

# DIIM & Firestopping

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# Outline

- FCIA – DIIM – A FAST Look....
  - Total Fire Protection & Effective Compartmentation
  - Specs, Codes, Testing, Products - Design
  - Installation
  - Inspection
  - Maintenance
  - Firestopping for Safety – A Quality Protocol
    - DIIM

# FCIA – Firestop Contractors International Association

- FCIA Members
  - Firestop Contractors
  - Firestop Manufacturers
  - Firestop Consultants
  - Firestop Distributors, Reps, Friends
- FREE MOP/Spec - Specifiers @ AE, Independent
- FREE Life Safety Digest
- 3<sup>rd</sup> Party Contractor/Inspection Company Accreditation Programs
- Chair, ASTM Inspection Standards
- Tools for Specifiers

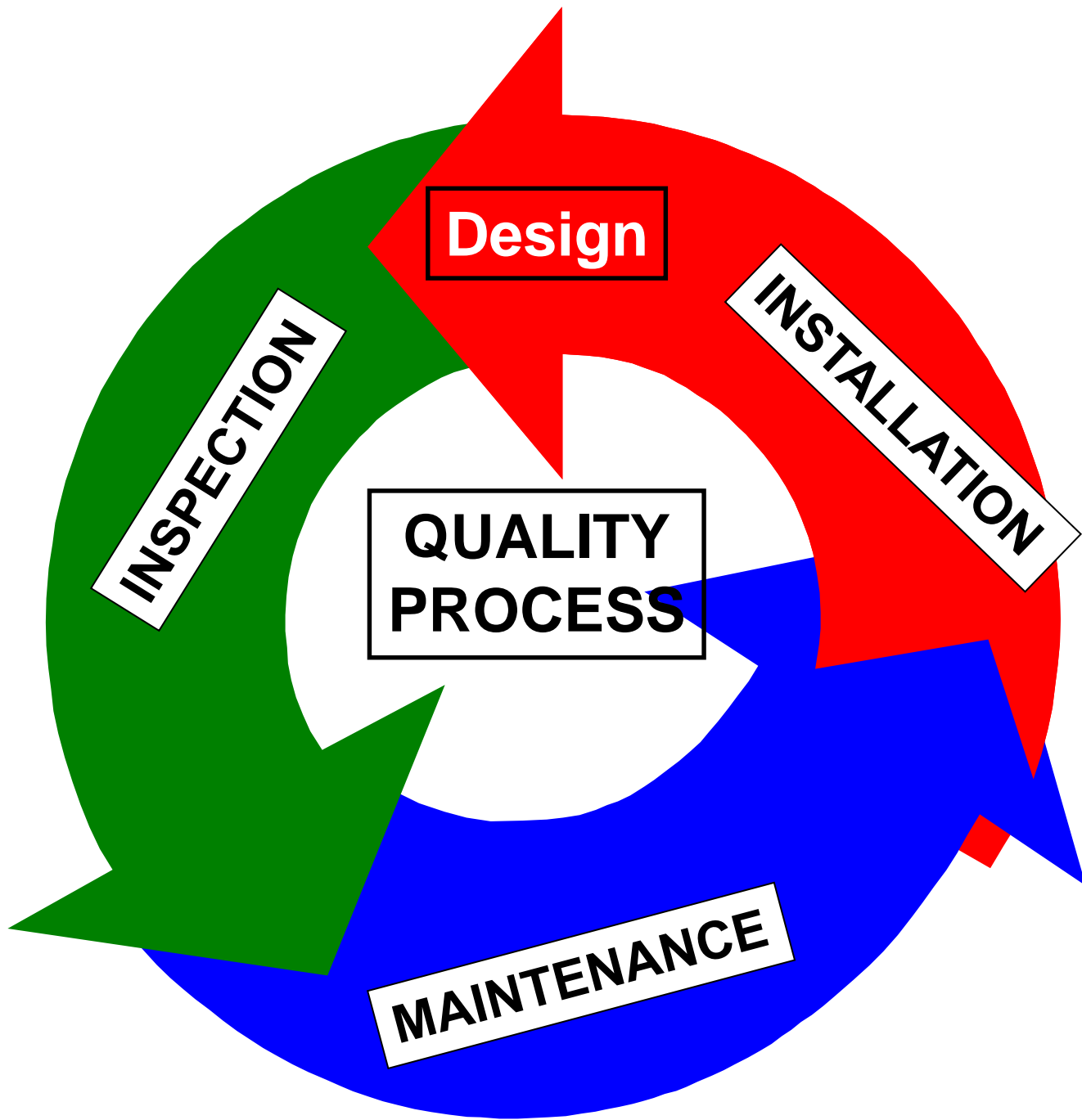


# FCIA – Firestop Contractors International Association

- FCIA Member Firestop Contractors
  - 3<sup>rd</sup> Party Company Accreditation Programs
  - ULC Qualified Firestop Contractors
  - FM 4991 Approved Firestop Contractors
- FCIA Member Inspection Agencies
  - IAS AC 291 Accredited Special Inspection Agencies

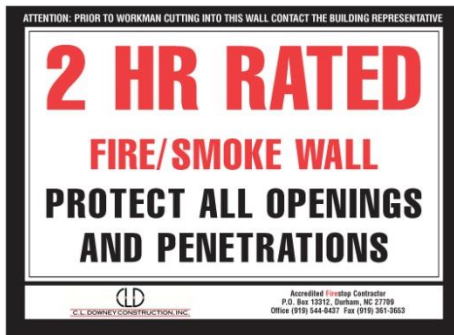
# “DIIM”

- Firestopping for Safety – DIIM
  - Properly *Designed* and Specified Firestopping  
FCIA - 07-84-00 - Specification
  - *Tested and Listed Systems* - ASTM E 814 / UL 1479 - UL 2079, FM 4990, ULC-S-115, ASTM E2837, E2307, E3037, E3038, more...
  - Professional *Installation* – FCIA Member, FM 4991 Approved, UL/ULC Qualified Contractors
  - Properly *Inspected* - ASTM E 2174 / 2393  
Protocol by IAS AC 291 Accreditation Criteria  
for Inspection Agencies
  - *Maintained & Managed* (Annually - FCIA  
Members – NFPA 101, International Fire Code



# “TOTAL FIRE PROTECTION”

- Effective Compartmentation
  - Fire Barriers, Fire Walls/Floors, Smoke Barriers
  - Firestopping, Fire Dampers, Swinging and Rolling Fire Doors, Fire Rated Glazing
- Detection & Alarm Systems
- Sprinkler Suppression Systems
- Education & Egress—
  - Building Owners & Managers, Building Occupants and Firefighters



# “DIIM”

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UL 1479 - UL 2079, ULC-S-115, ASTM E2307
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Protocol by IAS AC 291 Accreditation Criteria  
for Inspection Agencies; FM, UL Firestop Exam
  - *Maintained & Managed* - Annually - NFPA 101,  
International Fire Code, UAE Fire & Life Safety,  
National Fire Code of Canada



# Building & Fire Code Requirements

- NFPA 5000 – 101- Chapter 8
- National Building Code – Canada
- UAE Fire and Life Safety Code – Chapter
- International Codes –
  - New and Existing Buildings International Building Code – Chapter 7
  - International Fire Code – Chapter 7
- *Minimum requirements - Construction*



# Building & Fire Code Requirements

- Compartmentation Codes – US –
  - **Fire Resistance** – Time, in minutes or hours that materials or assemblies have withstood a fire exposure as determined by tests, methods based on tests, or this code .... NFPA, Ch 8. **ICC adds... “*Systems*”**

# Building & Fire Code Requirements

- Compartmentation Codes – US –
  - *Exterior Walls*
  - *Fire Walls*
  - *Fire Barriers*
  - *Fire Partitions (Not NFPA)*
  - *Smoke Barriers*
  - *Smoke Partitions*

# Building & Fire Code Requirements

- Smoke Barriers
  - Healthcare
  - Other Occupancies
- NFPA 101 - no quantified L Rating for Firestops
- IBC – Quantified L Rating for Firestops

# Building & Fire Code Requirements

- Compartmentation Codes – US
  - **Smoke Barrier – Firestopping** for Continuity
    - IBC – Hourly Rated, “L” Rating
      - <5cfm/sf (IBC 2006)
      - < 50 cfm, 100sf of Wall Area (IBC 2009)
    - **NFPA** – ... ‘restricting the passage of smoke’...  
**no quantified “L” Rating ... YET**
      - Continuous, Barrier to Barrier, ... through concealed spaces,
      - Not always fire resistance rated.
  - **Smoke Partition**
    - IBC – Continuous barrier, not rated...’retard’.
    - NFPA – Continuous membrane that is designed to form a barrier to *limit the transfer of smoke*....

