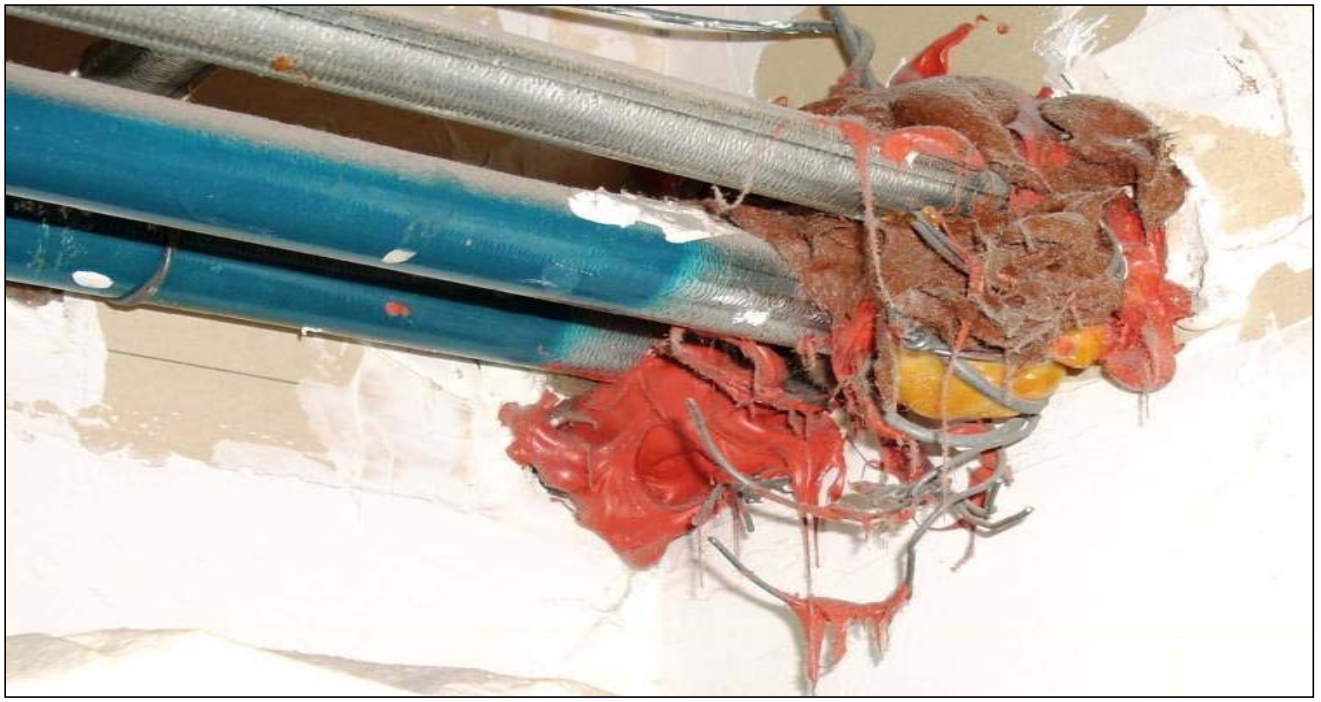


Improper Firestop Installations

Improper Firestop Installations

Improper Firestop Installations

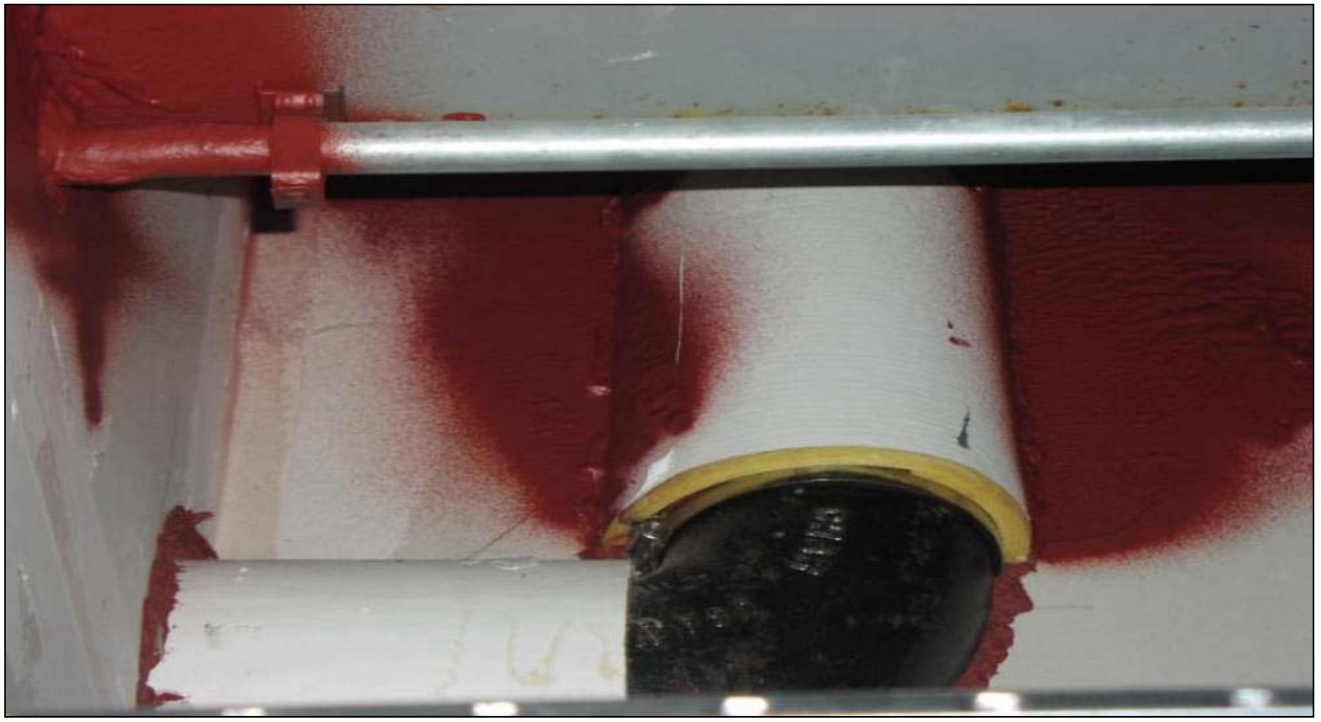
Improper Firestop Installations



Improper Firestop Installations

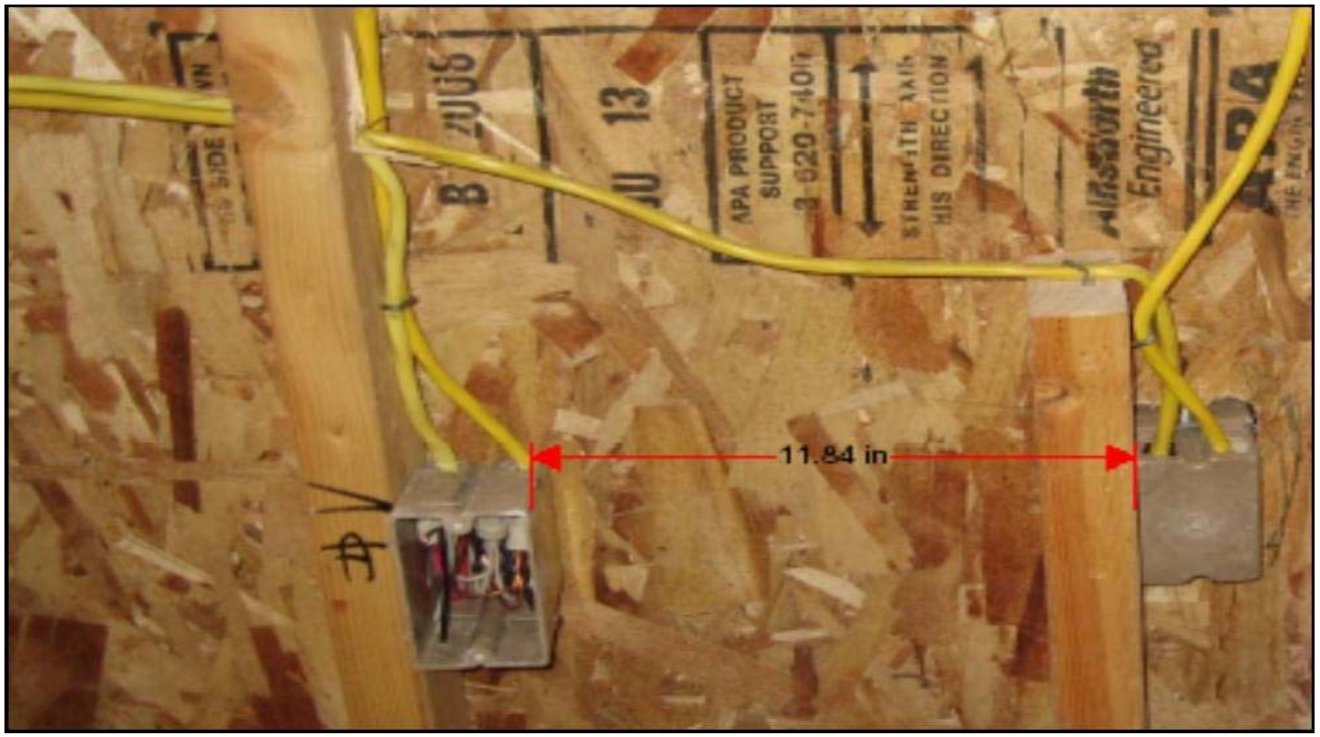
Improper Firestop Installations

