

# INSPECTION CHALLENGES OF FIRESTOPPING

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 15 years
- ▶ Served as the Executive Director for International Firestop Council for 2-1/2 years



# Outline of Presentation

- ▶ Welcome and Introductions
- ▶ Fire Blocking and Draftstopping
- ▶ 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
- ▶ ASTM Firestop Inspection Standards
- ▶ Existing Buildings – Maintenance
- ▶ Firestopping in the Real World
- ▶ Plan Review / Inspection of Firestopping



# 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**



# How Does Firestopping Work?

- ▶ Seals a penetration, or joint in a fire-resistive assembly
- ▶ Prevents fire from spreading from one side of the assembly through to the opposite side
- ▶ Composed of tested elements (“a system”) to stop fire and hot gases for a prescribed period of time



# Definitions

- Firestopping
- Draftstopping
- Fireblocking



# Fireblocking and Draftstopping

## Draftstopping

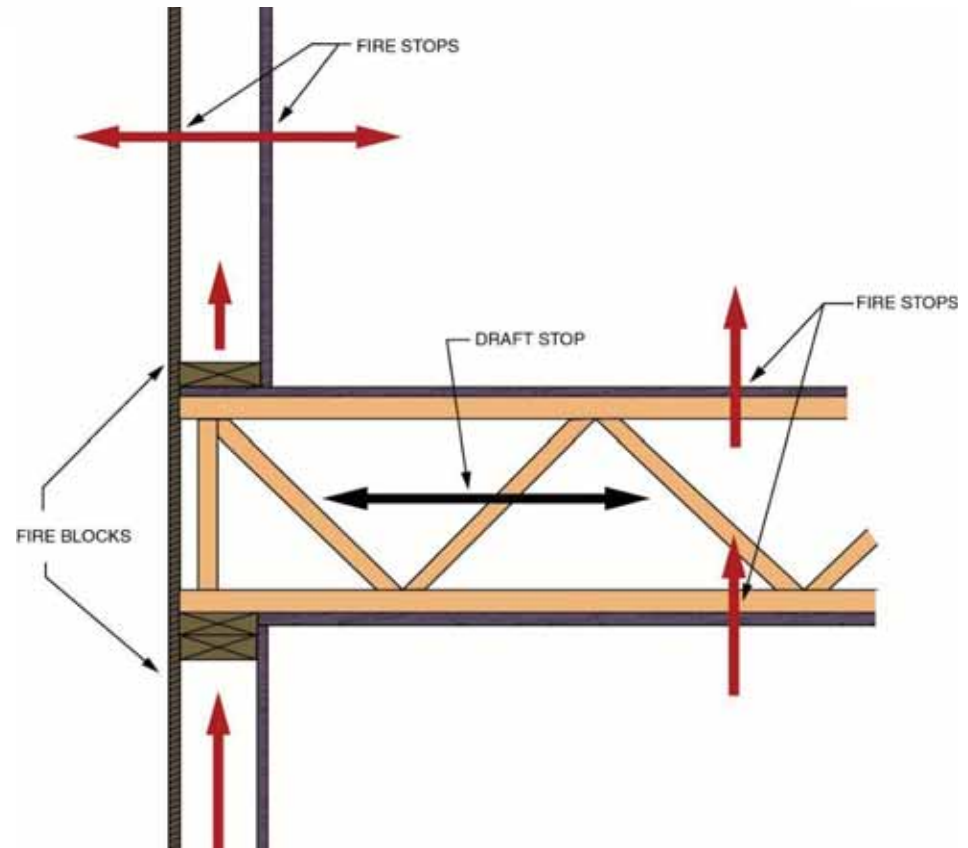
- ▶ To divide a large concealed spaces into smaller compartment (Intent: limit the movement of air w/n the cavity, reducing the potential for rapid fire spread)

## Fireblocking

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



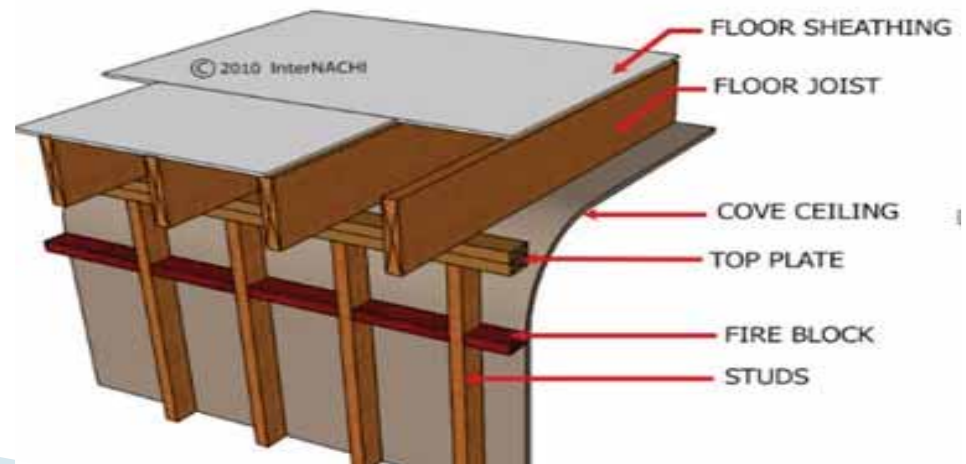
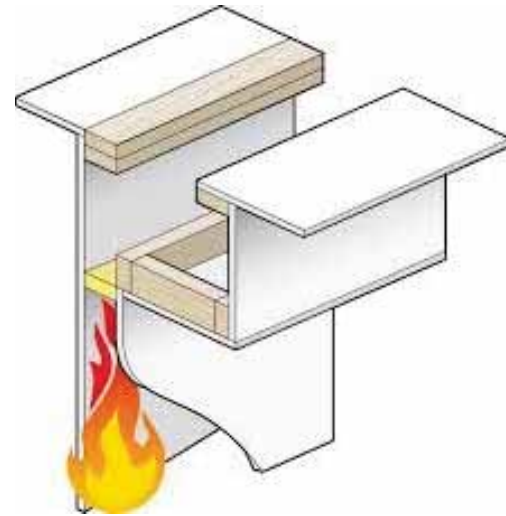
# Firestopping , Fireblocking and Draftstopping





# FIRESBLOCKING IN COMBUSTIBLE CONSTRUCTION

- ▶ PURPOSE
- ▶ MATERIALS
- ▶ WHERE REQUIRED
- ▶ LOCATIONS



# Fireblocking for Combustible Construction –IRC 302 and IBC 718

- ▶ Purpose of Fireblocking is to:
  - Cut off both vertical and horizontal concealed draft openings
  - Form an effective fire barrier between stories
  - Form a fire barrier between top story and the roof space



# FIRE BLOCKING MATERIALS – R302.11.1

- ▶ 2 x nominal lumber
- ▶ 2 layers of 1" nominal lumber with broken lap joints
- ▶ 23/32 Wood Structural Panel (WSP) w/ joints backed
- ▶ ¾" particleboard with joints backed



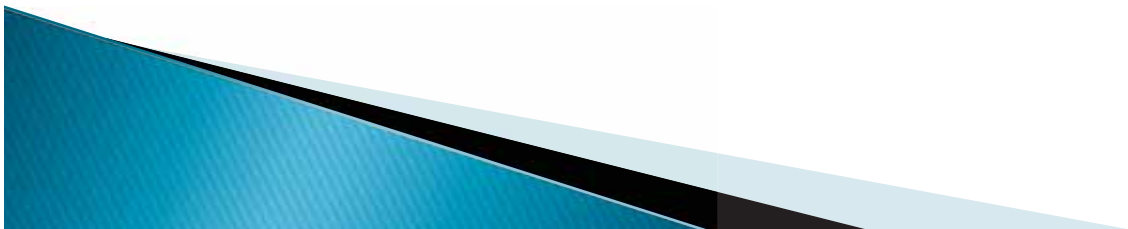
# FIRE BLOCKING MATERIALS CONTINUED

- ▶ ½" Gypsum
- ▶ ¼" Cement fiber board



# FIRE BLOCKING MATERIALS CONTINUED

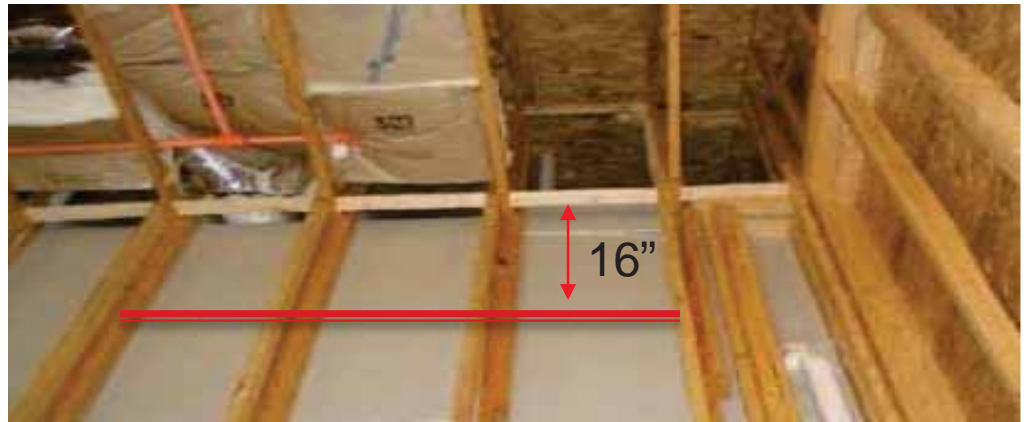
- ▶ Batts or blankets of mineral or glass fiber installed to be securely retained in place





