

# Firestopping: Responsibilities for Code Officials and Design Professionals

Presented by: Brice Miller



# Brice Miller

- ▶ 25 years as Building Official, Inspector and Plans Examiner with four International Code Council (ICC) Certifications
- ▶ Past President of Colorado Chapter of the ICC
- ▶ Developed Firestop Presentations for ICC on line training
- ▶ Provided firestop training throughout the US for 14 years
- ▶ Served as the Executive Director for International Firestop Council for 2-1 / 2 years



# Outline of Presentation

- ▶ Welcome and Introductions
- ▶ Importance
- ▶ Balanced Fire Protection
- ▶ Code Requirements and Testing
- ▶ Firestop Code Changes
- ▶ Penetration Firestop Systems
- ▶ Joint Systems
- ▶ Perimeter Fire Containment Systems
- ▶ Review of Special Inspection requirements
- ▶ Plan Review and Firestopping
- ▶ Firestopping in the Real World



# What is Firestopping?

Which of the Following is the Definition of Firestopping:

- A) That expensive red goop with the UL logo on the tube.
- B) The process of restoring the hourly rating to fire barrier walls and floors that have lost their fire rating from penetrations, joints and other openings (using materials tested to ASTM E-814 and UL1479.)
- C) A huge pain in the neck.

**Answer: All of the above**

# Fireblocking and Draftstopping

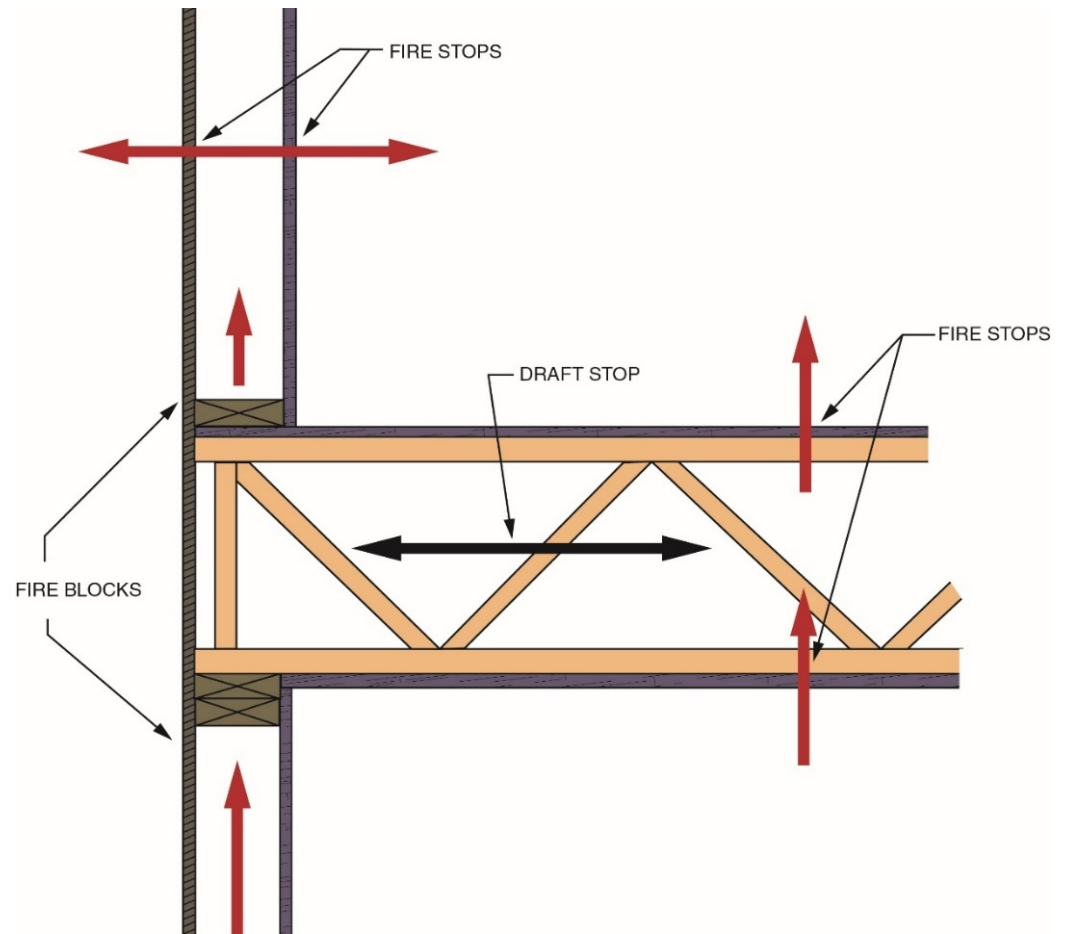
## Draftstopping

- ▶ To divide a large concealed spaces into smaller compartment (Intent: limit the movement of air w/n the cavity, reducing the potential for rapid fire spread)

## Fireblocking

- ▶ Installed within concealed spaces to resist or block the migration of fire and hot gases to isolate movement from vertical to horizontal areas

# Firestopping , Fireblocking and Draftstopping



# Who's Responsible for Making Certain Firestopping is code compliant?

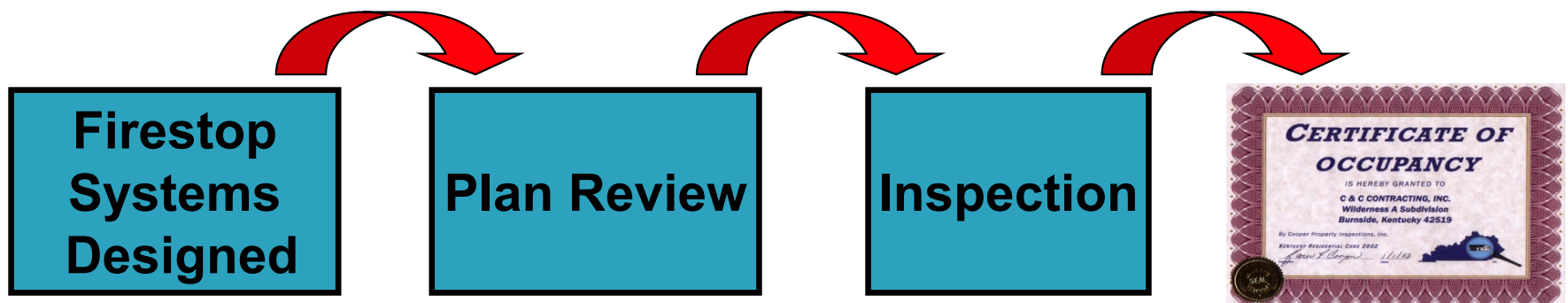
- Owner
- Design Professional
- Manufacturer
- General Contractor
- Installer
- Plans Examiner
- Firestop Inspector





# FIRESTOP PROCESS

1. Designed
2. Plan Review
3. Installation
4. Inspection
5. Maintenance




# International Code Council Certified Firestop Inspector?

- ▶ The International Code Council (ICC) has approved a new Firestop Inspector Certification that may be implemented in the future.
- ▶ Survey to determine if firestopping needs an exam and if inspected properly



# THE REAL PROBLEM

Firestop Inspections are difficult to perform:

- Firestopping is the only code required work that is installed by every trade.
  - Code Officials are frequently limited on the time they can spend on firestopping.
  - Code officials typically are not accustomed to providing destructive testing.
  - Firestopping is not included in the plan submittals
- 

# Course Objectives:

- ▶ Plan Review and Firestopping
- ▶ Require firestop submittals
- ▶ Impact of firestop inspections according to NEW ASTM Standards
- ▶ Review firestop inspection tips and techniques
- ▶ Recognize common firestop system code violations and provide solutions
- ▶ To become comfortable with requirements for inspection of all firestop systems
- ▶ Assist code officials with level of firestop enforcement
- ▶ Review methods of firestop inspections

# COMPARTMENTATION



The  
Life Safety  
Triangle



DETECTION



SUPPRESSION



# Finding The Right Balance

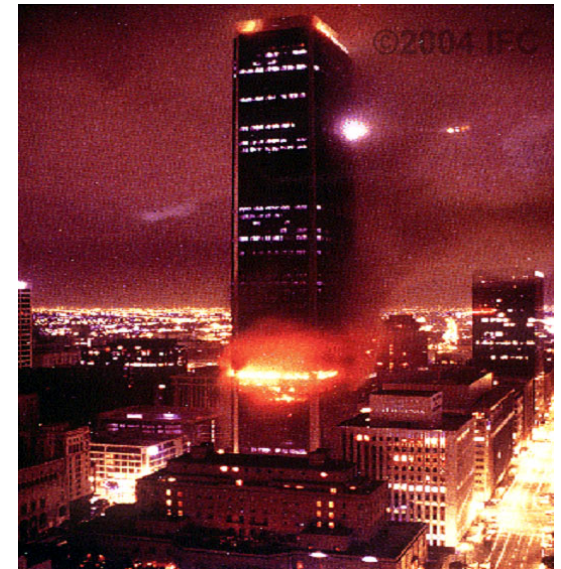
**Active  
Protection  
(Sprinklers and  
Alarms)**



**Passive  
Protection  
(Fire-resistant  
Assemblies)**

# Why is Firestopping Required

- Mandated by code
- Life Safety
- Property Protection
- Compartmentation
  - Divide buildings into spaces of manageable risk
  - For Escape and Access for fire-fighters



# MGM Grand Fire – 1980



- ▶ Fire occurred on 1st floor
- ▶ Fire never left 1st floor
- ▶ 14 victims in casino area
- ▶ 64 victims found 20 – 25 floors above
- ▶ Total deaths – 84

# First Interstate Bank – 1988



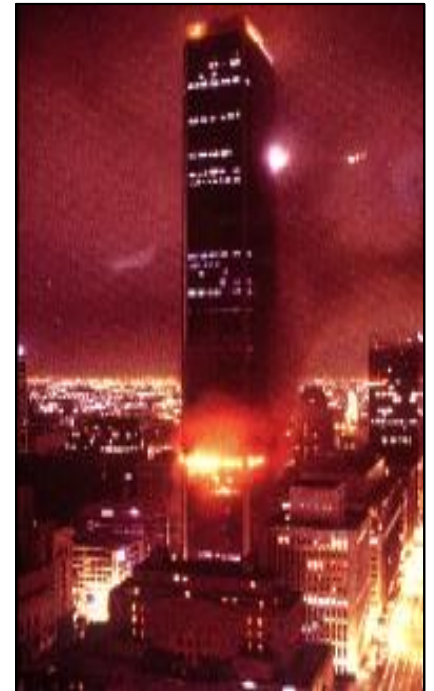
- ▶ On May 4, 1988 a fire occurred on the 12th floor extending to 16th floor (62 story high-rise):
  - “The lack of firestopping between the floor slabs and the skin permitted the fire to spread from floor to floor through this space. Fire was observed spreading through this area even before the glass 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.



# Legal Cases

- ❑ Only a few examples of why buildings need proper firestopping to Mitigate liability for the building owner and contractors. We do not want anyone to be dangerously vulnerable to liability.
- ▶ American States Ins. vs. Hannan Construction
  - Builder allegedly failed to Firestop open plenum
  - Builder found negligent
- ▶ Sunlake Apt. Residents vs. Tonti Development
  - Fire destroyed building, residents sued
  - Architect settled then sued government inspectors
- ▶ One Meridian Plaza Businesses vs. Owner
  - Fire destroyed 40-story building
  - Tenants and near-by businesses sued owner
  - Building owner sued government officials & GC





Unsealed or Improperly sealed  
firestopping cost lives and huge  
liability losses...

## One Meridian Plaza – 1991

- ▶ **Building owner collected \$110 million:**
  - Building owner sued approx. 25 defendants including the general Contractor, sub-contractors and manufacturers
  - The GC paid over 40 million – Claimed failure to supervise, install and inspect the fire protection system

# Sprinklers suppress flames, NOT smoke & gasses

75% 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".

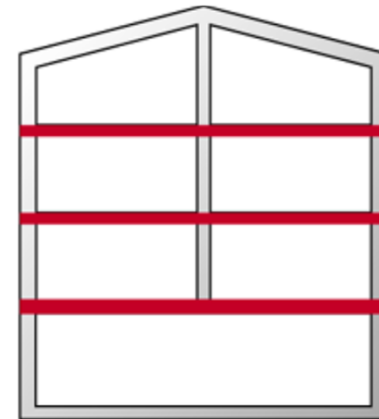
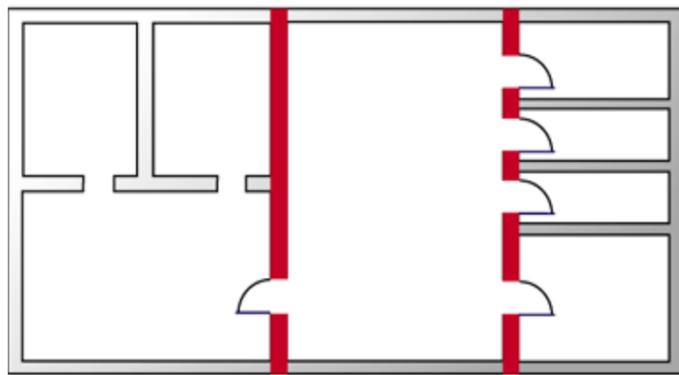


# Contain fire, smoke and toxic gases to the point of origin

- Create compartments with fire-resistive walls and floors
- Increases Time Available to Escape (TAE)
- Increases number of escape routes
- Increases structural safety for fire fighters
- Limit property loss

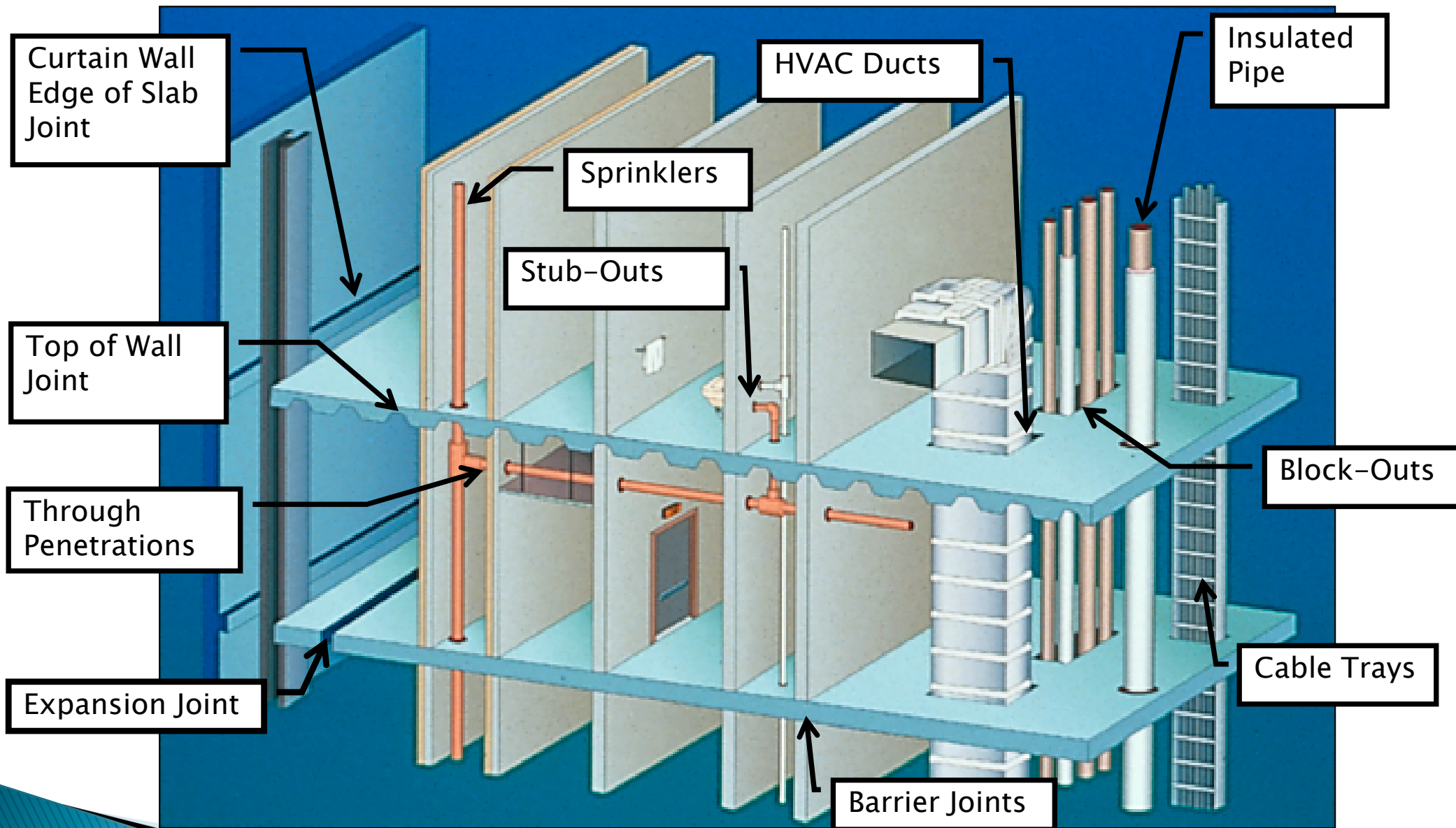


Fire/Smoke  
Barriers



Fire floors

# Firestopping needed in many Applications





# When Reviewing and Inspecting Firestopping the code can be Vague

- ▶ We will give you our opinion at times
- ▶ Feel free to research our recommendations
- ▶ The Authority Having Jurisdiction (AHJ) will make the final decision

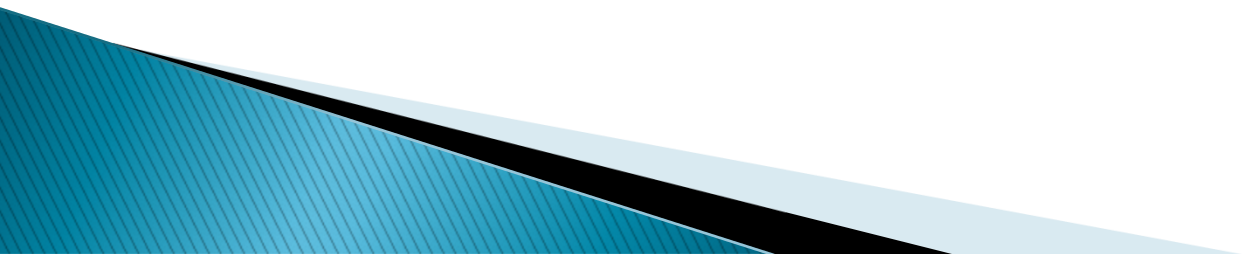




# Containment in Construction

International Building Code requires firestop systems to be used in the below locations:

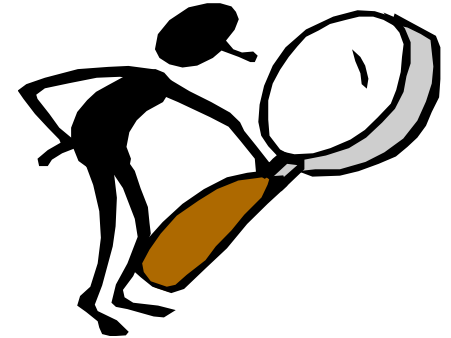
- ▶ Fire-resistance-rated wall assemblies
- ▶ Fire-resistance-rated floor and roof assemblies
- ▶ Joints in fire-resistance-rated assemblies
- ▶ Perimeter exterior wall systems



# Containment in Construction

## ▶ Fire-resistance-rated assemblies

- *Fire Walls – 706*
- *Fire Barriers – 707*
- *Fire Partitions – 708*
- *Smoke Barriers – 709*
- *Smoke partitions – 710*



- Family of Walls and firestopping
  - Fire wall is most restrictive and fire Partitions is the least restrictive
  - Fire Barriers include shafts and exit Passageways
  - Smoke Barriers will always need to have an L rating
  - Smoke partitions require joints and penetrations to be filled with an approved material.
  - All Walls have different types of ratings and usages

# 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
- NFPA 1 – Chapter 12



# Firestopping Code Requirements – IBC

- Section 714 – Penetrations
- Section 715 – Fire-Resistant Joint Systems



# 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. Deferred submittals are defined as those portions of the design that are not submitted at the time of the application and that are to be submitted to the *building official within a specified period.*
  - ▶ **Typically approved prior to the start of Firestop system installation**



# Firestop Code Requirements

## Special Inspections

- 1705.1.8 Fire-resistant penetrations and joints. In high-rise buildings or, in buildings assigned to Risk Category III or IV, or in fire areas containing Group R occupancies with an occupant load greater than 250, special inspections for through-penetrations, membrane penetration firestops, fire resistant joint systems, and perimeter fire containment systems that are tested and listed
- 1705.1.1 Special cases. *Special inspections shall be required for proposed work that is, in the opinion of the building official, unusual in its nature*

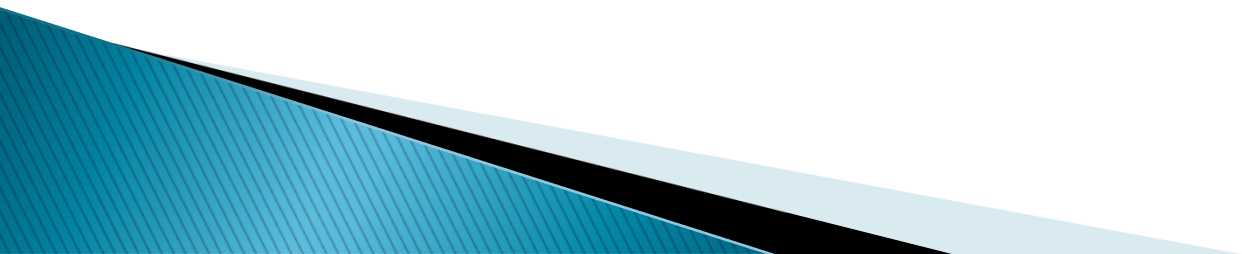
# NFPA 1 Fire Code Requirements For Firestop Special Inspections

- ▶ 12.3.2\* Quality Assurance for Penetrations and Joints. In new buildings three stories or greater in height, a quality assurance program for the installation of devices and systems installed to protect penetration and joints shall be prepared and monitored by the RDP responsible for design. Inspections of firestop systems and fire-resistive joint systems shall be in accordance with 12.3.2.1 and 12.3.2.2.
- ▶ 12.3.2.1 Inspection of Penetration firestop systems shall be conducted in accordance with ASTM E 2174, *Standard Practice for On-Site Inspection of Installed Fire Stops*. [5000:40.9.1]
- ▶ 12.3.2.2 Inspection of fire-resistive joint systems shall be conducted in accordance with ASTM E 2393, *Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers*. [5000:40.9.2]



# NFPA 1 –Maintenance

- ▶ 12.3.3\* Maintenance of Fire-Resistive Construction, Draft-Stop Partitions, and Roof Coverings. 12.3.3.1 ..... shall be maintained and shall be properly repaired, restored, or replaced where damaged, altered, breached, penetrated, removed, or improperly installed.



# International Fire Code (IFC)

## Inspection and Maintenance of Buildings

- 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.
- In the 2021 IFC added provisions in 701.6 **requiring building owners to annually inspect** firestops and joint systems and properly repaired, restored or replaced where damaged, altered, breached or penetrated. Records of inspections and repairs **shall be maintained**.

# *UL / IFC Video*

- ▶ **“CLOSE ENOUGH IS NOT GOOD ENOUGH”: A Demonstration of Proper vs. Improper Firestopping**



# Code Requirements – IBC

## International Building Code Firestop Test Standards

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





## Third Party Testing Labs

Underwriters Laboratories Inc.

Intertek (Warnock Hersey & ETL)

FM Global (Factory Mutual)

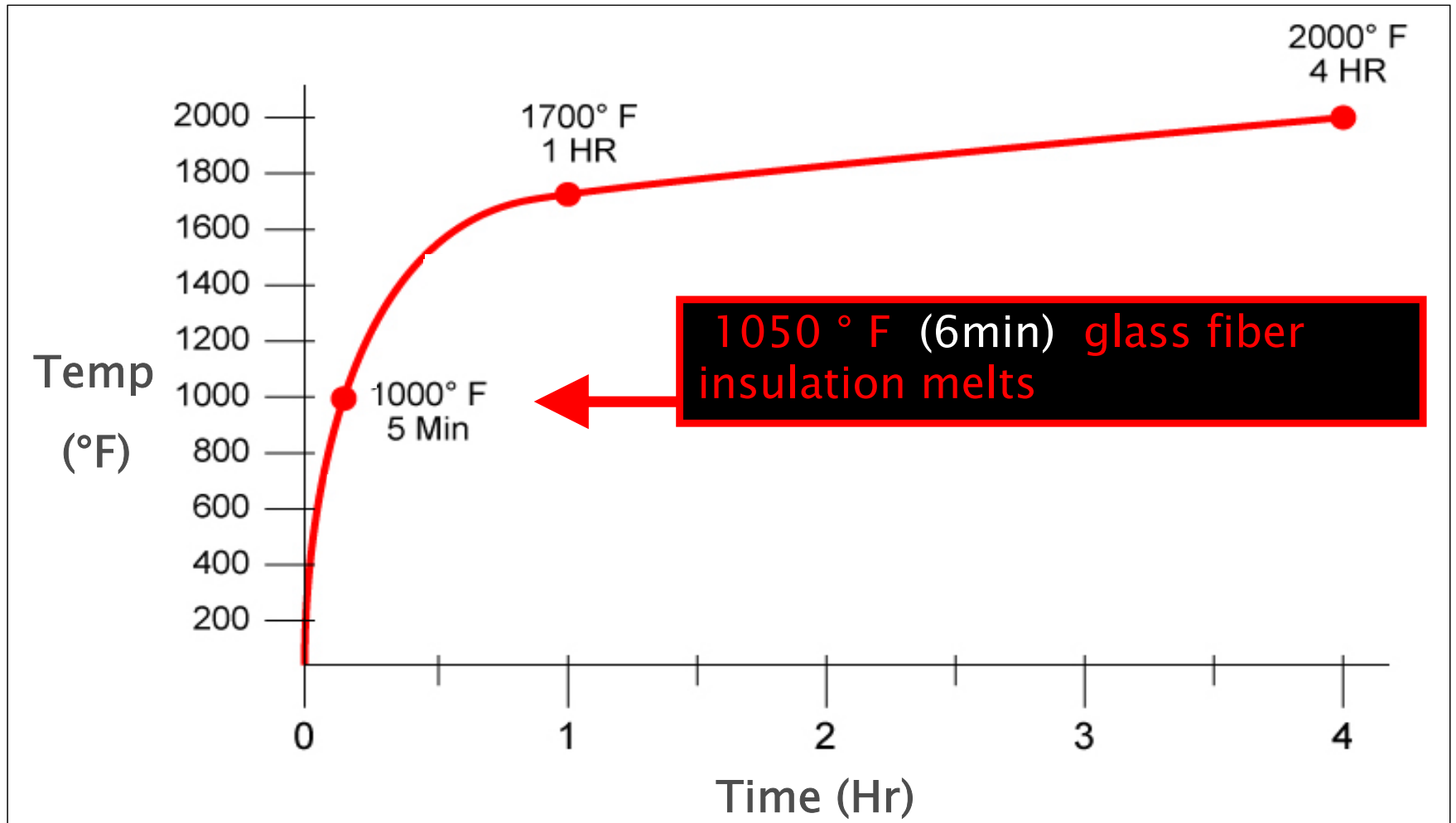
Southwest Research Institute

## Labs Test to Standards

American Society of Testing and Materials (ASTM)

Underwriters Laboratories Inc. (UL)

# Time - Temperature Curve



# Hose Stream Test

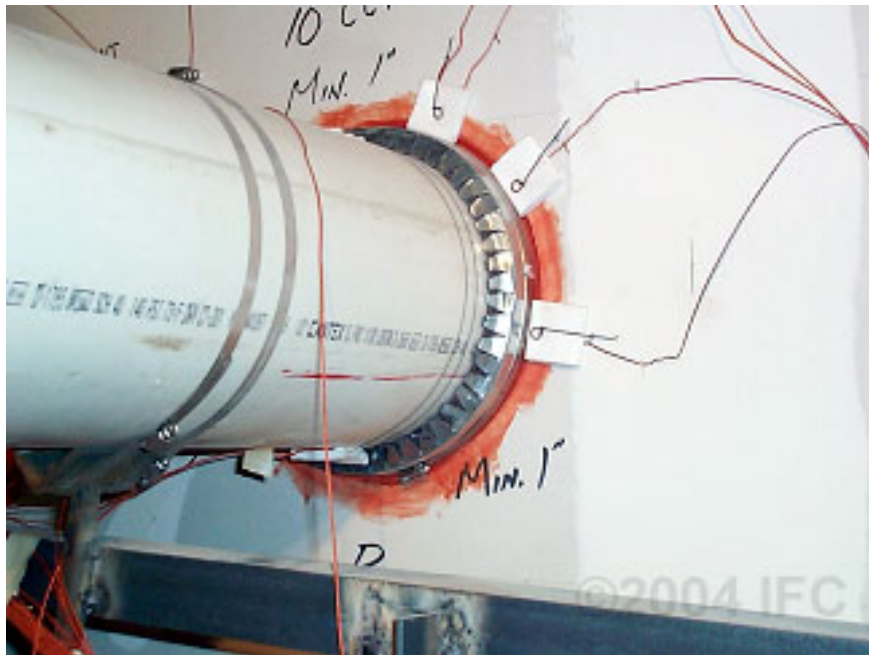




# Example of Successful Testing

Construction – 4" PVC Through Drywall

Firestopping – Intumescent Device & Sealant



Before



After

# ASTM E 814 / UL 1479 Test Standards for Through Penetration Firestop **Systems**

## F-Rating

The duration of time in which flames must not pass through the **system**

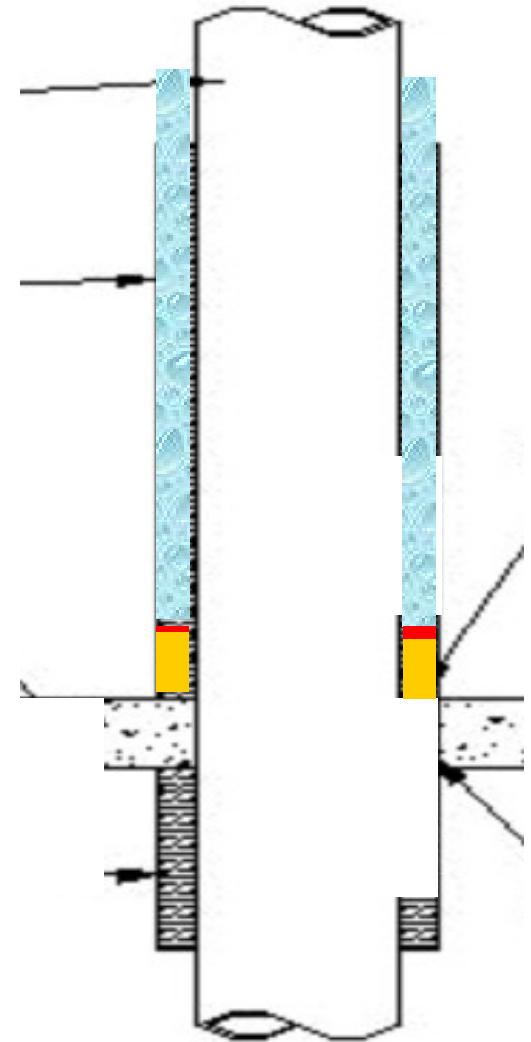
## T-Rating

The time it takes for the non-fire side to reach 325°F



# ASTM E 814 / UL 1479 Test Standards for Through Penetration Firestop Systems

- ▶ L-Rating
  - ▶ Rate of air leakage through the **system** at ambient and 400°F
  - ▶ Measured in CFM/sq. ft. The lower the number, the better.
- ▶ W-rating (currently optional)
  - ▶ the ability of a **system** to restrict the flow of water
  - ▶ Class 1-rated **systems** resist a 3 foot water column for 72 hours

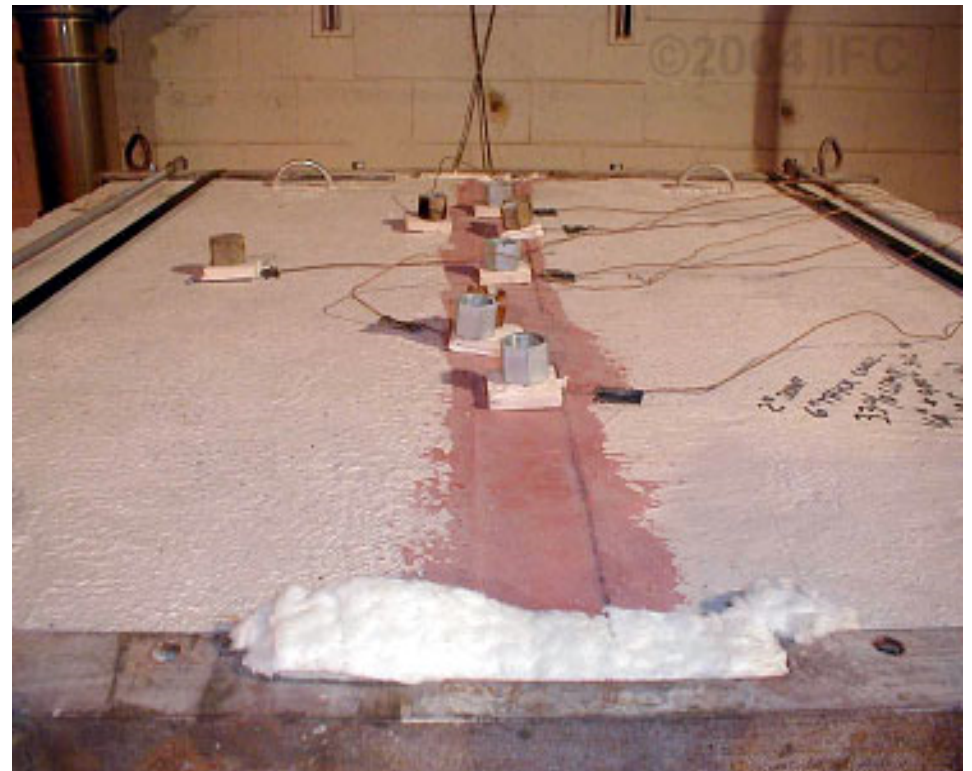


# Fire Resistive Joint Testing

*Head of Wall Joint*



*Floor to Floor Joint*




# Conditioning Prior to Fire Test


Movement Class	Min. No. of Cycles	Min. Cycling Rate (Cycles / Minutes)
Class I (Thermal)	500	1
Class II (Wind Sway)	500	10
Class III (Seismic)	100	30