Improper Firestop Installations



Improper Firestop Installations

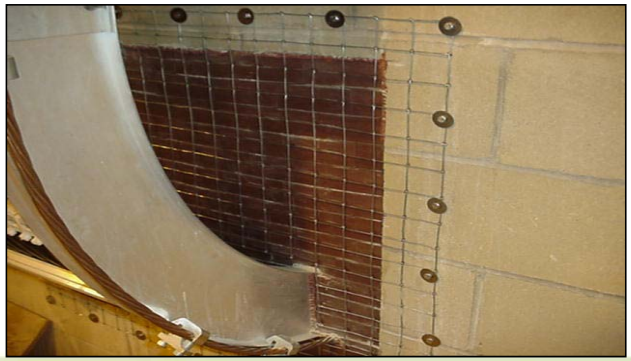
Improper Firestop Installations



Improper Firestop Installations

Improper Firestop Installations

Correct Firestop Installations



Correct Firestop Installations

Correct Firestop Installations

Correct Firestop Installations

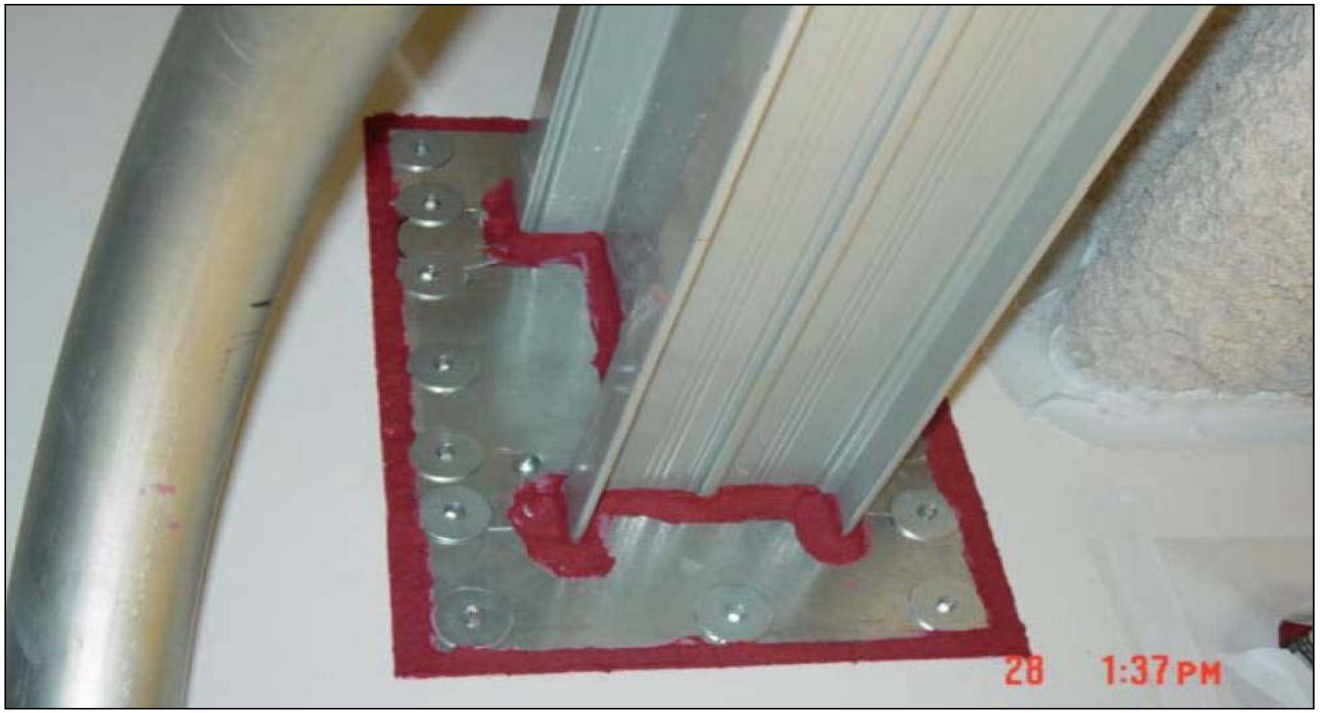
Correct Firestop Installations

Correct: First Floor - Underside of Joint

Correct Firestop Installations

Correct Firestop Installations

Correct Firestop Installations



Visual Inspection Quiz

What's wrong with these installs?