# FIRE BLOCKING MATERIALS CONTINUED

- ▶ Unfaced fiberglass batt insulation used as fireblocking shall fill the entire cross section of the wall cavity to a minimum height of 16"



# OTHER MATERIALS TO CONSIDER

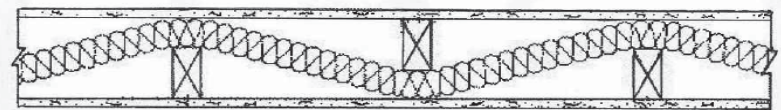
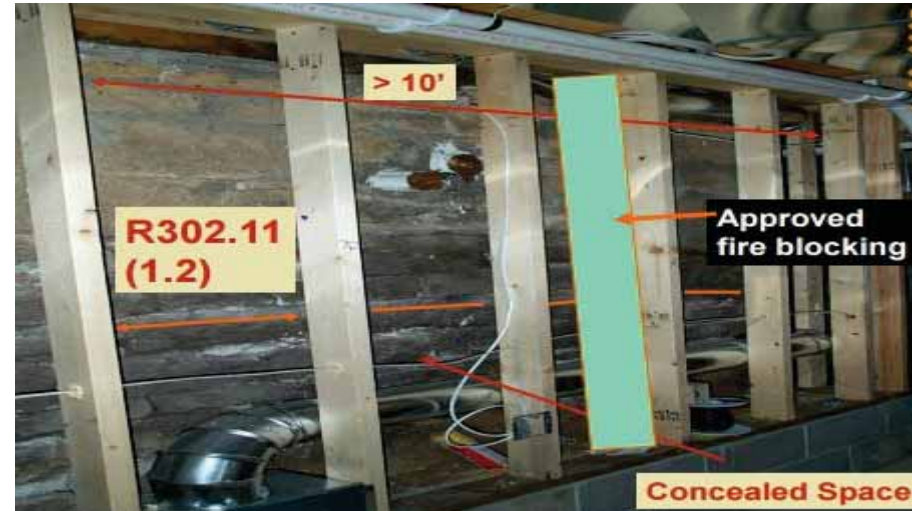
- ▶ Spray foam (must approved material)
- ▶ Loose fill insulation (must be specifically tested)
- ▶ Mineral wool or glass fiber (must be securely retained in place)
- ▶ Cellulose insulation (if tested for specific application according to ASTM test)
- ▶ Other approved materials



# FIRE BLOCKING WHERE REQUIRED

## R302.11

- ▶ Concealed spaces of stud walls **and** partitions, furred spaces **and** parallel rows of studs **or** staggered studs:
- ▶ Vertically at the ceiling and floor levels
- ▶ Horizontally at intervals not exceeding 10'

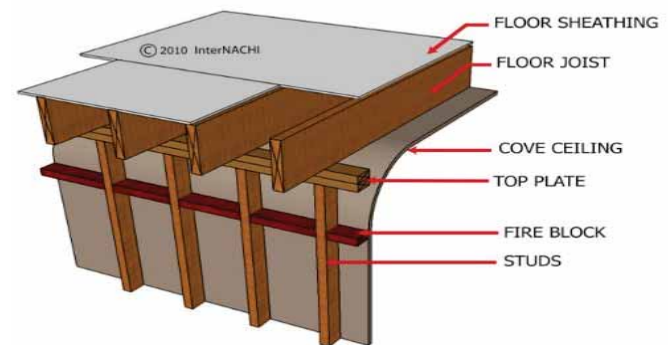




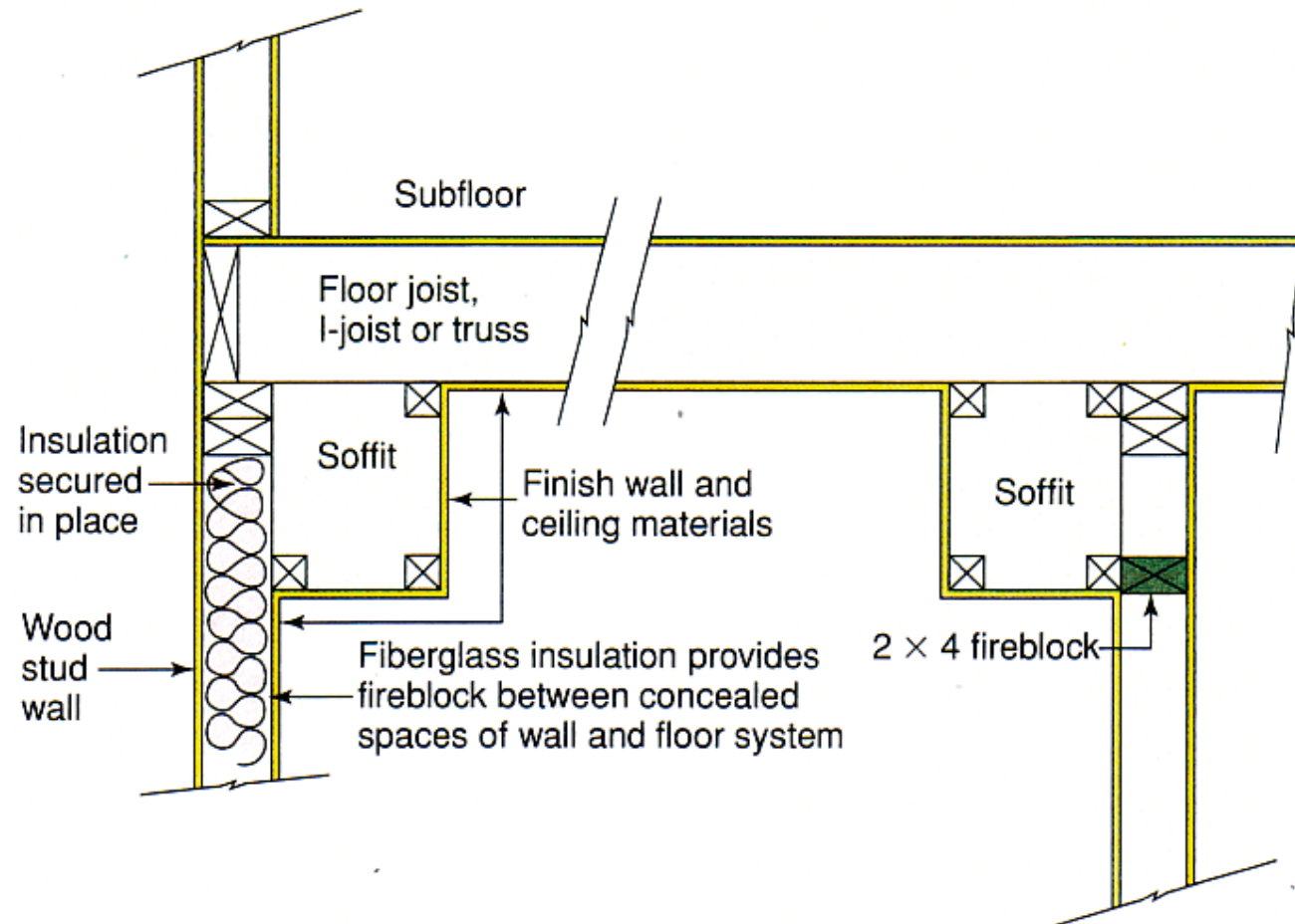
# FIRE BLOCKING WHERE REQUIRED

- ▶ All interconnections between concealed vertical and horizontal spaces such as soffits, drop ceilings & cove ceilings.