# Building & Fire Code Requirements

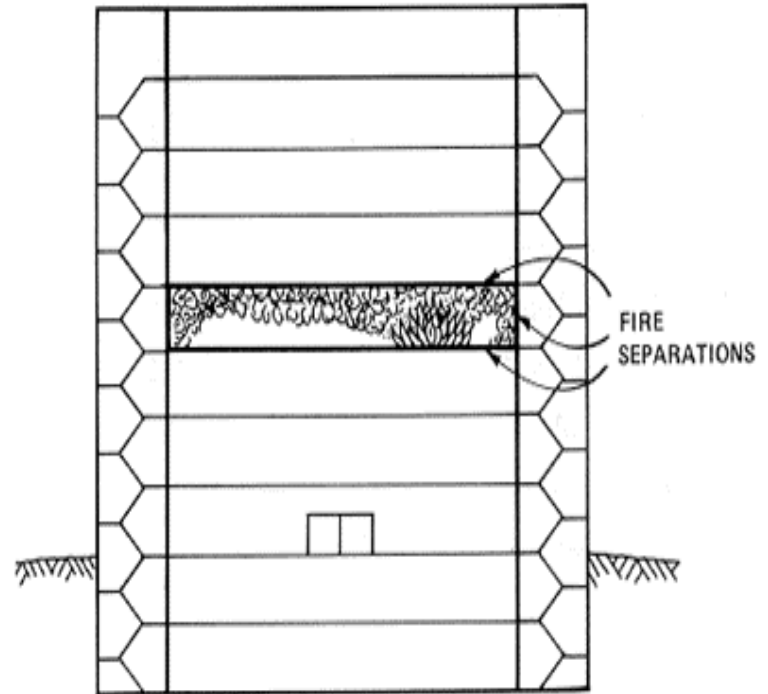
- *Continuous Fire Resistance*
  - **Walls / Horizontal Assemblies – Continuity**
    - Firestop Products Become Firestop Systems
      - Penetrations
      - Joints – Head /Bottom of Wall – Perimeter Joints
    - Fire & Smoke Damper Duct Systems
    - Fire Doors and Hardware Systems
      - Rolling & Swinging
    - Fire Rated Glazing

# Building & Fire Code Requirements

- *Chemical, Biological, Radiation, Explosion, etc.*
  - **Standards?**
    - **R - Nuclear Power Plant Standards**
    - **E – Blast Strength? Check with manufacturer – 2psf**
    - **C – Which Chemicals? Check with manufacturer**
    - **B – Which Agents? Check with manufacturer**
    - **G – Germ – Check with manufacturer & industrial hygienist**
  - **How to Regulate for Unexpected Events?**
  - **Due Diligence - Review Required by code?**

# Fire Resistance Continuity All Occupancies

- Effective Compartmentation
  - Education
  - Office
  - Mercantile
  - Multi Family Residential
  - Industrial – Insurance influences
  - Institutional – Healthcare





# Buildings are Safe Because....

- ***Total Fire Protection Stats -  
North America High Rise***
- ***11,025 Tall Buildings - 20 + stories***
- ***70% in NY, SF, LA, CHI, HI, Toronto...***
  - ***2/3 Canada's high rise built before 1985***
- = ***Compartmentation Primary in Older Structures***
  - ***Chicago, NY, Toronto – Older stock of buildings***
  - ***SF, LA, HON – Earthquakes***

» *Source, Emporis.com*



# Buildings are Safe Because....

- *Total Fire Protection*  
= *Safer buildings...*
- *Compartmentation*
- *Sprinklers, Alarms,*
- *Egress Strategies*
- *NIST Reports...*



# Continuity – Barriers, Walls & Horizontal Assemblies

- Fire Walls and Floors –

- *Continuous Fire Resistance Rated Assemblies*

- Concrete
    - Concrete Block
    - Plaster
    - Gypsum Block
    - Gypsum Board / ‘Drywall’
    - Floor/Ceiling Assemblies
    - Firestop Systems

***“Tested & Listed Wall/Floor Systems”***



# Charging Language - General

**701.1 Scope.** The provisions of this chapter shall govern the materials, systems and assemblies used for *structural fire resistance* and fire-resistance-rated construction *separation of adjacent spaces* to safeguard against the spread of fire and smoke within a building and the spread of fire to or from buildings. [IBC 2018 701.1]

# Fire-Resistance Ratings & Tests

**703.2 Fire-resistance ratings.** The *fire-resistance rating* of building elements, components or assemblies shall be determined in accordance with the test procedures set forth in **ASTM E119 or UL 263** or in accordance with Section 703.3. The *fire-resistance rating* of penetrations and *fire-resistant joint systems* shall be determined in accordance Sections 714 and 715, respectively. [IBC 2018 703.2]

# Restrained Classifications

**703.2.3 Restrained classification.** Fire-resistance-rated assemblies tested under ASTM E119 or UL 263 shall not be considered to be restrained unless evidence satisfactory to the *building official* is furnished by the *registered design professional* showing that the construction qualifies for a restrained classification in accordance with ASTM E119 or UL 263.

**Restrained construction shall be identified on the *construction documents*.** [IBC 2018 703.2.3 ]

# Methods for Determining Fire-Resistance

**703.3 Methods for determining fire resistance.** The application of any of the methods listed in this section shall be based on the fire exposure and acceptance criteria specified in ASTM E119 or UL 263. The required *fire resistance* of a building element, component or assembly shall be permitted to be established by any of the following methods or procedures:

- 1. *Fire-resistance designs*** documented in approved sources.
- 2. *Prescriptive designs*** of fire-resistance-rated building elements, components or assemblies as prescribed in **Section 721**.
- 3. *Calculations*** in accordance with Section 722.
- 4. *Engineering analysis*** based on a comparison of building element, component or assemblies designs having *fire-resistance ratings* as determined by the test procedures set forth in ASTM E119 or UL 263.
- 5. *Alternative protection*** methods as allowed by **Section 104.11**.
- 6. *Fire-resistance designs*** certified by an **approved agency**.

[IBC 2018 703.3 ]

# Automatic Sprinklers

**703.4 Automatic sprinklers.** Under the prescriptive fire resistance requirements of this code, **the *fire-resistance rating*** of a building element, component or assembly shall be established **without the use of *automatic sprinklers or any other fire suppression system being incorporated as part of the assembly*** tested in accordance with the fire exposure, procedures and acceptance criteria specified in ASTM E119 or UL 263. However, this section shall not prohibit or limit the duties and powers of the *building official* allowed by Sections 104.10 and 104.11.

[IBC 2018 703.4 ]



# Fire-Resistance Requirement

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

1. Be located in accessible concealed floor, floor-ceiling or *attic spaces*;
2. Be located 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; and
3. 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 AND PENETRATIONS”** or other wording.

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



# Structural Elements

**704.1 Requirements.** The *fire-resistance ratings* of structural members and assemblies shall **comply with this section and** the requirements for the type of construction as specified in **Table 601**. The *fire-resistance ratings* shall be not less than the ratings required for the fire-resistance-rated assemblies supported by the structural members. [IBC 2018 704.1]

# Structural Elements

**704.9 Impact protection.** Where the fire protective covering of a structural member is subject to impact damage from moving vehicles, the handling of merchandise or other activity, the fire protective covering shall be protected by corner guards or by a substantial jacket of metal or other noncombustible material to a height adequate to provide full protection, but not less than 5 feet (1524 mm) from the finished floor.

[IBC 2018 704.9]

# Fire-Resistance - Barriers

- Exterior Walls
- Fire Walls
- Fire Barriers
- Fire Partitions (not in NFPA)
- Smoke Barriers
- Smoke Partitions

# Fire-Resistance – Barriers, SFRM & IFRM

- Tested and Listed Assemblies
  - ASTM E119/UL 263
  - Resist Fire, Heat, Smoke/Hot Gasses
  - Structural Integrity during Fire Test
  - Hose Stream Test Survival
    - (Barriers & Walls Only)

# Fire-Resistance - Barriers

- Fire Resistance Rating
- Continuity
- Openings & Penetrations
- Types of Materials
- Structural Robustness
- **Supporting Construction**
- Assembled
  - Listing
  - Manufacturers installation instructions

# Fire-Resistance – Fire Barriers

- Fire area separations
- Mixed Occupancy Separations
- Incidental use areas
- Hazardous area separations
- Exit enclosures
- Shaft enclosures
- Horizontal exits
- Corridor Walls (NFPA only) **Koffel Slide**

# Fire-Resistance – **Smoke Barriers**

- **Occupancy Groups**
  - Institutional 2
  - Institutional 3
  - Areas of Refuge
  - Other
  - Above code...specified



# Fire-Resistance – Smoke Barriers

- Minimum 1 hour fire-resistance
- Continuous, floor/ceiling to deck...
- Supporting construction = rating, ex..
- Smoke Resistant ‘Features’

# Fire-Resistance – Smoke Partitions

- Corridor Walls - Institutional 2 – IBC Only
- Sprinkler protected hazardous areas, NFPA
  - ‘0’ hour fire-resistance
  - Not always continuous...
    - Tight to underside of ceiling membrane in ceiling membrane designed to limit the passage of smoke
    - Ceiling Tiles differ – NFPA/IBC
- **No Supporting construction rating**

# 706 - Fire-Walls

- Hourly Fire-Resistance-Rated
- Structural Independence
- One Side Collapses, Other Side Intact
- Continuous
  - Foundation through floor/ceilings, roof to 3' above roof...exception.