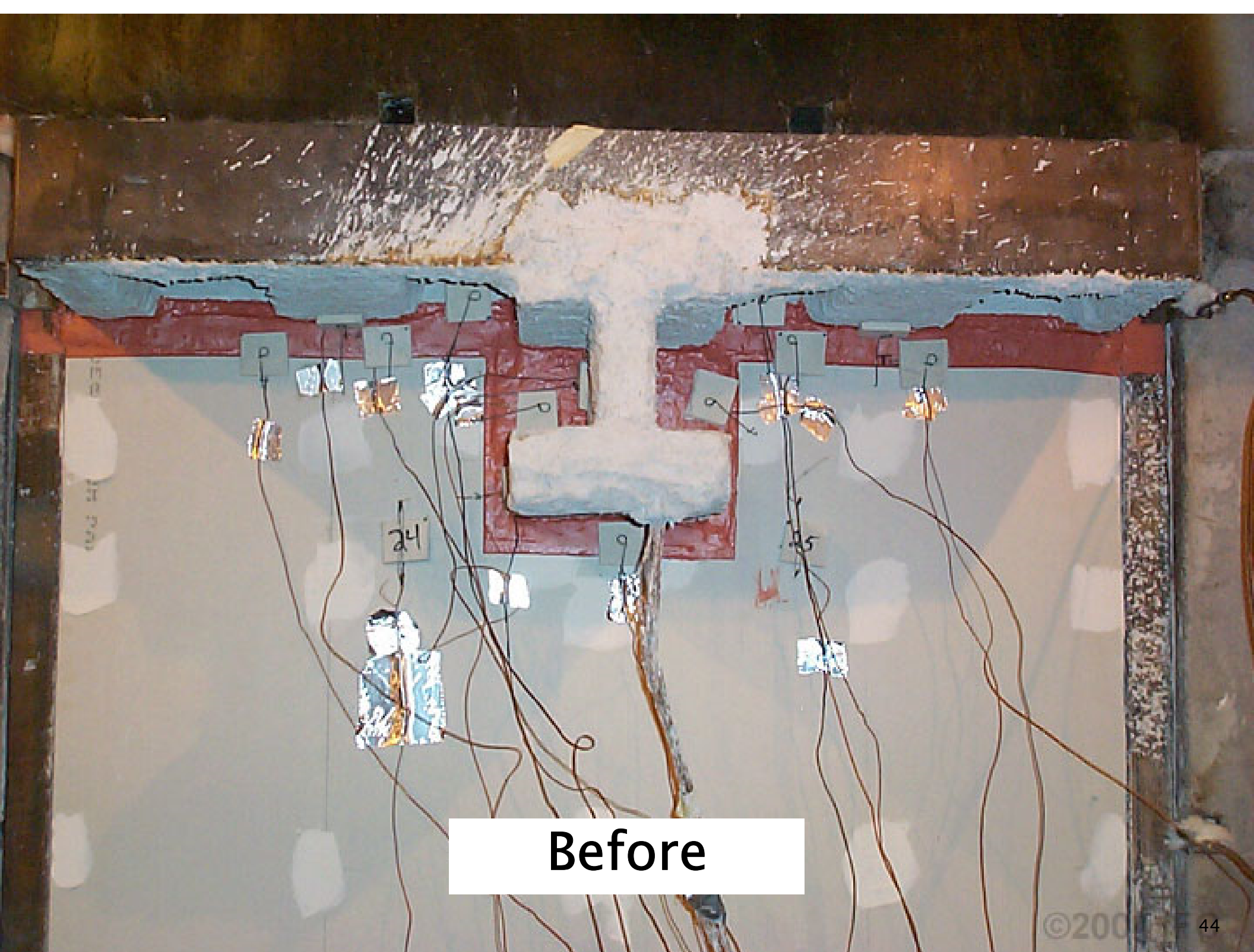


# New UL Test Method for Measuring Movement capabilities of Through Penetration Firestop Systems

- ▶ ASTM E3037 movement test for firestop Penetration systems are now called the “M Rating”
  - ▶ This movement cycling is independent of fire test
  - ▶ After movement tests still requires full compliance with the fire tests
  - ▶ The codes do not address this issue
- 

# Why do we need a New Firestop Movement Test

- ▶ Movement during construction and natural influences will happen.
  - ▶ Some examples are:
    - Thermal Expansion
    - Building Vibrations
    - Seismic activity
    - Building Settlement
    - Mechanical vibrations
    - Water Hammer
    - Wind forces
- 



Before

# Now that we understand testing of firestopping

How are they expressed?

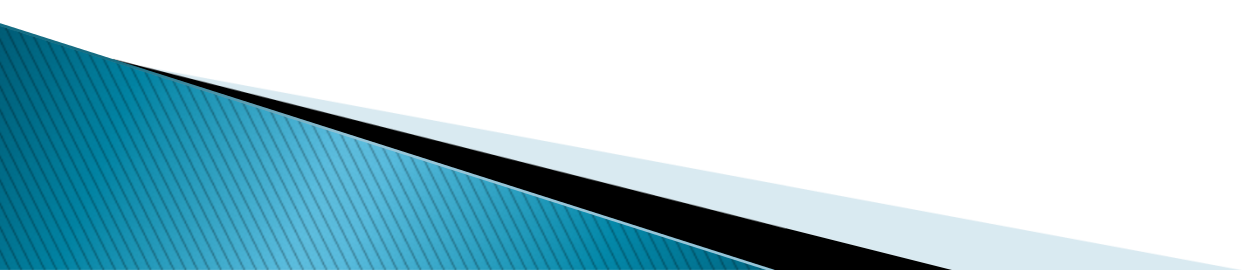
- ▶ Shop Drawings
- ▶ UL systems (or another lab)
- ▶ Design Listings

All are essentially “Firestop Systems”



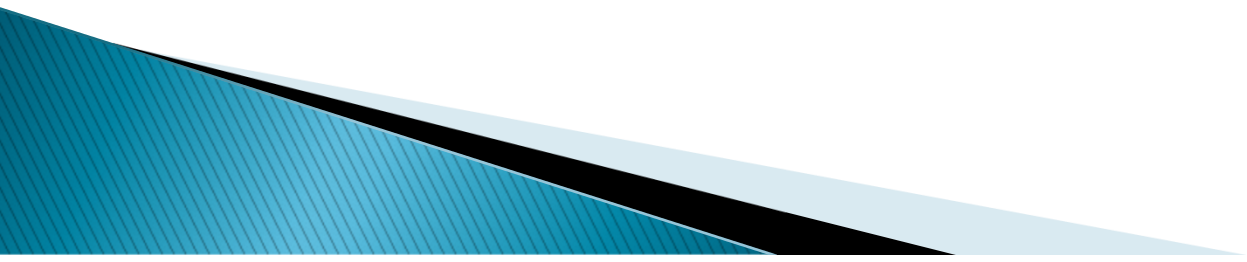
# Why should code officials require Tested and Listed Firestop Systems?

- Required by Code
- Cut down on fire and life safety risk
- Prevent a potential weak link or hole in the assembly
  - Provide required firestopping resistance
  - Meet ASTM requirements





# REACTION OF CONTRACTORS WHEN ASK FOR THE PAPERWORK OF THE TESTED, LISTED FIRESTOP SYSTEMS

1. Shock (Deer in the headlight look)
  2. Denial (We never had to do that in....)
  3. Irritation
  4. Negotiating
  5. Despair
  6. Consent
- 

# Evaluating Firestopping

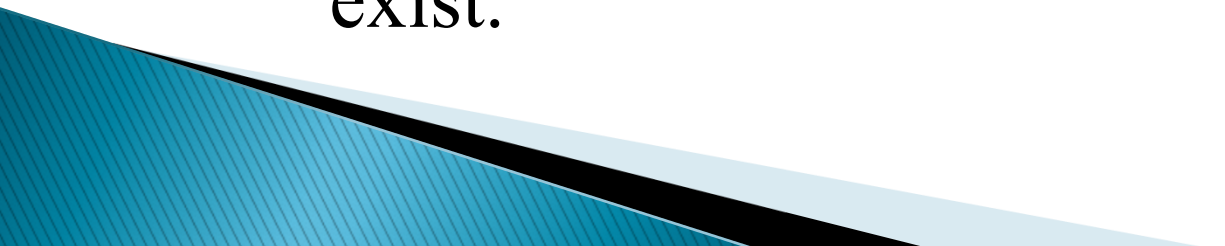
It is all about the  
**SYSTEMS**

## Points to remember

- Firestop materials are not systems
- Systems employ Firestop materials
- Products do not receive ratings,  
“Systems Do”

# Types of Approved Firestopping

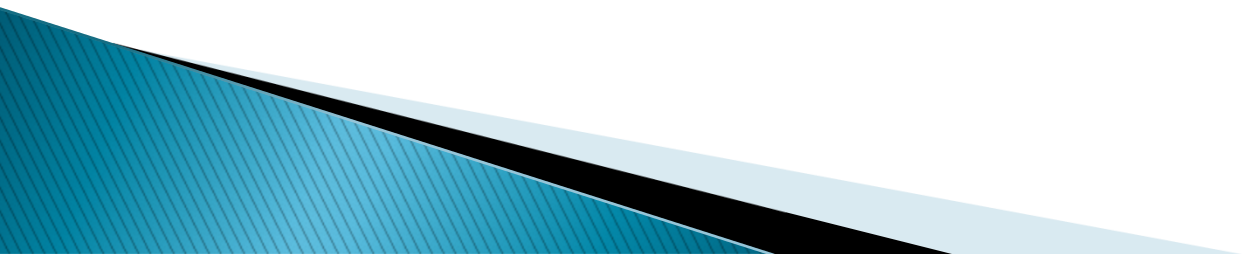
There are two kinds of Classifications:

- *TYPICAL (Tested and Listed)*: Those for which a third-party tested system exists.
  - *Engineering Judgement*: Those unique conditions when tested systems do not exist.
- 

# 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.
- ▶ They are also known as:
  - *Qualified Technical Judgment*
  - *Engineering recommendations*
  - *Alternative solutions*
  - *Manufactured Certified Installation Instructions*

# What are Some Variances to Tested and Listed Systems?

- ▶ Too many penetrating items
  - ▶ Annular space/gap too large or too small
  - ▶ Joint width
  - ▶ Movement
  - ▶ Oversized penetrating item
  - ▶ Oversized Insulation
  - ▶ Backing material
- 

# 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



# Engineering Judgments Cont.

- ▶ Contractor or architect typically initiates process
- ▶ Can be in letter and/or drawing
- ▶ AHJ makes decision on validity of engineering judgment letter and if approved, inspects construction for consistency with letter.

# Who Issues Engineering Judgments?

- Professional engineer
  - Fire protection engineer
  - Manufacturer
  - Testing laboratory
- ▶ Must be acceptable to the Building Official or the AHJ



# Are EJ's provided when tested listed systems are available?

Sometimes  
Maybe  
Yes-ish  
Perhaps  
Not always



*Maybe we should examine this further...*

# When are they acceptable?

- When tested systems do not exist.
- When modifying the application is unrealistic.
- When existing test data supports the interpolation.
- When the author has experience with the performance of the system and knowledge of the conditions.
- When issued only for a specific jobsite



# IFC Guidelines

- ▶ Two Documents
  - Recommended IFC Guidelines for Evaluating Firestop Systems in Engineering Judgments (EJs)
    - Covers firestops, joint systems and grease/air duct assemblies
  - Recommended IFC Guidelines for Evaluating Firestop Systems in Engineering Judgments (EJs) – Perimeter Fire Barrier Systems
    - Covers perimeter fire barriers systems (a.k.a. perimeter fire containment systems or perimeter joints)

<https://www.firestop.org/engineering-judgment-guidelines.html>

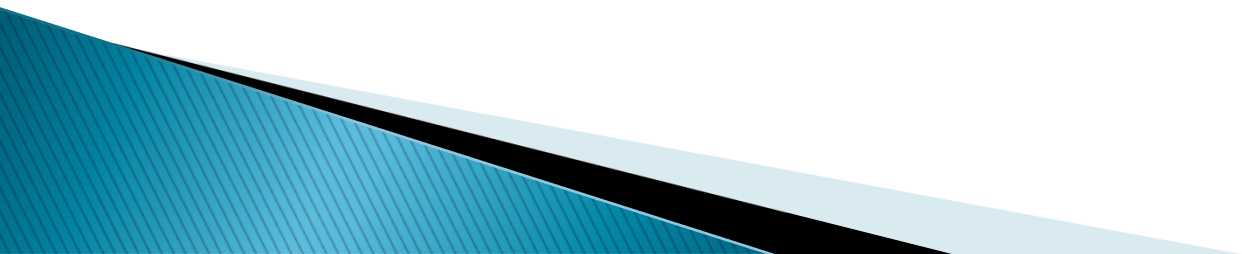
# Questions and General info on EJ's

- ▶ Should field inspectors approve Engineering Judgments?
- ▶ Is it ever appropriate to accept an Engineering Judgments if there are other tested listed systems?
- ▶ If develop policy for EJ's consider charging for each EJ that you review.



# PROCESS to find Tested Listed Systems or Engineers Judgment

- ▶ Always try to find Tested Listed System by employing ALL firestop manufactures
- ▶ If non exists, then develop Engineering Judgment that is the same fire resistance rated.



# General Discussion of EJ's

- ▶ EJ's Should Raise Flag
- ▶ Manufacturers provide EJ's even though there are Tested And Listed Systems from other manufactures.
- ▶ Often A Symptom Of Poor Planning
- ▶ Remember EJ's Are Untested!
- ▶ Increases Hopes and Paperwork; One piece of paper for every opening.
- ▶ In Renovation Or Unique Construction, A Necessary Evil
- ▶ May Increase Liability For Contractor



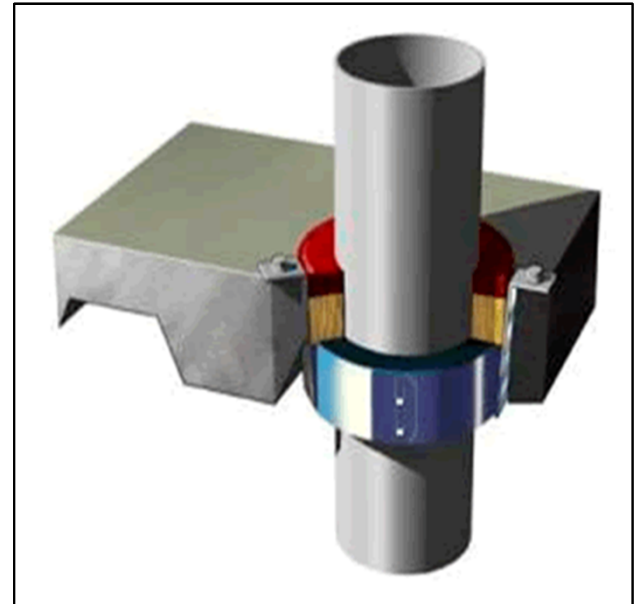
There are 3  
parts to a  
Listed  
Firestop  
System



# Penetration Firestop System

Consists of:

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



# Firestop System Materials

- ▶ **Sealants**
  - Silicone, Latex, Intumescent
- ▶ **Wrap Strips**
  - “Thick, Thin, Wide, Less Wide”
- ▶ **Putties**
- ▶ **Pillows**
- ▶ **Composite Sheets**
- ▶ **Bricks / Plugs**
- ▶ **Pre Fabricated Kits**
- ▶ **Mortar**
- ▶ **Spray Products**

# Code Requirements

## General – IBC Section 714

- 714.4. Penetrations into or through fire walls, fire barriers, smoke barrier walls and fire partitions shall be protected
- 714.5. Penetrations of horizontal assemblies not required to be protected by shaft enclosure shall be protected per Section 713.4
- 714.4.3 and 714.5.3. Noncombustible penetrants shall not be connected to combustible material beyond point of firestop system



# Code Requirements

## Wall Assemblies

- 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 E814
  - ▶ Exceptions:
    - Full Thickness of Concrete, grout or mortar
    - Annular space protection materials
- 714.4.1.2. When tested to ANSI/UL 1479 or ASTM E814, systems shall have F Rating equal to rating of wall penetrated

# Code Requirements

## Horizontal Assemblies

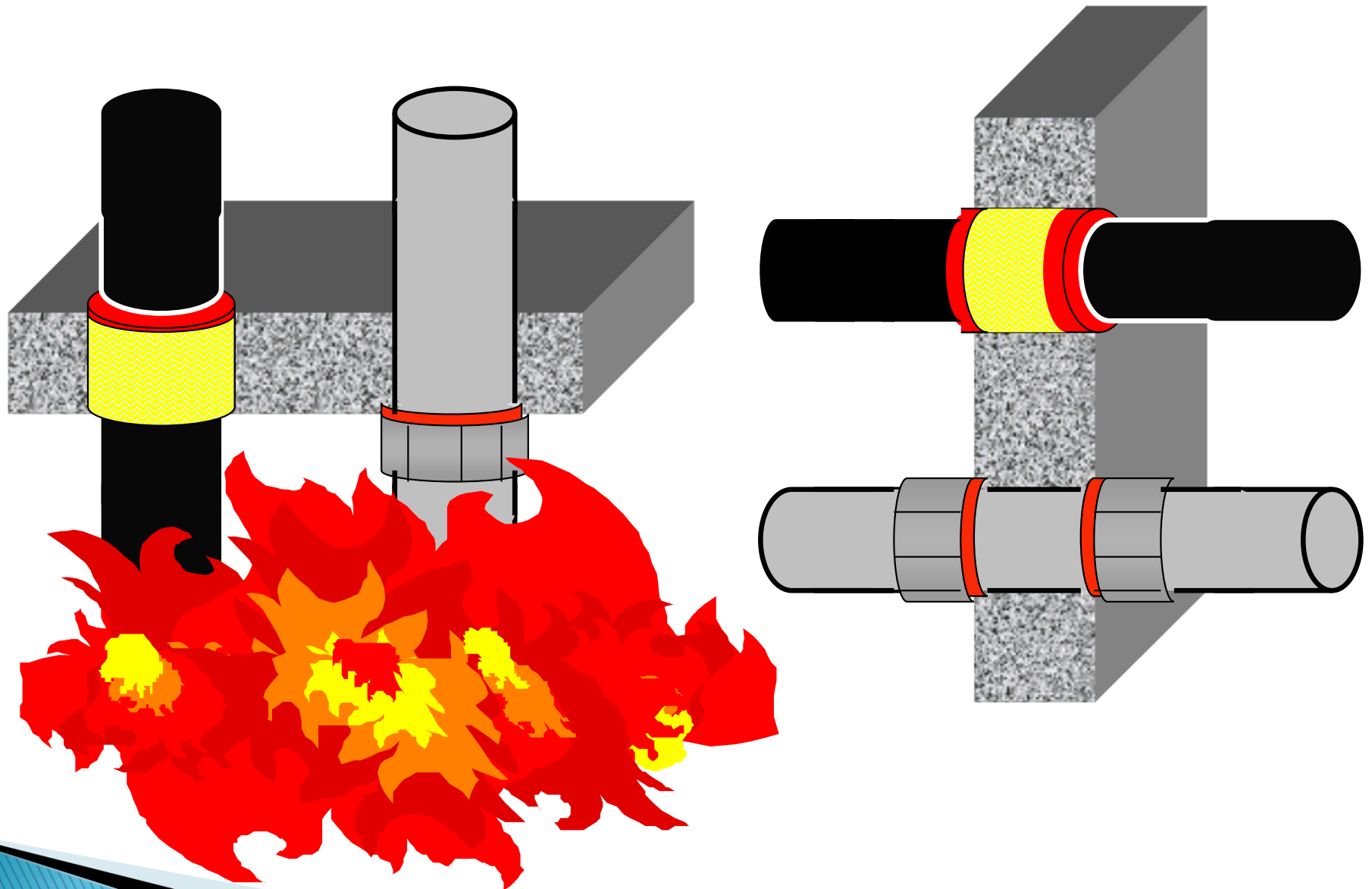
- 714.5.1. Through-penetration shall be protected by one of the following:
  - ▶ As tested as part of the entire horizontal assembly
  - ▶ As tested to UL 1479 / ASTM E814
  - ▶ Exceptions:
    - Annular space protection material
    - Concrete, grout or mortar
    - Listed electrical boxes (poke-throughs) of any material installed per listing

# Conditions of Acceptance T Rating

- ▶ No Passage of Flame
- ▶ Not to exceed 325°F Temperature Rise
- ▶ Hose Stream



# IBC – T Rating



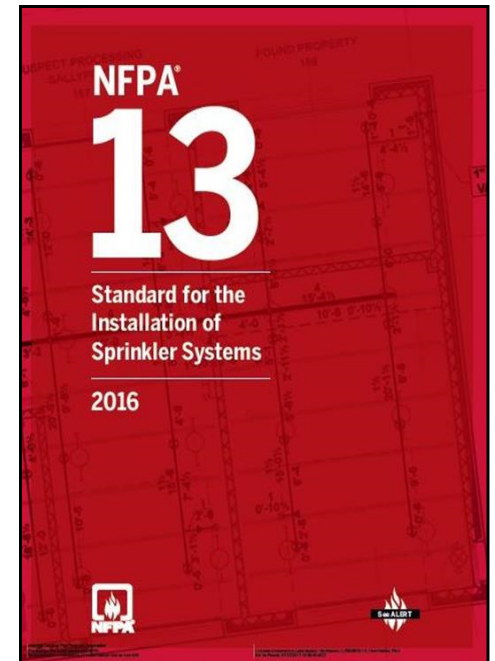
# IBC – T Rating

- ▶ Required for through- or membrane-penetrations of horizontal assemblies only
- ▶ Floor penetrations contained and located within the cavity of a wall either above or below the horizontal assembly do not require a T rating
- ▶ 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

# Sprinkler Pipe Considerations

## Metallic Sprinkler Pipe Penetrations:

- NFPA 13 Annular Space Limitations in Seismic Regions
  - ▶ If pipe  $\leq 3.5"$ , hole diameter shall be 2 in. larger than nominal pipe diameter
  - ▶ If pipe  $\geq 4"$ , hole diameter shall be 4 in. larger than nominal pipe diameter







The diagram illustrates a wellbore, represented by a vertical grey cylinder. To the left of the wellbore is a square area filled with a brown, grainy texture, representing a gravel pack. To the right is a larger rectangular area with the same texture, also representing a gravel pack. A red line with a circular endpoint points from the text 'Annular Space' to the gap between the wellbore and the right-hand gravel pack. At the bottom of the wellbore, there is a blue and black shaded area representing the wellbore floor or casing.

Annular Space

# Properly Tooled Penetrations

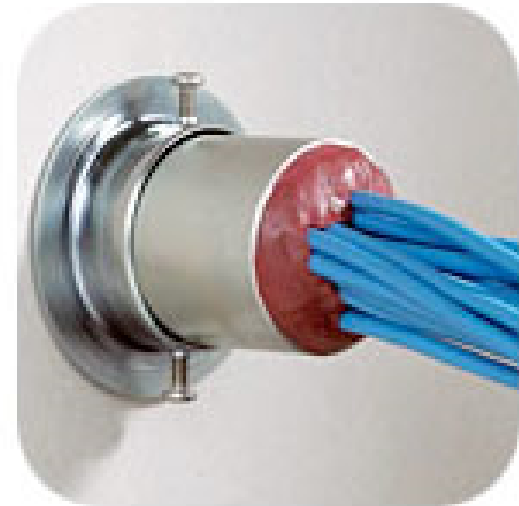
- ▶ The Firestop sealant must be well bonded to penetrating item and surrounding wall or floor
- ▶ Should always inspect both sides



# Sleeves

Sleeves are commonly used where penetration needs to be removed or changed frequently

- The sleeve need to be securely fastened to assembly
- Both the space between penetrant and annular space needs to be firestopped



# Steel Collars and Intumescent Wrap Strips

- ▶ Intumescent sealant expands and fills the void
- ▶ The collar expands to crush pipe



# Evaluating a Penetration

## **It is all about the SYSTEMS**

### **Points to remember:**

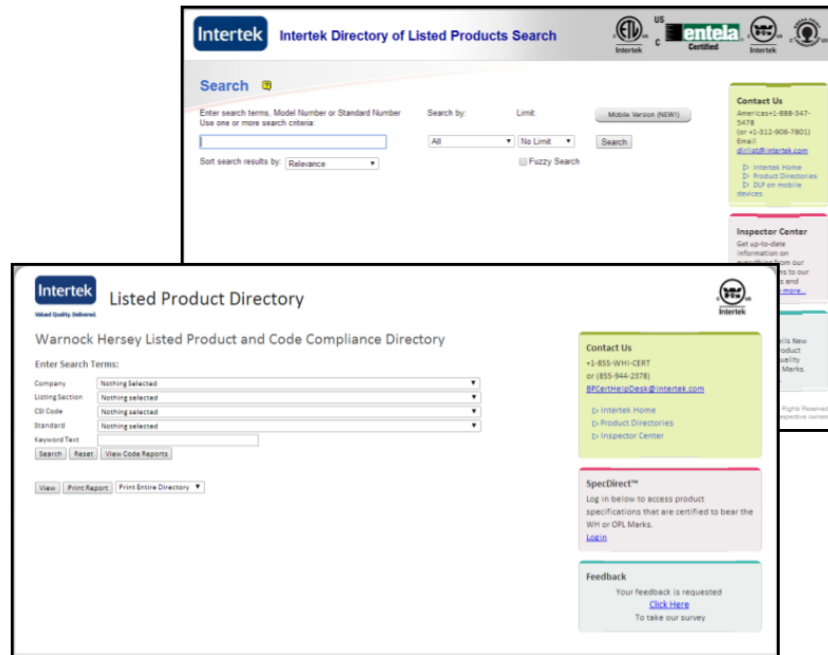
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- Systems employ firestop materials
- Products do not receive ratings,  
“Systems Do”

# Where Can I Find The Most Current Listings?

<https://ul.com/apps/product-ig> Take you to Product IQ

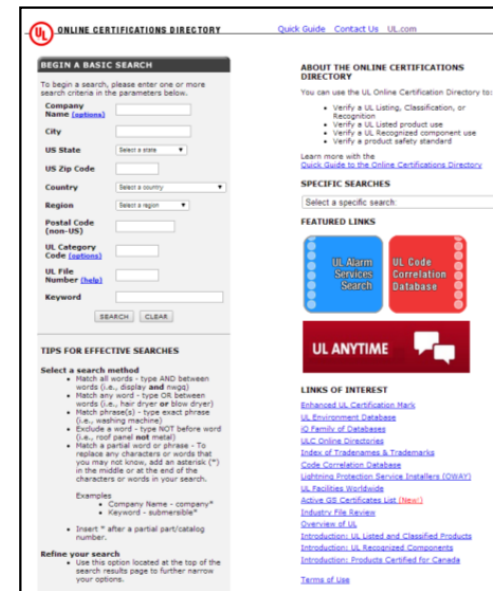
[www.ul.com/database](http://www.ul.com/database)

[www.intertek.com/directories/etl-listed-mark/](http://www.intertek.com/directories/etl-listed-mark/)



The image shows two screenshots of the Intertek website. The top screenshot is the 'Intertek Directory of Listed Products Search' page, which features a search bar, a 'Search' button, and a 'Mobile Version (NEW)' link. The bottom screenshot is the 'Listed Product Directory' page, which displays a search form with fields for Company, Listing Section, CUL Code, and Standard. It also includes a 'Search' button, a 'View Code Reports' button, and a 'Print' button. The page also features a 'Contact Us' section with a phone number and email, and a 'SpecDirect™' section with a login link.

[whdirectory.intertek.com/](http://whdirectory.intertek.com/)

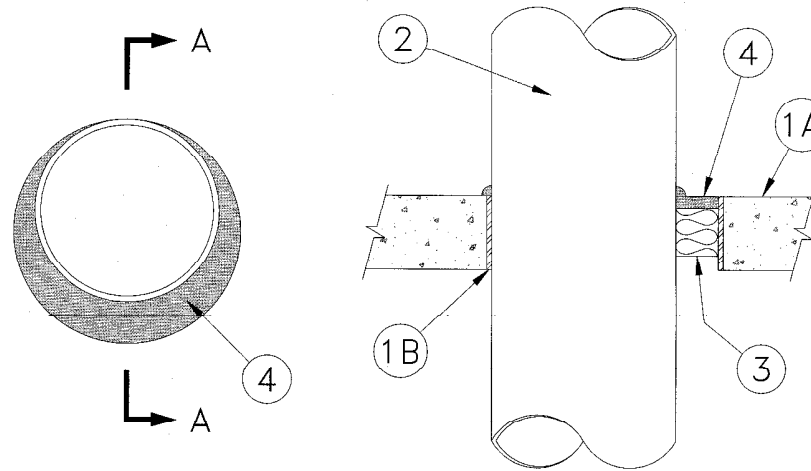


The image shows the 'UL ONLINE CERTIFICATIONS DIRECTORY' page. It features a 'BEGIN A BASIC SEARCH' section with a search bar and a 'Search' button. The search criteria include Company Name, City, US State, US Zip Code, Country, Region, Postal Code, UL Category Code, UL File Number, and Keyword. There is also a 'SPECIFIC SEARCHES' section with a 'Select a specific search' dropdown. The page includes a 'FEATURED LINKS' section with buttons for 'UL Norm Services Search' and 'UL Code Correlation Database'. There is also a 'LINKS OF INTEREST' section with various links to UL resources.



F Ratings  
T Ratings

– 3 Hr  
– 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.

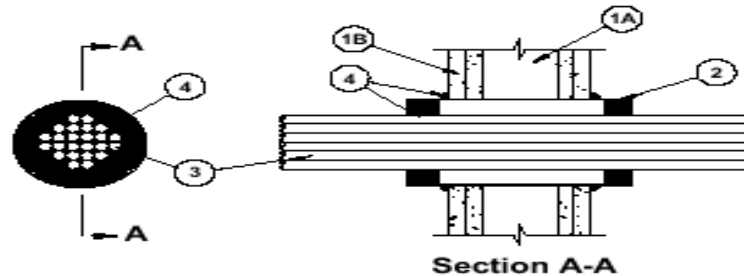
**3. Packing Material** – Mineral wool insulation of min 4 pcf firmly pressed into opening as a permanent form. Insulation material to be recessed by min depth of 1/2 in. from top surface of floor or both surfaces of wall.

**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. **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 and series shall be as specified in the individual U300 or U400 Series Wall or Partition Designs in the UL Fire Resistance Directory.
2. **Steel Sleeve** — Nom 4 in. diam (or smaller) steel electrical metallic tubing (EMT) or Schedule 40 (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 pairs No. 24 AWG (or smaller) copper conductor cable with polyvinyl chloride (PVC) jacketing and insulation.
  - B. Max 3 No. 10 AWG (or smaller) copper conductor cable with PVC insulation and jacket.
  - C. Max 3 No. 8 AWG (or smaller) copper conductor cable with 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 Hytrel 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 be applied at the gypsum wallboard/steel sleeve interface on both sides of the wall.
 