FIRE BLOCKING - COVE CEILING

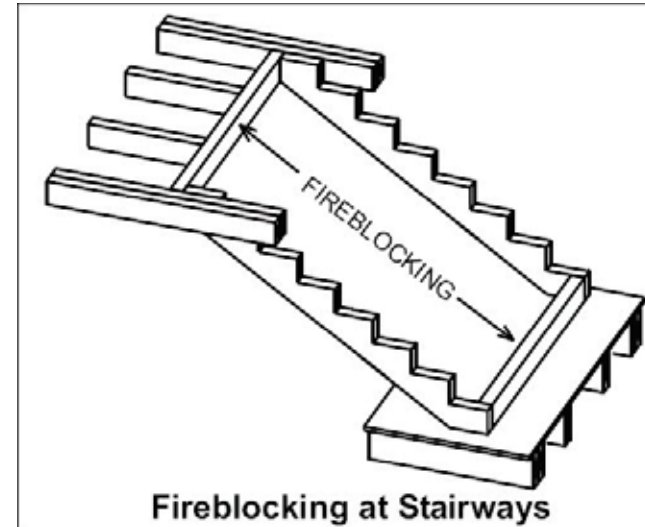


# FIRE BLOCKING WHERE REQUIRED



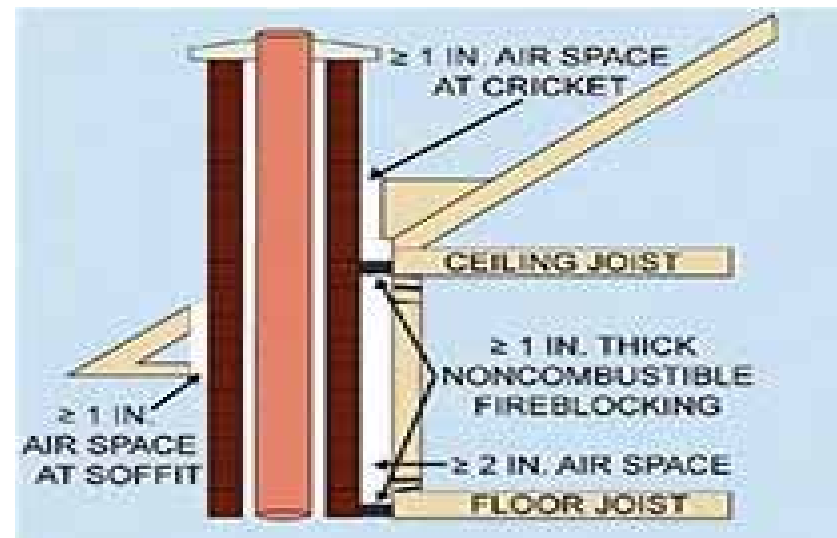
# FIRE BLOCKING WHERE REQUIRED

- ▶ Concealed spaces between stair stringers at the top and bottom
- ▶ Along the side of stairs IF under stairs unfinished



# FIRE BLOCKING WHERE REQUIRED

- ▶ chimneys and fireplaces – R1003.19
  - Fireblocked with noncombustible material



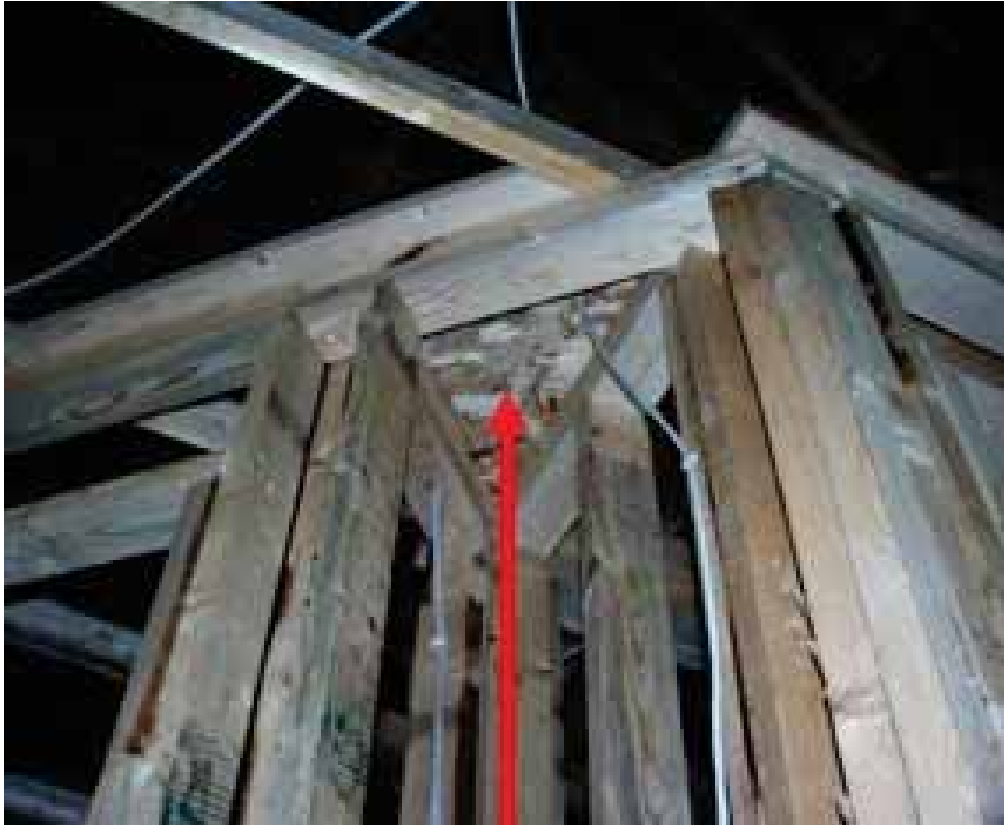
# FIRE BLOCKING WHERE REQUIRED

- ▶ Fireblocking of cornices of a two-family dwelling is required at the line of dwelling unit separation



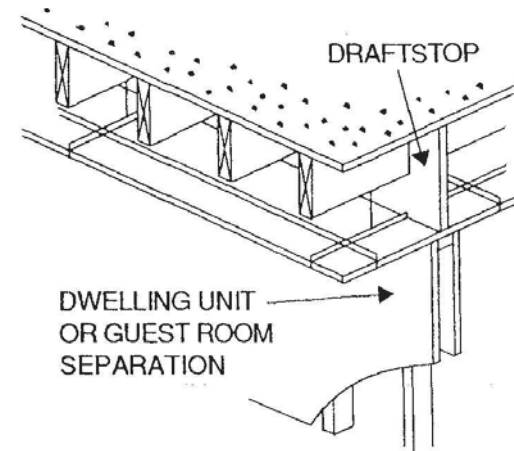
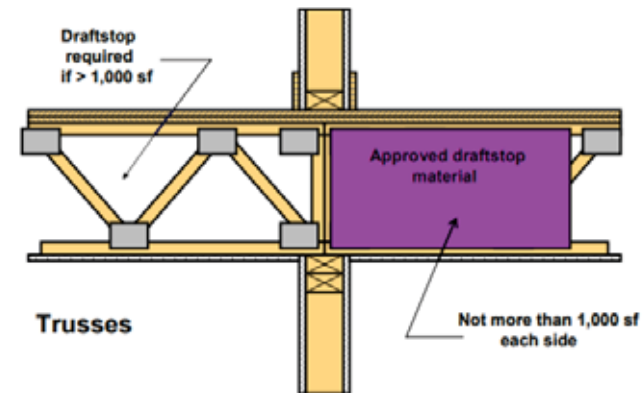






# DRAFTSTOPPING

- ▶ PURPOSE
- ▶ MATERIALS
- ▶ WHERE REQUIRED
- ▶ LOCATIONS





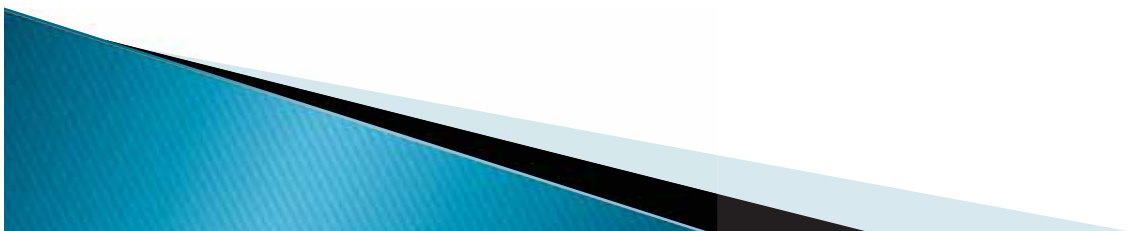
# Definition and Purpose of Draftstopping

## Definition:

- ▶ To divide a large concealed spaces into smaller compartment

## Purpose:

- ▶ Limit the movement of air w/n the cavity
- ▶ Acts as a barrier to smoke and gases
- ▶ Designed to prevent considerable damage from rapid fire spread



# DRAFTSTOPPING MATERIALS – 717.2

Materials shall not be less than:

- ▶ 1/2-inch gypsum board
- ▶ 3/8-inch wood structural panel



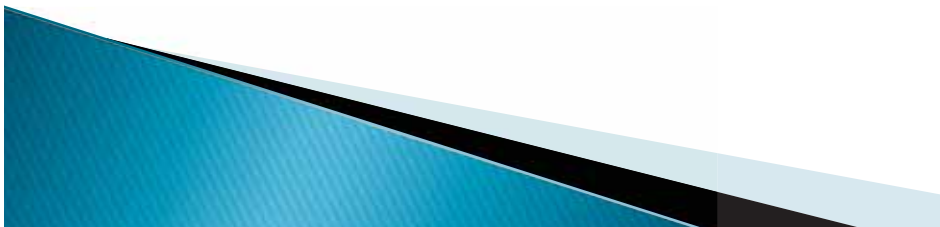
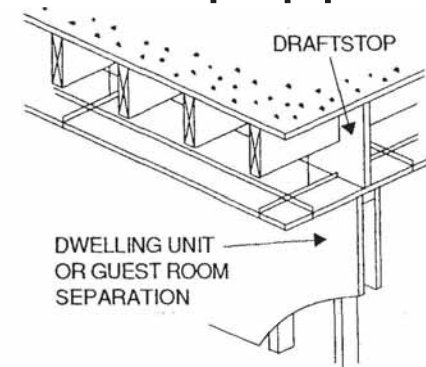
# Code Requirements for Draftstopping Section 717

- ▶ Required For Combustible Construction:  
**Group R-2 (Apartments)**
- ▶ Required if three or more dwelling units
- ▶ Where a corridor also serves as a dwelling unit separation, draftstopping is only required above one of the corridor walls.