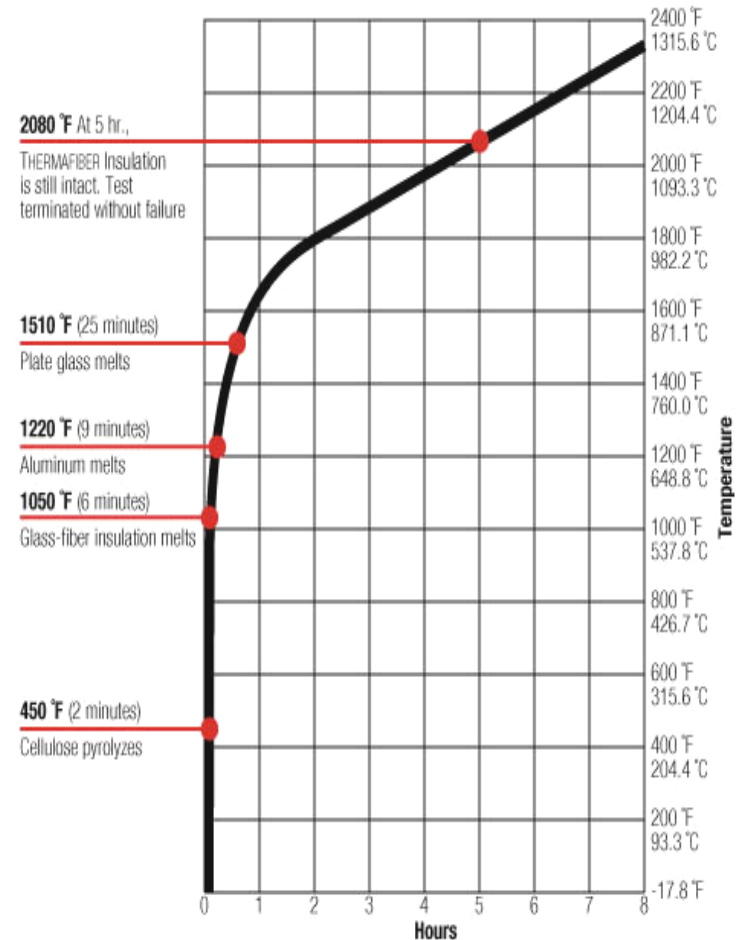
# 705 - Fire-Resistance – Exterior Walls

- Hourly Fire-Resistance-Rated
  - Table 601, 602, separation distances...
  - $>10'$  – resist from inside only
  - $\leq 10'$  – resist on both sides
- Continuous
  - Foundation through floor/ceilings, roof to 3' above roof...exception.

# IBC – Chapter 7

**703.2 Fire-resistance ratings.** The *fire-resistance rating* of building elements, components or assemblies shall be determined in accordance with the test procedures set forth in **ASTM E119 or UL 263** or in accordance with Section 703.3. The *fire-resistance rating* of penetrations and *fire-resistant joint systems* shall be determined in accordance Sections 714 and 715, respectively.

[IBC 2018 703.2]



**Thermafiber Image**

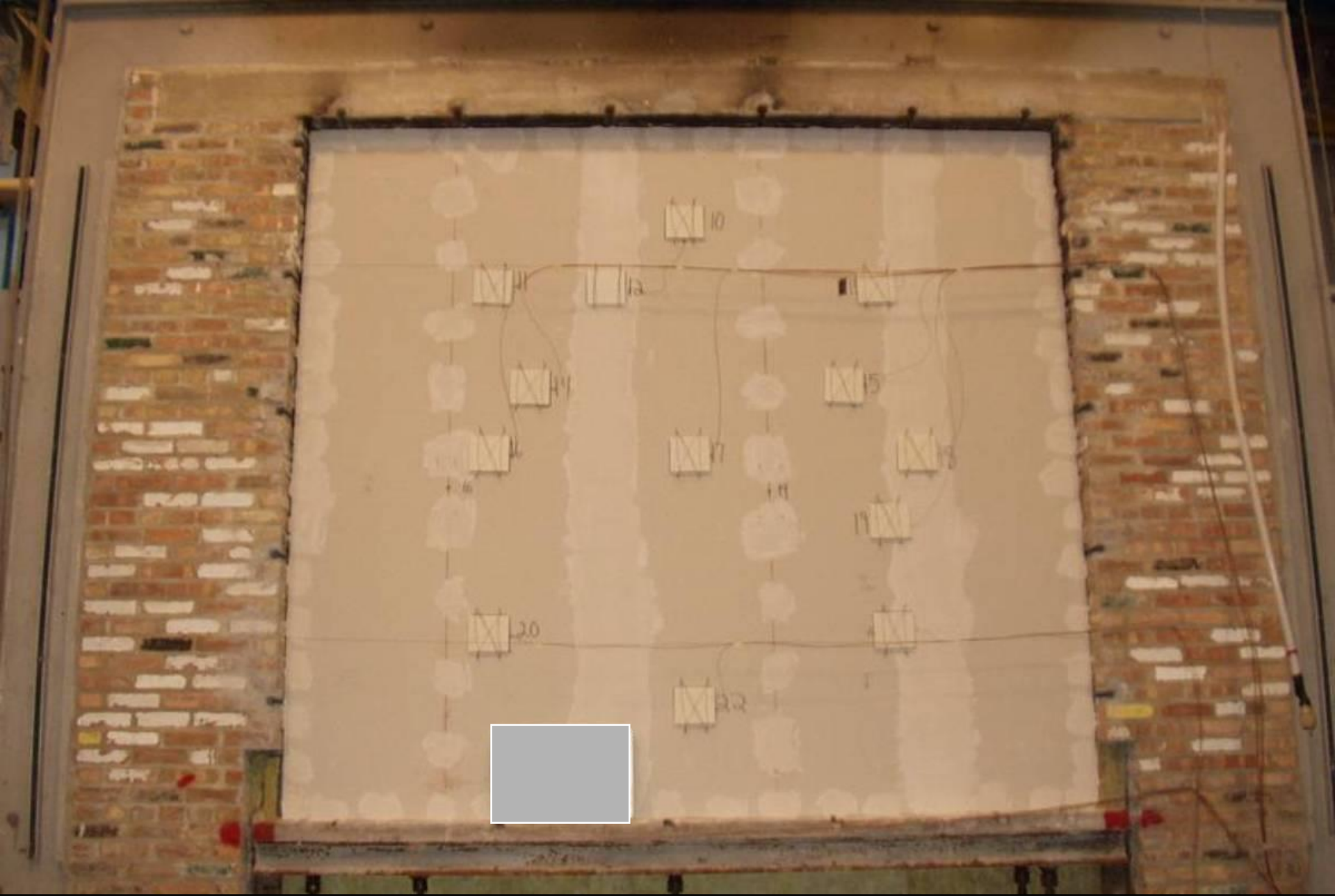
# Fire Testing

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- ANSI/UL 263 or ASTM E119
  - Large Scale
  - Small Scale
  - Hourly = Time
  - 30 minutes – 4 hours
  - Restrict Temperature Rise of **Structural Element**
  - Compartmentation / Containment