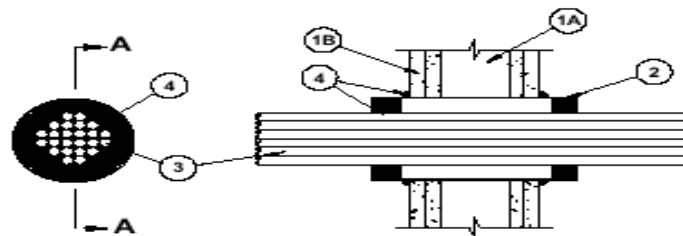
**Specified Technologies Inc. — SpecSeal Series 100 or Series LC Sealant**

\*Bearing the UL Classification Marking

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Created or Revised: 01/01/00  
Specified Technologies, Inc., Somerville, NJ (800) 992-1180

FOD-3258

# For the Building / Fire Official



## UL Systems serve two roles:

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. l
  - B. **Wall** — thickr Series
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:
  - A. Max insu
  - B. Max jack
  - 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 be applied at the gypsum wallboard/steel sleeve interface on both sides of the wall.  
**Specified Technologies Inc. — SpecSeal Series 100 or Series LC Sealant**

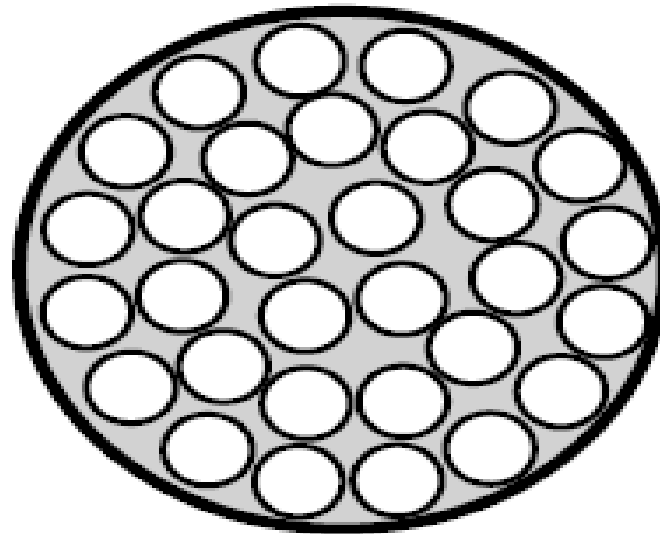
\*Bearing the UL Classification Marking

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FOD-3256

## **Fig. 2: Cable Loading...**

**Visually Full... Half Empty By Calculation!**



**Let's calculate the cable loading of this opening:**

Diameter of Opening = 4"

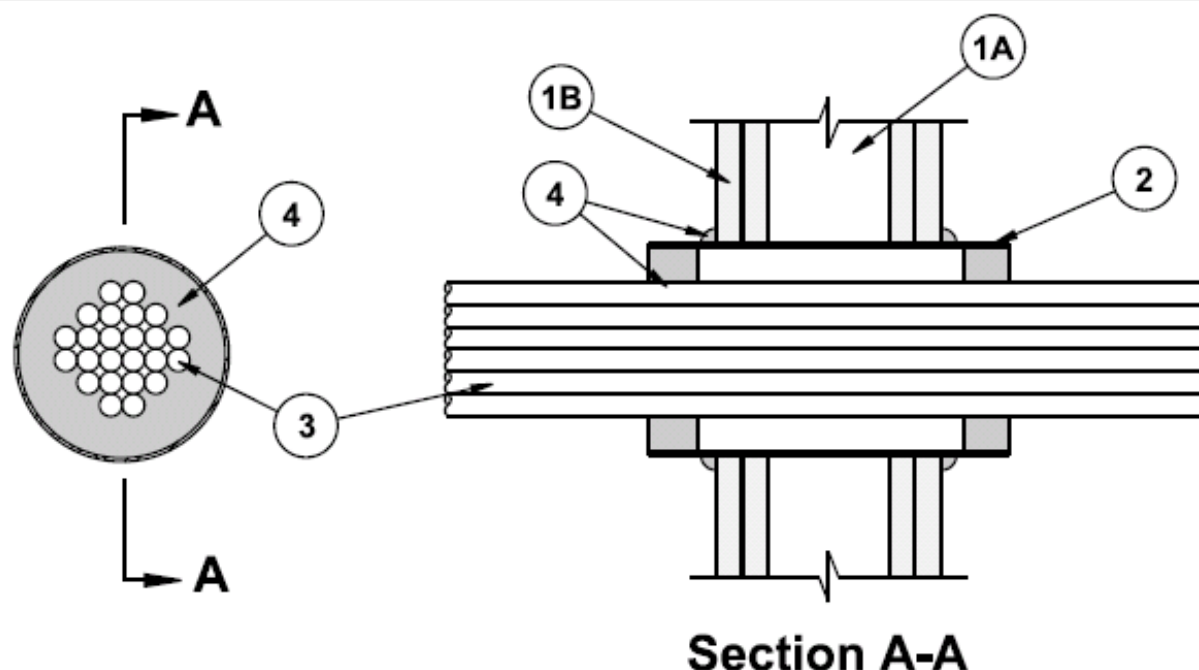
Diameter of Cables = 5/8" (.625")

Number of Cables (N) = 21

Area of Opening (A) =  $\pi r^2$  or  $3.1416 \times 2^2 = 12.57$  sq. in.

Area of Cables (C) =  $\pi r^2$  or  $3.1416 \times .3125^2 = .307$  sq. in.

Cable Loading =  $\frac{C \times N}{A} = \frac{.307 \times 21}{12.57} = 51\%$

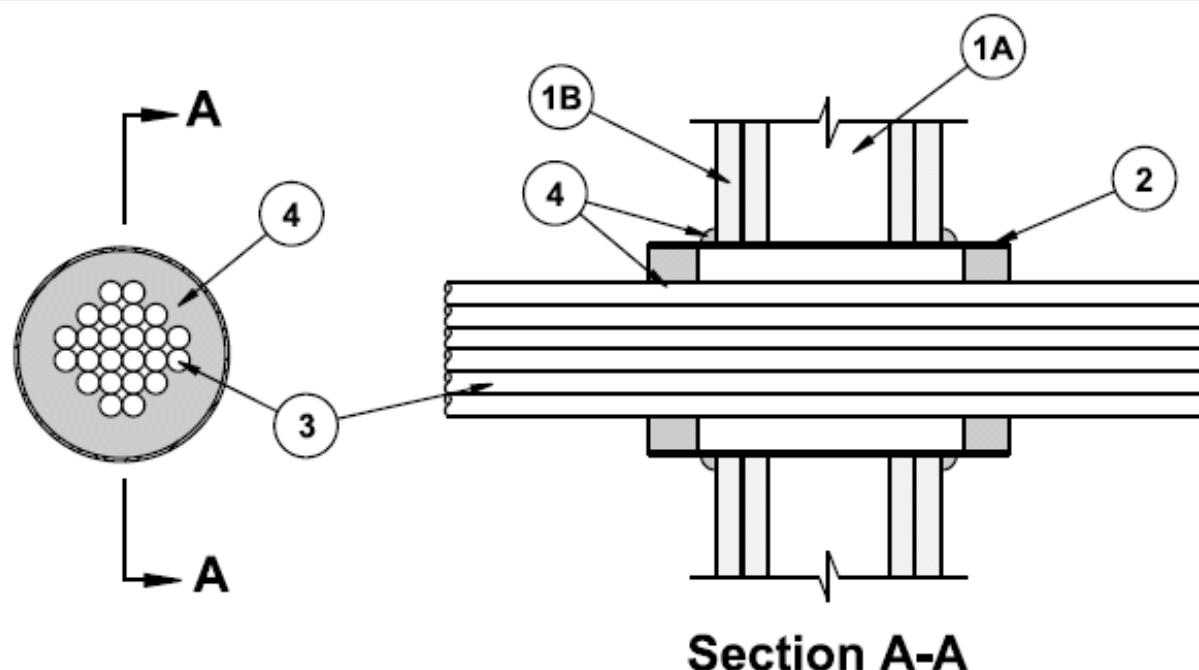


**System No. W-L-3132**  
**F Ratings — 1 and 2 Hr (See Item 1)**  
**T Rating — 0 Hr**

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.





**System No. W-L-3132**

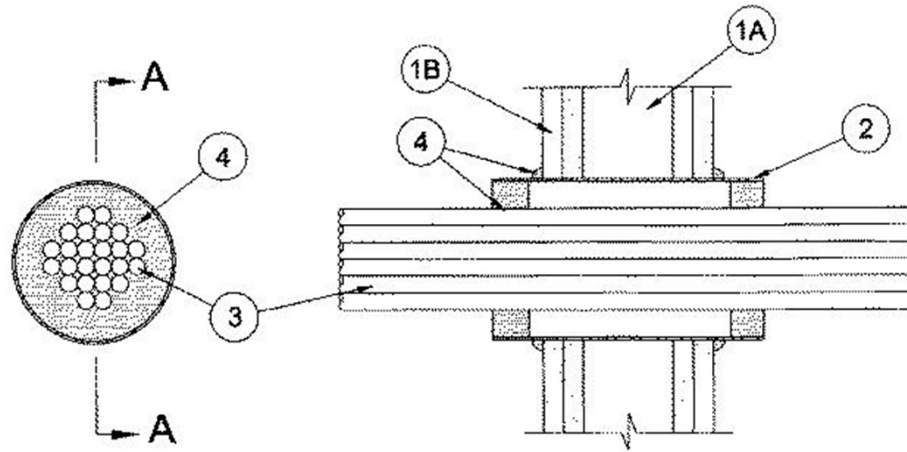
F Ratings — 1 and 2 Hr (See Item 1)

T Rating — 0 Hr

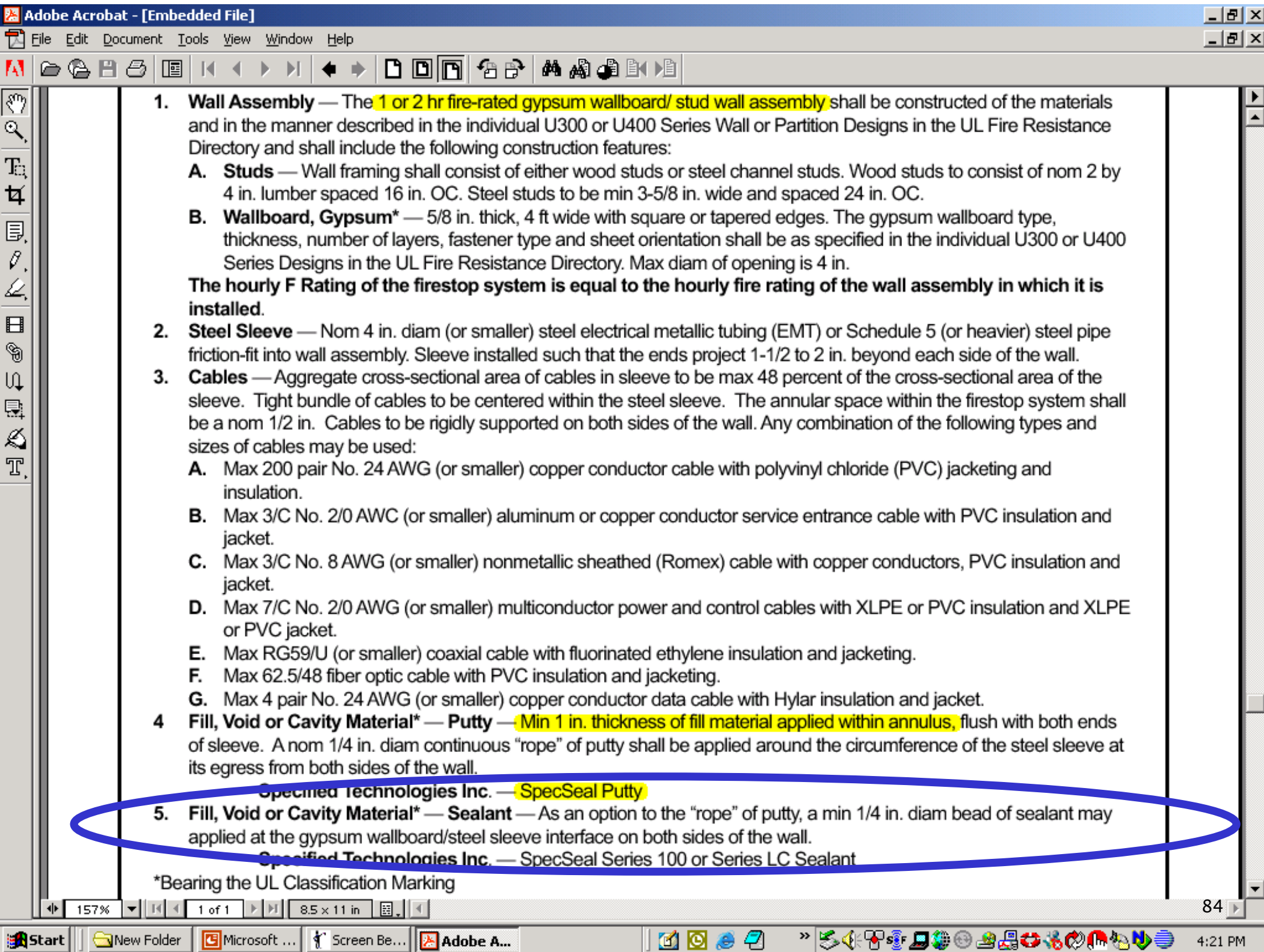
1. **Wall Assembly** — The 1 or 2 hr fire-rated gypsum wallboard/ stud wall assembly shall be constructed of the materials and in the manner described in the individual U300 or U400 Series Wall or Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
  - 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.





- ▶ 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.



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  - 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 be 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

# Factors Affecting Penetrations

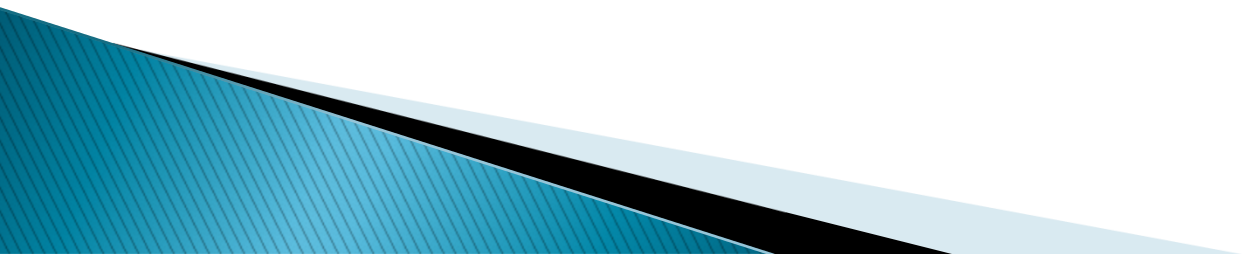
- Floor or wall construction type and thickness
- Size and shape of opening
- Size and type of penetrating item(s)
- Percent fill of cables
- Annular space
- Rating requirement
- Firestopping materials



# Membrane Penetrations

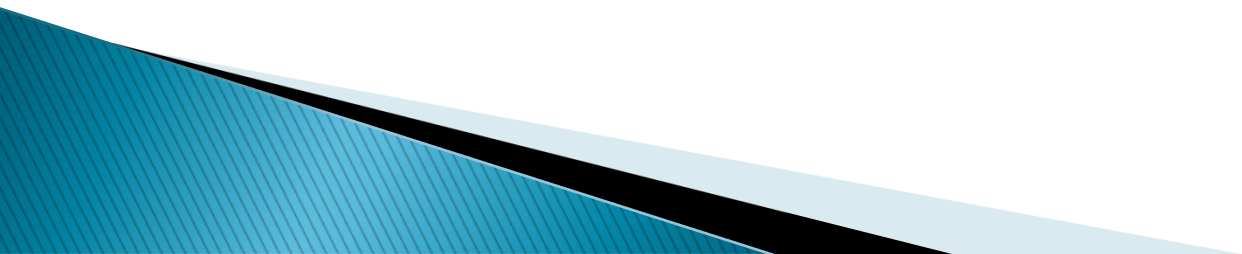
714.4.2. Membrane penetrations shall comply with Section 714.4.1. Where walls or partitions are required to have a *fire-resistance rating*, recessed fixtures shall be installed such that the required fire-resistance will not be reduced.

Exceptions:



# Methods to address Membrane penetrations

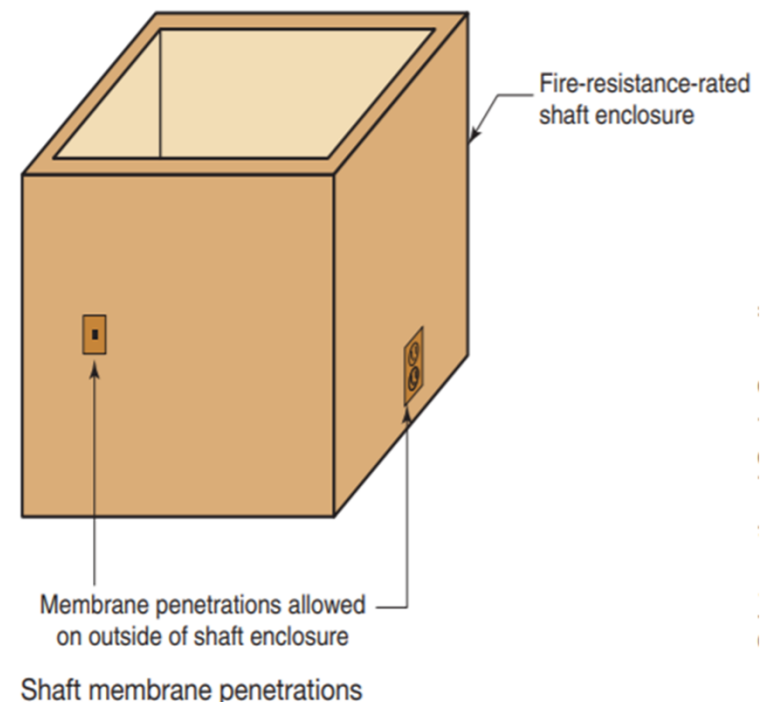
- Meet the exceptions such as Electrical boxes
- Tested as part of the assembly according to ASTM E814 or UL1479





# Membrane Penetrations – Exceptions for Walls

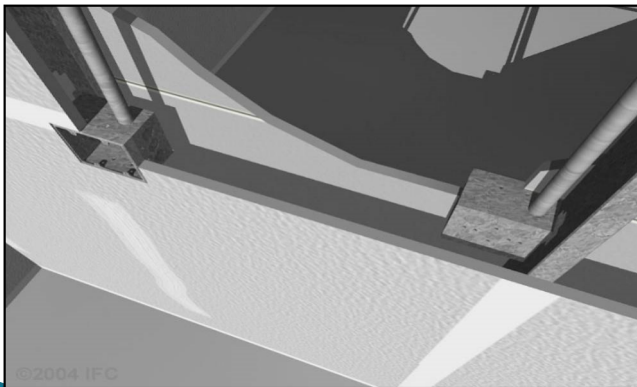
- ▶ 2018 code change for Membrane Penetrations of Shaft enclosures
  - Membrane penetrations not related to the purpose of a shaft enclosure are no longer prohibited from penetrating the outside of the enclosure.





# Membrane Penetrations – Exceptions for Walls Cont.

- Electrical boxes
- Boxes other than electrical such as washing machine hose connections, manual fire alarm pull boxes, dryer exhaust boxes, electrical panel boards, etc.
- Sprinkler penetrations



# Membrane Penetrations – Exceptions for Horiz. Assemblies

- Steel, ferrous or copper conduits, pipes, tubes or vents of small sizes
- Electrical boxes
- Sprinkler penetrations
- Noncombustible cast-in-place elements
  - Double top plates of 1 or 2 hr walls sheathed with Type X gypsum board with protected penetrations
  - Listed luminaire and luminaires protected with listed materials




# Membrane Penetration – Sprinkler Penetrations

- Fire sprinkler with a metal escutcheon plate covering annular space
- Needs to be firestopped if air leakage rating is required



# Membrane penetrations by boxes other than electrical boxes Exception 4

- Such as washing machine hose connection boxes, hose cabinets, manual fire alarm pull boxes, dryer exhaust boxes, electrical panel boards, etc.
  - As tested in accordance with ASTM E814 or UL 1479
  - Requires both an F and a T rating
  - Be installed in accordance with their listing.
- 

# Code Requirements

## Wall Assemblies

- 714.4.2. Installed such that the required fire resistance will not be reduced:
  - Metallic boxes installed per prescriptive information, or as tested and listed
  - Nonmetallic boxes installed as tested and listed
- Note: There are no approved systems for Electrical boxes that are back to back

# Metallic Electrical Outlet Boxes in Walls

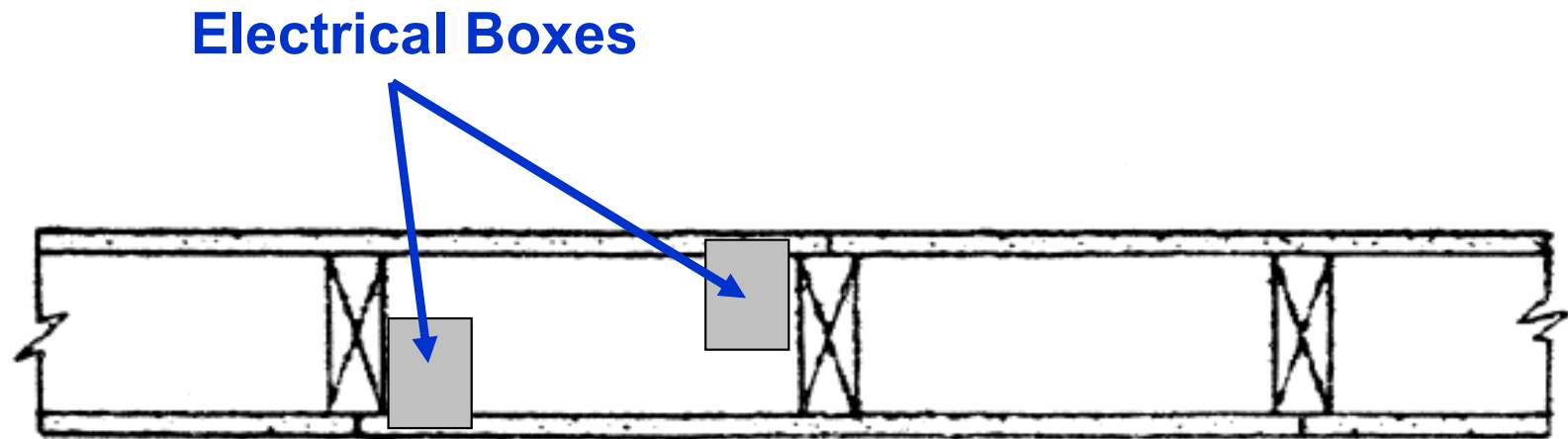
- Metallic boxes installed per code
  - ▶ Maximum 16 sq in. outlet box
  - ▶ Maximum 100 sq in. of opening on each side of wall per 100 sq ft of wall area
  - ▶ Maximum 1/8 in. annular space between wall membrane and box
  - ▶ Boxes on opposite sides of wall shall be separated
    - Horizontally by minimum 24 in.,
    - Horizontally by a distance not less than the depth of the wall where the cavity is filled with cellulose loose-fill, rockwool or slag mineral wool, or
    - By fireblocking



# Metallic Electrical Outlet Boxes in Walls Cont.

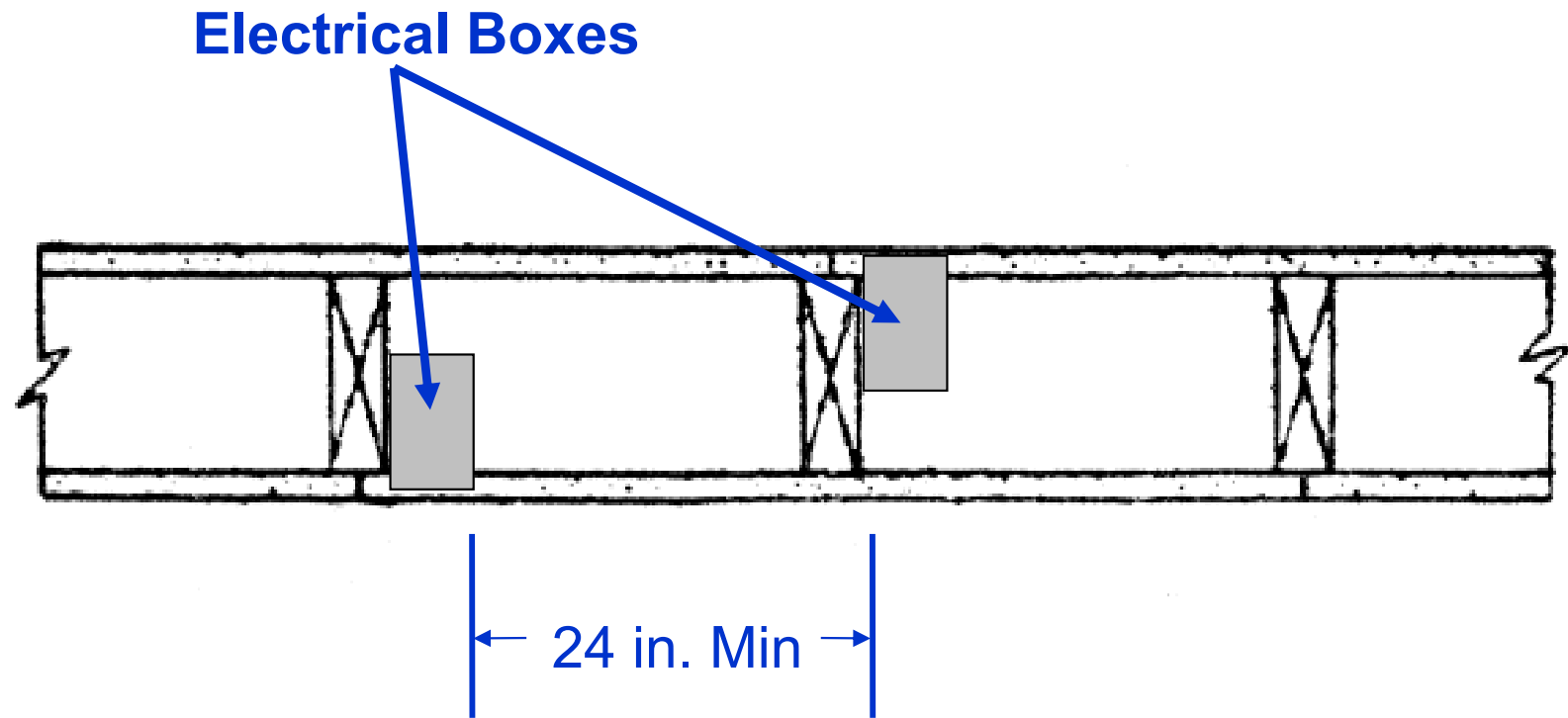
- ▶ Installation not complying with these prescriptive requirements shall be installed as tested and listed
  - Putty pads
  - Other listed materials and methods
    - Insert pads
    - Gaskets

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



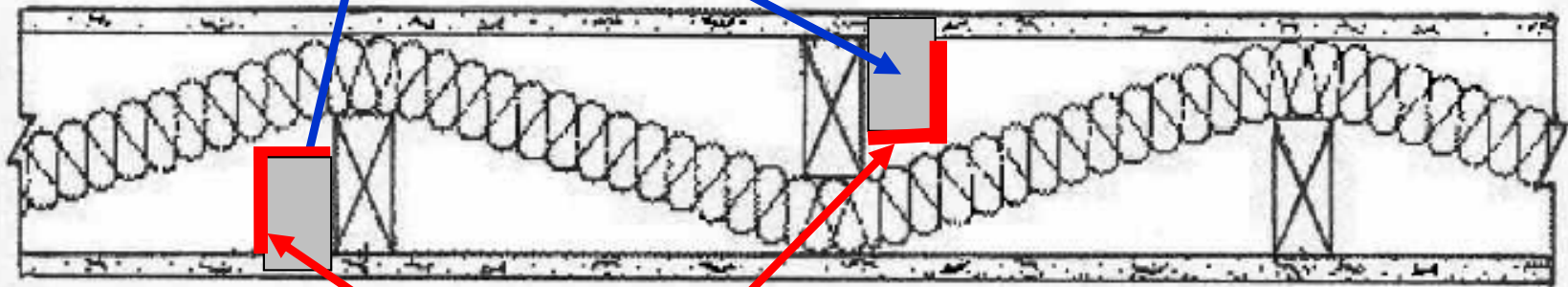
**Non-Compliant**

# Metallic Electrical Boxes in Wall with Minimum 24 in. Spacing



# Metallic Electrical Boxes in Staggered Stud Walls with Protection

**Electrical Boxes**



**Putty Pads, Insert Pads or Gaskets  
(CLIV / QCSN), or other methods**

# Electrical Box Protection

## Intumescent Putty Pads, Insert Pads or Gaskets



Preparation: Free from dirt, grease, oil, or loose materials....

# Electrical Box Protection

- Intumescent Putty Pads should overlap onto any conduits or attachments
- The minimum overlap is specified in the firestop systems listing
- They should be securely adhered to the recessed box and this application should be verified





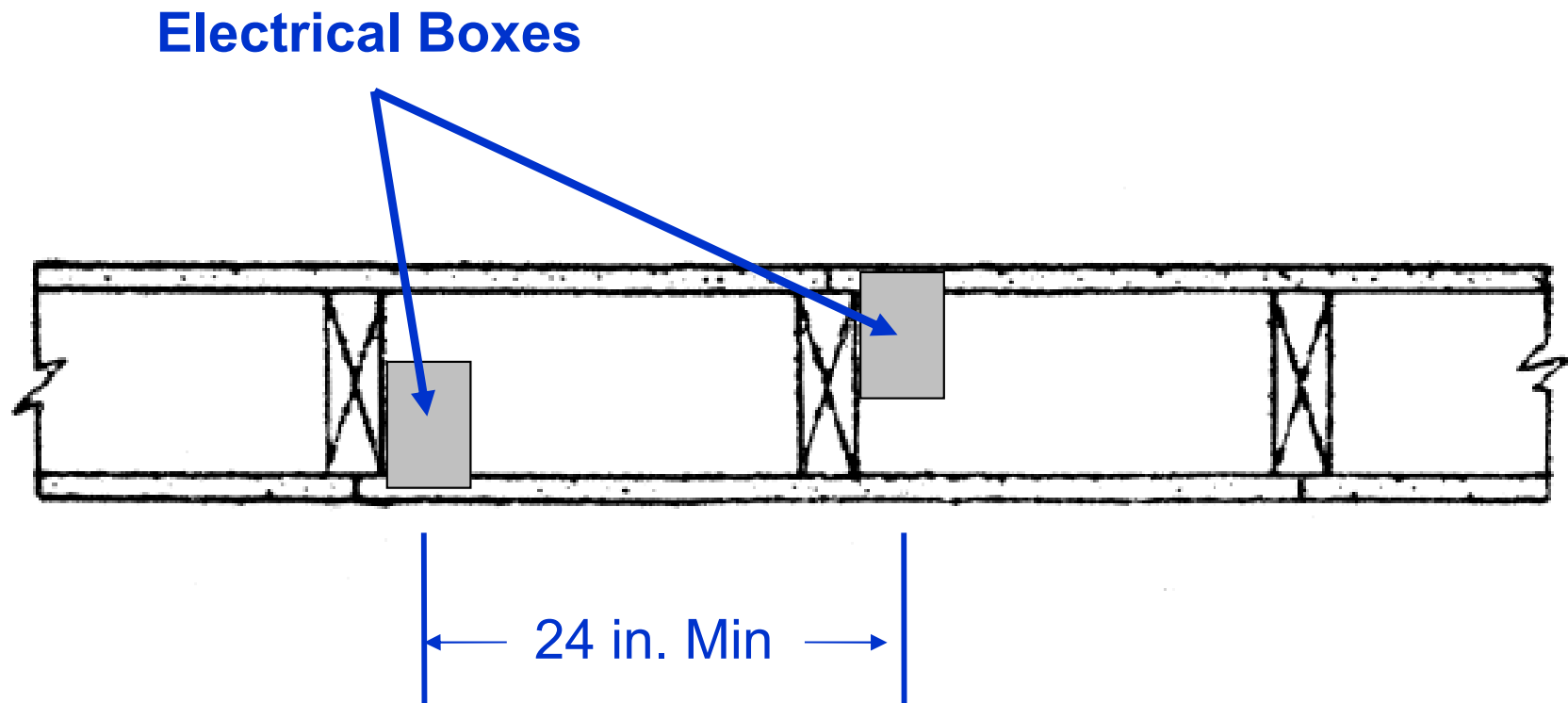
# Nonmetallic Electrical Outlet Boxes in Walls

- Nonmetallic boxes installed as tested and listed
- Boxes can be of any material
- Maximum 1 / 8 in. annular space between wall membrane and box

# Nonmetallic Electrical Outlet Boxes in Walls

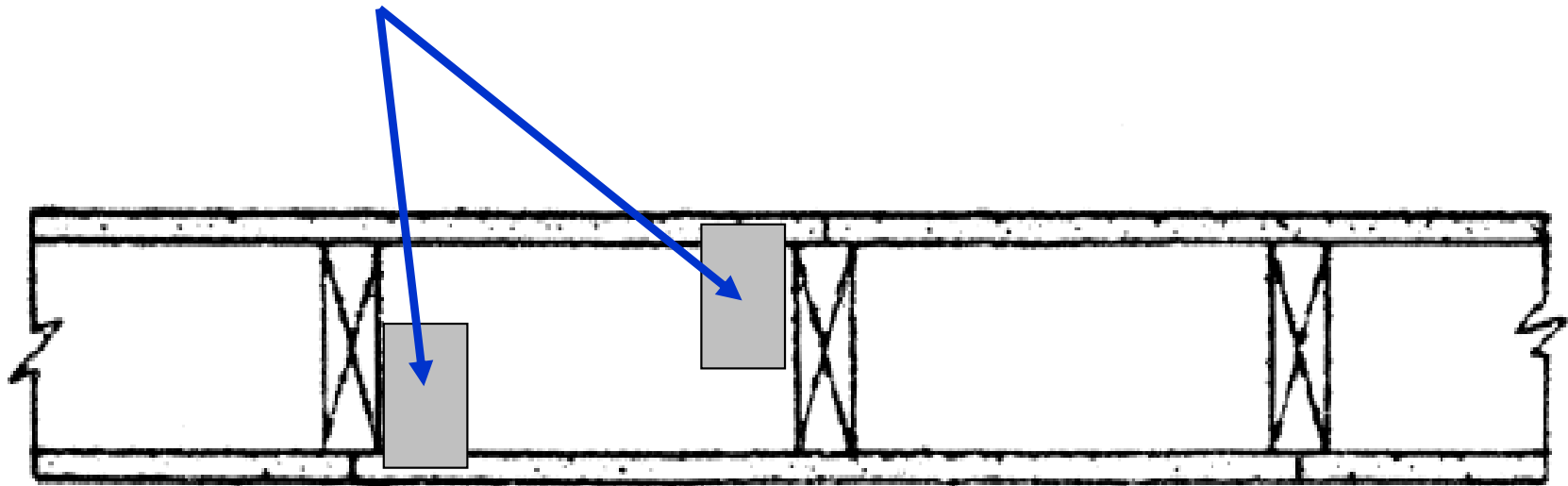
- Boxes on opposite sides of wall shall be separated
  - ▶ As specified in their listing,
  - ▶ By fireblocking,
  - ▶ By listed putty pads, or
  - ▶ By other listed materials and methods
    - Insert pads
    - Gaskets