## Group R-1 (Hotels)

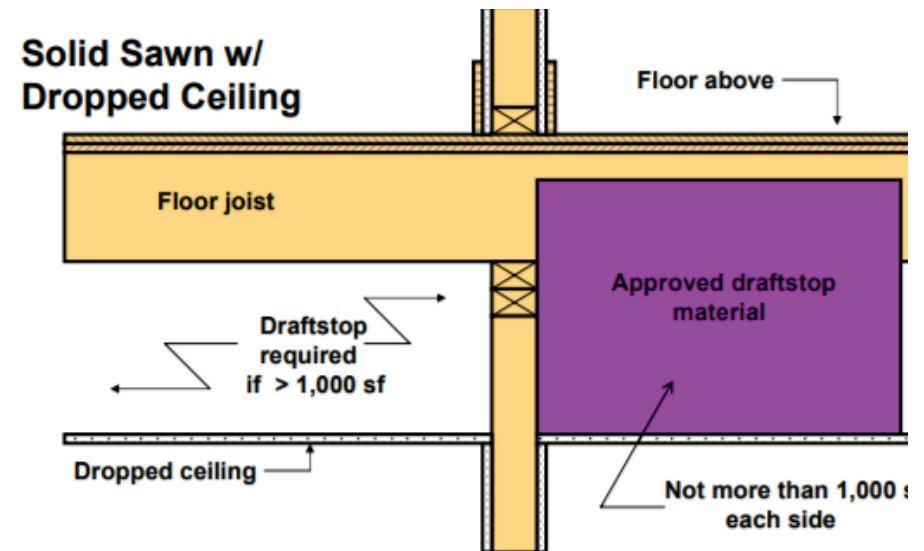
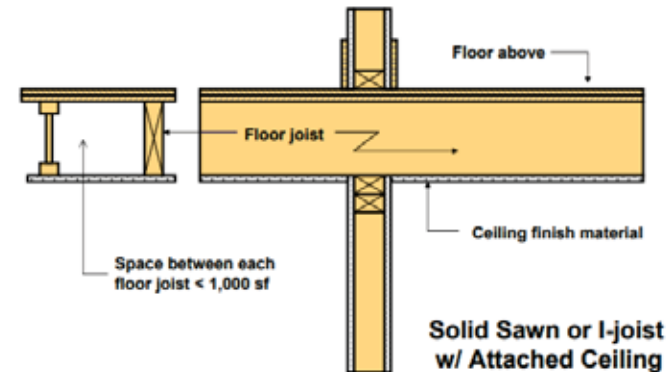
- ▶ Required in all building

**Exception:** Draftstopping not required if equipped with sprinkler system



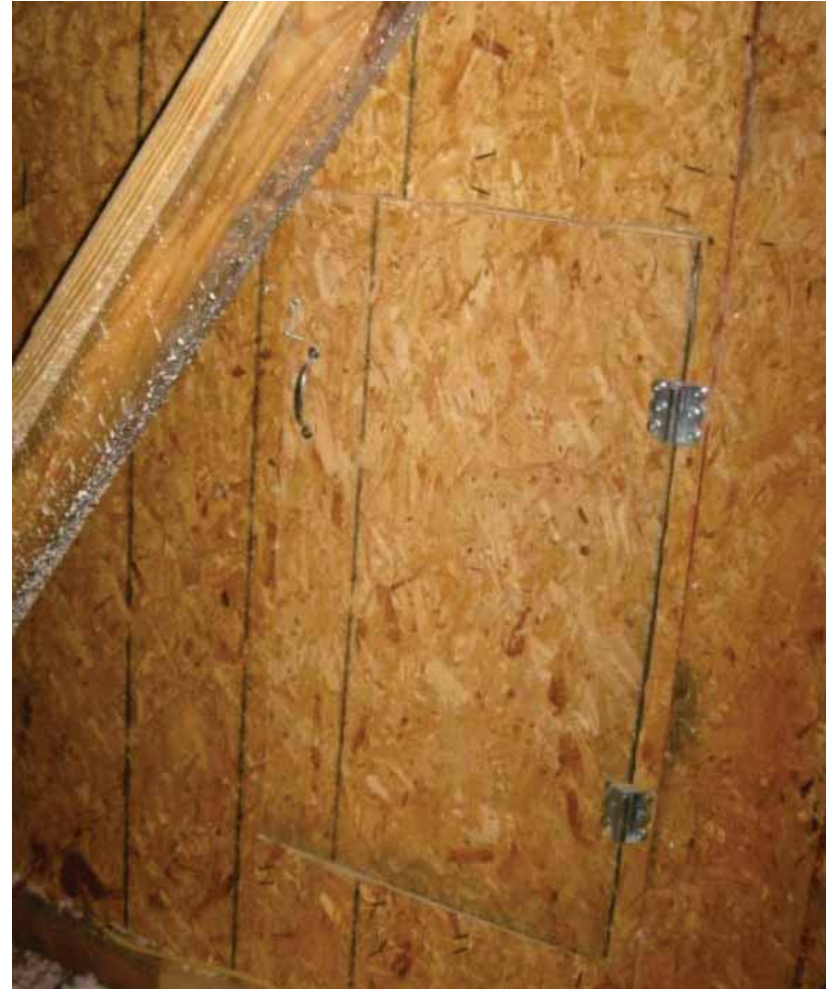
# Draftstops in Floors

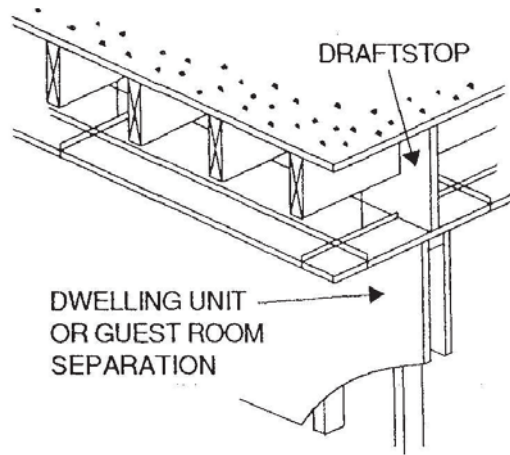
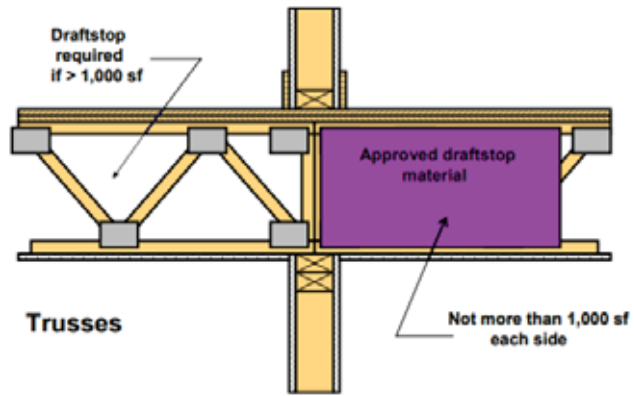
- ▶ Solid joist or I-joists  
Draftstops when ceiling finish is added.
- ▶ Draftstops in Dropped Ceiling
- ▶ Horizontal floor areas can not exceed 1,000 square feet



# OPENINGS

- ▶ Self-closing doors with automatic latches







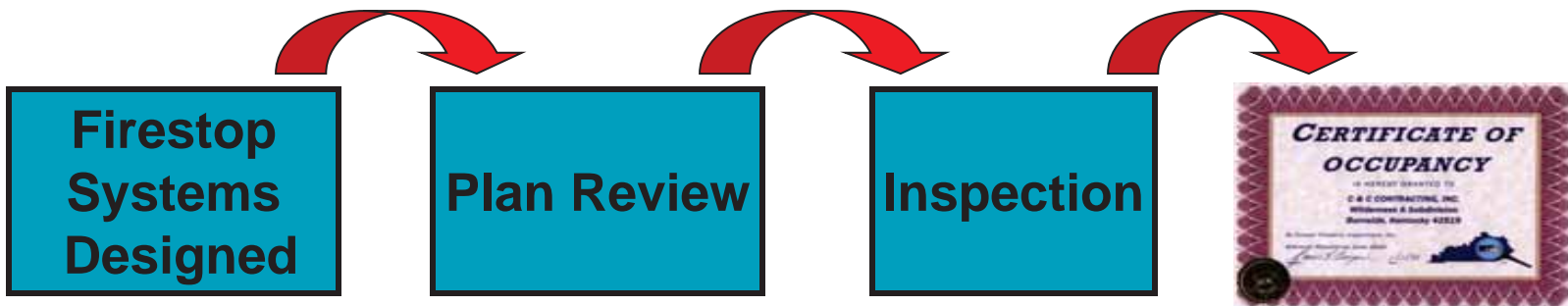
# Who's Responsible for Making Certain Firestopping is code compliant?