**UL Slide**



**UL Slide**



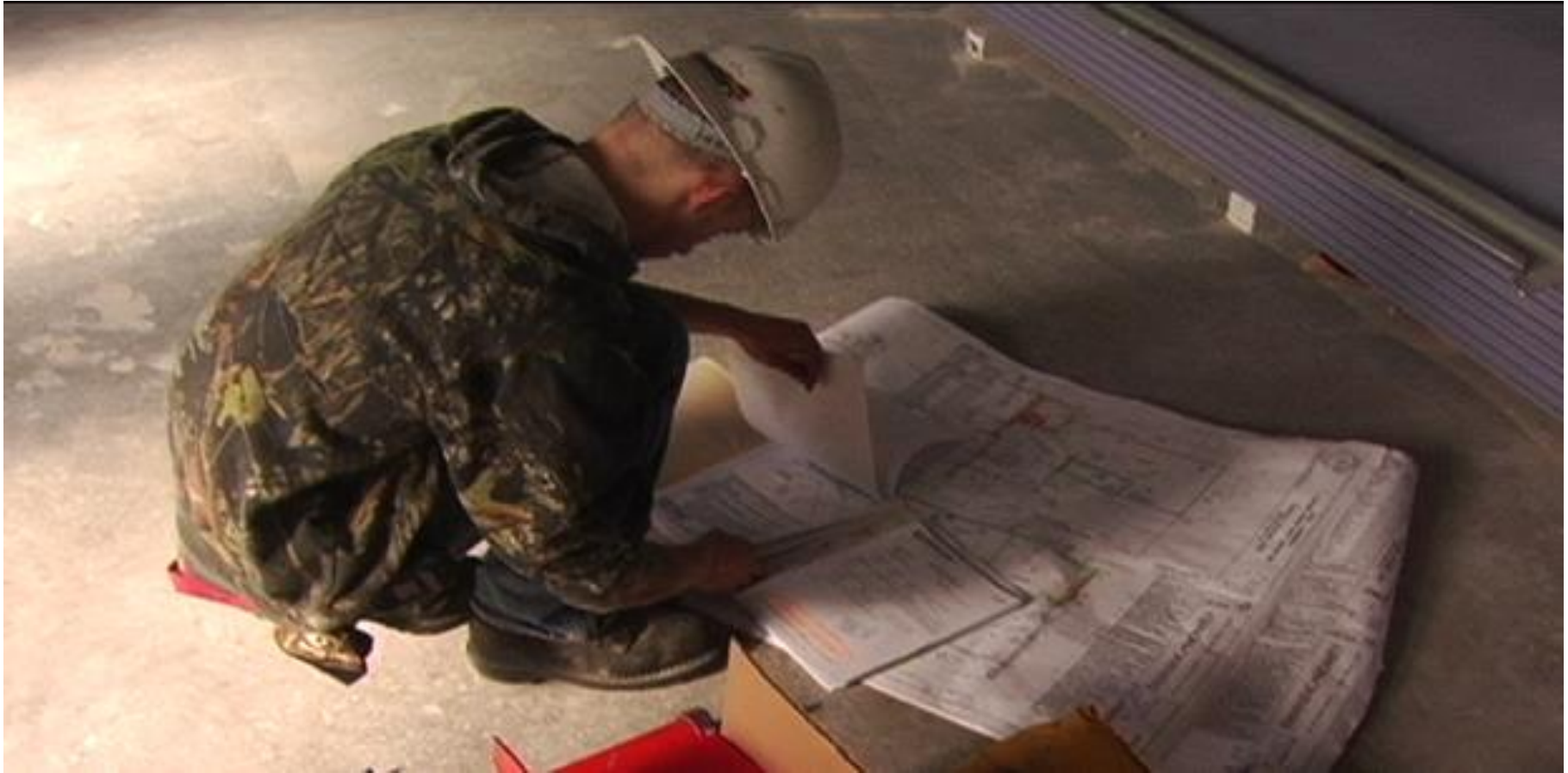


**UL Slide**

# Fire Resistance SYSTEMS

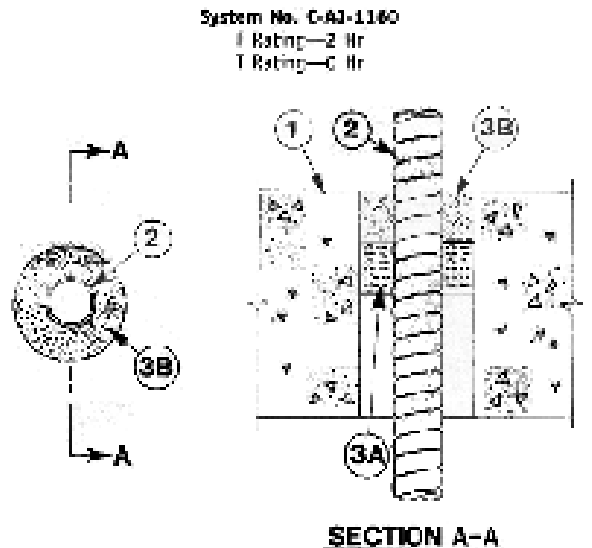
- **Products Become Systems Through....**
- **Test Standard References**
  - **Structural Elements & Assemblies-** ASTM E 119, UL 263
  - **Fire & Smoke Barriers** - ASTM E 119, UL 263
  - **Firestopping** - ASTM E 814 / UL 1479, ULC-S-115, UL 2079, E-1966, E-2307, **E-2837**, ...test method...”
  - **Fire/Smoke Dampers** - UL 555, UL 555S
  - **Swing/Rolling Fire Doors** - UL 10B, 10C
  - **Fire Rated Glazing** - UL 9, NFPA 252
- **SYSTEM Testing = Suitability statement for use of a product in a specific system/design application**

# Firestopping for Continuity I – Listed Systems



# Firestopping for Continuity

## I – Classified Systems



- 1. Floor or Wall Assembly**—Min. 4-1/2 in. thick lightweight or normal weight (100 to 150 pcf) concrete. Will may also be constructed of any UL Classified Concrete Block\*. Min. of floor or through opening in floor or wall assembly to be 1/8 in. to 1-1/2 in. larger than diam of flexible metal conduit (Item 2) installed in through opening. Max diam of opening is 6 in. See Concrete Block (AAC) category in the Fire Resistance Directory for names of manufacturers.
- 2. Through Penetrating Product**—Max. 4 in. diam (or smaller) diam. or max. 3/8 in. diam (or smaller) aluminum Flexible Metal Conduits. Also one flexible metal conduit to be installed near center of circular through opening in floor or wall assembly. Flexible metal conduit to be rigidly supported on both sides of floor or wall assembly.
- 3. Packing Material**—Max. 1 in. thickness of organic (plumtree silica) fiber blanket or mineral wool batt insulation. Insulation to be installed in a permanent form. Packing material to be recessed min. 1 in. from top surface of floor or from both surfaces of wall.
- 4. FILL, Void or Cavity Material**—Caulk—Applied to fill the annular space around the flexible metal conduit. In floors, a min. 1 in. depth of fill material to be installed flush with top surface of floor. In walls, a min. 1 in. depth of fill material to be installed flush with wall surface on both sides of wall assembly.

Minnesota Mining & Mfg. Co.—TF 257016

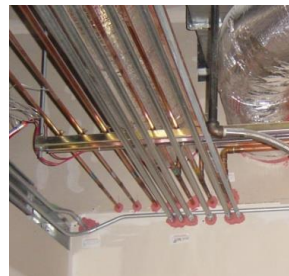
\*Bearing the UL Classification Marking  
 (Bearing the UL Listing Mark)



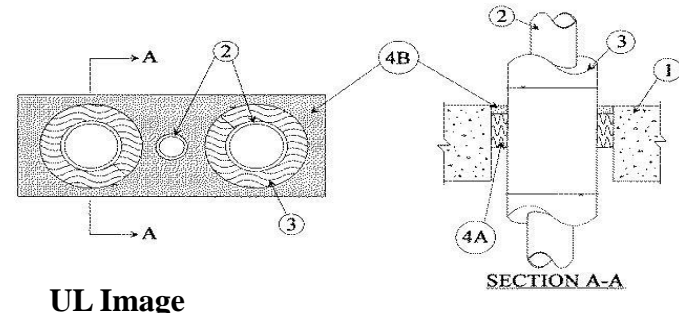
Pro-Firestop Image

# Firestopping for Continuity

- **Firestop Products Become Firestop Systems --**
  - “A Specific field erected construction, consisting of an assemblage of materials to prevent the spread of fire through openings in fire rated walls and floors using ASTM E 814 / UL 1479 / **FM 4990**, ULC-S-115, UL 2079, **E-2307 E-2837**, as the test method...”
  - **Testing = Suitability statement for use of a firestop product in a specific system application**



SFS Image



UL Image

# Firestopping for Continuity

## Firestop Products

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



# Fire/Smoke Dampers & Firestops

- Dampers are UL 555, 555S Listed *Systems*
  - Installed to manufacturer's written instructions (Systems
    - Angles...no sealants)
- Firestop sealants – UL 1479 –
  - Improper hole sizing or poor installation...

**Consult the Damper  
Manufacturer & the  
Authority Having  
Jurisdiction**

Graphics - Greenheck



# Fire/Smoke Dampers Firestop Installation

- Combination Fire Smoke Dampers
- Multi-blade Fire Dampers
- Underfloor applications
- Max. size 72" W x 96" H
- SYSTEM...AHJ

- Greenheck Graphic



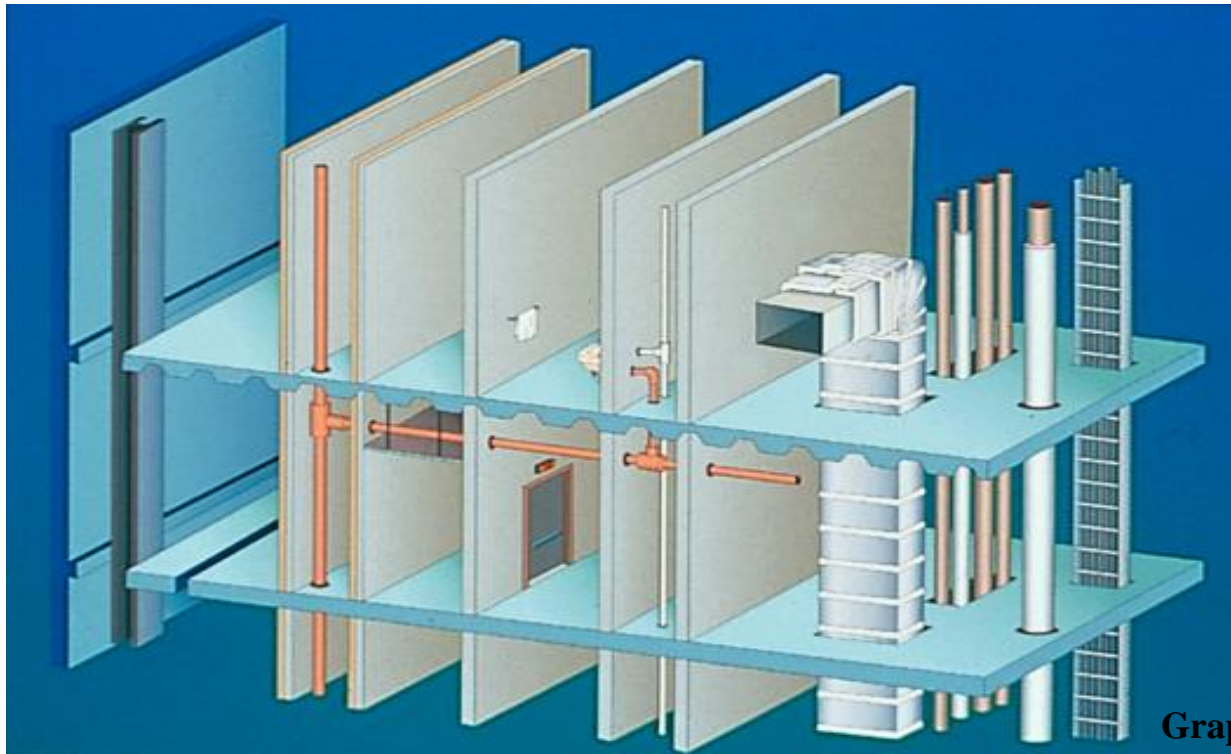


# D- Design

## SYSTEMS SELECTION

## SYSTEMS ANALYSIS

Who's Responsible, How to Choose???