# Listed Nonmetallic Electrical Boxes in Wall with Minimum 24 in. Spacing



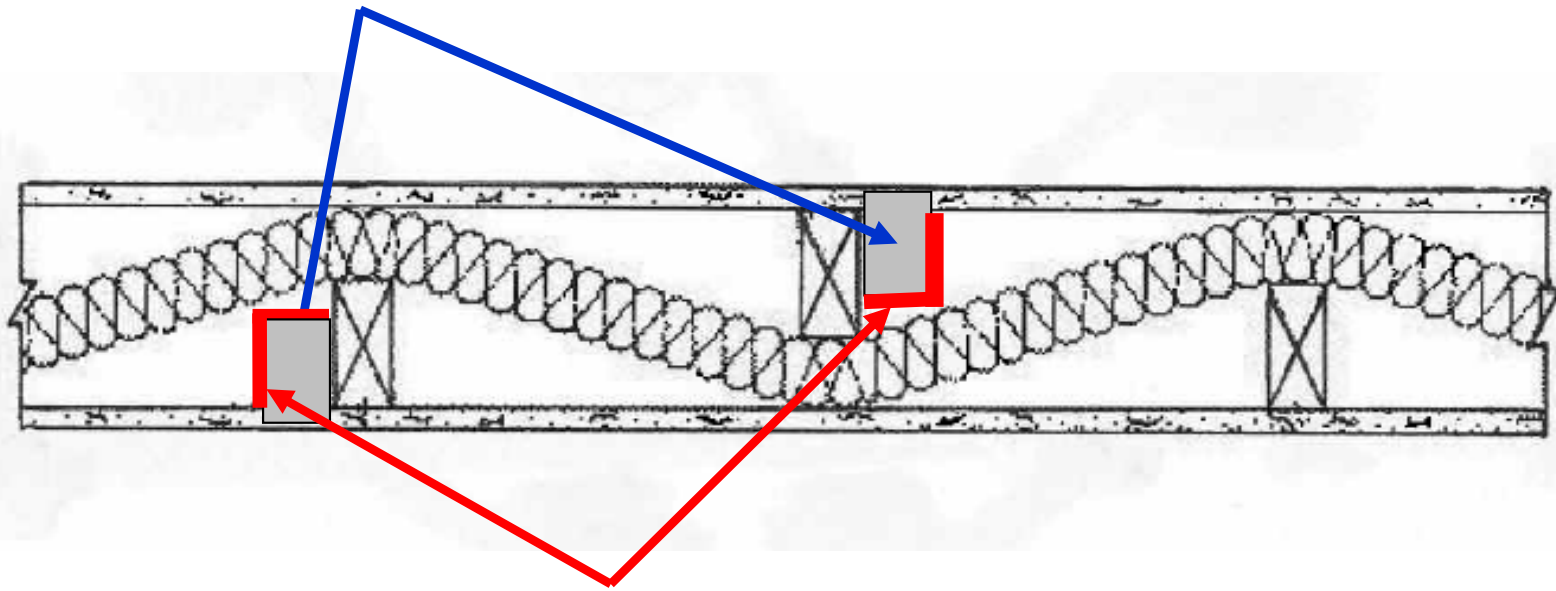
# Listed Nonmetallic Electrical Boxes in Wall at Reduced Spacing Per Listing

**Electrical Boxes**



# Listed Nonmetallic Electrical Boxes in Staggered Stud Walls Per Listing

**Electrical Boxes**



**Putty Pads, Insert Pads or Gaskets  
(CLIV / QCSN), or other methods**

# Code Requirements

## Horizontal Assemblies

- 714.5.2. Installed such that the required fire resistance will not be reduced:
  - ▶ Metallic boxes installed per prescriptive information, or as tested and listed
  - ▶ Nonmetallic boxes installed as tested and listed



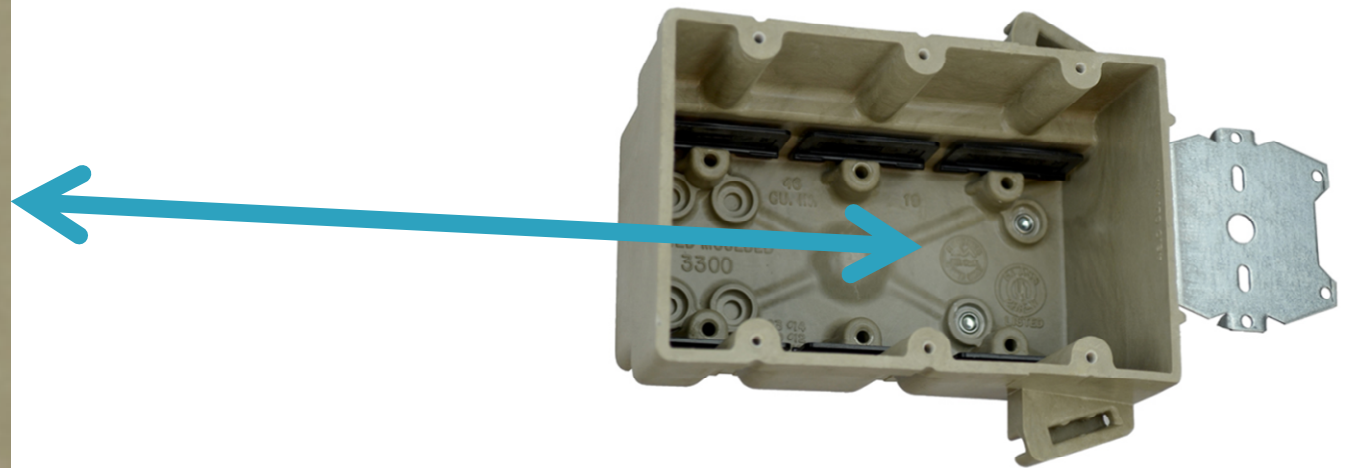
# Metallic Electrical Outlet Boxes in Ceilings

- 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 installed as tested and listed

# Nonmetallic Electrical Outlet Boxes in Ceilings

- Nonmetallic boxes installed as tested and listed
- Maximum 1 / 8 in. annular space between ceiling membrane and box
- Boxes need to be marked with the UL in a circle located in the box
- Box will have the hourly rating and F, W, and/or C, where F=Floor, W=Wall, and C=Ceiling

# UL Marking on Nonmetallic Outlet Boxes



Box will have the hourly rating and F, W, and/or C, where:

W = Wall boxes

C = Ceiling boxes

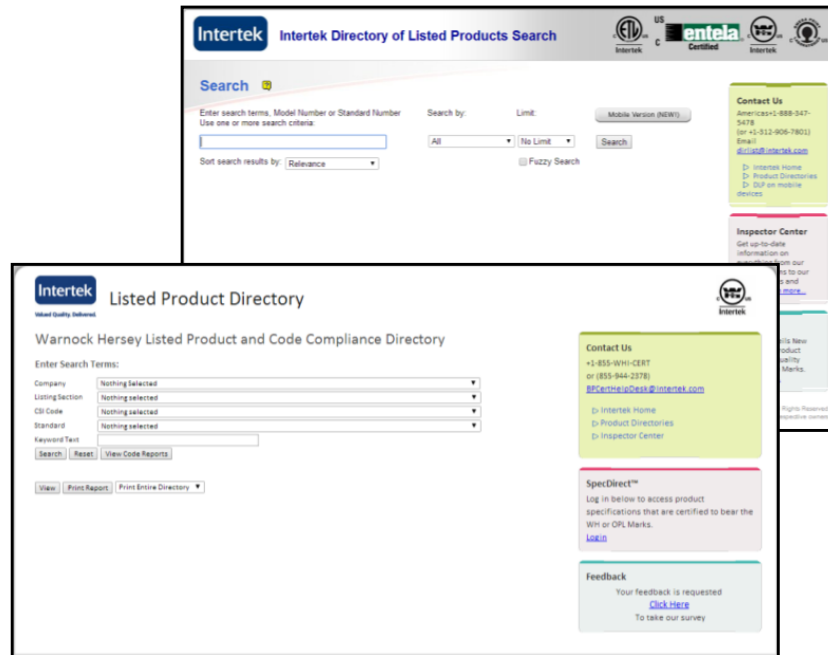
F = Floor boxes

# Where Can I Find The Most Current Listings?

<https://ul.com/apps/product-ig> Take you to Product IQ

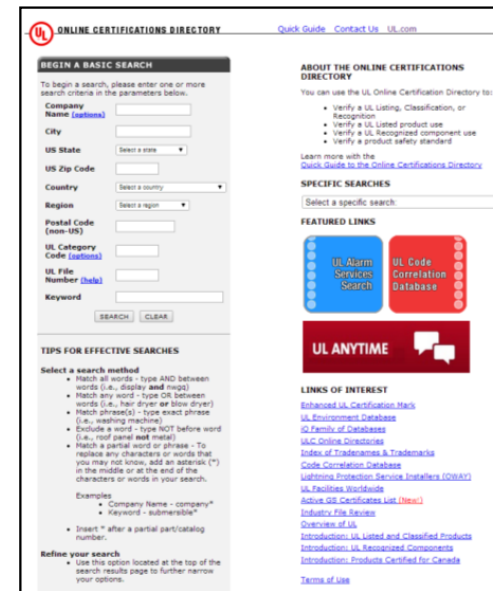
[www.ul.com/database](http://www.ul.com/database)

[www.intertek.com/directories/etl-listed-mark/](http://www.intertek.com/directories/etl-listed-mark/)



The image shows two screenshots of the Intertek website. The top screenshot is the 'Intertek Directory of Listed Products Search' page, which features a search bar, a 'Search' button, and a 'Mobile Version (NEW)' link. The bottom screenshot is the 'Listed Product Directory' page, which displays a search form with fields for Company, Listing Section, CUL Code, and Standard. It also includes a 'Search' button, a 'View Code Reports' button, and a 'Print' button. The page also features a 'Contact Us' section with a phone number and email address, and a 'SpecDirect™' section with a login link.

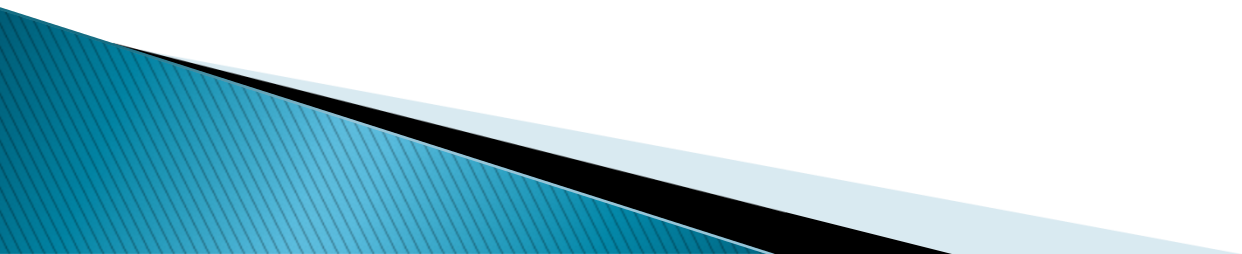
[whdirectory.intertek.com/](http://whdirectory.intertek.com/)



The image shows the 'UL ONLINE CERTIFICATIONS DIRECTORY' page. It features a 'BEGIN A BASIC SEARCH' section with a search bar and a 'Search' button. The search criteria include Company Name, City, US State, US Zip Code, Country, Region, Postal Code, UL Category Code, UL File Number, and Keyword. There is also a 'SPECIFIC SEARCHES' section with a 'Select a specific search' dropdown. The page includes a 'FEATURED LINKS' section with buttons for 'UL Norm Services Search' and 'UL Code Correlation Database'. A 'LINKS OF INTEREST' section lists various resources like 'Advanced UL Certification Mark', 'UL Environment Database', 'UL Family of Databases', 'ULG Online Directories', 'Index of Trademarks & Trademarks', 'Code Correlation Database', 'Lightning Protection Service Installers (LPSI)', 'UL Facilities Worldwide', 'Active UL Certificates List (New)', 'Industry File Review', 'Overview of UL', 'Introduction: UL Listed and Classified Products', 'Introduction: UL Recognized Components', 'Introduction: Products Certified for Canada', and 'Terms of Use'.

# Product iQ – UL's New Online Directory

---

- ▶ Replaces the old Online Certifications Directory which was developed in 1999
  - ▶ Identifies Certified products, designs, systems, assemblies and constructions
  - ▶ Helps you achieve code compliance
  - ▶ Is continuously updated
  - ▶ Requires registration to create user account
  - ▶ Basic Service – no charge for use
- 

# UL Product iQ – [www.ul.com](http://www.ul.com)

UL Offerings Insights News Events About UL Resources Search

## Featured tools

**TOOL**

**Product iQ™**

Engineers, product developers and other professionals can use Product iQ to verify UL certification of products and components, locate UL guide information and search for alternative products they can trust.

**TOOL**

**Prospector®**

Whether you're looking for technical data, product documentation, global supplier contact lists or wanting to request product samples, Prospector has you covered.

**DATABASE**

**SPOT Product Database**

As one of the world's leading databases to identify credible and sustainable products, SPOT® makes it easy to source the right products for your next project.

**TOOL**

**myUL™ Client Portal**

myUL is a secure, self-service tool designed to provide increased visibility into your UL projects and services. The myUL Client Portal is replacing myHome.



# Guide Information

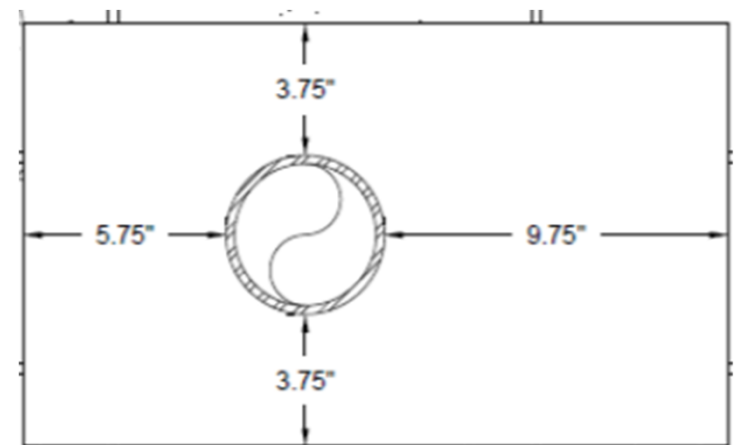
- ▶ Equipment, materials or systems included in the Category
- ▶ Intended use, restrictions or supplemental information that apply
- ▶ Standard(s) used to evaluate products under the Category
- ▶ Listing or Classification Mark information for the Category
- Go to UL: XHDG.GuideInfo Perimeter–fire–containment Systems and XHBN.GuideInfo Joint Systems

# Examples of Guide Information for Firestop Systems

- ▶ General Description of a Firestop System
- ▶ Standard
- ▶ Description of Ratings
- ▶ Permitted Substitutions
- ▶ Specifications of Penetrating Items
- ▶ Support of Penetrating Items
- ▶ Angle of Penetration
- ▶ Description of Numbering System


# Example of UL Guide Information for Through-Penetrations

- How to determine annular space when penetrants are passing through a rectangular opening.
- Is determined by measuring the distance from the closest point of the penetrating item to a point perpendicular to each of the four sides of the opening.



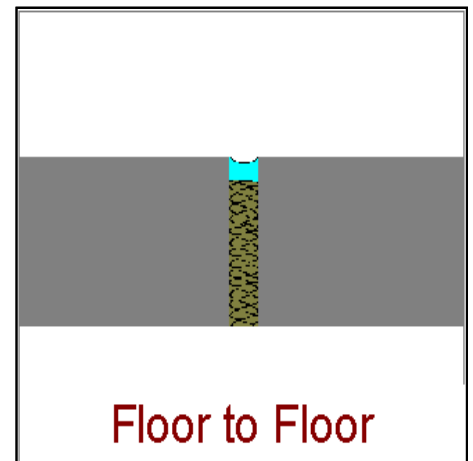
# Building Code Requirements

## 2018 IBC – Joints

- ▶ 715.2 Installation. A fire-resistant joint system shall be securely installed in accordance with the manufacturer's installation instructions and the listing criteria in or on the joint for its entire length so as not to impair its ability to accommodate expected building movements and to resist the passage of fire and hot gases.
  - ▶ 715.3. Joints shall be tested to ANSI/UL 2079 or ASTM E1966”
- 

# 2018 IBC – Definition

- 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. (IBC)



# Forces Which Induce Movement

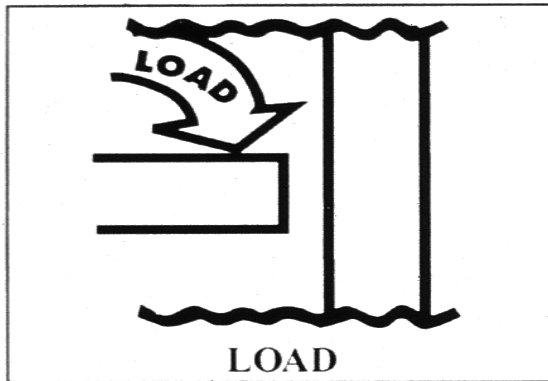


Fig. 1

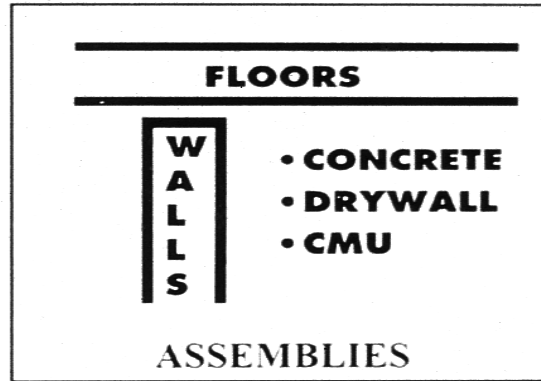


Fig. 3

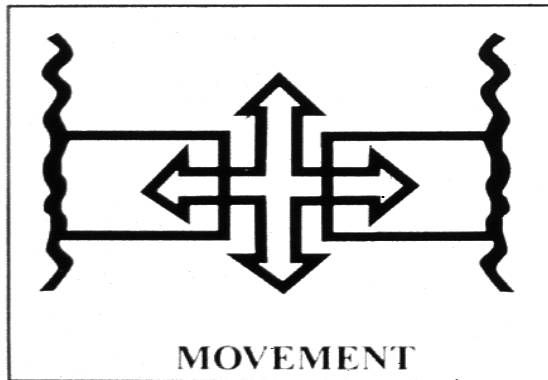


Fig. 2

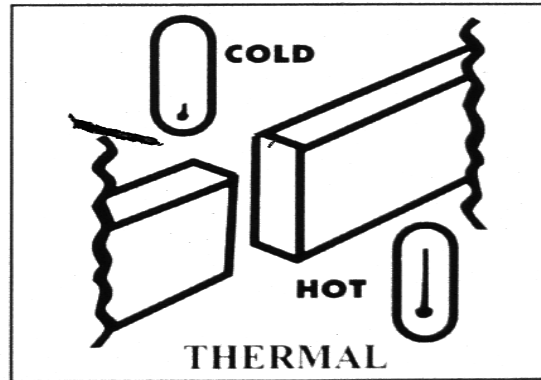


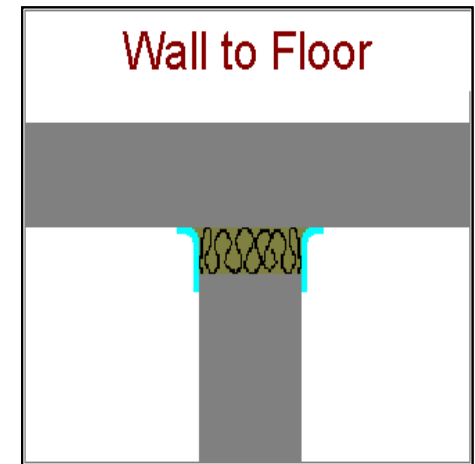
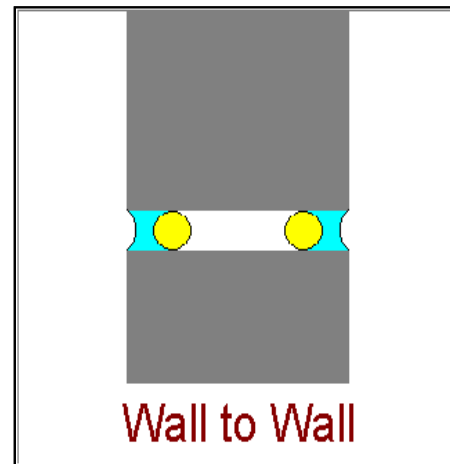
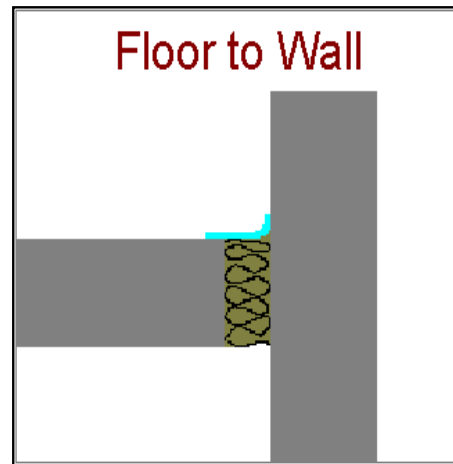
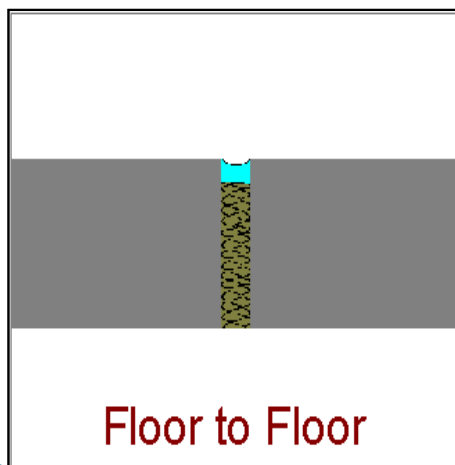
Fig. 4

- Thermal
- Wind Sway
- Seismic
- Load



# 4 Types of Rated Joint Systems

- ▶ Floor-to-Floor (Expansion Joint)
- ▶ Floor-to-Wall (Slab/Shaft)
- ▶ Wall-to-Floor (Top & Bottom of Wall)
- ▶ Wall-to-Wall (Vertical Control Joint)



# Construction Joint Terminology

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

# Categories of Fire-Resistive Joints

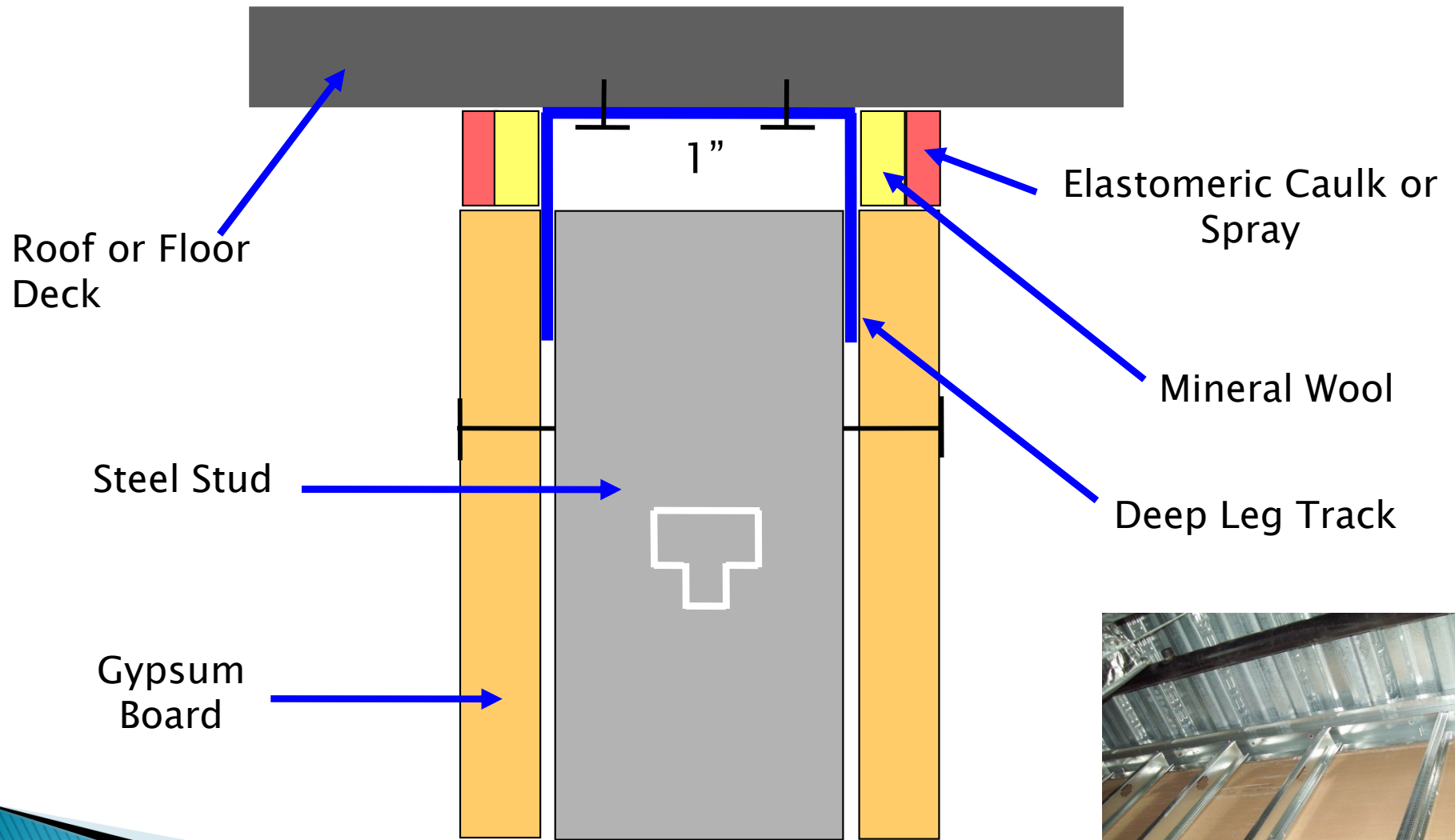
- ▶ Sealant Systems (Caulks)
- ▶ Sprayed /Elastomeric Membranes (Sprays)
- ▶ Mechanical Joints

# Head-Of-Wall Joint Systems

For interior non-load bearing fire-rated walls



# Typical Head of Wall Joint System With Nominal Joint Width



# Head-of-Wall Spray Application



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



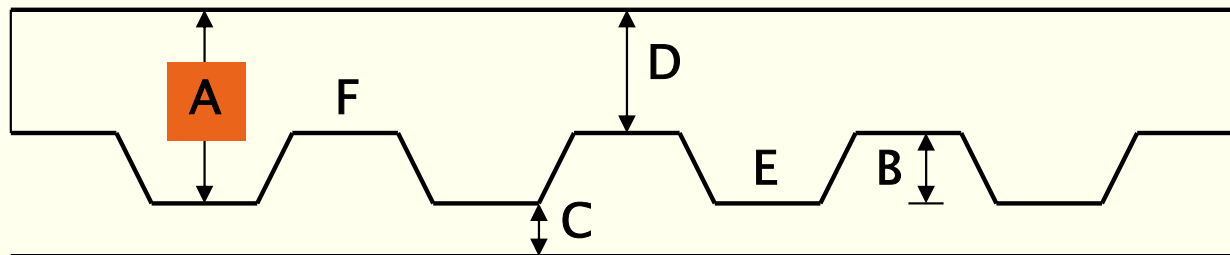
Remaining joint is stuffed with mineral wool or speed strips per UL system.



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



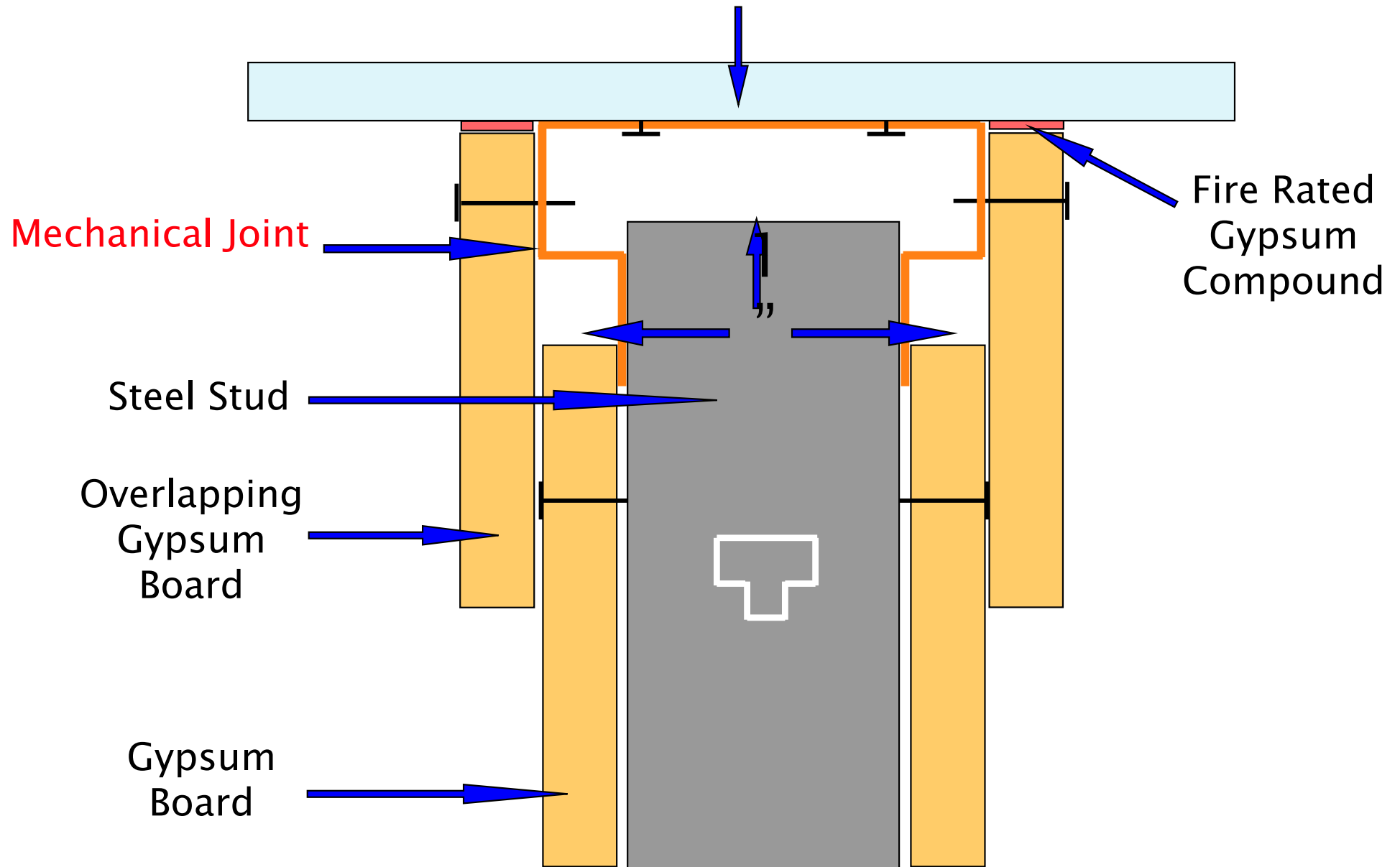
# Head-of-Wall Terminology



A - Overall depth of floor assembly  
B - Flute depth  
C - Joint width  
D - Minimum depth  
E - Valley  
F - Crest

# Mechanical Joint

Roof or Floor Deck



# Overlapping Wallboard Mechanical Joint



System No. FW-D-0001

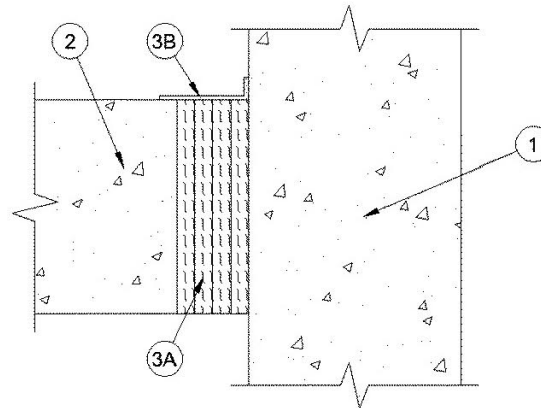
Assembly Rating - 1 Hr

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

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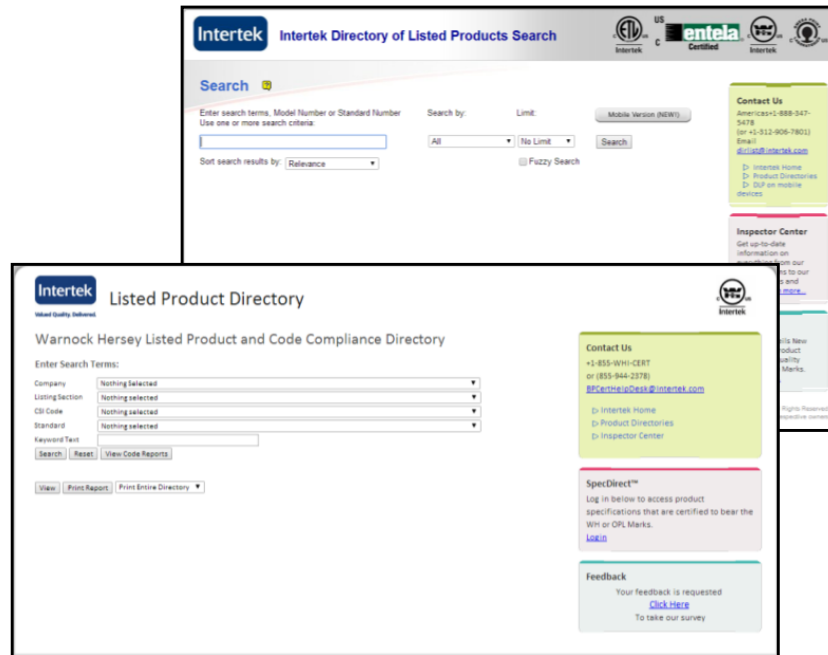
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# Where Can I Find The Most Current Listings?