- 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 Firestop Inspector **Survey**

- ▶ A few years ago the International Code Council (ICC) approved a new Firestop Inspector Certification; however, it was never implemented.
- ▶ During this approval process an **ICC Survey** was developed to determine if firestopping needs an ICC exam and if Firestopping was inspected properly



# THE REAL PROBLEM

Firestop Inspections are difficult to preform:

- 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



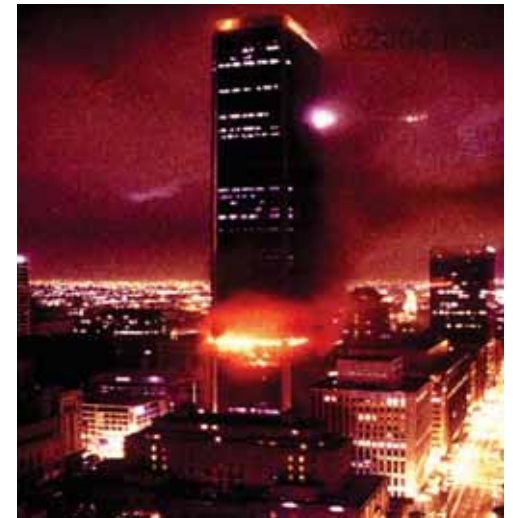
DETECTION



SUPPRESSION

# 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



# Firestop & Liability

## ONE MERIDIAN PLAZA BUSINESSES vs. BUILDING OWNER

- » **Fire destroyed 40-story building.**
  - Tenants sued owner
  - Affected businesses within one block also sued
  - Three fire-fighters dead; numerous injuries
- » **Claimed potential exposure: \$800 million**
  - Building owner sued approx. 25 defendants, including the General Contractor /Subcontractors/ Manufacturers



# 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".

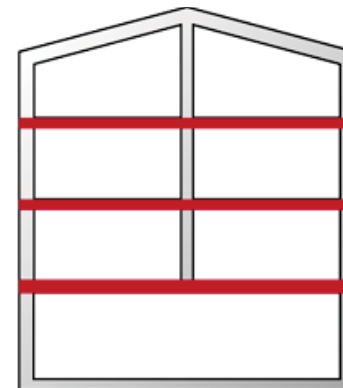
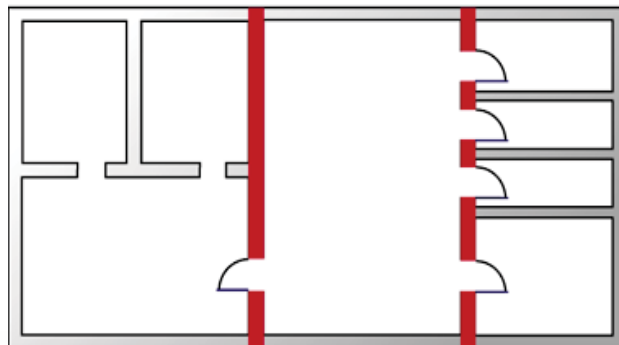


# Contain fire, smoke and toxic gases to the point of origin

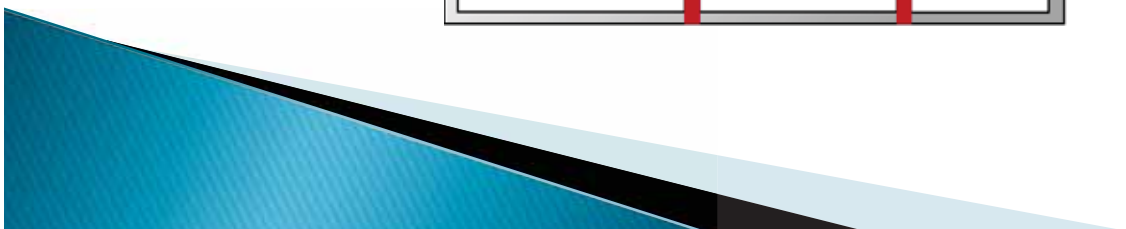
- Create compartments with fire-resistive walls and floors
- Increases Time Available to Escape (TAE)
- Increases number of escape routes
- Increases structural safety for fire fighters
- Limit property loss



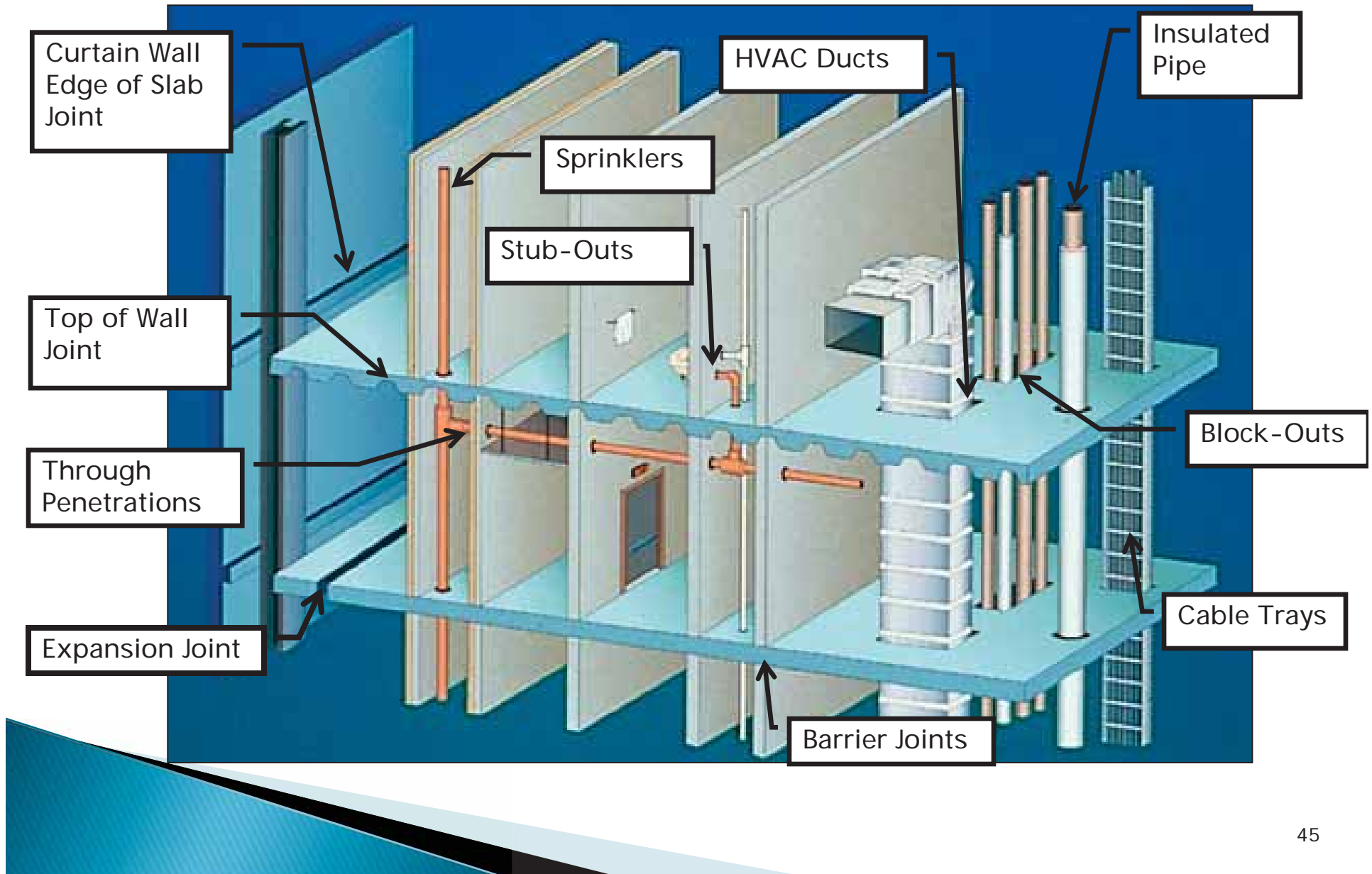
Fire/Smoke Barriers



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





# Code Requirements – Firestopping



# Containment in Construction

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

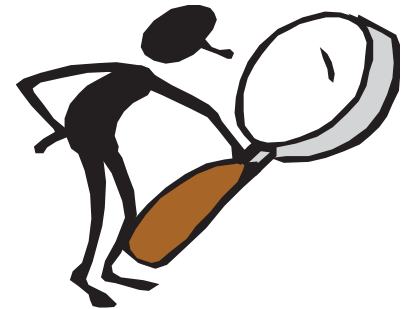
- ▶ Fire-resistance-rated wall assemblies
- ▶ Fire-resistance-rated floor and roof assemblies
- ▶ Joints in fire-resistance-rated assemblies
- ▶ Perimeter exterior wall systems



# 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



# 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]



# Firestop Code Requirements

## Special Inspections

- 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 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 – 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.**



# 2021 International Fire Code

## Inspection and Maintenance of Buildings

**701.6 Owner's responsibility.** The owner shall maintain an inventory of all required *fire-resistance-rated* construction, construction installed to resist the passage of smoke. Such construction shall be **visually inspected by the owner annually and properly repaired**, restored or replaced where damaged, altered, breached or penetrated. Records of inspections and repairs shall be maintained.