Graphics – STI

# Firestopping for Continuity

## Products become **SYSTEMS**

- After Installation...
- **‘Field Erected Construction...Tested to...’**
  - Standards - ASTM E814/UL 1479–UL 2079, ASTM E 1966, ASTM E 2307, ULC S-115, FM 4990
  - **F Rating - Flame**
  - T Rating – Temperature
  - H Rating – Hose
  - **L Rating – Smoke**
  - **W Rating – Water**



Graphics – 3M



# Products become Systems

## Hose Stream = Shock Test







Fire Stop  
Technologies,  
Inc.



Fire Stop  
Technologies,  
Inc.

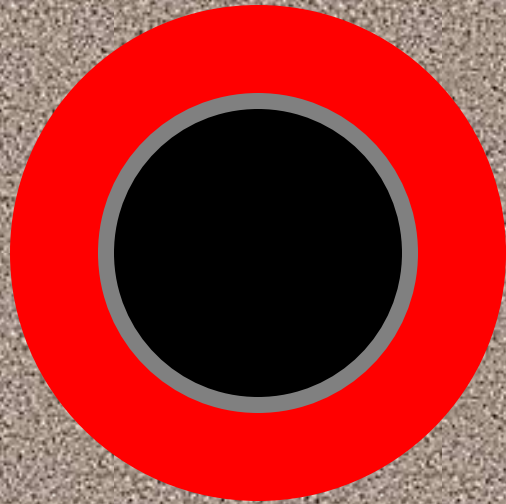
# Firestopping - Products Become *SYSTEMS*

# How do Contractors Select Systems & Inspection Agencies Analyze?

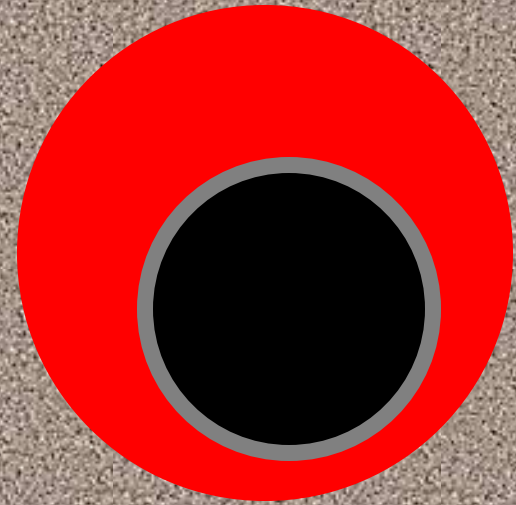
- Wall or Floor Construction Type, Rating
- Wall or Floor Thickness
- Penetrating Item, Coverings
- Size, Type, Thickness
- Annular Space Sizes
- Joint / Gap Sizes
- Backing Materials
- Fill Material(s)

***= Rated Firestop System***

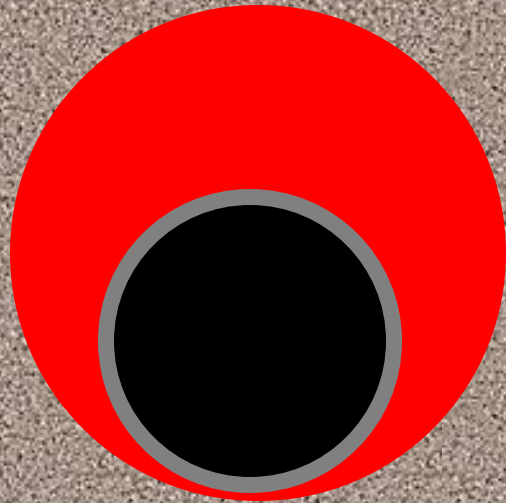




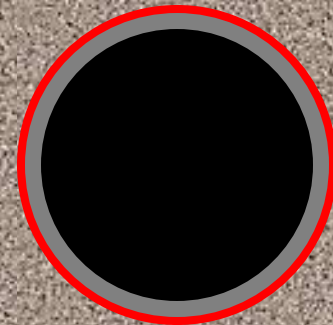
**1. Centered**



**2. Off-Centered**



**3. Point Contact**



**4. Continuous Point Contact**

# Engineering Judgments/EFRRRA

- Field or other Variances to Tested and Listed Systems?
  - No System Exists
- Why???
  - Lack of Planning
  - Unique Conditions



Fire Stop  
Technologies,  
Inc.



# Engineering Judgments/EFRRA

- **First Action in Process**
  - Find another system – Same Manufacturer
  - Find another system – Different Manufacturer
  - If no system exists in either case....
- **Second Action –**
  - *Engineering Judgment* – “EJ”
  - *Equivalent Fire Resistance Rated Assembly* – “EFRRA”
- *Based on engineering, IFC Protocol*
- *Inspection Agency?*

**IFC Guidelines for Evaluating Engineering Judgment  
Guidelines**

‘Construction industry professionals, building officials, fire officials, firestop contractors and other stakeholders need appropriate guidelines for evaluating and using such judgments.

As such, IFC developed *Recommended IFC Guidelines for Evaluating FireStop Systems in Engineering Judgments*.

# **IFC EJ Guidelines - Engineering Judgments for firestop systems should:**

- 1. Not be used in lieu of tested systems when available;**
- 2. Be issued only by a firestop manufacturer's qualified technical personnel or in concert with the manufacturer by a knowledgeable registered Professional Engineer, Fire Protection Engineer, or an independent testing agency that provides listing services for firestop systems;**
- 3. Be based upon interpolation of previously tested firestop systems that are either sufficiently similar in nature or clearly bracket the conditions upon which the judgment is to be given. Additional knowledge and technical interpretations based upon accepted engineering principles, fire science and fire testing guidelines (e.g. ASTM E 2032 – Standard Guide for Extension of Data from Fire Endurance Tests, ULC Subject C263E – Criteria for Use in Extension of Data from Fire Endurance Tests, or ASTM E2750 – Standard Guide for Extensions of Data for Penetration Seals) may also be used as further support data;**

# **IFC EJ Guidelines**

**Engineering Judgments for firestop systems should:**

- 4. Be based upon full knowledge of the elements of the construction to be protected, the understanding of the probable behavior of that construction and the recommended firestop system protecting it were they to be subjected to the appropriate Firestop Standard Fire Test method for the rating indicated on the Engineering Judgment;**
- 5. Be limited only to specific conditions and configurations upon which the engineering judgment was rendered and should be based upon reasonable performance expectations for the recommended firestop system under those conditions;**
- 6. Be accepted only for a single, specific job and project location and should not be transferred to any other job or project location without thorough and appropriate review of all aspects of the next job or location's circumstances.**

# **IFC EJ Guidelines - Basic Presentation Requirements**

**Proper EJ's should:**

- 1. Be presented in appropriately descriptive written form with or without detail drawings where appropriate;**
- 2. Clearly indicate that the recommended firestop system is an EJ;**
- 3. Include clear directions for the installation of the recommended firestop system;**
- 4. Include dates of issue and authorization signature as well as the issuer's name, address and telephone number;**
- 5. Reference tested system(s) upon which design (EJ) is based on;**
- 6. Identify the job name, project location and firm EJ is issued to along with the non-standard conditions and rating supported by the EJ;**

# **IFC EJ Presentation Guidelines – What’s Seen?**

**7. Have proper justification (i.e. UL, Intertek or other independent laboratory system(s) and or opinions);**

**8. Provide complete descriptions of critical elements for the firestop configuration. These should include, but not be limited to the following:**

**a. Basic, Common**

- **Type(s) of assembly used or being penetrated;**
- **Rating supported by the EJ.**

**b. Through Penetrations**

- **Penetrating item(s) (type, size, etc.);**
- **Annular space requirements, (minimum, maximum, actual, nominal, etc.)**
- **Opening size;**
- **Firestop product(s) to be used, type and amount (thickness if applicable);**
- **Accessory items(s) (i.e. anchors, backing material, etc.)**

**c. Joints**

- **Joint Width (installed width, nominal)**
- **Movement Capability;**
- **Movement Class (thermal wind sway, seismic);**
- **Accessory item(s) (i.e. insulation type, thickness and compression, etc.)**

# **IFC EJ Presentation Guidelines – What’s Seen?**

**d•Duct Enclosure Systems – SEE [www.Firestop.org](http://www.Firestop.org)**

**e• Firestop System – annular space dimensions, floor/wall construction, design number, components, installed thickness.**

**f. Perimeter Fire Barrier Systems –**

- Type(s) of assembly used or being penetrated;**
- Hourly Rating required**
- Closest Listed System upon which the EJ is based**
- Joint Width**
- Static or Dynamic**
- Safing Insulation Types), thickness and compression, etc.**
- Five Basic Principles**
  - 1. Mechanical Attachment of the Spandrel Insulation**
  - 2. Protection of the Mullions**
  - 3. Compression Fitting and Orientation of the Safing Insulation**
  - 4. Installation of a Reinforcement Member(s), stiffener, at the safe-off area behind the spandrel insulation.**
  - 5. Firestop Coating, type, thickness,**

# IFC EJ Presentation Guidelines – What's Seen?

## *f• Continuity Head-of-Wall Joints*

- Joint Width, (installed width, nominal)*
- Movement Capability*
- Movement Class – (thermal, wind sway, seismic)*
- Accessory Item(s) (i.e. insulation type, thickness, compression, etc.)*

*IFC recommends that these guidelines be considered when evaluating whether any firestop system engineering judgment meets minimal requirements. Questions concerning the EJ request should be addressed to the initiator of the judgment.*



# INSTALL FIRESTOP SYSTEM

## Firestop Sealant, MW installation to Tested and Listed System Limits = Firestop System



Pack

1



Apply Sealant

2



Tool/Smooth

3

**Walls - BOTH SIDES**

# Properly Tooled/Smoothed Firestop Sealants



# Sleeved Pipes



# Fire/Smoke Dampers & Firestops

- Dampers are UL 555, 555S Listed *Systems*
  - Installed to manufacturer's written instructions (Systems
    - Angles...no sealants)
- Firestop sealants – UL 1479 –
  - Improper hole sizing or poor installation...