<https://ul.com/apps/product-ig> Take you to Product IQ

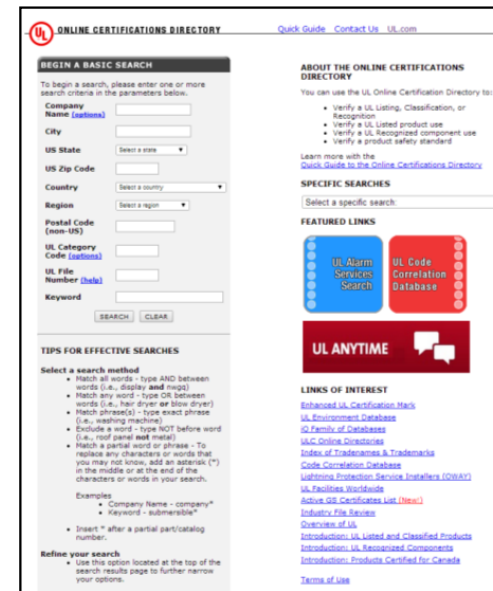
[www.ul.com/database](http://www.ul.com/database)

[www.intertek.com/directories/etl-listed-mark/](http://www.intertek.com/directories/etl-listed-mark/)



The image shows two screenshots of the Intertek website. The top screenshot is the 'Intertek Directory of Listed Products Search' page, which features a search bar, a 'Search' button, and a 'Mobile Version (NEW)' link. The bottom screenshot is the 'Listed Product Directory' page, which displays a search form with fields for Company, Listing Section, CUL Code, and Standard. It also includes a 'Search' button, a 'View Code Reports' button, and a 'Print Report' button. The 'Listed Product Directory' page also features a 'Contact Us' section with a phone number (+1-855-WHI-CERT or (855) 944-2378) and an email address (whi@intertek.com). It also includes a 'SpecDirect™' section with a 'Log In' button and a 'Feedback' section with a 'Click Here' button.

[whdirectory.intertek.com/](http://whdirectory.intertek.com/)



The image shows the 'UL ONLINE CERTIFICATIONS DIRECTORY' page. It features a 'BEGIN A BASIC SEARCH' section with a search bar and a 'Search' button. The search criteria include Company Name, City, US State, US Zip Code, Country, Region, Postal Code, UL Category Code, UL File Number, and Keyword. There is also a 'SPECIFIC SEARCHES' section with a 'Select a specific search' dropdown. The page includes a 'TIPS FOR EFFECTIVE SEARCHES' section with a list of search methods and examples. It also features a 'LINKS OF INTEREST' section with various links to UL resources.

# HW-D-0060

HW = Head of Wall

D = Dynamic  
(Subject to Movement)

Starts with "0" (0000 - 0999) = Nom. Joint Width  $\leq 2"$

Starts with "1" (1000 - 1999) = Nom. Joint Width  $> 2"$  and  $\leq 6"$

## Listings 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

Resource: ICC/IFC Pocket Guide

# Navigating the UL Directory:

HW – D – 0060

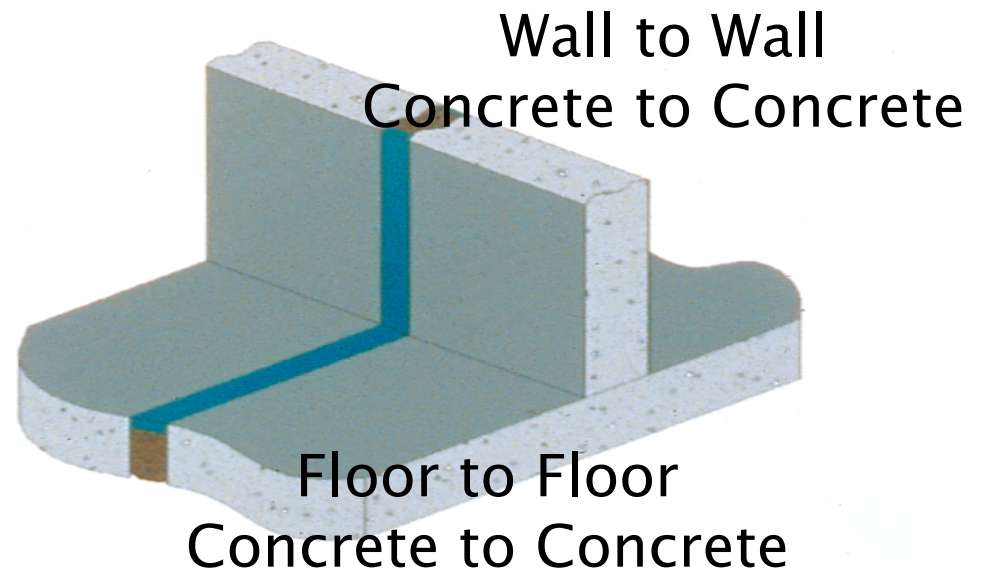
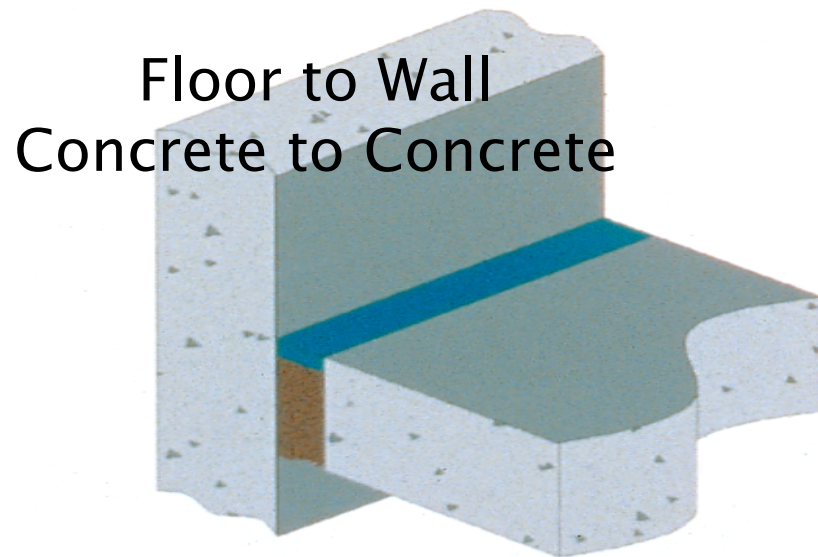
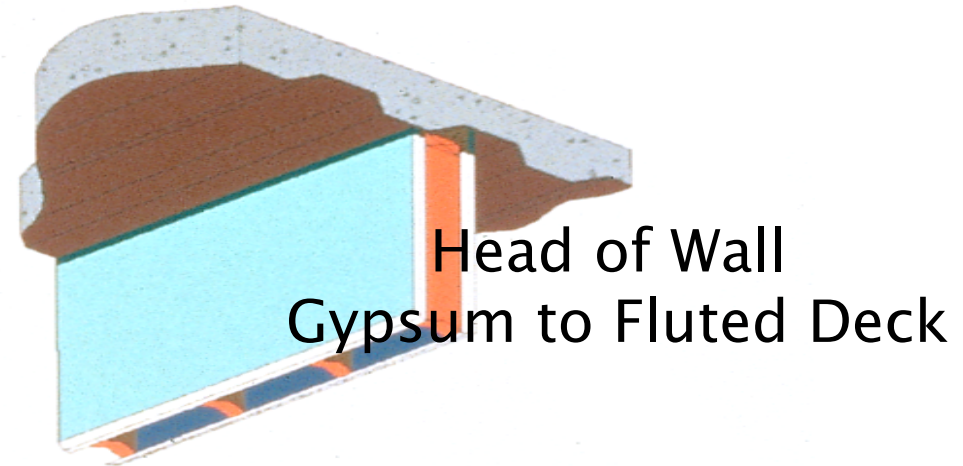
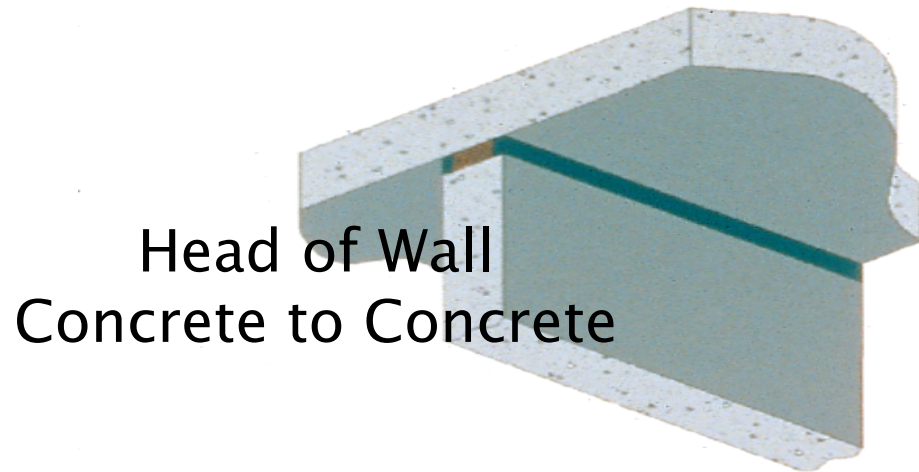
## JOINT SYSTEMS (XHBN)

Third Alpha Character identifies the movement capabilities of the system:

D = Dynamic (movement capabilities)

S = Static (no movement capabilities)

# Typical Joint Types



# 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

- ▶ Inspect joints at framing inspection
- ▶ 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)



# Recommended Inspection Checklist

- ▶ Checklist
  - Penetration
  - Joint
  - Curtain Wall

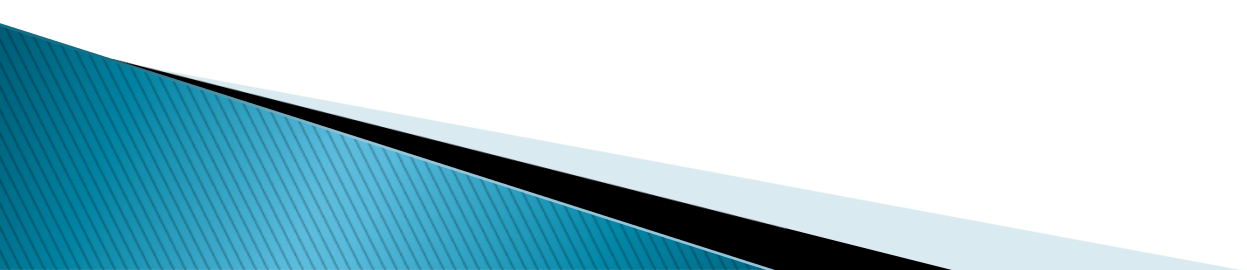
DOWNLOAD:  
[www.FireContainmentTraining.com](http://www.FireContainmentTraining.com)

Firestop Inspection Checklist		
Provided by: Fire Containment Training Services		
Date: _____		
Address: _____		
City: _____		
Contractor: _____		
Inspector: _____		
Permit No: _____		
System # or E.I.: _____		
Location: _____		
Visual or Destructive: _____		
Penetration	Y/N	Additional Comments
The assembly matches the system		
The assembly type and thickness matches the system		
The F-rating of the assembly & system match		
The penetrant is allowed by the system		
The penetrant quantity, size, and angle is allowed by the system		
Percent fill of cables ok		
The hole size is allowed by the system		
The annular space measurements are within the system limits		
The sealant type is correct		
Is a sleeve present?		
Is a sleeve allowed?		
Is the sleeve compliant?		
Number depth measurements taken		
The sealant depth meets the system minimums		
This firestop system passes inspection		

Fire Containment Training Services 7727 Park Ridge Circle Fort Collins, CO 80528 P: 970.223.4985  
tfc@firecontainmenttraining.com www.firecontainmenttraining.com

# Example of FCTS Newsletter on Website:

- ▶ **5 Common Firestop Deficiencies Found When Code Officials Enforce Firestopping:**
  1. Firestop installers only using the “RED GOOP”, instead of tested and listed systems.
  2. Joint movement: Joints move and Code Officials should confirm that the Structural Engineer on the project has identified the movement needed on every firestop joint system.



## 5 Common Firestop Deficiencies Found When Code Officials Enforce Firestopping Cont:

3. Fill material inadequate per tested and listed system, which leads to premature failure.
4. Orientation and compression of fill material not installed according to the tested and listed system.
5. Tooling not performed on penetrations. Sealants must be bonded to penetrating items and surrounding walls and floors.

FCTS Website: [www.FireContainmentTraining.com](http://www.FireContainmentTraining.com)



# What is a Curtain Wall?

A curtain wall is 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.

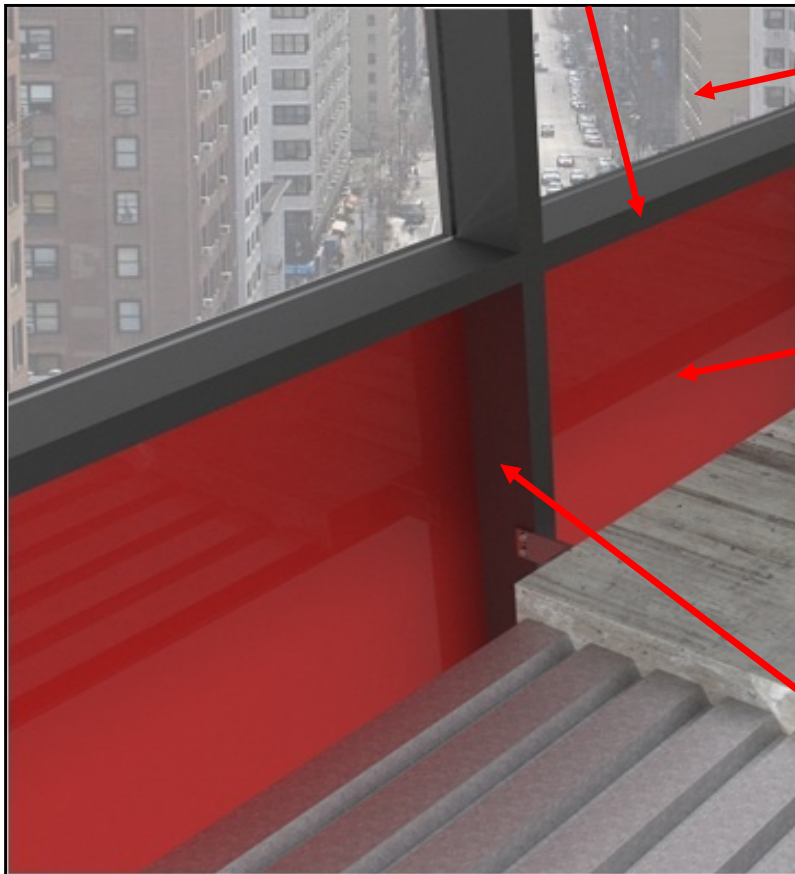




# Common Terminology

Aluminum Transom

Vision Glass

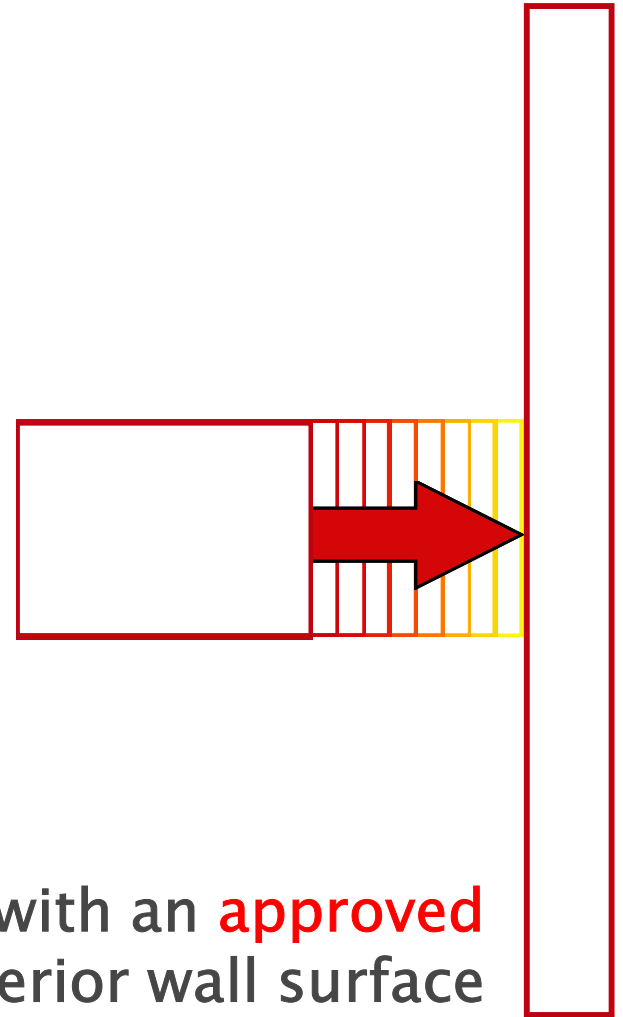


Spandrel: Glass,  
Aluminum or .....

Aluminum  
Mullion

# Extending the Floor to the Wall...

**MANDATORY!**



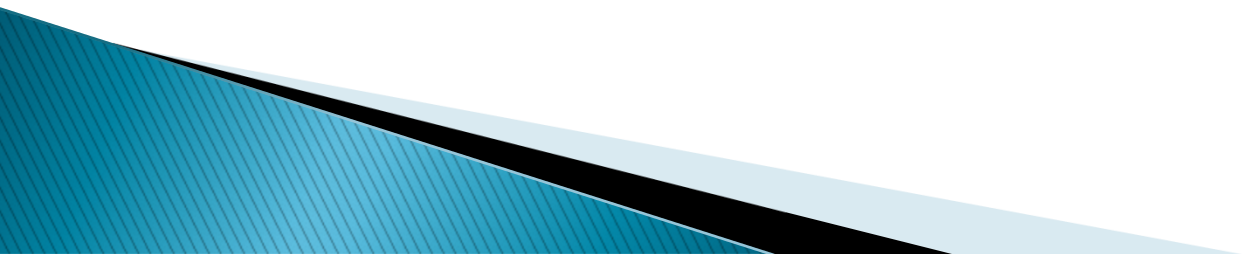
The perimeter joint must be sealed with an **approved material or system** that extends to the exterior wall surface

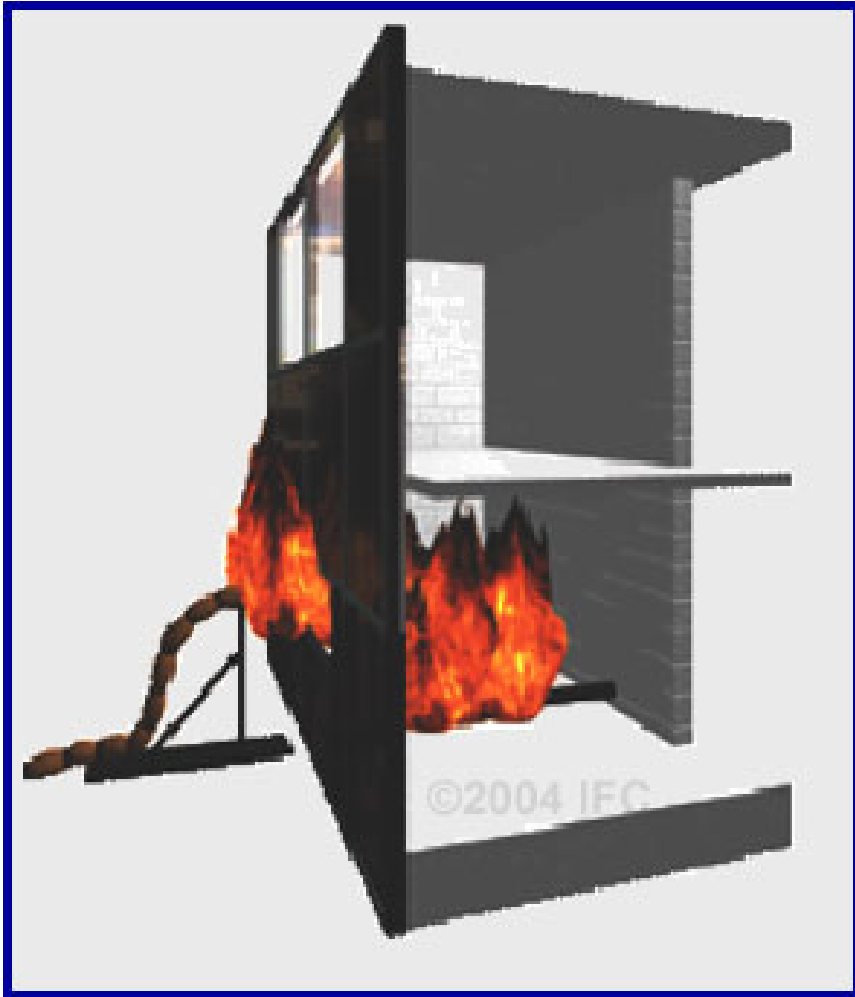


# Nonrated floor and the Curtain Wall

- ▶ No Guidance for the code
- ▶ If utilize an approved curtain wall joint the Building Official will need this documented.
- ▶ If use tested system will need to address similar to Engineering Judgment.

**NOTE:** The perimeter joint must be sealed with an approved material or system that extends to the exterior wall surface

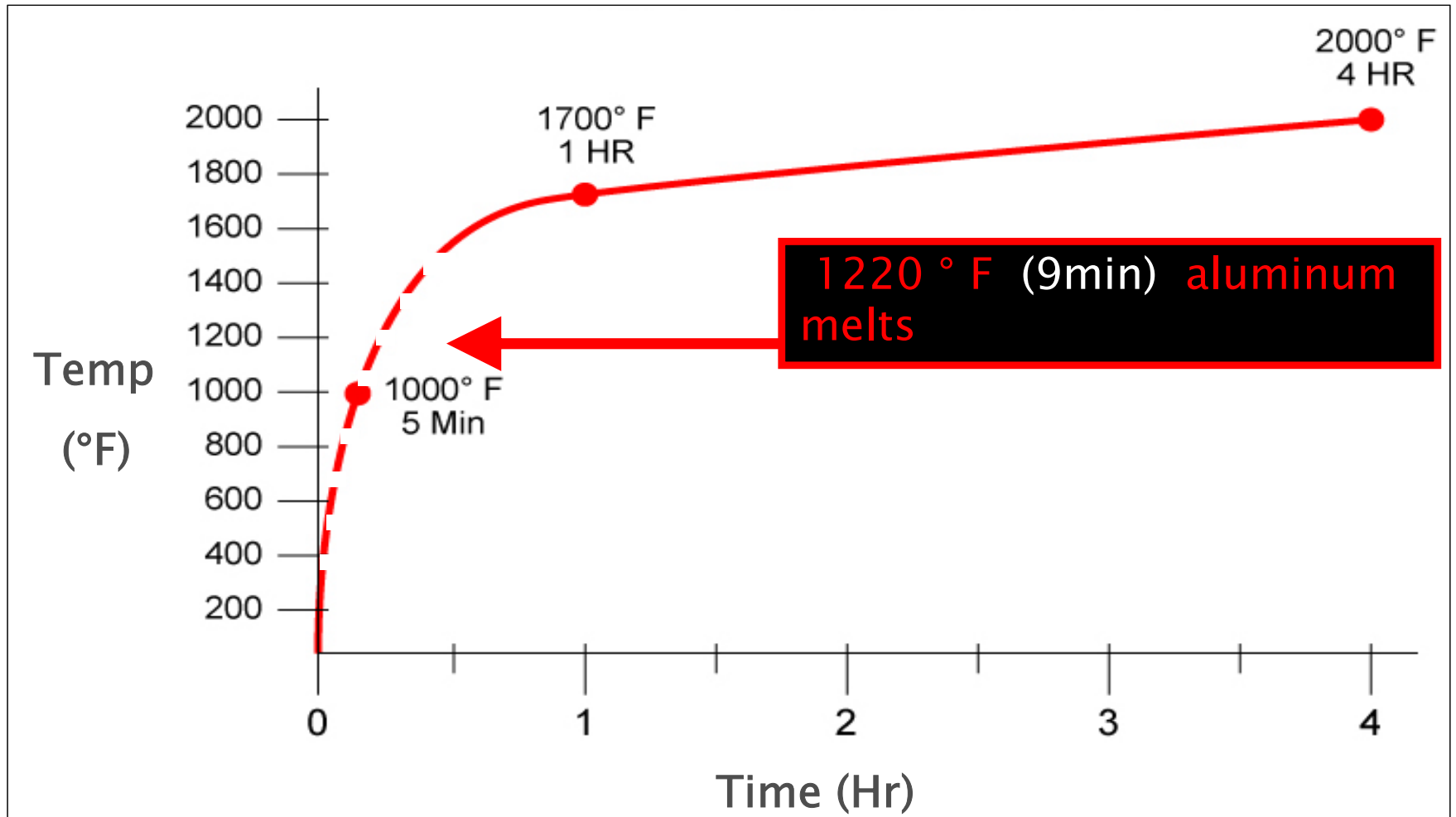




## ASTM E2307

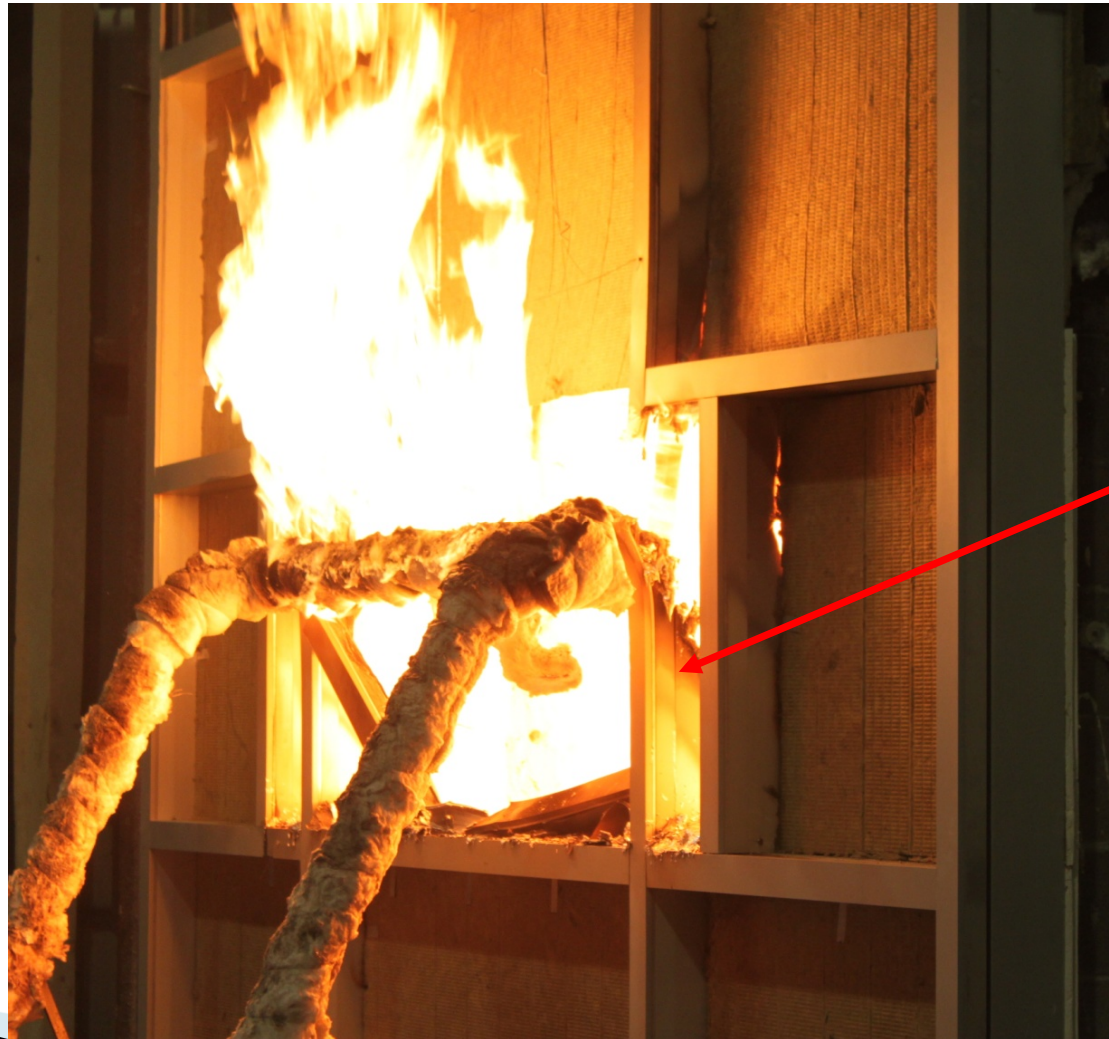
Standard Test Method  
for Determining Fire  
Resistance of Perimeter  
Fire Barriers Using  
Intermediate-Scale,  
Multi-Story Test  
Apparatus

# Time - Temperature Curve



# Fire Performance

## Mullion exposure to fire test

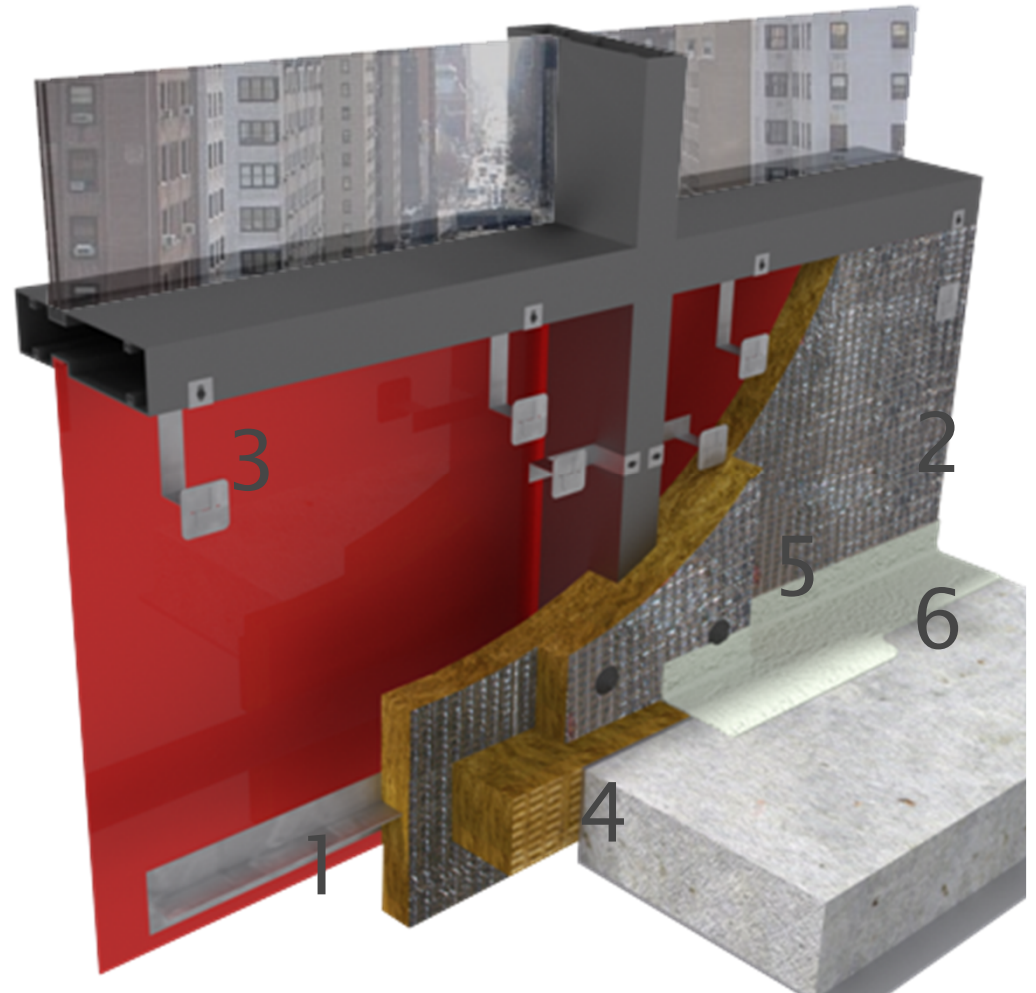


Exposed side  
of vertical  
mullion  
almost  
completely  
melted out.