# 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**



## *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

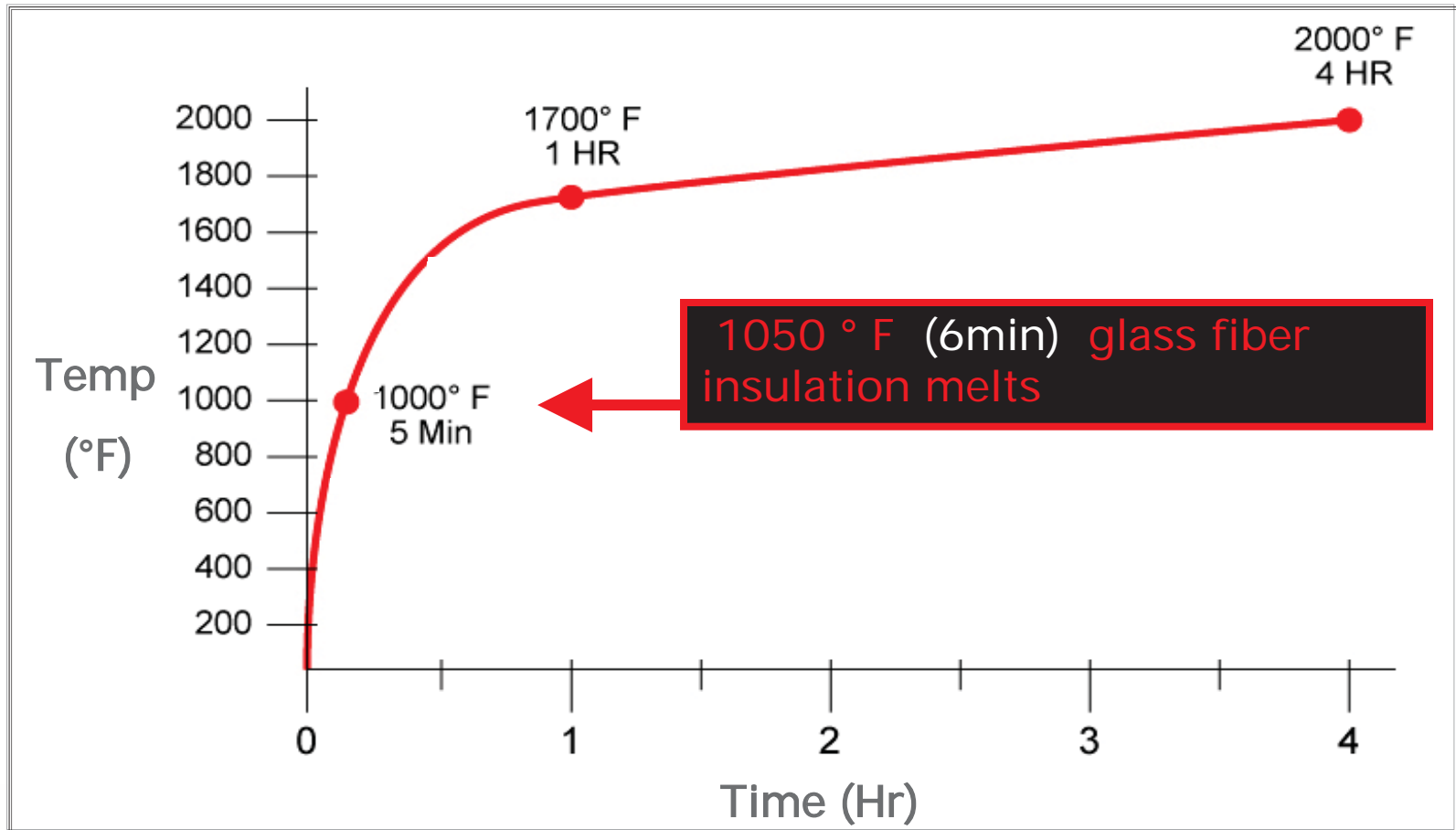
## Labs Test to Standards

American Society of Testing and Materials (ASTM)

Underwriters Laboratories Inc. (UL)



# Time – Temperature Curve



# Definition of Intumescent

Intumescent – A substance which swells, inflates or expands as a result of heat exposure thus increasing in volume and decreasing in density.