**Consult the Damper  
Manufacturer & the  
Authority Having  
Jurisdiction**

Graphics - Greenheck



# Fire/Smoke Dampers Firestop Installation

- Combination Fire Smoke Dampers
- Multi-blade Fire Dampers
- Underfloor applications
- Max. size 72" W x 96" H
- SYSTEM...AHJ

- Greenheck Graphic



# Installing an Incorrect System May Void the Fire / Smoke Damper Manufacturer's Warranty



# Barriers With Combustible Penetrants

- Plastic Pipe
- Plastic-Jacketed cables
- Certain pipe insulation



# Firestop Joint Systems Definition

---

- UL 2079, ASTM E 1966, ULC-S-115
  - “A joint system is a **specific construction** consisting of adjacent **wall and floor assemblies**, *and* the materials designed to prevent the spread of fire through a linear opening between the wall and / or floor assemblies”
  - Definition
    - Joint?
    - Breach?
    - Opening?

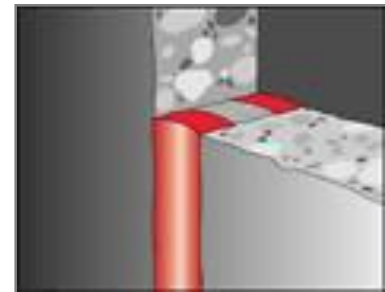




# Firestopping for Safety

- **Firestop Joint Systems Definition – UL 2079**
  - Min. Positive Pressure – .01 Water, 12” below assy.
  - Movement Cycling
    - Class I – min. 500 cycles, min. 1 cycle / minute
    - Class II- min. 500 cycles, min. 10 cycles / minute
    - Class III-min 100 cycles, min. 30 cycles / minute
  - Fire Tested at Maximum Joint Width
  - No Load Bearing Characteristics, unless noted
  - Assembly, L or W Ratings

HILTI Graphic



# Firestop Applications

**Floor to Wall**



**Top of Wall**



Fire Stop  
Technologies,  
Inc.

Graphics – Firestop Solutions

# Joints and Seams

## Head of Wall



# Joints and Seams

## I-Beam to Fluted Deck



# Penetrations in Head of Wall



# Unacceptable



# Results of Improperly Installed Mineral Wool



# Firestop Perimeter Fire Containment Systems

- Firestop Perimeter Systems

**Definition – ASTM E 2307**

- “A Perimeter Fire Containment System is a **specific field erected construction** consisting of a floor with a fire resistance rating, and an exterior curtainwall with no hourly resistance rating, and the fill material installed between the floor and the curtain wall to prevent the vertical spread of fire in a building.”





# Tamweel Towers, Dubai

## Perimeter Fire Protection

*Gulf News: A discarded cigarette ???*



# *NFPA 285 & ASTM E 2307?*



**Intertek Image**



**Thomas Bell-Wright International Consultants**

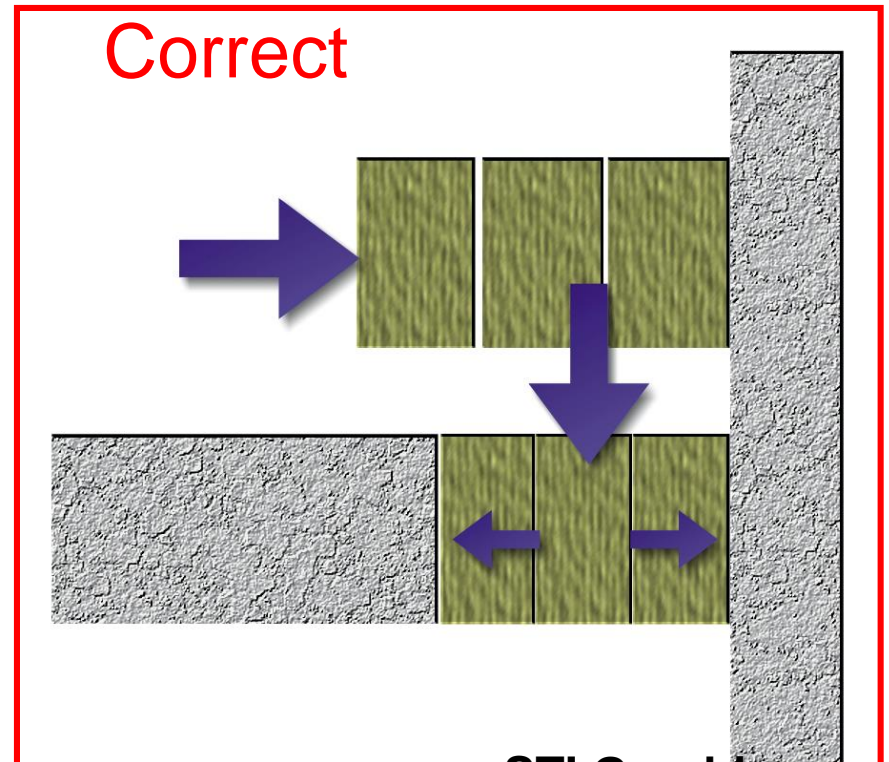
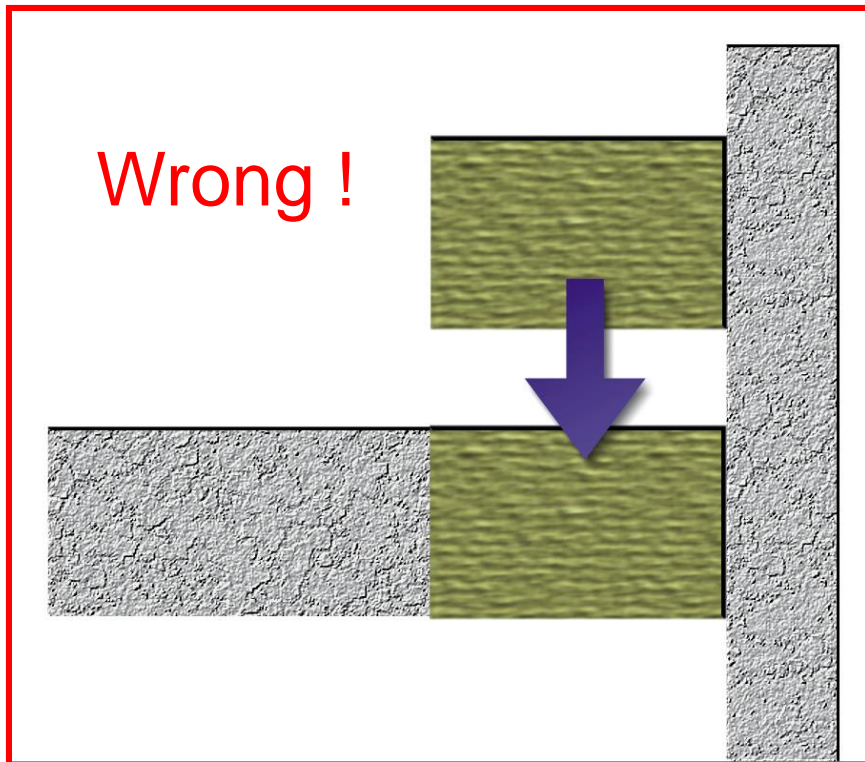
# Firestop Perimeter Fire Containment Systems



Graphic – Intertek

# Proper Installation of Mineral Wool

- Compressed mineral wool must be inserted perpendicular to the joint to allow for movement between the slab and wall.