# Curtain Wall Fire Containment

## Six Components of System

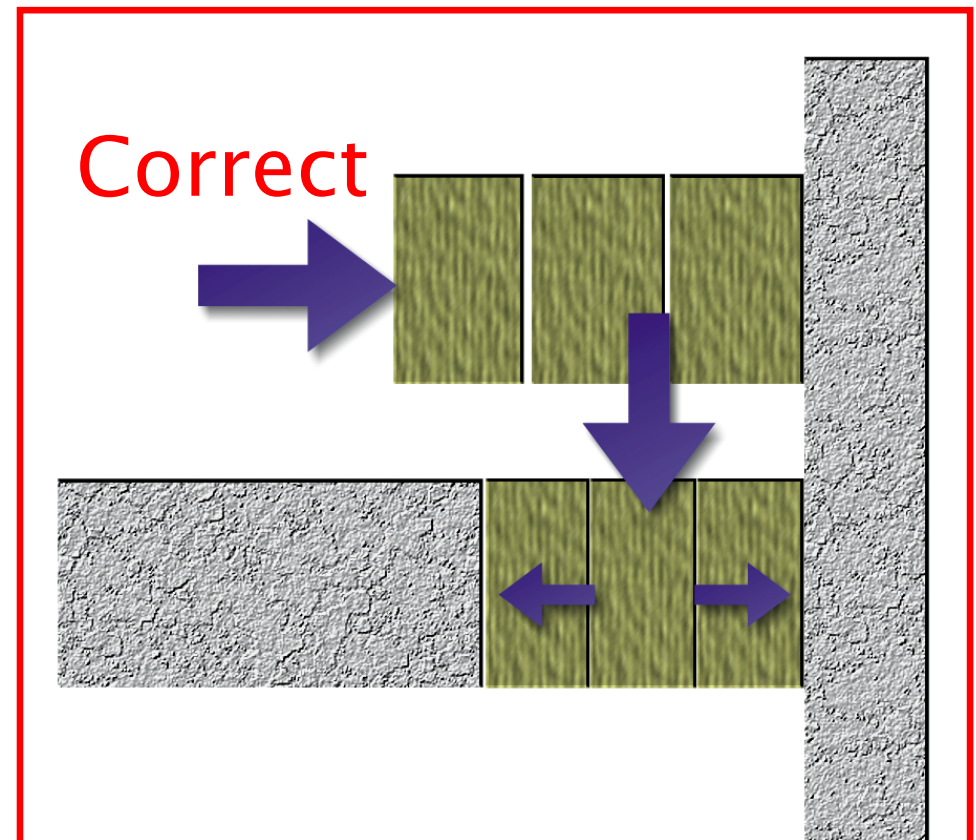
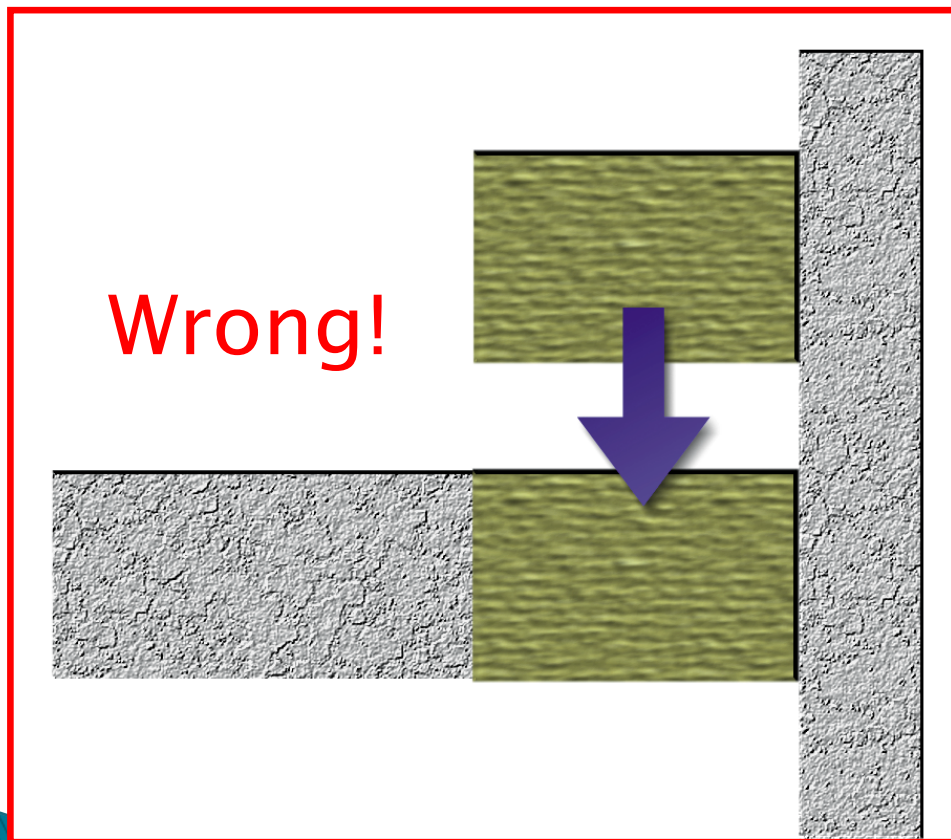
- 1 Reinforcement Member
- 2 Mineral Wool Insulation
- 3 Mechanically Attached
- 4 Compression Fit Siding
- 5 Protect Mullions
- 6 Smoke Barrier





# Typical Curtain Wall System Cont

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



STI Graphic

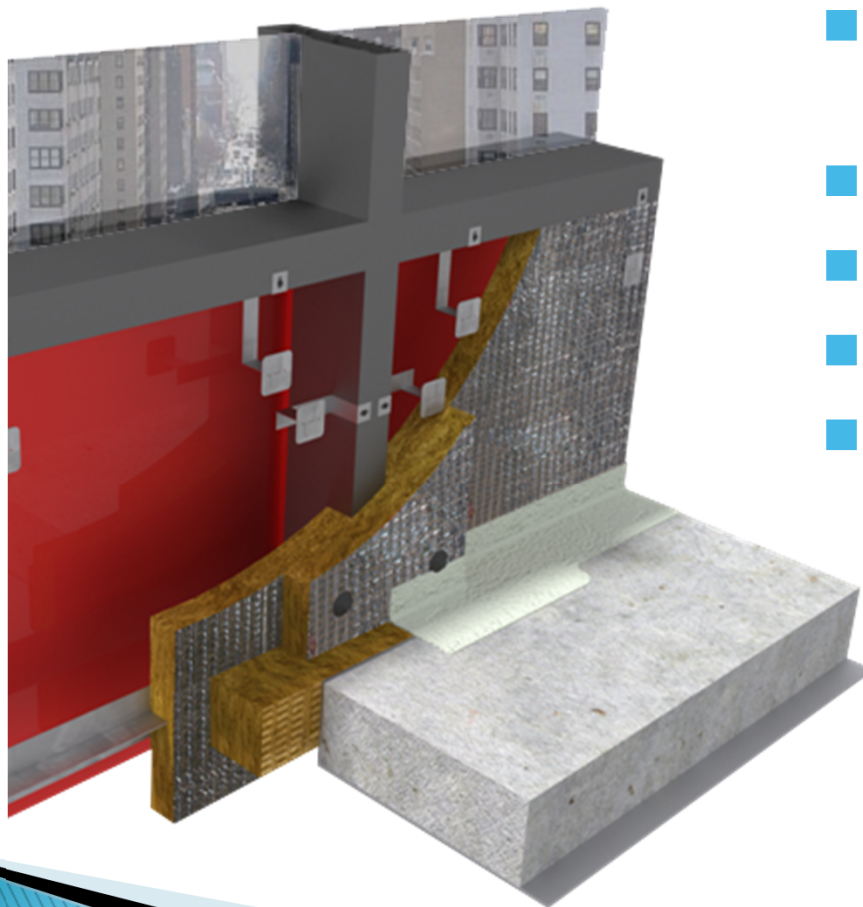


# PERIMETER FIRE CONTAINMENT SYSTEMS (XHDG)

Third Alpha Character identifies the movement capabilities of the system:

- D = Dynamic (movement capabilities)
- S = Static (no movement capabilities)

# Plan Review of Perimeter Joints



- Floor and/or wall construction type and thickness
- Joint width
- Movement requirements
- Rating requirement
- Firestopping materials

# 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?



# DEFINITION

## Continuity Head-of-Wall Joint

- Continuity Head-of-Wall Joint System – Material or devices, or both, installed to resist the spread of fire for a prescribed period of time through the joint opening between a fire-resistance rated wall assembly below and a nonrated horizontal assembly above. (ASTM)

# 2015 IBC Requirement

- ▶ 707.9 – The voids created at the intersection of a fire barrier and a non-fire resistance rated roof assembly shall be filled. An approved material or system shall be used to fill the void, shall be securely installed in or on the intersection for its entire length so as not to dislodge, loosen or.....

# IBC 2012 Code Changes

Such Identification shall be located in accessible concealed floor, floor ceiling or attic spaces.

- Within 15 feet (4572 mm ) of the end of each wall and at intervals not exceeding 30 feet (9144 mm) measured horizontally along the wall or partition
- Include lettering not less than 3 inches (76 mm ) in height with a minimum 3/8 inch (9.5 mm) stroke in a contrasting color incorporating the suggested wording:
- FIRE AND/OR SMOKE BARRIER—PROTECT ALL OPENINGS




# LABELING OF FIRESTOPPING 2024

- ▶ Provide identification label to identify the firestop system or EJ
- ▶ Not required by code at this time
- ▶ Recommend that the information is readable and includes System number, Date, Installer, and Warning such as “Do not remove”



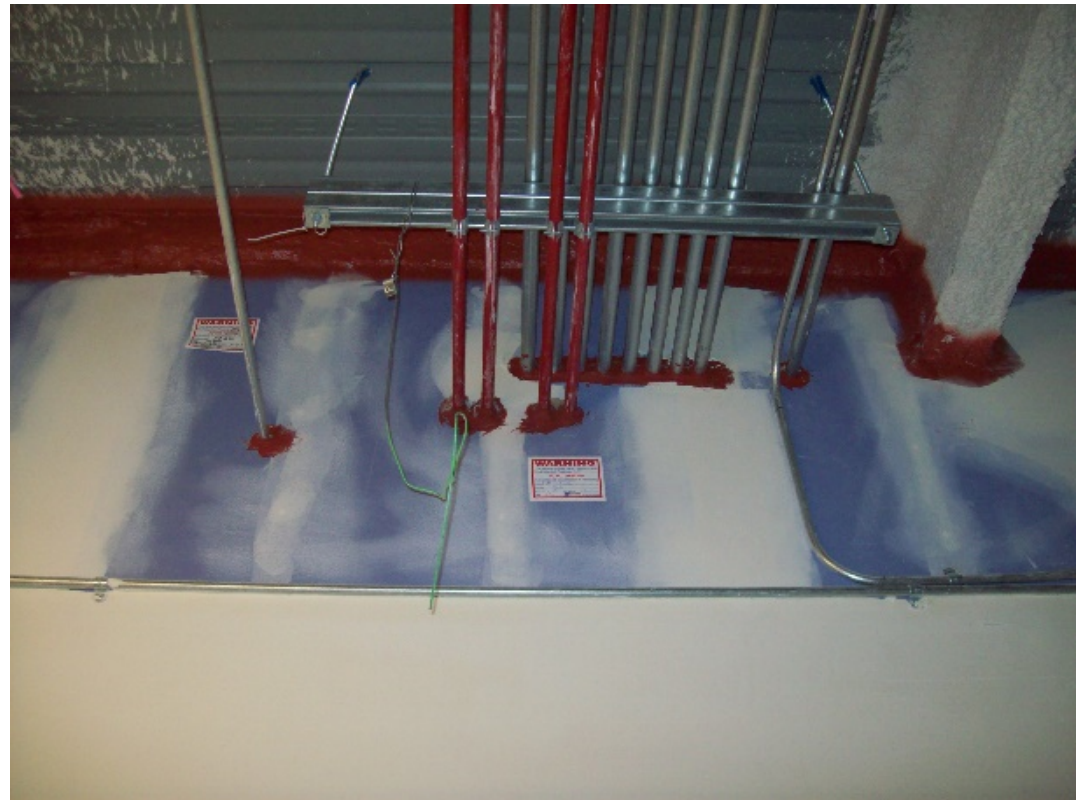
# International Fire Code (IFC)

## Inspection and Maintenance of Buildings

- 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.
  - In the 2021 IFC added provisions in 701.6 **requiring building owners to annually inspect** firestops and joint systems and properly repaired, restored or replaced where damaged, altered, breached or penetrated. Records of inspections and repairs **shall be maintained**.
- 

# IBC 2018 Code Changes

- ▶ Firestopping installed in accordance with manufactures instructions and the listing criteria.



# IBC 2021 Code Changes

- ▶ Firestop special inspections expanded to include R occupancies (Residential) with occupant load greater than 250.





# MASS TIMBER BUILDINGS AND FIRESTOPPING

- The 2021 International Building Code allow for: Larger heights and areas than is currently permitted in Types III, IV, and V construction.
- ▶ There are no Tested and Listed Firestop Systems for Mass Timber Buildings. Penetrations by EJ's
- ▶ Wood Shrinks and buildings can settle



# Shrinkage of wood walls and bearing partitions –IBC

2304.3.3 Shrinkage. Wood walls and bearing partitions shall not support more than two floors and a roof unless an analysis satisfactory to the building official shows that shrinkage of the wood framing will not have adverse effects on the structure or any plumbing, electrical or mechanical systems or other equipment installed therein due to excessive shrinkage or differential movements caused by shrinkage.






# 2021 IBC MASS TIMBER – SEALING INTERSECTIONS

- ▶ 703.7 Sealing of adjacent mass timber elements in abutting edges and intersections of rated assemblies.
- ▶ 1705.20 Sealing of Mass Timber Requires Periodic Special Inspections for Types IV–A, IV–B & IV–C



# MASS TIMBER AND SPECIAL INSPECTIONS

- ▶ 1705.5.3, 1705.20 Mass Timber Special Inspection
  - ▶ Special inspection is required where sealants and/or adhesives are provided in mass timber construction to resist the passage of air at abutting edges and intersections of mass timber elements required to be fire-resistant.
  - ▶ Firestop Special Inspections can be required by the building official for any work unusual in its nature.
- 

# NEWSCAST IN YOUR JURISDICTION?

[https://youtu.be/\\_OiCVupKGBw](https://youtu.be/_OiCVupKGBw)



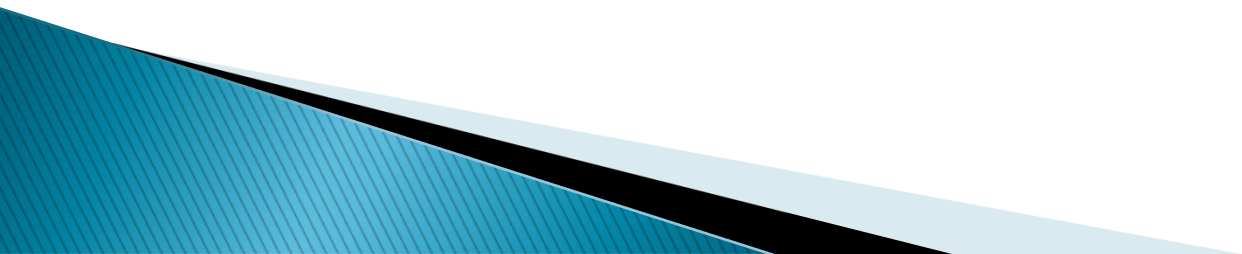
# Firestopping is a Headache



- “There is no other code-required work anywhere in construction that is installed by every trade”.
- These 6 to 9 different Trades typically do not take ownership for firestopping.
- Many trades consider firestopping a *necessary evil*, rather than a critical element of the fire-safety envelope.

# Firestop Installations

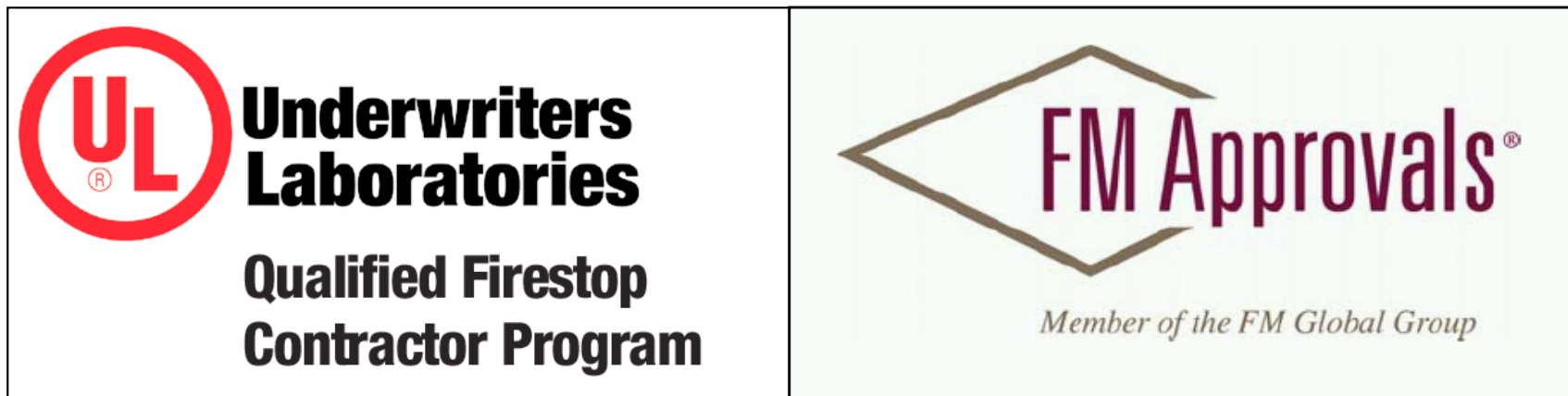
- All Trades – “Person who pokes hole, fills hole”
- Single Source Firestop Contractor – One specialty contractor covers entire project
- Multiple Firestop Contractors – Multiple Firestop Contractors or Subs



# UL and FM Qualified Single Source Firestop Contractor Programs


## ***Two Qualified Contractor Programs***

- UL Qualified Firestop Contractor Program
- FM 4991 Approved Contractor Program






# Qualifications for Firestop Installers (Trades)

- ▶ No recognized programs for all trades at this time so AHJ can develop their own program.
  - ▶ Recommendation for the different Trades:
    - I. Minimum of 1 years experience with the primary manufacture on the project.
    - II. Manufactures need to provide a signoff card with the date of training that covers how to read systems, storing of products, and identify hands-on training,
    - III. The Authority Having Jurisdiction (AHJ) will approve the firestop installers for each project.
    - IV. They will comply with ASTM E-3157
- 

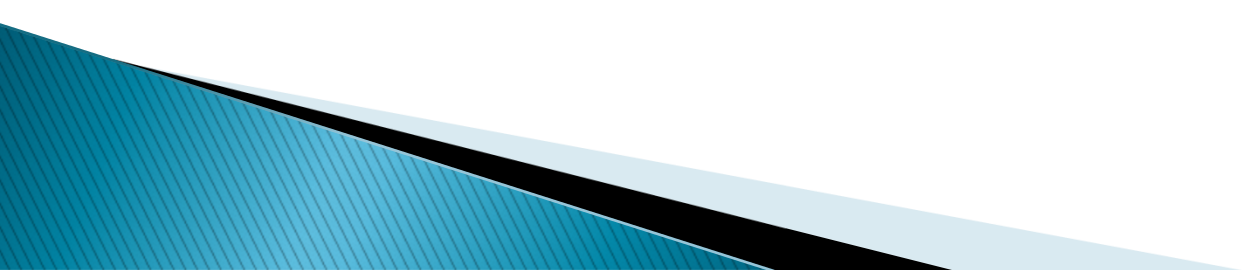
# NEW ASTM Firestop Installation Guide

- ▶ In 2019 ASTM published E3157 that is 22 pages of information related to installation of Firestop systems that consist of:
    - Tips for installation of penetration firestopping
    - Why Pre-Construction meetings
    - Effects of movement during cure
    - Proper surface preparation
    - Not mix products of different manufacturers
    - Importance of tooling
    - Shrinkage of firestop materials
- 

# Question for Owners and Contractors:

With firestopping are you getting what you are paying for?

- ▶ Are your installers qualified to install firestopping?
- ▶ Have you confirmed that your installers are using tested and listed firestop systems?
- ▶ Does the AHJ provide adequate firestop inspections?



# Firestopping Special Inspections And the IBC

- ▶ 1705.18 Fire-resistant penetrations and joints. In high-rise buildings or, in buildings assigned to Risk Category III or IV, or in fire areas containing Group R occupancies with an occupant load greater than 250 special inspections for....
- ▶ ASTM Inspection Standards ASTM E 2174 and ASTM E 2393 are required

# RISK CATEGORY III BUILDINGS

- ▶ Public assembly over 300 occupants
  - ▶ Schools over 250 occupants
  - ▶ Prisons and Jails
  - ▶ Buildings over 5,000 occupants
  - ▶ Water and waste treatment facilities
- 
- ▶ *Note: Category III represent a substantial hazard to human life*

# RISK CATEGORY IV BUILDINGS

- ▶ Buildings designed as essential facilities
- ▶ Group I–2 with emergency treatment
- ▶ Fire, rescue and police stations
- ▶ Emergency shelters and operation centers
- ▶ Aviation towers and control centers

*Note: Essential Facilities: Buildings and other structures that are intended to remain operational in the event of a major disaster*



# QUESTION FOR THE BUILDING OFFICIAL

- ▶ Does the AHJ Have the authority to require Firestop Special Inspections on large projects in their jurisdiction beyond section 1705.17 that Requires High Rise buildings and Category 3 and 4 buildings along with R Occupancies over 250

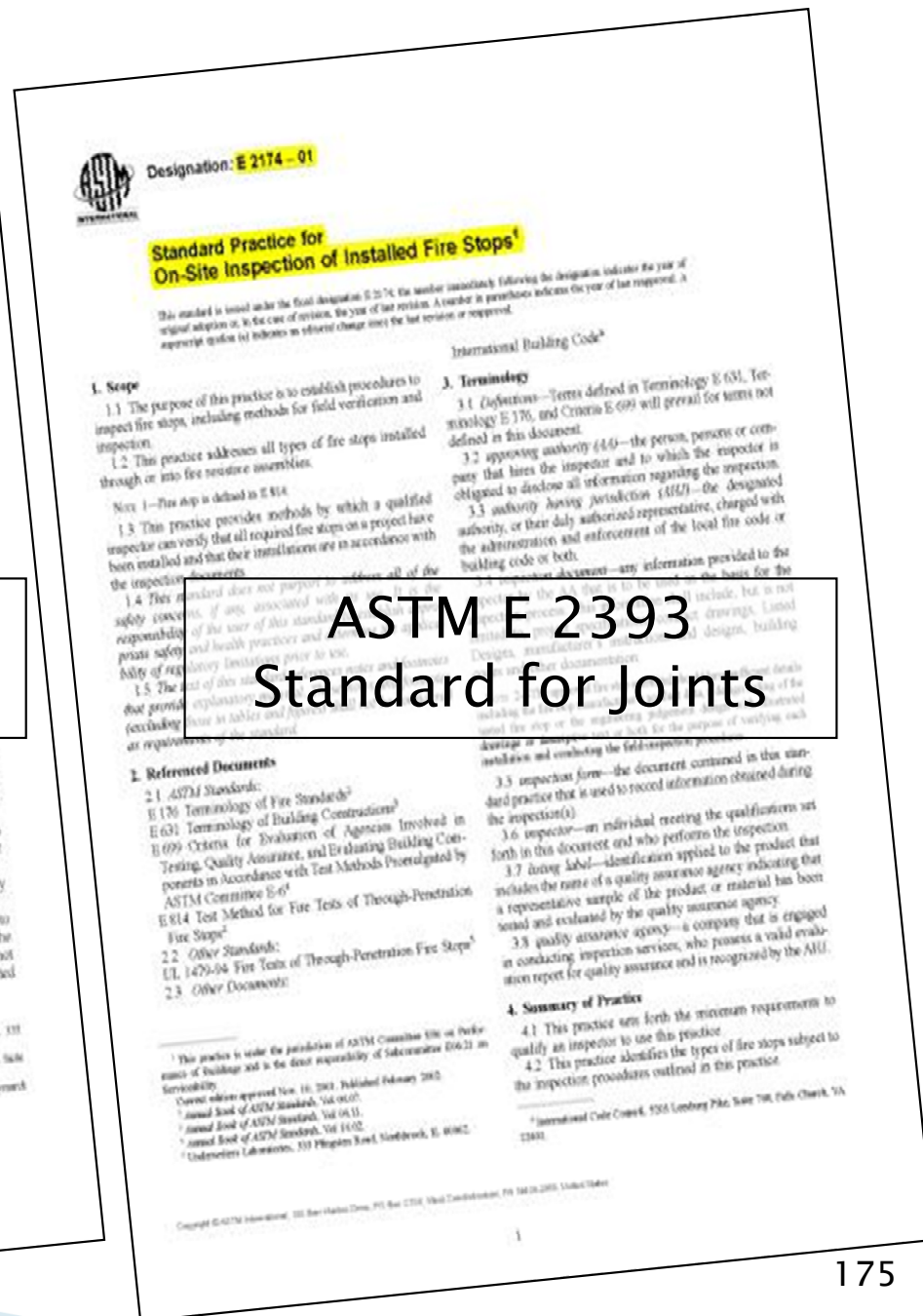
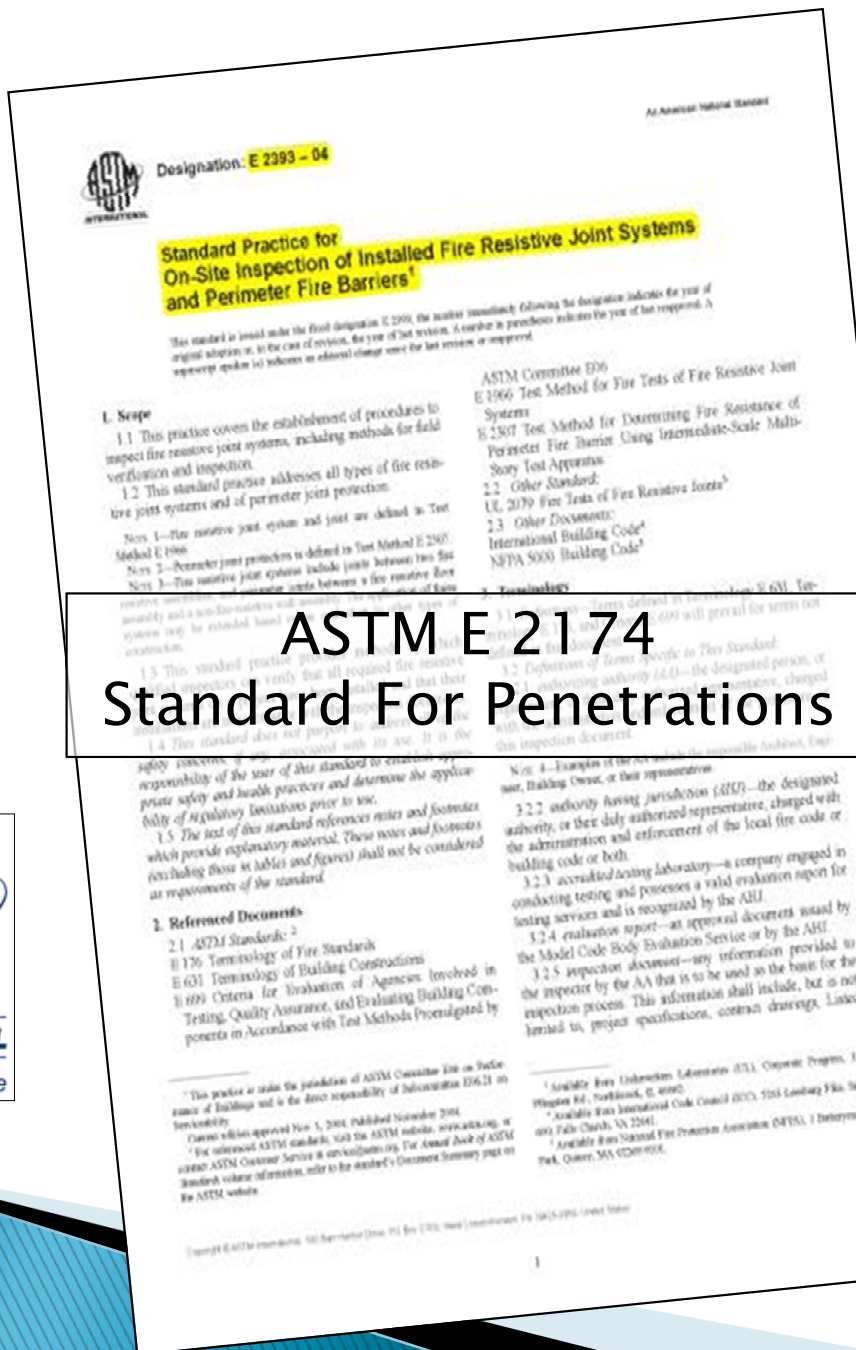


# The answer is YES! 1705.1.1 Special cases gives you that authority

1705.1.1 Special cases. *Special inspections* and tests shall be required for proposed work that is, in the opinion of the building official, unusual in its nature, such as, but not limited to, the following examples:

1. Construction materials and systems that are alternatives to materials and systems prescribed by this code.
2. Unusual design applications of materials described in this code. (EJ)
3. Materials and systems required to be installed in accordance with additional manufacturer's instructions that prescribe requirements not contained in this code or in standards referenced by this code.

# ASTM Inspection Standards



# ASTM

## Firestop Inspection Standards Overview

- Addresses all types of firestop systems
- Documents must go through a plan review
- Scheduling of firestop inspections
- Required to have Pre-Construction meeting
- Covers inspector qualifications
- Provides forms, reports and documents
- Inspection methods are identified




# ASTM

## Firestop Inspector Qualifications

- Have a minimum of 2 years experience in construction field inspection and have education, credentials, and experience acceptable to the AA. OR
  - ▶ Be a Quality Assurance Agency accredited by the AHJ. OR
  - ▶ Meet the criteria contained in ASTM E699 “Standard Practice for Evaluation of Agencies Involved in Testing Quality Assurance, and Evaluating of Building Components”
    - NOTE: Authorizing Authority (AA) is a designated person charged with administration of the ASTM Inspection Standards. This person could be an architect, Engineer or owner

# Conflict of Interest Statement

## ASTM E2174 and E2393

- 6.2.1 The inspector shall be completely independent of, and divested from, the installer, contractor, manufacturer, or supplier of any material being inspected
  - 6.2.2 The inspector shall not be a competitor of the installer, contractor, manufacture, or supplier of any material being inspected
  - 6.3 The inspector shall submit notarized statements to the AA assuring compliance with 6.2
- 



# ASTM E2174 and E2393

## General Requirements

- Inspection documents submitted 10 days prior to field inspection
- If mechanical systems are used, they need to be inspected after installation



# ASTM Inspection Schedule

- The inspector and installer(s) shall mutually agree upon a schedule for the notification of the following:
  - ▶ Start of installation of fire resistive joint systems
  - ▶ Review of Products – Inspection of firestop materials
  - ▶ Anticipated schedule of inspection(s) and
  - ▶ Anticipated completion of inspection(s).
  - ▶ The installer shall notify the inspector within one working day when any item agreed to on the schedule must be changed

# ASTM E2174 and E2393

## Inspection Documents

- The AA shall provide the inspector with a complete set of inspection documents at least ten working days prior to the inspection. The inspector shall review all inspection documents prior to conducting any inspection.
- As part of the inspection documents, Listed Designs shall be provided for every fire resistive joint system.