# 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

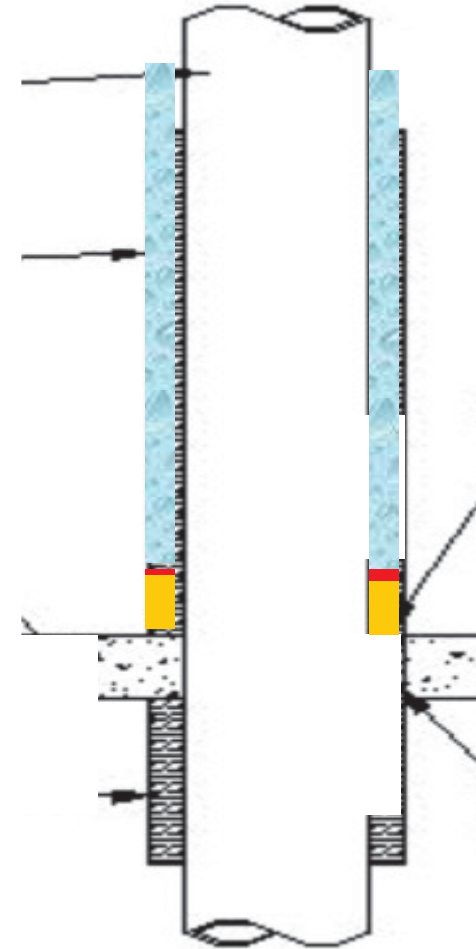
- ▶ **L-Rating**

- ▶ 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

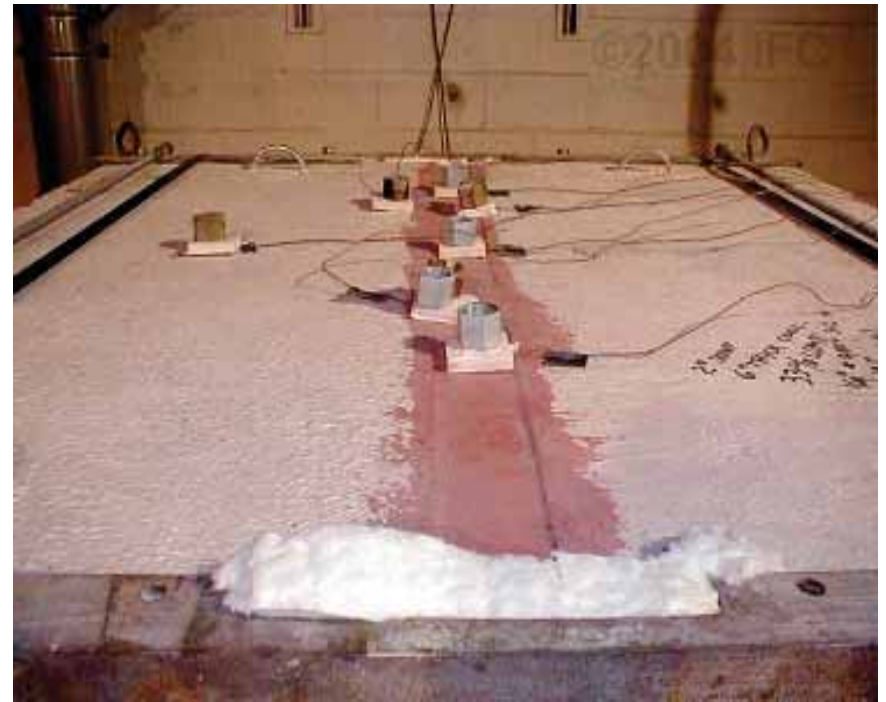


# Fire Resistive Joint Testing

*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

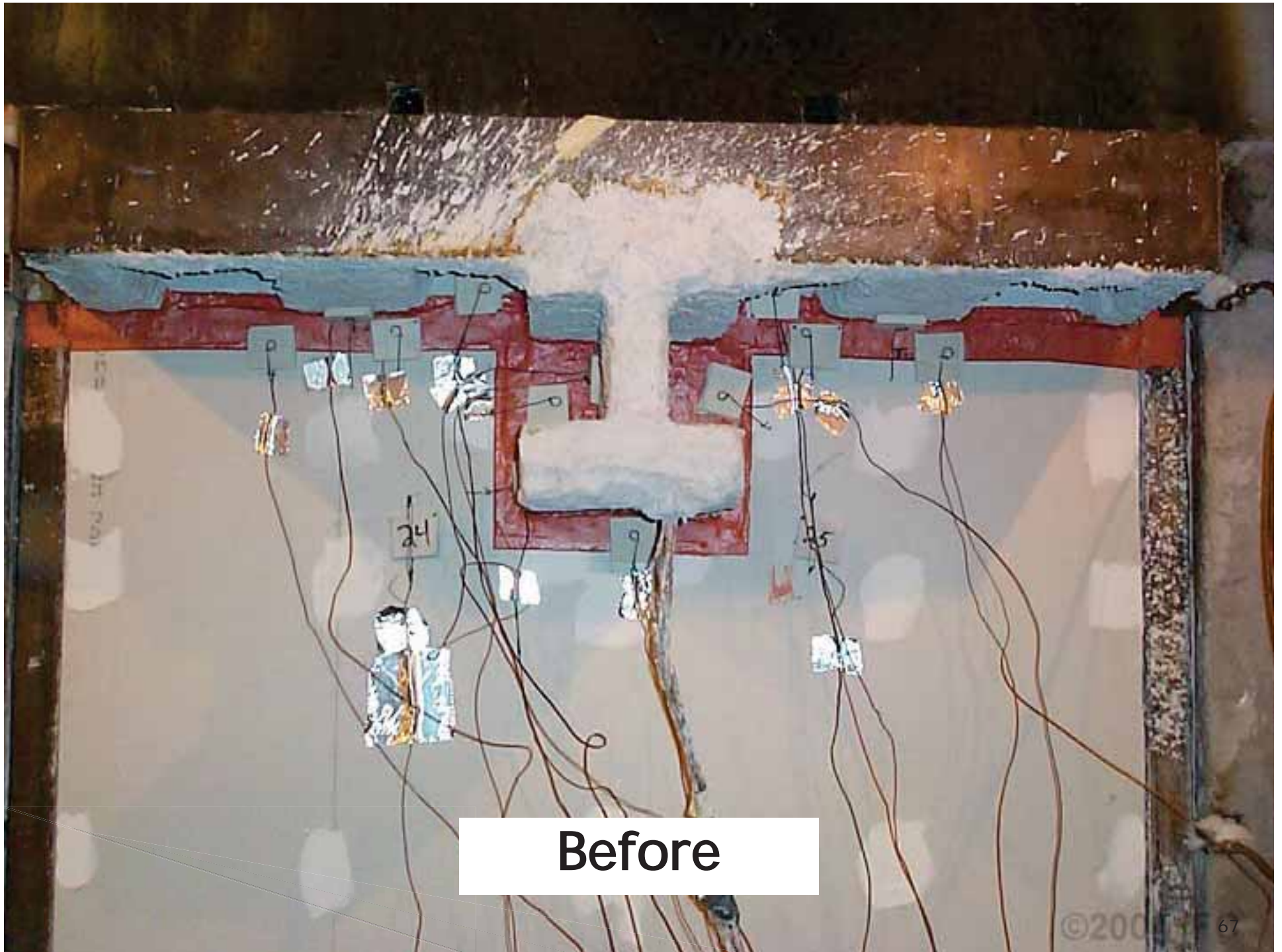
- ▶ ASTM E3037 movement test for firestop Penetration systems are now called the “M Rating”
- ▶ This movement cycling is independent of fire test
- ▶ After movement tests still requires full compliance with the fire tests
- ▶ The codes do not address this issue



# 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





**After Fire Exposure**

# 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 and Reviews Engineering Judgments?

- Professional engineer
  - Fire protection engineer
  - Manufacturer
  - Testing laboratory
- ▶ Must be acceptable to the Building Official and recommended to be submitted for review and approval by the Design Professional or Plan's Examiner.



# 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

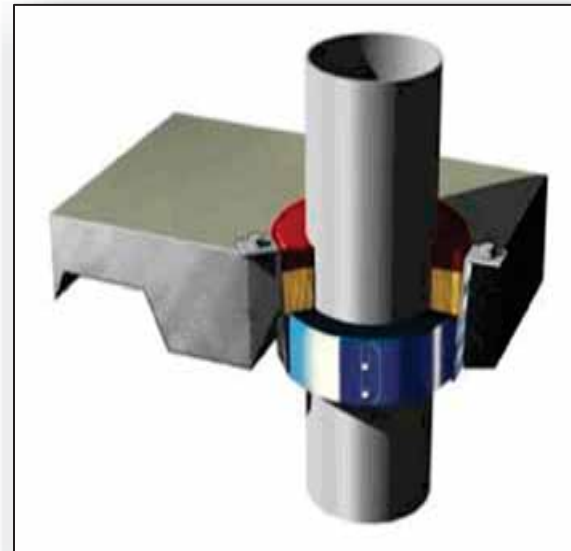
- ▶ EJ's Should Raise Flag
- ▶ Manufacturers provide EJ's even though there are Tested And Listed Systems from other manufactures.
- ▶ Often A Symptom Of Poor Planning
- ▶ Remember EJ's Are Untested!
- ▶ Increases Hopes and Paperwork; One piece of paper for every opening.
- ▶ In Renovation Or Unique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



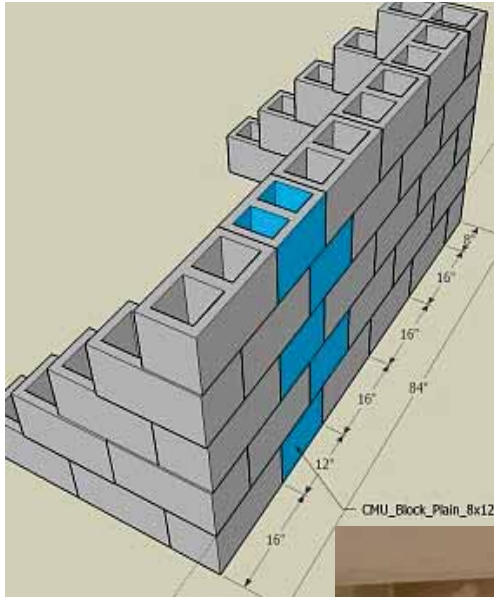
# Penetration Firestop System

Consists of:

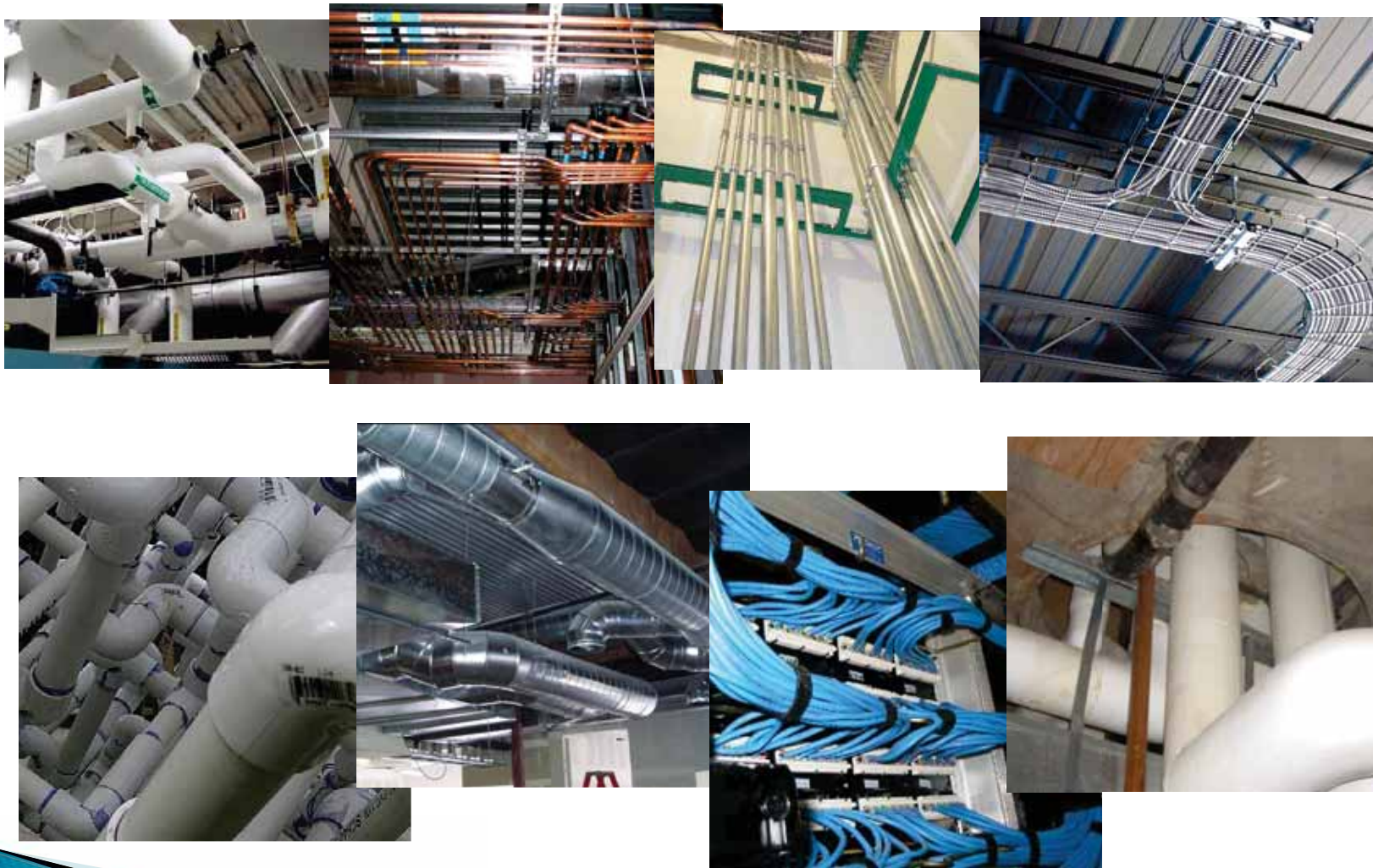
- ▶ Assembly being penetrated
- ▶ Penetrating item
- ▶ Fill, void or cavity materials (firestopping materials)