**STI Graphic**

# Firestop Installed at Perimeter of Floors at Curtainwall



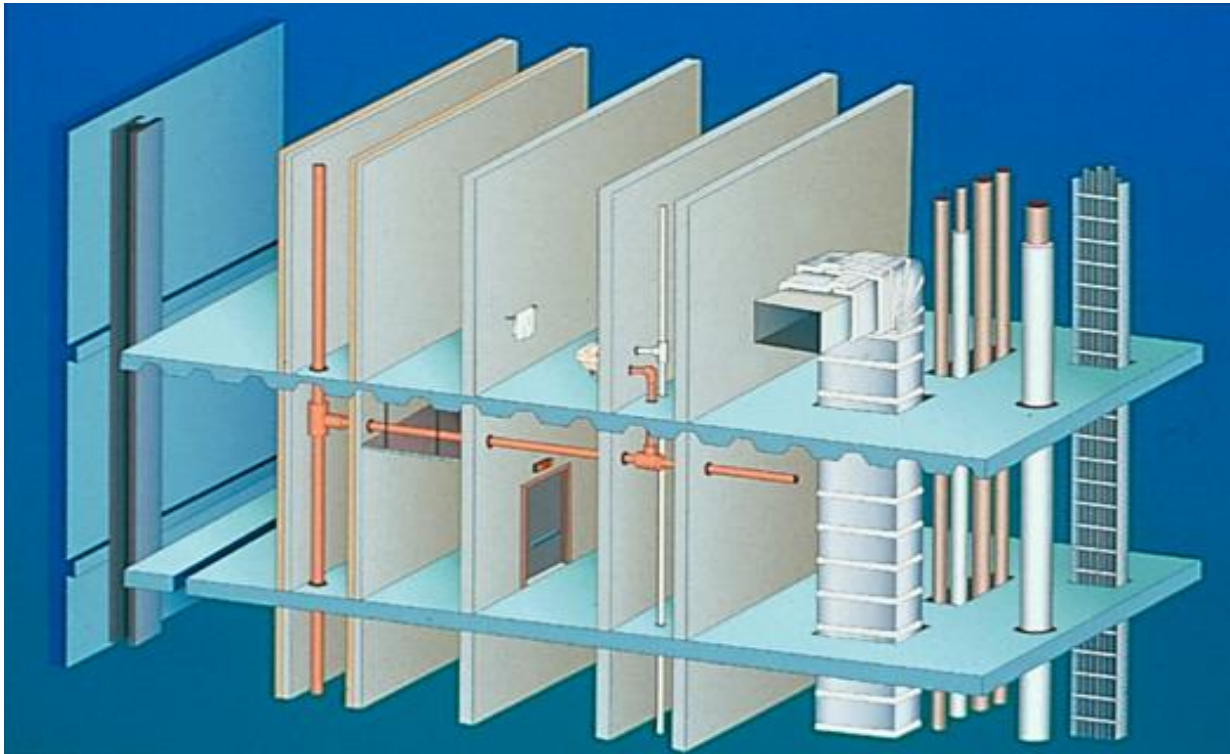
# Firestop Products Become Systems when Installed to SYSTEM



Graphics – OPL, 3M

# I- Installation

Who's Responsible, How to Choose???



Graphics – STI



# Installation – Who?

- Firestopping wrong, missing
- Systems Documentation?
- As Built Documentation??

*Conclusion –*

*Without Single Firestopping Trade....*

*fire & life safety risks*



*Adler Photo*

# 3 Firestop Installation Methods

- **Each Trade**
  - “He/She who pokes hole, fills hole”
- **Multiple Contracts**
  - Firestop Contractors, Trades
- **Single Source Firestop Contractor**
  - *FCIA Member in Good Standing*
  - *FM 4991, UL, ULC Qualified*

# Why Contractor Qualifications?

- **Firestopping** Ratings - F, T, H, L W
- **Zero Tolerances?**
  - Annular Space Sizes, Gap Sizes
- **Product Properties**
  - Movement
  - Compatibility
  - Storage, Application, Curing Temps
- **SYSTEMS DOCUMENTATION**

# Firestop Contractor Qualifications

## 1. **Bought at Hardware Store, etc.**

- Contractor or Individual?

## 2. **Manufacturer Trained Individuals**

- 1 hour program
- 1/2 day program
- 2 day education

## 3. **ULC Qualified, FM 4991 Approved Companies**

- 3<sup>rd</sup> Party Verified *Company* Management System
- *Individuals* Pass 3<sup>rd</sup> Party Exam
- *Individual* Knowledge – FCIA MOP
- All Manufacturers Products Covered
- *Company gets Approved or Qualified, not Individual*

# Firestop Contractor Qualifications?

- **Manufacturer Educated**
  - **Short Class – 25 - 60 minutes**
    - Some Training
    - Worker educated
    - Short test
    - Administered by salesperson
  - **Worker Education at Shop**
  - **Manufacturer HQ Education**
    - 1-2 Days Education
    - Test – Teach to the Test?
    - Not 3<sup>rd</sup> Party

# Firestop Contractor Qualifications

- **Association Member**
- Insurance – Classification?
  - Specialty Firestop Contractor?
  - Plumber, other trade??
- Workforce – Educated as Firestop/Containment Workers
- Bonding Capability
- Project References & Experience
- **Management System reviewed by....**
  - **FM 4991, UL or ULC ?**

# Firestop Contractor Qualifications

## FM & UL/ULC – 4 Components

1. Office Facility Quality Management System Audit
2. Field – Jobsite Audit
3. Employ a person
  - UL/FM Firestop Exam @ 80% or better
  - DRI if employed by Approved/Qualified Firm,
    - *Designated Responsible Individual (DRI)*
4. Annual Audit



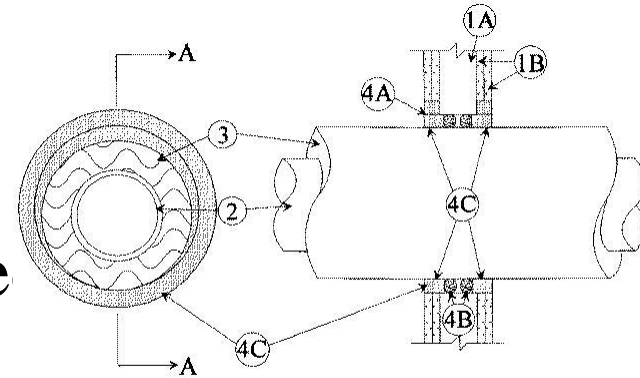
# **1. Office Audit of Company Management System Manual**

- Controlled Management Processes
- Project Successful Proven Contractor
- Education, Training, Accountability



# 1. FM, UL/ULC Company Audit of Management System (MS)

- Employee Training & Education
- Systems Selection
- Communicate systems to Field
- Material Controls
- Systems installation “protocol”
- Labeling
- Record keeping - Variance Proce
- Non-Conformances
- Documentation
- Project closeout



CONFIGURATION A

## 2. *Company MS Jobsite Audit* by **ULC, FM or UL**

- Verification of firestop systems Processes
- Verify Management System Works
- Verify Company “communication”
  - Office to field, field to office
- “Culture of Quality...”

»

Adler Photo



# 3. **DRI** – Company Appoints DRI if ....

- **Pass Rigorous Firestop Examination**
  - FCIA Firestop Manual of Practice
  - Firestop Systems Selection & Protocol
  - Management System Knowledge
- Keep CEU's – 6 FM, 10 UL, ea. 3 yrs.
- Retested every 3 years (FM Only)
- One DRI per Approved Contractor Location



# 4. Annual Audit

## FM 4991 UL / ULC

### Contractor Company Personnel

- Continued satisfactory performance
  - Quality Manual Implementation
- Documented - Archived record keeping
- Employee Training Documentation
- Jobsite Visit
- DRI CEU Verification
- **Find @ [www.fcia.org](http://www.fcia.org)**

# UL-ULC/FM 4991 Contractor Company Benefits

## **Quantified Differentiation ...**

- **Focus on the Company & Individual**
- Investment in Company Procedures
- Investment in People Education
- Investment in FCIA Manual of Practice
  - Project Successful Proven Contractor
  - Education, Training, Accountability
    - = Reduced Risk – Life, Property, Business

# Master Audit Certificate of Compliance Program

A Jobsite Specific Management System Audit – Our audit provides verified processes were followed to properly installed firestop systems.

A Renewable Jobsite Specific Certificate – After completion of a successful audit, we issue a jobsite specific certificate that is renewable for the building owner.

Improved Firestop Systems Documentation – The MACC certificate in conjunction with the firestop systems documentation, builds the fire-resistance inventory required by the 2018 International Fire Code for fire and smoke protection features



 **Qualified Firestop Contractor Program**  
**Master Audit**  
**Certificate of Compliance**

Certificate Number: 1000-0001  
Audit Date: 08/03/2018  
Expiration Date: 12/31/2019

This certificate reports the findings of an audit by UL to the management system requirements of the Qualified Firestop Contractor Program. The audit was conducted to the requirements specified in the Qualified Firestop Contractor Program requirements. The UL qualified contractor was found to be in compliance with the requirements at the time of the site audit.

Structure Name: Underwriters Laboratories  
Job Number: 0001  
Address: 333 Pfingsten Rd.  
Northbrook, IL 60062

Qualified Contractor: FCTA  
Address: 4415 W. Harrison Street, Suite 540  
Hillside, IL 60162

Qualified Contractor Scope of Work:  
For Project # 0001 Firestopping Head and Bottom of Interior Fire Walls and all Trade Penetrations / Except Cable Tray

UL LLC makes no representations or warranties, expressed or implied, that the installed Firestop system will prevent any loss or damage in the event of a fire or similar event, or that the system will in all cases provide the protection for which it is installed or intended. The certificate is evidence that the working contractor's management system was in compliance with the applicable requirements of the Qualified Firestop Contractor Program.  
UL LLC is not an insurer and does not assume any obligation or undertake to discharge any liability of the Qualified Issuing Contractor, or any other party for any loss, which may result in future, insurance settlements, non-compliance in requirements, qualifications of fire certificate, or withdrawal by the Qualified Issuing Contractor from the Qualified Firestop Contractor Program.  
Any modification to any Firestop system of the structure will affect the complete Firestop system and may render protection afforded by the system ineffective. Any changes will involve the certificate holder that the responsible party. It is the building owner's responsibility for an annual visual inspection of the inventory of fire-resistance-rated and smoke-resistance assemblies as required by the International Fire Code or other adopted codes. Please contact your local UL Qualified Firestop Contractor or visit [www.ul.com/firestopcontractor](http://www.ul.com/firestopcontractor) for a complete list of qualified contractors.