# ASTM E2174 and ASTM E2393

## Reporting/Inspection

- The Standards calls for the Inspector to verify that the materials bear a Listing Label
- Manufacturer's container labels shall include
  - ▶ Manufacturer's name
  - ▶ Product name
  - ▶ Manufactured Date or Expiration Date
- Where the material is being stored, does it comply with Manufacturer guidelines

# ASTM Procedure if firestop system is *non code compliant*

- What to do if firestopping is not acceptable
  - ▶ Notify ALL effected persons of deficiencies within one working day.
  - ▶ Will require more inspections to verify compliance
  - ▶ Will require % of like firestop systems to be inspected

# ASTM E2174 and ASTM E2393

## Reporting/Inspection Forms

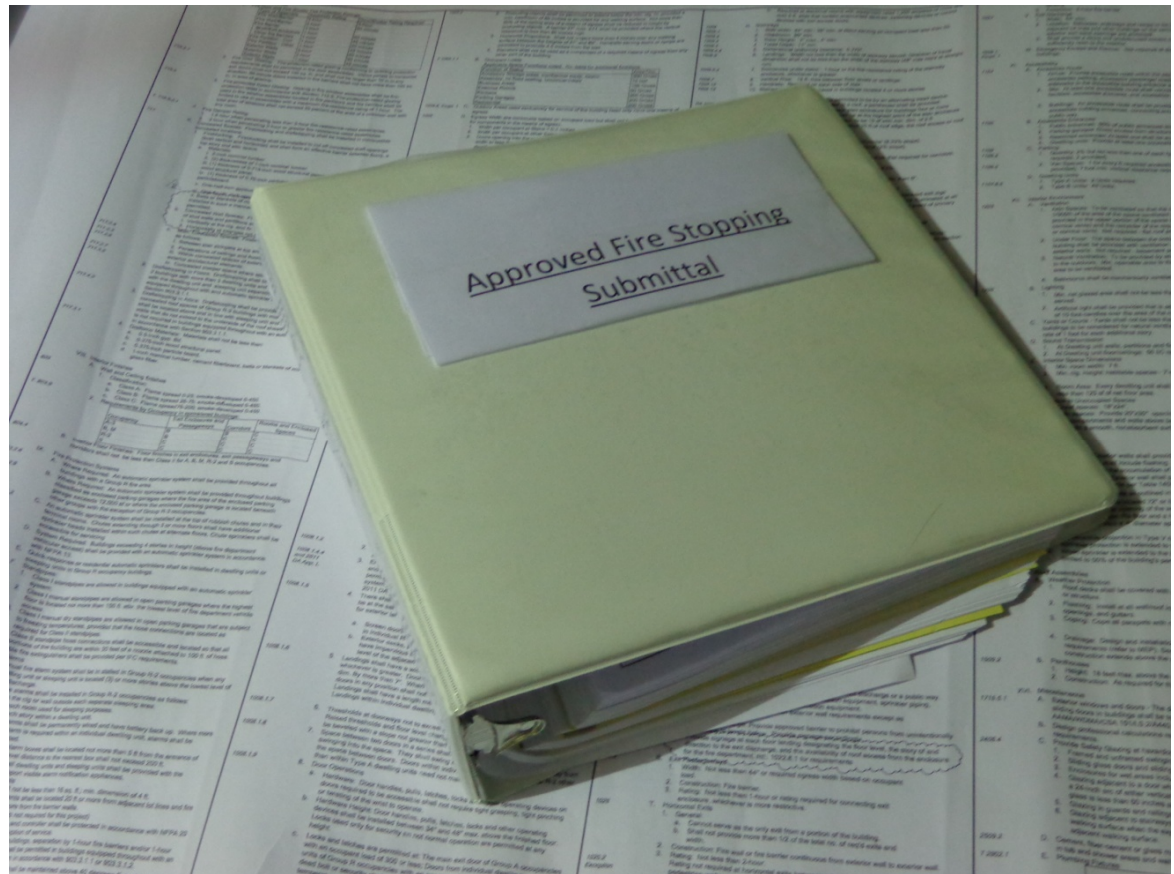
- Inspection Date
- Inspectors Name
- Project
- Reference No.
- Firestop type per Inspection
- Quantity of Firestop type on Project
- Quantity Inspected (the day of Inspection)
- Total Quantity Inspected to Date
- Locations of Inspected Firestop
- Deficiency (if non-compliant )



# ASTM E 2174 and ASTM E 2393

## Reporting/Inspection

- ▶ 12.1 At the end of the installation and inspection process, the inspector shall submit a final report.



# ASTM E2174 and ASTM E2393

## Final Report

- Report should contain:
  - ▶ Cover Page
  - ▶ Name and Address of Inspector
  - ▶ Name and Address of each firestop Installer, as well as the prime contractor
  - ▶ Name and Address of the AA
  - ▶ Name and Address of the AHJ
  - ▶ Executive Summary outlining verification method used to ascertain compliance
  - ▶ Notarized written statement of Conflict of Interest
  - ▶ Summary of contain percentages of deficiencies
  - ▶ All daily inspection reports

# ASTM E2174 and E2393

## General Requirements

- Section 10.4 Prior to installation, the inspector shall verify that all materials received for the installation meet the requirements
- Section 10.8 Inspector shall verify and document that the firestops required in the inspection documents have been installed.
- Inspector shall provide visual and/or destructive testing for a percentage of the systems (Or other approved methods)

# ASTM Inspection

- 10.12.2.1 The method shall be approved by the AA and the AHJ, which shall require one of the following methods:
  - 1) Destructive type
  - 2) Disassembly or
  - 3) Visual inspection
  - 4) Other appropriate methods
- 10.14 All observed deficiencies shall be documented and marked on the inspection forms.

# ASTM E2174



## **Onsite Inspection of Installed Firestop Penetrations**

### 2 Different type of inspections

- ▶ Visual Inspection: randomly witnessing a minimum of 10% of each type of firestop system installed OR
- ▶ Destruction Testing: destructively sampling of 2% but not less than one per floor, of like firestop systems within a 10,000 sq ft. area or less

# ASTM E2393

## On-site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers

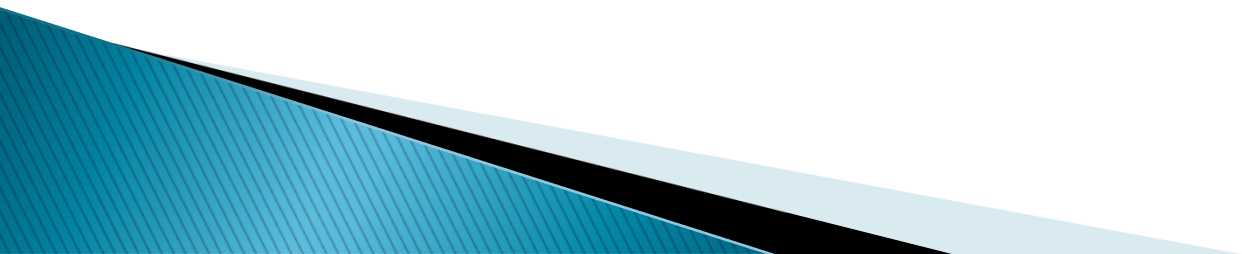
- 2 Different Type of Inspection
  - ▶ Visual Inspection: observing installation process of a minimum of 5% of the total lineal ft. *OR*
  - ▶ Destructive Inspection: destructively sampling a minimum of one sample per type of joint system per 500 lineal ft.



# Access for special inspection

## 1704.2.2

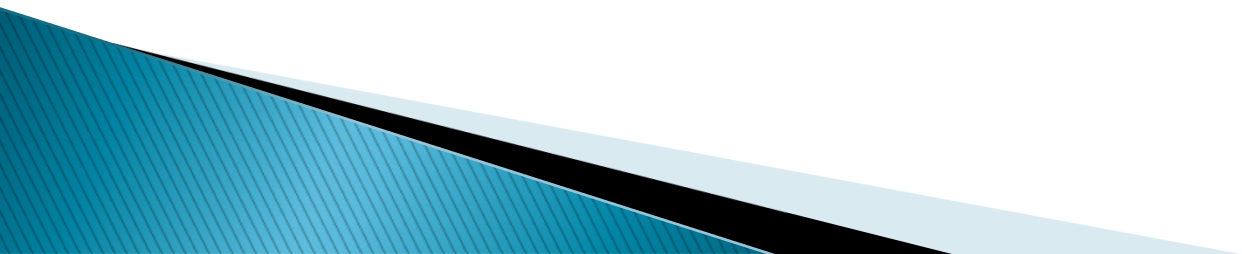
- ▶ The construction or work for which special inspection is required shall remain accessible and exposed for special inspection purposes until completion of the required special inspections.



# Report requirement

## 1704.2.4

- ▶ Special inspectors shall keep records of inspections. The special inspector shall furnish inspection reports to the building official, and to the registered design professional in responsible charge
- ▶ Reports shall indicate that work inspected was or was not completed in conformance to approved construction documents.



# Report requirement

## 1704.2.4


- ▶ If they are not corrected, the discrepancies shall be brought to the attention of the building official.
- ▶ A final report documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted to the *Building Official*

# Is there a credential specifically for Firestop Special Inspectors?

- The answer is YES
- Firestop Inspector Exam With the International Firestop Council (IFC)
  - ▶ Only exam specifically for Firestop Special Inspectors
  - ▶ Website: ([www.firestop.org](http://www.firestop.org))
  - ▶ Intertek IQP Program
  - ▶ International Accreditation Service (IAC) AC 291 Covers the firestop company. Now accepts IFC exam



# About the IFC Inspectors Exam

- All study material is free and online from many different sources
  - Developed by Firestop Special Inspectors and Fire Protection Engineers
  - 85 multiple-choice questions
  - Fee is reasonable
  - 2 hrs max
  - Passing grade: 80% (68 out of 85 questions)
  - Listing on IFC website  
[www.firestop.org/certificate-holders](http://www.firestop.org/certificate-holders)
- 

# International Code Council (ICC) and Firestop inspections

- The ICC has approved a new Firestop Training Program in March of 2021.
- **NEW 2021 ICC PROGRAM:**
- ICC called this program “Firestop Inspector Credential of Learning Achievement” (CLA)



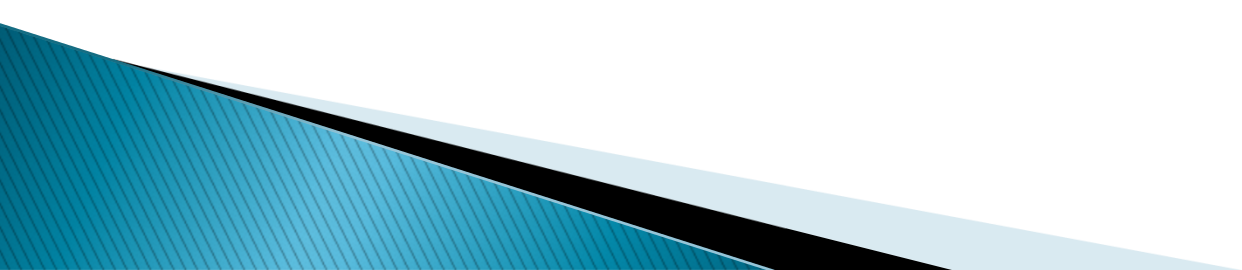


# Credential of Learning Achievement (CLA)

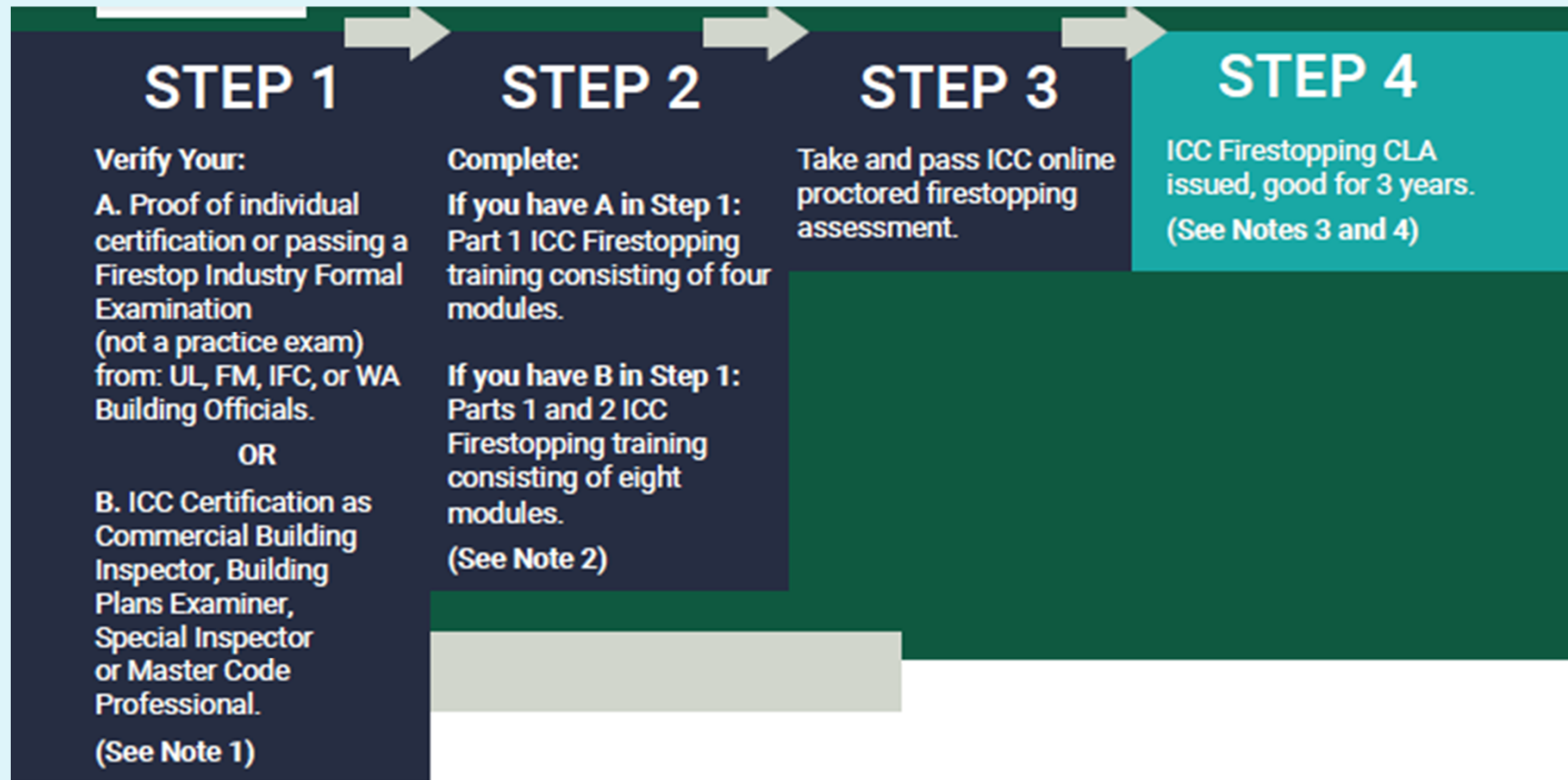
- ▶ A CLA is issued by the International Code Council to those individuals who complete a firestop training program and pass an assessment (examination) based on that training program in a specialty area of building safety such as firestopping.

Is this Credential the same as an ICC Professional Certification?

- ▶ NO! A Professional Certification certifies a professional based on an examination developed by the ICC Exam Development Committee that is based on a job task analysis.
- ▶ Let's review the path to be awarded a CLA Credential from ICC.



# Firestopping CLA Path



**Note 1:** Certifications must be in active status to qualify. All exam results are individual not a “company approval” or qualification for employees who have not individually passed an exam. Legacy certifications of ICC such as “Building Inspector” and “Plan Examiner” that included testing of commercial code provisions qualify as equivalent to ICC Commercial Building Inspector and ICC Building Plans Examiner.

**Note 2:** Having both A and B in Step 1 will still require Part 1 ICC Firestopping training.

**Note 3:** After 3 years from issuance of the CLA, a minimum of 0.3 CEUs (3hours of training) on the subject of Firestopping from ICC or an ICC Preferred Education Provider will be required to renew the Firestopping CLA.

**Note 4:** For Firestop Special Inspector credentials, contact the International Firestop Council (IFC). This CLA is not a substitute for quality assurance programs such as the UL Qualified Firestop Contractor Program or the FM 4991, Approval Standard for Firestop Contractors. For more information regarding contractor credentials, contact FCIA, UL, or FM Global.

# Firestop Inspection Techniques

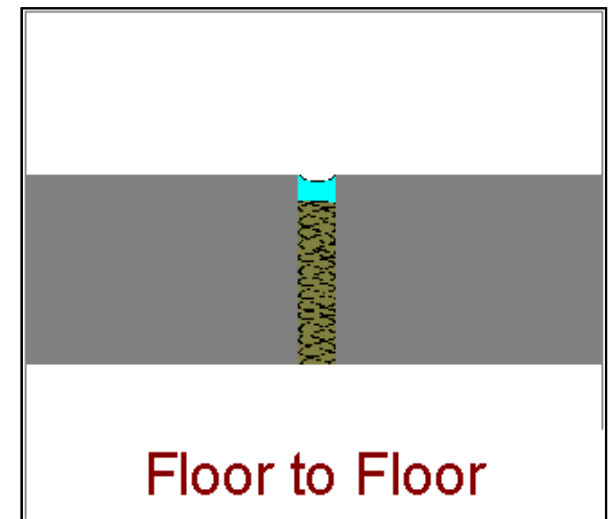
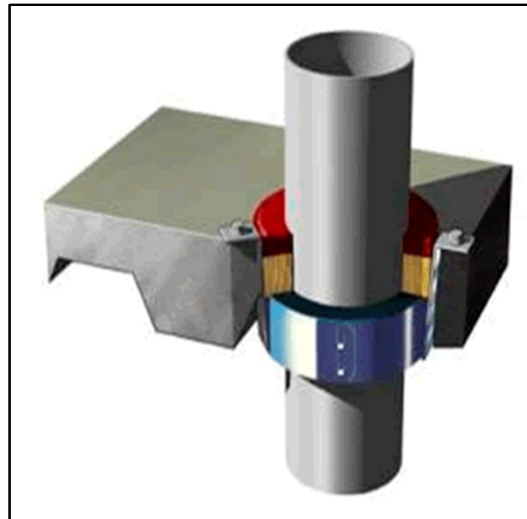
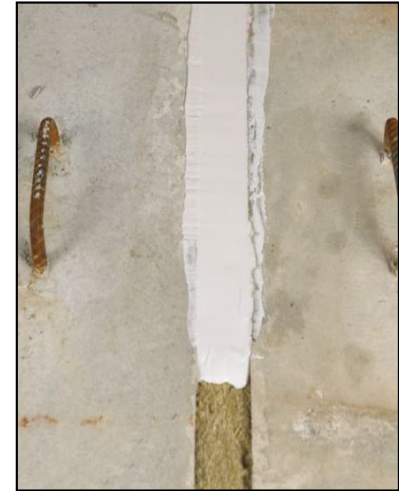
- ▶ Visual
- ▶ Destructive
- ▶ Consider requiring fill material and annular space inspection before sealant inspection.  
A two-step process for both penetrations and Joints.



# Annular OR Fill Material Inspection



# Sealant Inspection





There are systems that can be installed at one time. How do we inspect these systems

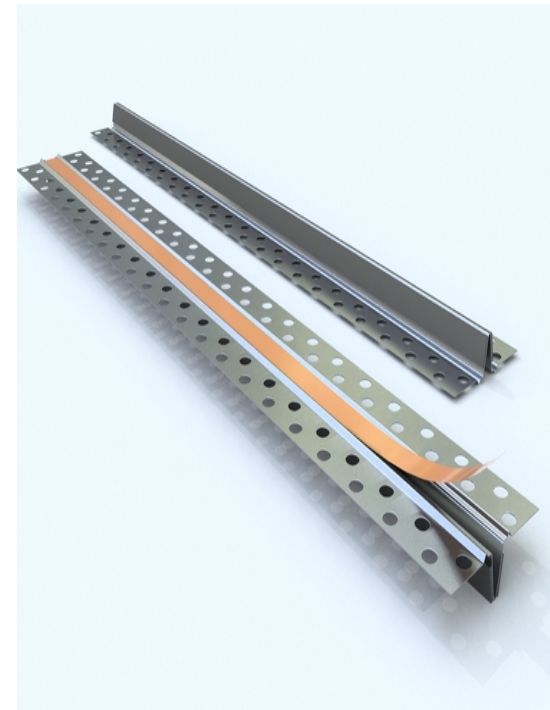


Floors and decks

Walls



Special Conditions





# Inspection of joints and pre formed devices

## FILL MATERIAL INSPECTION:

- ▶ Will lay out all of the joints and devices to be installed
- ▶ Will observe the fill material is installed and the nominal width is according to the tested and listed system if required.



# Inspection of joints and preformed devices

## SEALANT INSPECTION:

- ▶ Systems need to be installed with the tested listed systems available for our inspection



# Firestop Inspection Techniques:

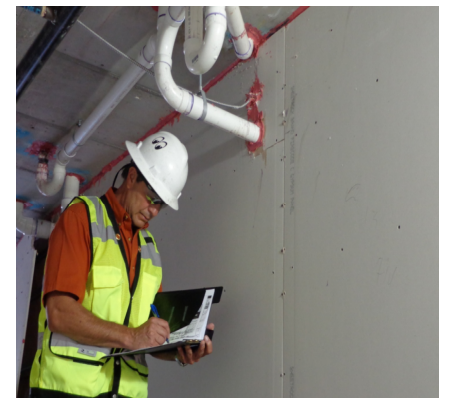
- ▶ Visual
- ▶ Destructive
- ▶ Consider requiring fill material and annular space inspection before sealant inspection. A two-step process for both penetrations and Joints.
- ▶ Consider having the firestop installer provide the destructive inspection with code official observing and identifying random systems to inspect





# Recommended Code Official Methods of Firestop Inspections

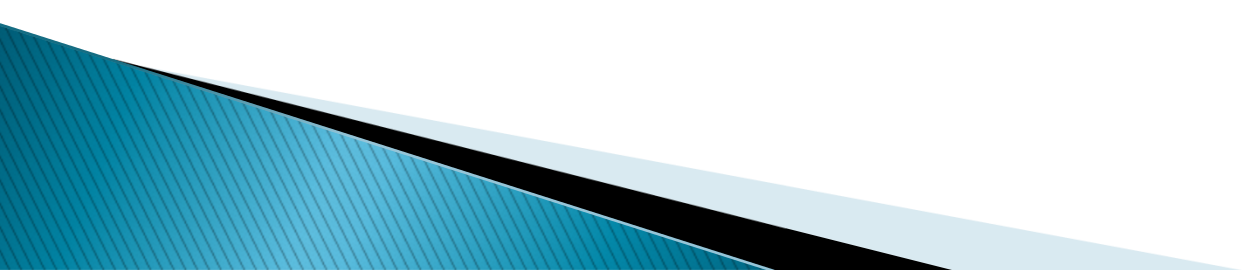
- ▶ Two step process of fill material and sealant inspection (Recommend providing inspection for only one of each type at Sealant inspection)
- ▶ Destructive Inspections by Installer with Code Official observing and identifying random systems to inspect.
- ▶ Destructive Inspection by Code Official



# Recommended Firestop Special Inspectors Methods of Firestop

## Inspections per ASTM Standards

- ▶ Destructive Inspection
- ▶ Two step process of fill material and sealant inspection
- ▶ Visual witness verification
- ▶ Have the installer provide the destructive test according to the ASTM standards.



# Firestop Joint Inspections

- ▶ Is the nominal joint width installed per the listing?
- ▶ Does the joint width fall within the system limits? (Compression and/or Extension)
- ▶ Check joints during framing inspection



# Sprinkler Pipe Considerations

## Plastic Sprinkler Pipe Penetrations:

- Need to confirm the firestop materials are compatible with the sprinkler pipes by approving only tested listed systems.
- Problem is that the chemical compatibility can cause splits or holes in the plastic pipes.

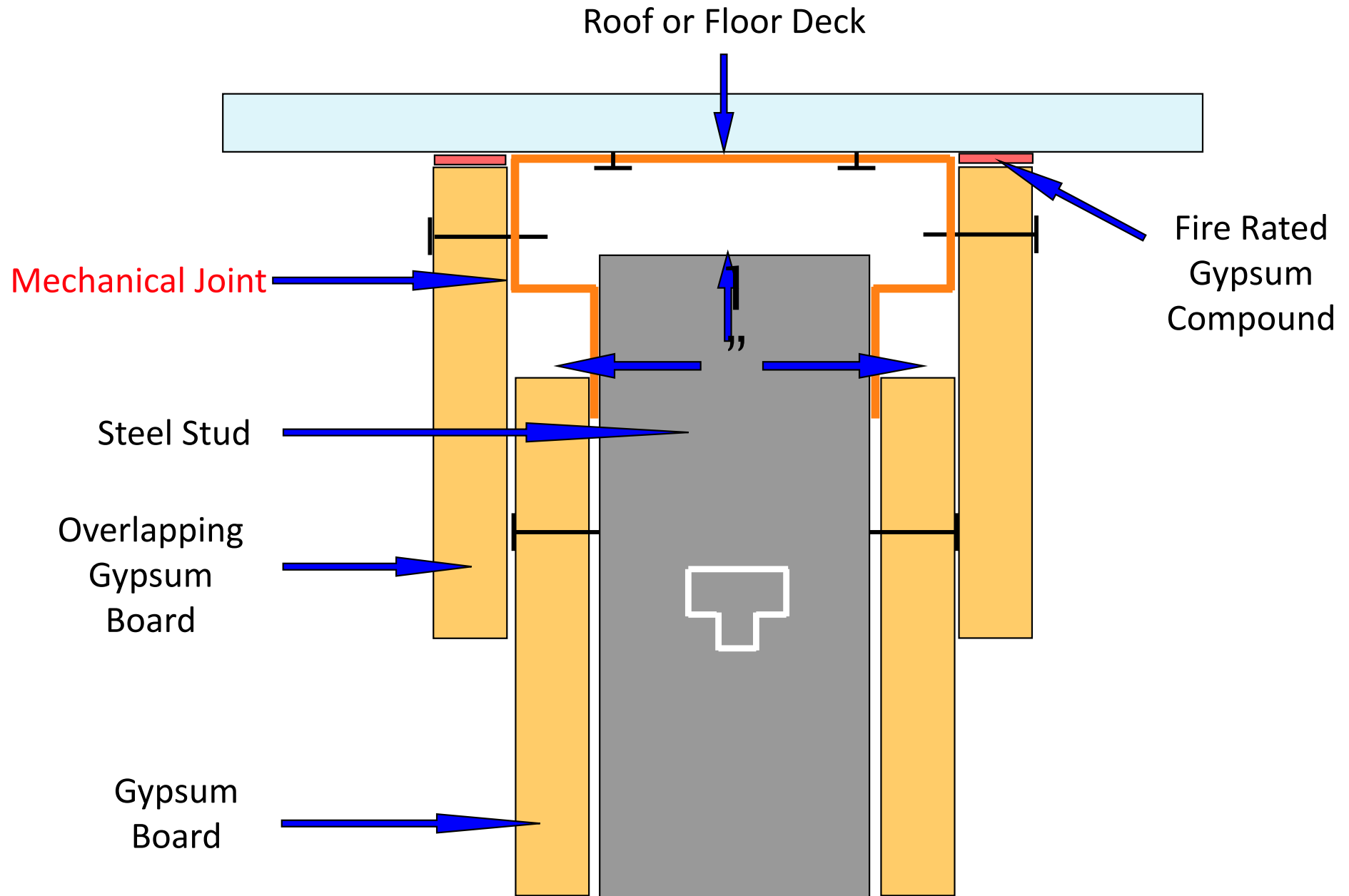


# Inspection of Penetrations

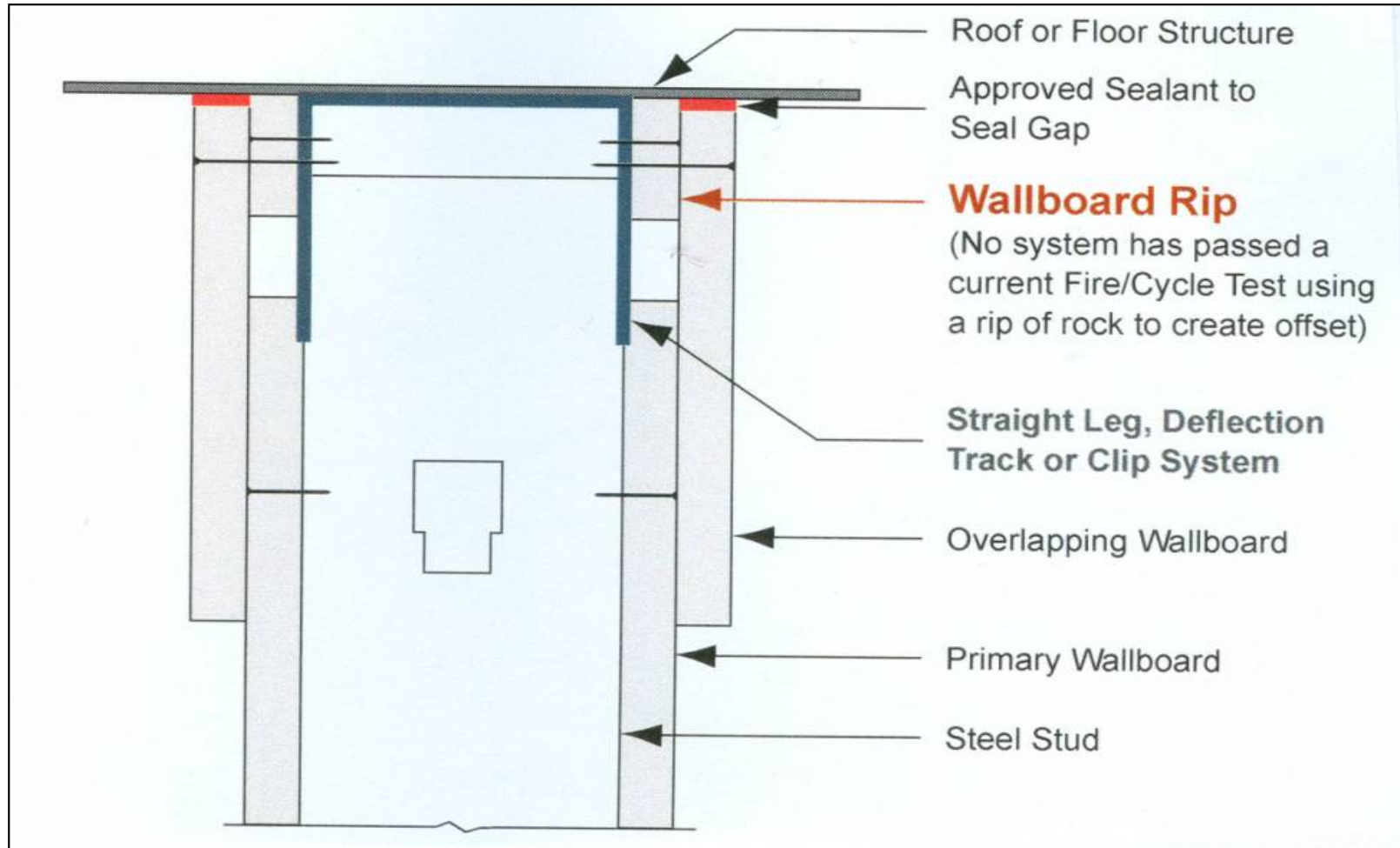
- ▶ Understand some sealants may shrink when installed and the amount of shrinkage may be in the listing
- ▶ If a sleeve is present confirm it is allowed
- ▶ Make certain the system indicates point of contact if needed.