# 1st Part of a Listed Firestop System:

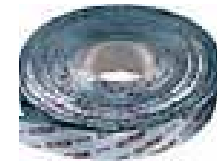


## 2nd Part of a Listed Firestop System: **System:**





# 3rd Part of a Listed Firestop System:





# 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**



So, what is the rating of the firestop material?



**ZERO!**

Only **systems** have ratings.

# 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

- **714.5.1.2** 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

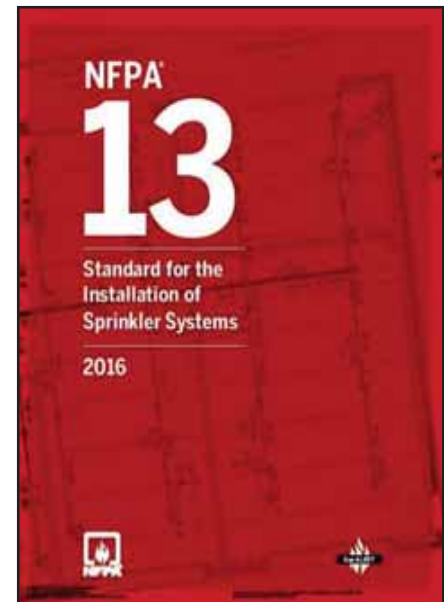
- ▶ Required for through- or membrane-penetrations of horizontal assemblies only
- ▶ Floor penetrations contained and located within the cavity of a wall either above or below the horizontal assembly do not require a T rating
- ▶ Methods for achieving a T Rating include:
  - Wrap metallic pipe with mineral 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

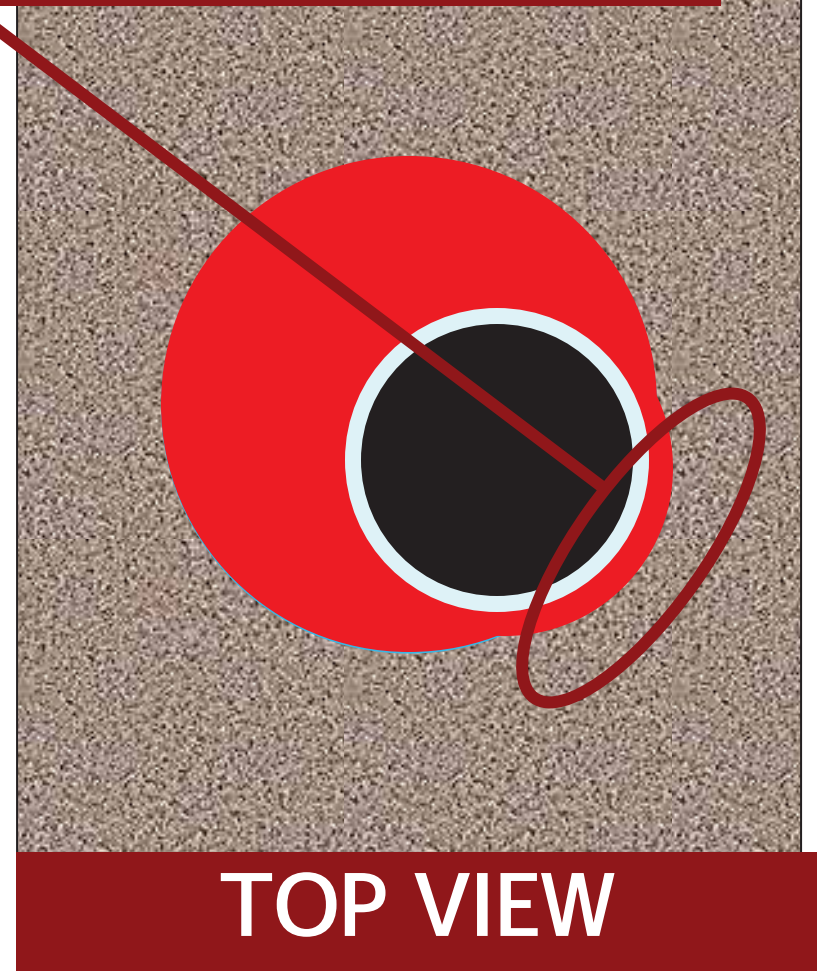
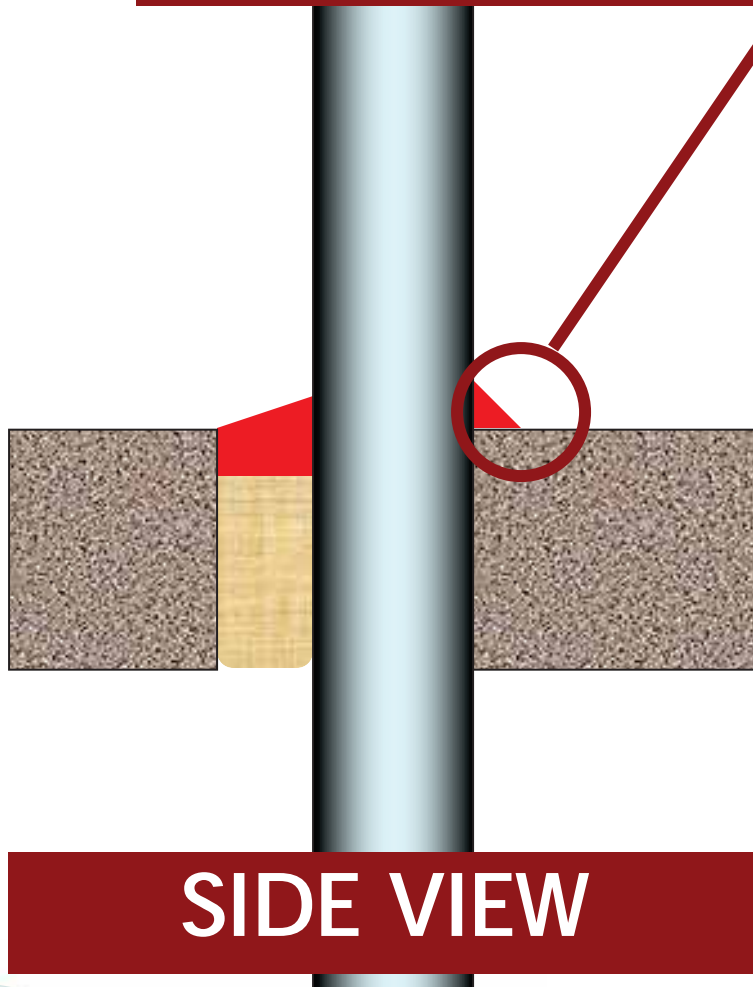




The diagram illustrates a wellbore system. A vertical blue cylindrical casing is shown. To its left is a square block of brown, grainy material representing the formation. To its right is a rectangular block of the same material. A red line with a dot at the end points from the text 'Annular Space' to the gap between the casing and the formation. At the base of the casing, a blue wedge-shaped area represents the wellbore fluid, and a light blue shadow is cast by the casing onto the ground.

**Annular Space**

# Crown Bead at Point Contact



# 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