Drywall compound is never an acceptable firestop material

Collar must be flush with ceiling surface

Visual Inspection Quiz

What's wrong with this install?

Visual Inspection Quiz

What's wrong with this install?

Visual Inspection Quiz

What's wrong with this install?

Head of wall joint is firestopped, but penetrations are not

Penetrant opening at top of wall must be firestopped with same product as head of wall

Is there firestopping behind the drywall compound?

Visual Inspection Quiz

What's wrong with these installs?

Visually … Nothing

Does thickness and overlap of coating match design?

What type, depth and compression of backing material is behind coating?

Does number and type of wrap strip match design?

Is there sealant in the void?

For additional self-education:

www.firestop.org/videos

Special Inspection of Firestopping, The 2012 IBC …

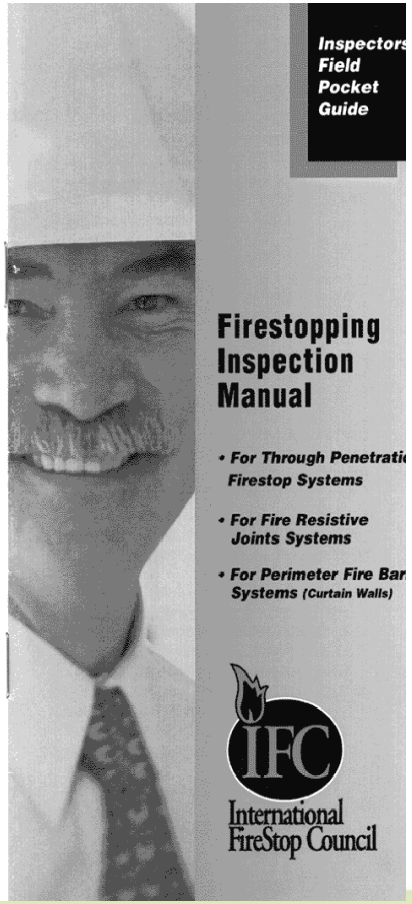
IFC Inspecting Firestop for Compliance

Close enough is not good enough: A demonstration of …

Available Resources

- Product Information - manufacturer's websites
- International Firestop Council (IFC) - www.firestop.org
- Firestop Contractors International Association (FCIA) -www.fcia.org

- **IFC pocket Firestopping Inspection Manual**
- **IFC Inspection Guidelines for Through-Penetration and Fire Resistive Joint Systems in Fire Resistance Rated Construction**



Additional firestop training

- IFC offers:
  - Free 2, 4, or 8 hour educational seminars for AHJs

    Learn more about:
    - Firestop system fire testing
    - Membrane penetration firestop systems
    - Understanding and navigating the UL Fire Resistance Directory
    - Evaluation of Engineering judgments
    - IFC recommended destructive examination techniques

  - Free Online special inspector training program
    www.firestop.org/inspection

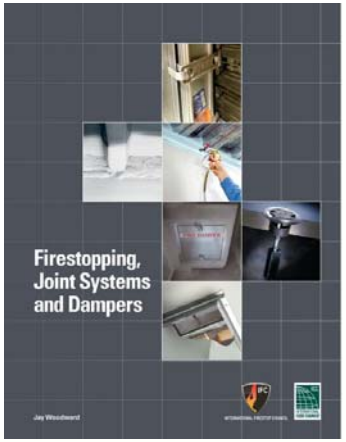
  - 1-day hands-on training seminar for special inspectors (inspect to ASTM E2174/E2393)

- Contact info@firestop.org to request training seminar

Further your knowledge of firestopping and codes:
Reference book published by ICC (2015)

- http://www.firestop.org/online-store.html
- http://shop.iccsafe.org/firestopping-joint-systems-and-dampers-1.html

ICC INTERNATIONAL CODE COUNCIL®



Available Resources

- International Firestop Council (IFC)
  www.firestop.org
- Firestop Contractors International Association
  www.fcia.org
- Fire Safe North America
  www.firesafenorthamerica.org
- ASTM International standards
  www.astm.org

Firestopping is only installed to the level of knowledge of the AHJ

- You are the last line of defense!
- You need to ensure:
  - The code is enforced
  - Contractors do the job per specifications
  - Buildings are safe for occupants and first responders

THANK YOU FROM THE IFC

The *International Firestop Council (IFC)* is a not-for-profit association of manufacturers and industry partners of fire protective materials and systems.

IFC's mission is to promote the technology of fire containment in modern building construction through research, education and development of safety standards and code provisions.

Website - www.firestop.org

Email - Info@firestop.org