# Review of Mechanical Joint



# Non-Code Compliant Head-of-Wall Joint




# PROCESS

## Building Department Submittals




- 107.1.1 – 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

# Firestop Submittals for Plan Review:

- ▶ Needs to Clarify if firestopping details are to be submitted for plan review or provided to the inspector in the field.
  - ▶ The firestop Plans examiner needs to make clear when and how submittals need to be reviewed and if a deferred submittal is acceptable.
  - ▶ Ensure tested and listed systems are identified for fire-resistant penetrations, fire resistant joints systems and perimeter fire barrier systems.
  - ▶ Specify if inspection provided by special inspector or AHJ.
  - ▶ If code officials are inspecting firestopping plans examiner should address firestop method of inspections
- 

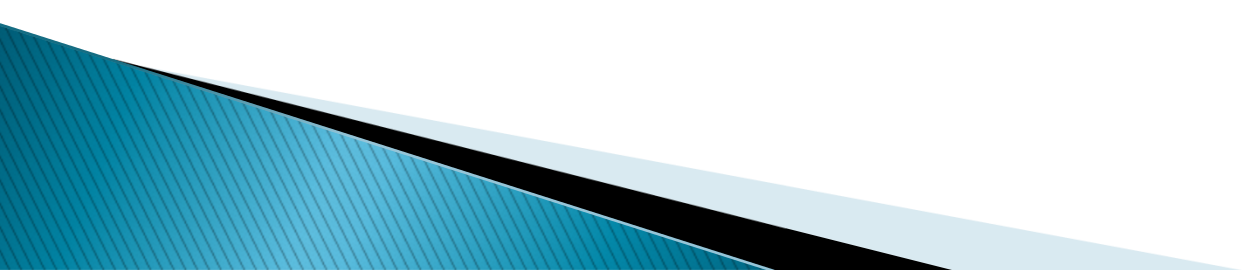


# Firestopping Plan Review/ Inspector Issues for AHJ to Clarify


- ▶ Building and Fire Departments needs to confirm who is taking responsibility of Firestopping
  - ▶ At time of Permit application explain Firestop Inspection Process for submittals.
  - ▶ The AHJ inspector or special inspector should confirm the specific tested and listed systems are appropriate 10 days before firestop inspection.
  - ▶ Confirm that contractors do not cover up firestop systems that will become concealed behind other construction until each installation has been examined by the inspector and approved.
- 

# Firestopping Plan Review/ Inspector Issues for AHJ to Clarify Cont.


- ▶ Where conditions exist and construction does not conform to a tested and listed firestop detail an engineering judgement EJ's can be utilized. These EJ's should be submitted for review and approval by the plan's examiner.
- ▶ That firestop joint systems will be inspected at the rough framing stage of construction to confirm the nominal joint width. This is why plan review for Joints are very important to reduce delays of projects



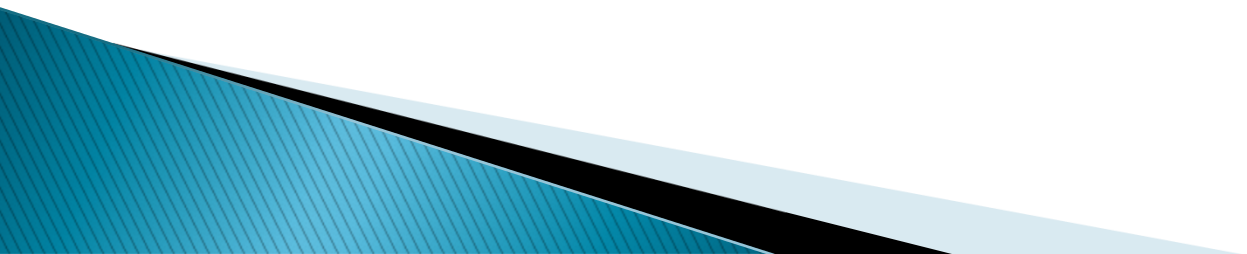
# Firestop Special Inspector and the AHJ

- ▶ The AHJ Should maintain a list of approved quality personnel to provide firestop special inspections.
  - ▶ Recommend that the AHJ require the Firestop Special Inspector label each approved inspected system with the Listing #, Inspector and date
  - ▶ Clarify what is to be integrated in the Daily and Final Inspection Reports
- 


# Firestop Special Inspector and the AHJ Cont.

- ▶ Establish inspection guidelines and expectations at Pre-Construction Meeting
  - ▶ The firestop special inspector final report will be reviewed and accepted by the Building Official prior to final building inspection.
  - ▶ The AHJ building inspector will approve the firestopping prior to final building inspection.
- 

# Example of Firestop Special Inspector Daily Inspection Report

- ▶ Location
  - ▶ Meets construction documents
  - ▶ Expiration of materials
  - ▶ Verification of installers
  - ▶ Number of Penetrations and joints installed
  - ▶ Number and percentage of Penetrations and joints inspected
  - ▶ All systems have been inspected to the ASTM Standards E 2174 and E 2393
- 

# FIRESTOP RESPONSIBILITIES FOR DESIGN PROFESSIONALS

- ▶ Specify fire-resistant penetration and joint designs on the submitted drawings to comply with the required hourly rating for the assembly being protected.
  - ▶ Consider Specifying fire-resistant penetration and joint designs as a deferred submittal that will be submitted 10 to 30 days before firestop installation.
  - ▶ Confirm the general contractor and firestop installers have all tested and listed firestop systems that have been reviewed.
- 

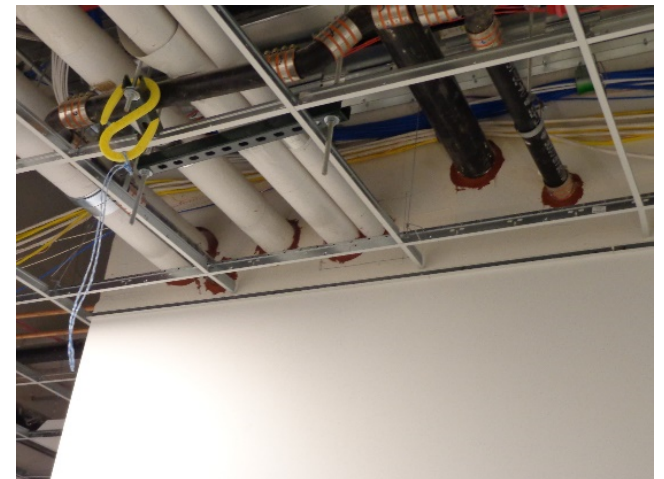


# Design Professional finding Firestop Systems


- ▶ Methods to Find Firestop System
  - Manufacturer Literature
  - UL Product IQ
  - Firestop system selection software
- ▶ Determine the steps involved in selecting an appropriate firestop system
- ▶ The UL listings / systems can be imported into the plans
- ▶ Importing listings into plans does NOT violate UL copyright requirements

# FIRESTOP RESPONSIBILITIES FOR DESIGN PROFESSIONALS CONT.

- ▶ Projects will provide a submittal of firestop details that will be available on the jobsite, with the approved set of plans, for the AHJ inspector or firestop special inspectors.
- ▶ Firestop joint systems to accommodate building movements without impairing their integrity



# GENERAL RECOMMENDATIONS FOR DESIGN PROFESSIONALS

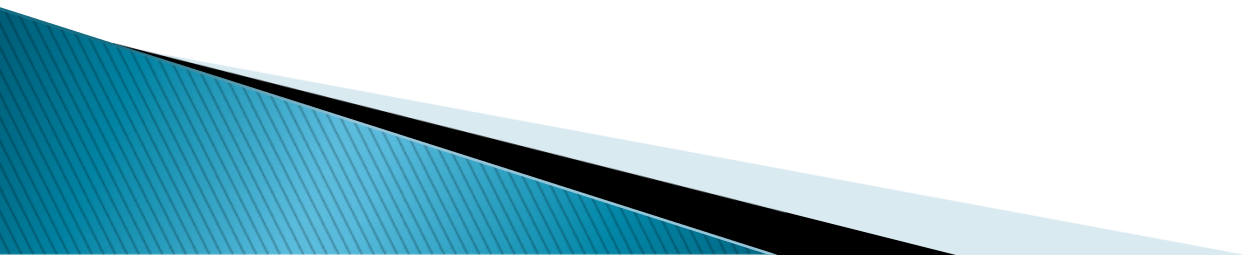
- ▶ Where conditions exist and construction does not conform to a tested and listed firestop detail an engineering judgement (EJ) can be utilized. Should clarify how Jurisdiction's handle Engineering Judgments and these EJ's should be submitted for review and approval by the plan's examiner.
  - ▶ If cutting and pasting specs from other projects, make sure systems are not too old and they are up to date with new codes and standards.
  - ▶ Establish Design Professional worksheets for firestopping
- 

# Example of Design Professional Worksheet

- ▶ Project
- ▶ Contractor
- ▶ Joint
- ▶ Penetration
- ▶ Assembly
- ▶ Hourly Rating
- ▶ Insulated Y/N
- ▶ Angle Y/N
- ▶ Design (UL)
- ▶ Notes



# GENERAL RECOMMENDATIONS FOR DESIGN PROFESSIONALS CONT.

- ▶ Support attending firestopping preconstruction meetings with AHJ and Manufactures along with all trades.
  - ▶ Utilizing Firestop Associations such as International Firestop Council (IFC) and manufactures online tools along with MasterSpec or BSD SpecLink
  - ▶ Recommend having firestop mockups meeting field conditions
- 



# Inspection Practices for Firestopping

## MOCKUP'S CONSTRUCTED IN THE FIELD

- ▶ Mockup's are not required by code; however, it is highly recommended
- ▶ Prior to installing firestop systems it is recommended to erect mockups for each different firestop system
- ▶ The AHJ's should approve the mockups before start of firestop installation.
- ▶ Mockups should be retained and maintained during construction.





# Inspection Practices for Firestopping

- Verify who will do installation of systems to determine reasonable verification
- Identify primary Firestop Manufacturer that typically is for all trades
- Pre-Construction Meeting – Attempt to meet with all firestop installers to make sure the inspection process runs smoothly



# Inspection Practices for Firestopping Pre-Construction Meeting

- Establish inspection guidelines and expectations
- Review qualifications/experience of firestop installers
- Review Design Drawings Submittals, if available
- Confirm they will be utilizing only tested listed firestop systems OR
- Obtain Pre-Approved Engineering Judgments



# Inspection Practices for Firestopping

## Pre-Construction Meeting

- Schedule firestop Inspections with the firestop contractor if possible
- If requiring Firestop Special Inspector need to confirm the above points.
- Quote from a Firestop Special Inspector: “You have to know that a Firestop Special Inspector does not have the same pull with contractors that you do as an AHJ”



# Inspection Practices for Firestopping Cont.

- ▶ The AHJ will decide percent of penetrations and joints to be inspected
- ▶ The Special Inspector will inspect required percentage of penetrations and joints according to ASTM Inspection standards
- ▶ During inspection have firestop installer follow-up to make necessary repairs after inspection
- ▶ If Possible, schedule each trade to be inspected at the same time



# Inspection Practices for Firestopping cont.

- ▶ Observe the products, empty containers or boxes for label with name, description and approved testing agency
- ▶ Must observe all firestop systems
- ▶ Have your inspection tools such as a flashlight, coring device, wire, drill bit, borescope, tape measure, digital calipers, camera and other appropriate tools



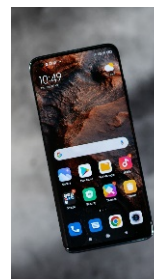


# Firestop Tools

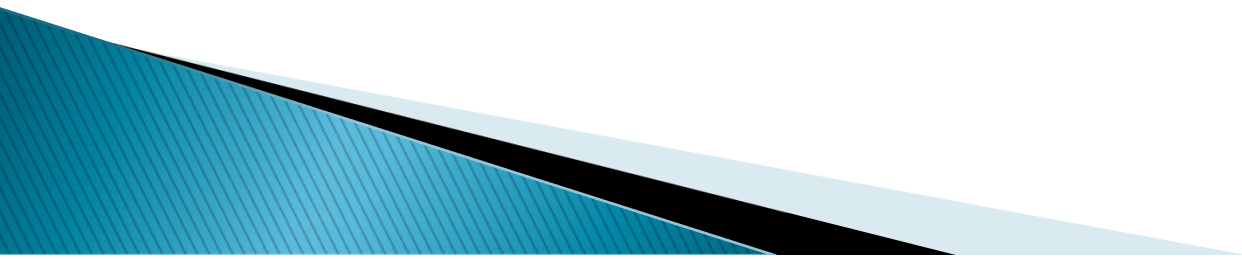




# Firestop Tools Cont.



# Do Code officials really need to understand firestop materials?

- ▶ The answer is yes!
  - ▶ Code officials need to know where to go to clarify storage of materials, effects of weather, and if inspection could damage the devices or firestop materials.
  - ▶ Recommend that AHJ invite primary Manufacturer to provide training for your staff
- 

# Firestop Inspection

## Product Issues

- ▶ Pre-formed firestop devices (Collars)
- ▶ Movement during Cure and the life of the building
- ▶ Mechanical Joints
- ▶ Aging of firestop material
- ▶ Painting firestop material
- ▶ Firestop sealant shrinkage
  - Wet sealant depth
  - Dry sealant depth

# Firestop Materials

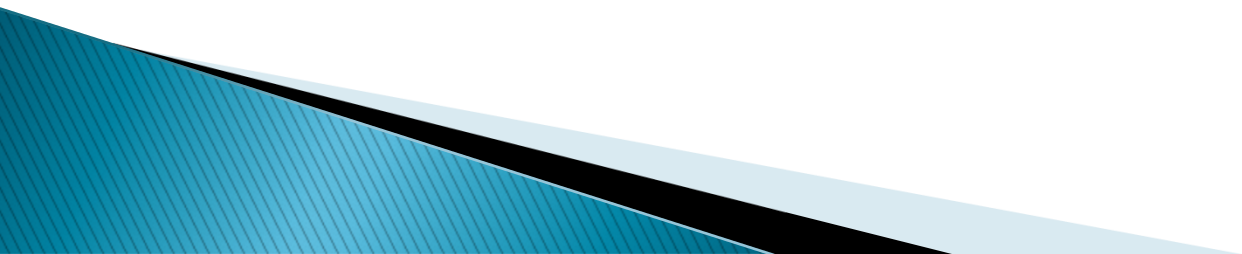
- ▶ Sealants
  - Silicone, Latex, Intumescent
- ▶ Wrap Strips
  - “Thick, Thin, Wide, Less Wide”
- ▶ Putties
- ▶ Pillows
- ▶ Composite Sheets
- ▶ Bricks / Plugs
- ▶ Pre Fabricated Kits
- ▶ Mortar
- ▶ Spray Products

# FIRESTOP BACKING MATERIALS

- Mineral Wool
- Ceramic Fiber
- Backer Rod
- Spray Foam

# Inspection of Packing or Forming Materials:

- ▶ Proper type
- ▶ Density
- ▶ Compression
- ▶ Orientation
- ▶ Depth

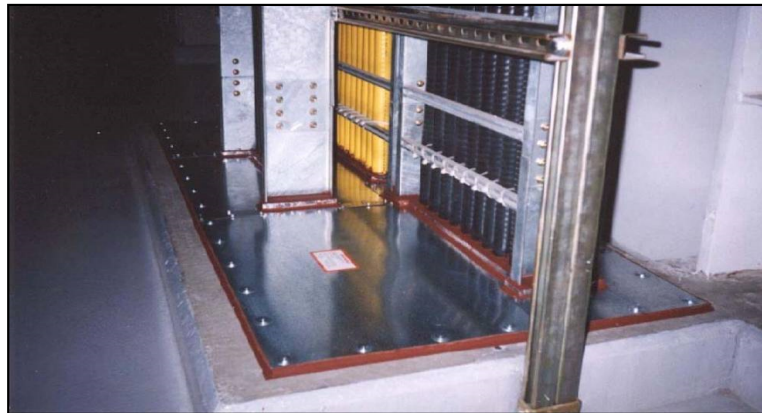




# Firestop System Materials

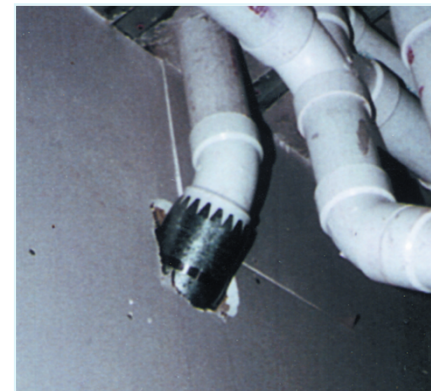
## Firestop Composite Sheets

- ▶ Sheet metal laminated to intumescent material with foil and metal scrim on the other side



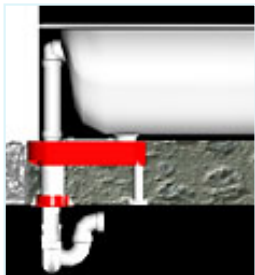
# Firestop Collars

- ▶ Through Wall “Cans” allow angled pipes
- ▶ Clearance required away from walls, floors



# Firestop Pre-formed Devices

- ▶ “Pre assembled, preformed molding kits in stainless steel frames, mechanically sealed”
- ▶ “Pre-assembled Open Pathway Devices



# Firestop Mortars

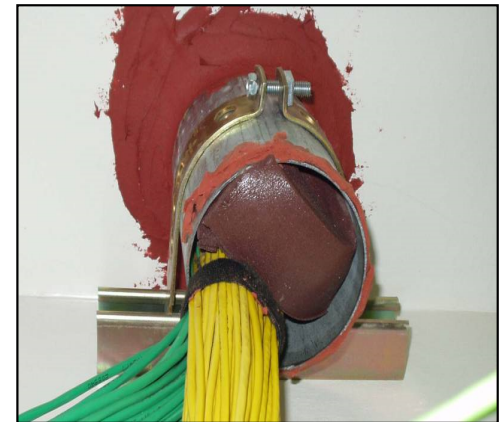
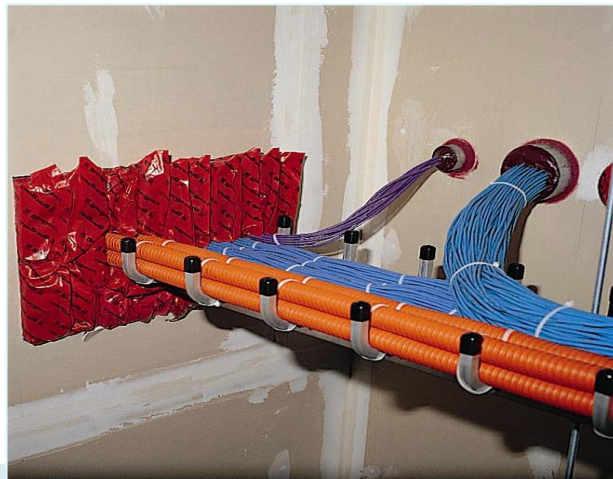
- Lightweight Aggregate Concretes
- Unexpanded Vermiculite or Perlite Concrete
- Specialty Foam Concretes
- Gypsum / Iron Ore Mortar





# Firestop Pillows or Bricks

- Review specifications on stacking
- Special attention to Floors
- Question the water seal
- Is Metal Lath or wire mesh on one or both sides required



# Electrical Box Protection

## Intumescent Putty Pads, Insert Pads or Gaskets

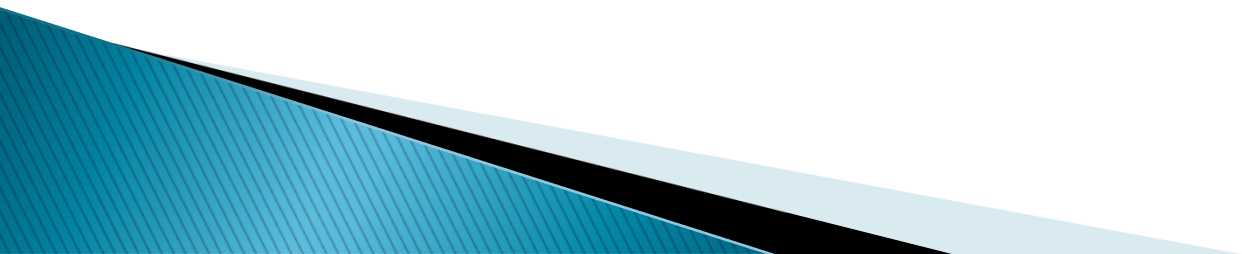


Preparation: Free from dirt, grease, oil, or loose materials....



# Why Firestopping can Fail in Existing Buildings

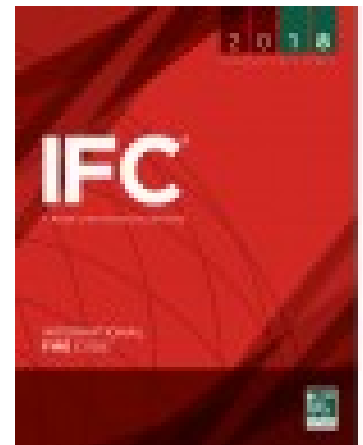
- ▶ Improper installation
- ▶ Building movement
- ▶ Effects of paint and water
- ▶ System selection not done properly
- ▶ Lack of maintenance



# Code Requirements – Firestopping


Minimum requirements for **Maintenance**

- International Fire Code
- International Property Maintenance Code
- NFPA 101 – Chapter 8
- NFPA 1 – Chapter 12



# International Fire Code (IFC)

## Inspection and Maintenance of Buildings

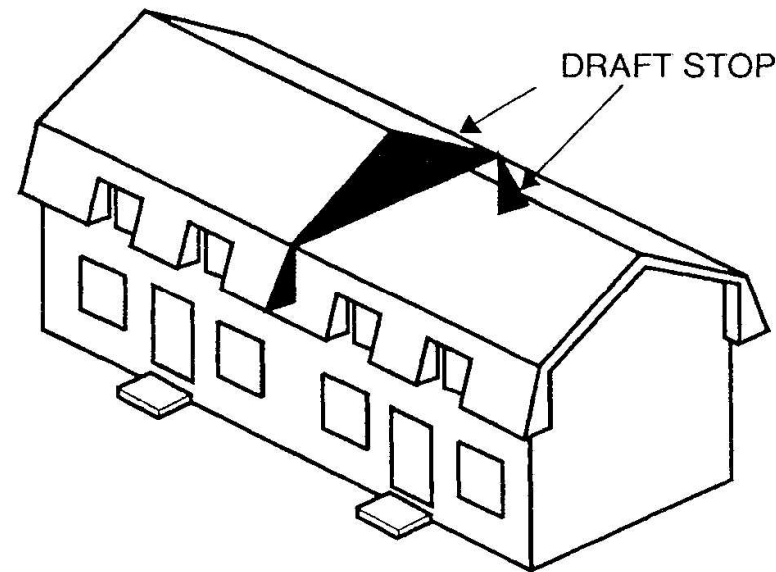
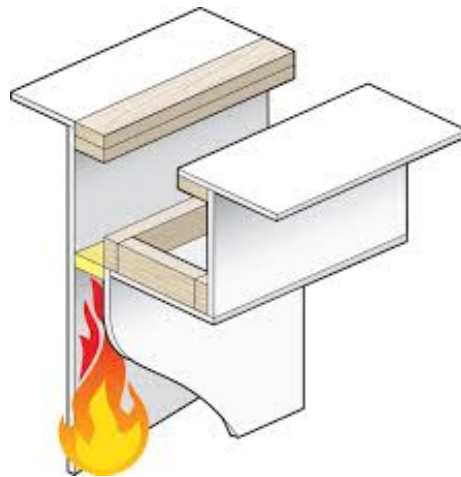
- 703.1 Maintenance. The required fire-resistance rating of fire-resistance-rated construction (including walls, firestops, shaft enclosures, partitions, smoke barriers, floors, fire-resistive coatings and sprayed fire-resistant materials applied to structural members and fire-resistant joint systems) shall be maintained.
  - 701.6 requiring building owners to annually inspect firestops and joint systems and properly repaired, restored or replaced where damaged, altered, breached or penetrated. Records of inspections and repairs shall be maintained.
- 

# 2018 International Fire Code Maintenance

- ▶ 703.1 Maintaining protection. Materials and firestop systems used to **protect membrane and through penetrations**.. Where the system design number is known, the system shall be inspected to the **listing criteria and manufacturer's installation instructions**
- ▶ 704.1 Maintaining protection. **protect joints and voids** shall be maintained.

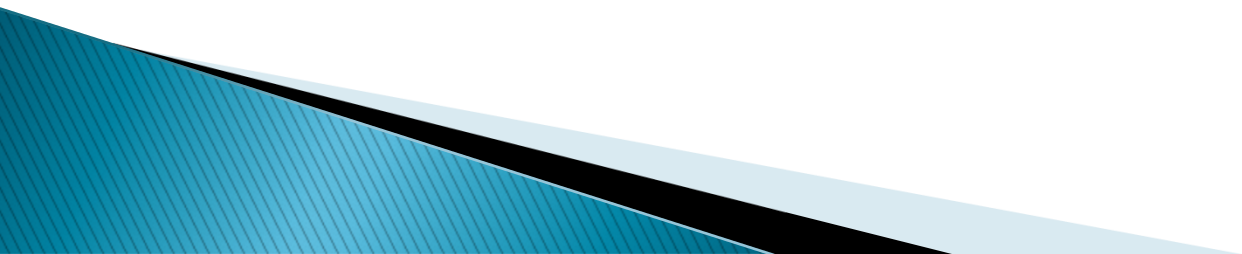
# 2018 International Fire Code Maintenance Cont.

- ▶ SECTION 707 CONCEALED SPACES • 707.1  
Fireblocking and draftstopping. **Required  
fireblocking and draftstopping** in combustible  
concealed spaces **shall be maintained** to  
provide continuity and integrity of the  
construction.



# 2018 International Property Maintenance Code

- ▶ SECTION 703 • 703.1 Fire-resistance-rated assemblies. The required fire-resistance rating of fire-resistance-rated walls, firestops, shaft enclosures, partitions and floors shall be maintained.



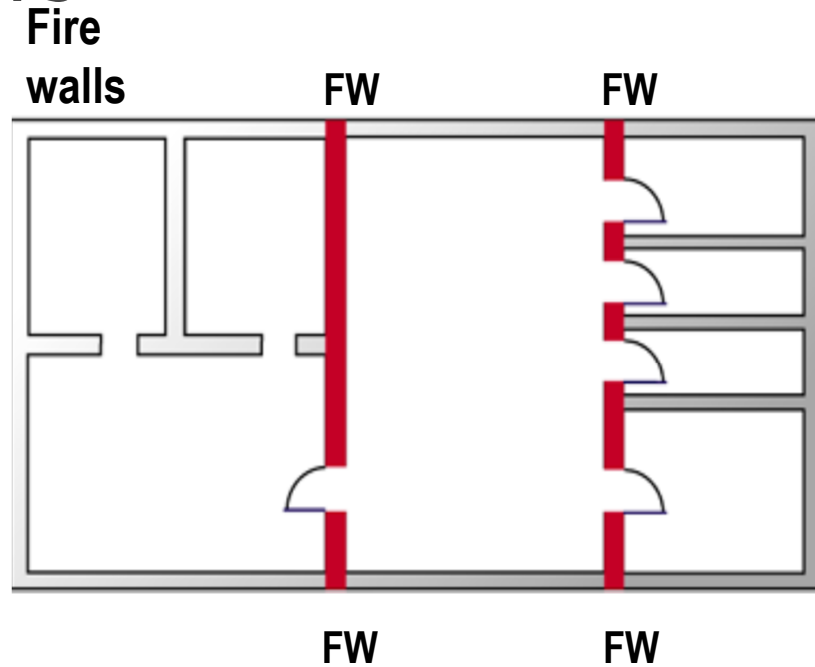


# Existing Building Firestop Inspections

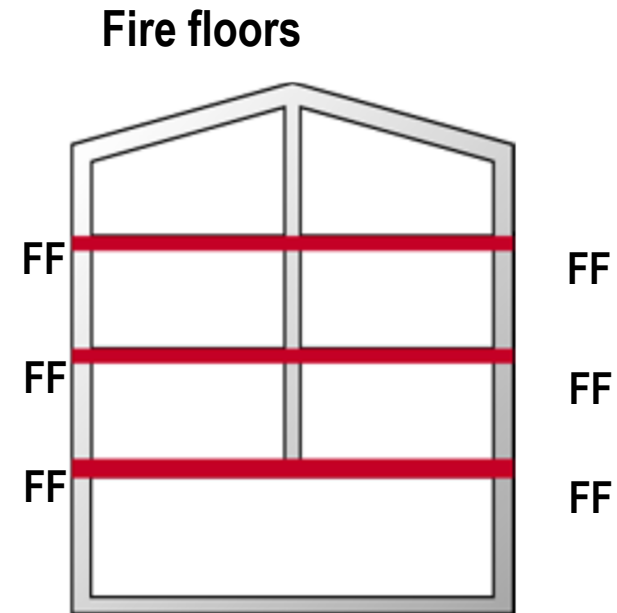
- The International Fire Code requires building owners to annually inspect firestopping
  - ▶ Firestop systems needs to be documented and labeled with procedure to re-firestop holes that the “cable guy” or others made.
  - ▶ Firestopping needs to be properly repaired, restored or replaced when damaged, altered, breached or penetrated.
  - ▶ QUESTION: Does your jurisdiction require existing commercial building inspections? If required how often are they inspected and do they inspect above the ceiling?

# When Inspecting Existing Buildings

- Understand occupancies with fire-rated (protected) corridors, separation walls and floors




FW = Fire Rated Wall



FF = Fire Rated Floor

# Recommending have a Statement of Compliance to include:

- ▶ Name and address of Facility
  - ▶ Signed by owner or authorized agent
  - ▶ According to chapter 7 of the IFC
  - ▶ Identify all assemblies and features inspected
  - ▶ All Deficiencies have been repaired, restored, or replaced where breached
  - ▶ Used only approved materials and methods
  - ▶ Signed with Date and title by inspector
- 



This is what code calls for...





# Firestopping in the Real World

- Firestop system details are hardly ever on the plans
- Firestopping is not included in the Plan Check Submittal checklist
- Code Officials generally do not ask for copies of Tested and Listed firestop systems
- *Building Owners* are not getting what they pay for regarding firestopping.



# Firestopping in the Real World

- Building departments generally do not have the resources to provide visual inspections according to standards
- Code officials are not accustomed to providing destructive testing according to the standards
- Joints are generally not inspected during the framing inspection and installed to provide movement





# Firestopping in the Real World Cont.

- Engineering judgments are being used when there are tested and listed systems available
- Firestopping is the only code required inspection on a project that is typically installed by every trade.
- Tested/Listed systems rarely installed appropriately
- Most users are untrained



Fire Officials and Contractors  
are starting to understand that

“WITH FIRESTOPPING YOU GET  
WHAT YOU INSPECT,  
NOT WHAT YOU EXPECT”



# Question for the Building Official

- ▶ What is your Building Department's Plan Review and Building Inspection Policy and Procedure for Firestopping?

# OPTIONS IF YOU CHANGE FIRESTOP POLICY AND PROCEDURE

- Different levels of enforcement
  - A. AHJ Will provide all firestop enforcement
  - B. 3<sup>rd</sup> party will provide all firestop enforcement
  - C. *According to IBC firestop special inspections section 1705.18*
  - D. *Large projects provided by 3<sup>rd</sup> party and other projects by staff*



# Building Departments can require Firestop Special Inspectors beyond Section 1705.18

- ▶ Section 1705.1.1 can be utilized to require additional buildings to the list of required firestop special inspections.
- ▶ 1705.1.1 Special cases. *Special inspections shall be required for proposed work that is, in the opinion of the building official, unusual in its nature*
- ▶ Your department could also amend the code to support firestop enforcement that works for your jurisdiction

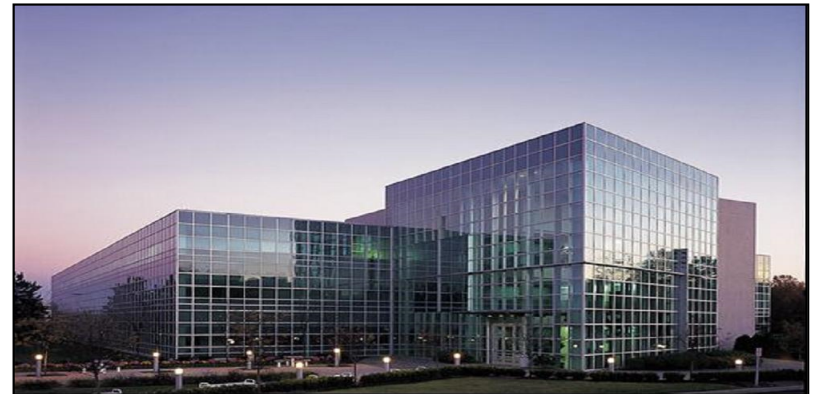
# OPTIONS IF YOU CHANGE FIRESTOP POLICY AND PROCEDURE

Common consideration:

*Large projects provided by 3<sup>rd</sup> party and other projects by staff*

QUESTION: What size of project should our department require firestop special inspectors?

- ☐ Three stories or greater in height
- ☐ Occupant load over 250 or BO sets OC
- ☐ Square footage of building
- ☐ Type of Occupancy
- ☐ Type of Construction





# Recommended steps if Building or Fire department changes firestop policy and procedure

- ▶ Designate one or more staff person to be the lead Firestop code official.
- ▶ Determine level of Firestop enforcement your department will provide.
- ▶ If Firestop Special Inspectors are required need to develop minimum qualifications for them and confirm format needed for daily and final reports.



# Recommended steps if Building or Fire department changes firestop policy and procedure cont.

- ▶ Include Firestop systems in your plan check submittals OR require tested and listed Firestop systems for the inspector in the field.
- ▶ If code officials are inspecting firestopping plans examiner must address methods of inspections
- ▶ Support Firestop Training needed to maintain the level of service provided by your department.




# Firestop Training Recommendations

## ▶ **International Code Council (ICC):**

- Self-paced, online course: “Firestop Inspector Credential of Learning Achievement” (CLA)

## ▶ **International Firestop Council (IFC)**

- Take the IFC Firestop Special Inspectors training and consider having some of your staff take the IFC exam.
  - Request a 2-hr, 4-hr, 6-hr, or 8-hr presentation that is non-product specific firestop training. Consider having your State ICC Chapter sponsor this free training.
  - Go online at firestop.org and take advantage of the video’s and other training tools along with IFC member websites.
- 

# Improper Firestop Installations





# Repair of Fire Rated Wall Assembly

## Gypsum Association

### (GA-225-19)



**Figure 1. Damaged Gypsum Board**



**Figure 2. Square-Off Damaged Area**



**Figure 3. Frame Cutout**



**Figure 4. Apply Gypsum Board Patch**



**Figure 5. Tape and Finish Patched Area**



**Figure 6. Redecorate Patched Area**

This document may be revised or withdrawn from circulation at any time. The status of the document should be verified by the user prior to following any recommendations contained herein. To verify that you have the most current edition of the document, access the Gypsum Association website at: [www.gypsum.org](http://www.gypsum.org).

# Correct Firestop Installations





# Available Resources General

- ▶ International Firestop Council (IFC)  
[www.firestop.org](http://www.firestop.org)
- ▶ Firesafe North America  
[www.firesafenorthamerica.org](http://www.firesafenorthamerica.org)
- ▶ Firestop Contractors International Association  
[www.fcia.org](http://www.fcia.org)
- ▶ ASTM International standards  
[www.astm.org](http://www.astm.org)

# Reference Materials

- ASTM E 2174 & ASTM E 2393 “Standard Practice for On-Site Inspection of Installed Fire Stops”
- UL-IFC Video “CLOSE ENOUGH IS NOT GOOD ENOUGH”: (YouTube: UL and IFC Video)
- ICC – Credential of Learning Achievement
- ICC/IFC Pocket Guide for Inspectors
- ICC Firestop and Damper book by Jay Woodward



# THANK YOU

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*FCTS APPRECIATES THE OPPORTUNITY*