UL and the UL Logo are Trademarks of UL LLC © 2018  
Unauthorized reproduction or modification of this certificate constitutes fraud.  
This certificate is for reference use only.  
To verify Site Audit Certificate or Audit Requirements, please refer to website:  
[www.ul.com/firestopcontractor](http://www.ul.com/firestopcontractor)

 Certificate Number: 1000

**QUALIFIED FIRESTOP CONTRACTOR CERTIFICATE**

Company Name: Underwriters Laboratories Inc. File number: R12345 Issued: January 31, 2018  
Address: 333 Pfingsten Rd. Telephone: 480.290.6987 Expires: December 31, 2019  
Email Address: [Raben.Sandvaljr@UL.com](mailto:Raben.Sandvaljr@UL.com)

This company has demonstrated that it complies with UL's Qualified Firestop Contractor Program Requirements. This certificate is not transferable and expires on December 31<sup>st</sup> of the following Year. This certificate may be displayed, copied and shared with others but must be used in its entirety.

Only those companies listed in UL's online Directory for the Qualified Firestop Contractor Program at [www.ul.com/contractor](http://www.ul.com/contractor) are considered eligible for that program and to use this Certificate and the UL Qualified Firestop Contractor Program Marking (shown here) in its advertising and promotional material in accordance with marking guidelines provided at [www.ul.com/contractor](http://www.ul.com/contractor).

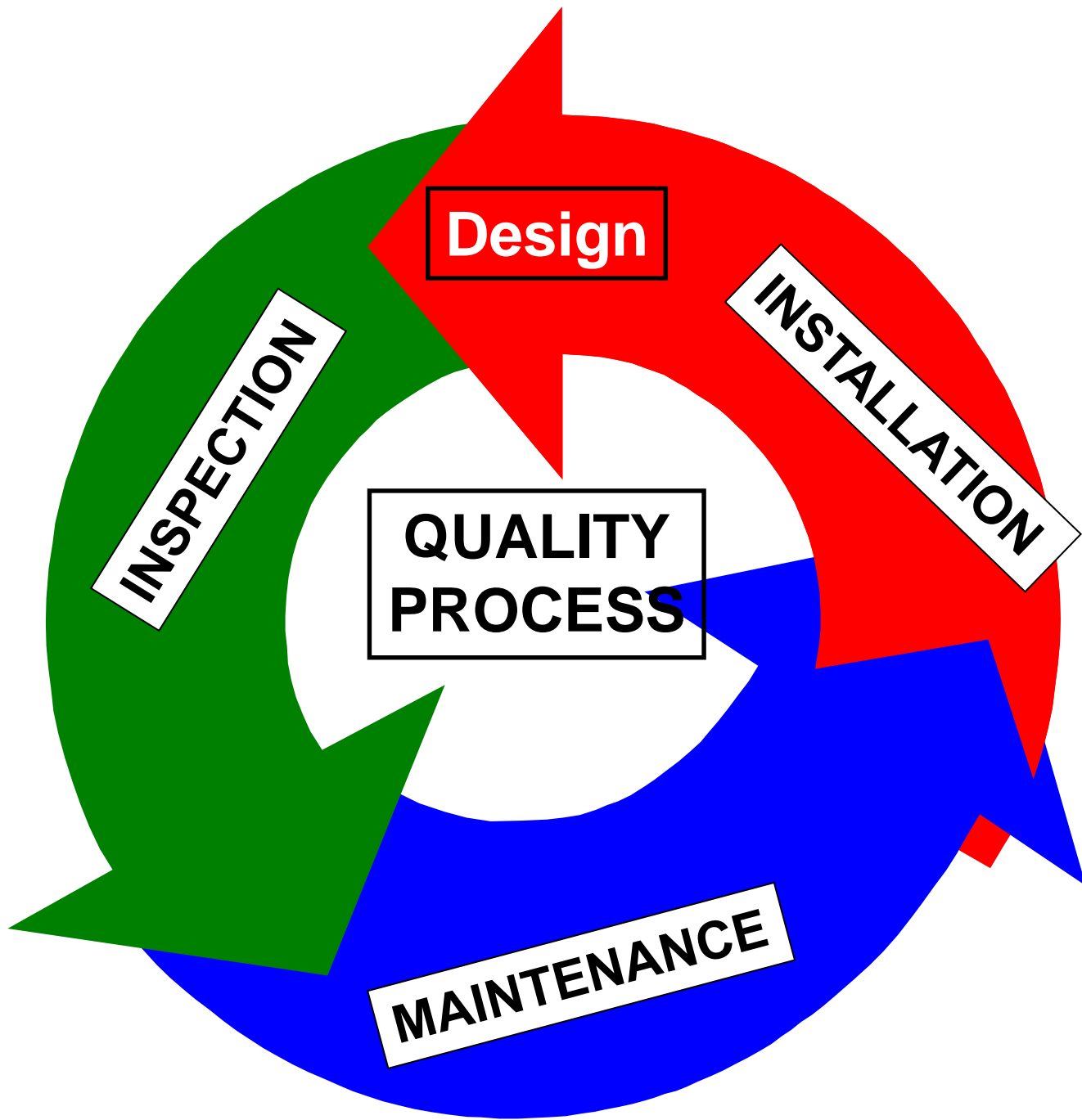
 Underwriters Laboratories  
Qualified Firestop Contractor Program

Underwriters Laboratories reserves the right to void this certificate at any point. This certificate does not indicate compliance with any UL product certification program.

For additional information regarding the Qualified Firestop Contractor Program, please visit [www.ul.com/contractor](http://www.ul.com/contractor)

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UL Slide



# Firestop Installation & Inspection

- ASTM E 2174/ ASTM E 2393 –





# I – Inspection – Options

- **Contractor Self Inspection**
  - Verify Management System validity
  - Not 2%, 10%
  - Required for FM & UL, ULC Contractors
- **Manufacturer Inspection**
  - Does not exist ... Survey, maybe
- **ASTM E 2174 & ASTM E 2393 –**
  - Independent 3<sup>rd</sup> Party
  - Destructive, Non Destructive
  - Specified Frequency

# I – Inspection – Code Requirements

**[A] 110.3 Required inspections.** The *building official*, upon notification, shall make the inspections set forth in Sections 110.3.1 through 110.3.10.

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

# I – Inspection – Scope

- **ASTM E 2174 & ASTM E 2393 –**
  - Firestopping
- **Other Scopes—possibilities for SIA’s**
  - Walls, Horizontal Assemblies
  - Fire Dampers
  - Fire Rated Glazing
  - Fire Doors

# I – Inspection – Code Requirements

## Definitions

**[A] APPROVED AGENCY.** An **established and recognized agency** regularly engaged in conducting tests or furnishing inspection services, when such agency has been *approved*. [IBC 202. Definitions]

**[A] APPROVED.** Acceptable to the *building official* or authority having jurisdiction.

[IBC 202 Definitions]

# I – Inspection – Code Requirements

**SPECIAL INSPECTOR.** A qualified person *employed or retained by an approved agency* and *approved* by the *building official* as having the competence necessary to inspect a particular type of construction requiring *special inspection*. [IBC 202. Definitions]

# I – Inspection – Code Requirements

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

# I – Inspection – Code Requirements

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

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

# Firestop Systems Inspection

## ASTM E 2174 - ASTM E 2393

- “Standard Practice for On-Site Inspection of Installed Fire Stops – Penetrations - Joints”
  - Standard Inspection Procedure
  - Special Inspection Agency Companies
  - Other Qualified Firms
  - Hired by & Report to Building Owner, Architect, Owners Rep, other than GC.
    - = Authorizing Authority



# Inspection in Codes

## ASTM E 2174 - ASTM E 2393

- NFPA 101 / 5000 - Chapter 8 - Annex
- 2012 International Building Code
  - CH 17 – Special Inspections
    - Buildings 75' & higher above Fire Department Access
    - Occupancy Type III, IV, Chapter 16 Table 1604.5
- Abu Dhabi International Building Code

# Inspection in Codes

- **Table 1604.5 – Risk III** - *Buildings and other structures that represent a substantial hazard to human life in the event of failure, include but are not limited to:*
  - *Public Assy., Occupant Load >300*
  - *Bldgs. Containing Elem., 2<sup>nd</sup>ary', day care, >250*
  - *I-2, >50, no surgery, emergency*
  - *I-3*
  - *Occupancy load >5,000*
  - *Power-gen, h2o treatment, wastewater treatment, public utilities, not in IV*
  - *Buildings not in IV, with toxic or explosives*

# Inspection in Codes

- **Table 1604.5 – Risk IV - Buildings and other structures designated as essential facilities, including but not limited to:**
  - *Group I-2 occupancies having surgery or emergency treatment facilities.*
  - *Fire, rescue, ambulance/police stations, emergency vehicle garages.*
  - *Designated earthquake, hurricane or other emergency shelters.*
  - *Designated emergency prep, communications and operations centers and other facilities required for emergency response.*
  - *Power-generating stations and other public utility facilities required as emergency backup facilities for*

# Inspection in Codes

- **Table 1604.5 – Risk IV - Buildings and other structures designated as essential facilities, including but not limited to:**
  - *Buildings and other structures containing quantities of highly toxic materials that:*
    - *Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the International Fire Code, and are sufficient to pose a threat to the public if released.*
    - *Aviation control towers, air traffic control centers and emergency aircraft hangars.*
    - *Buildings and other structures having critical national defense functions.*
    - *Water storage facilities and pump structures required to maintain water pressure for fire suppression.*

# Inspection Firm & Individual Qualifications

## ASTM E 2174 - ASTM E 2393

- Inspector Firm & Inspectors
  - **‘Independent of, and Divested from ’**  
Installing firm, Distributor, Manufacturer,  
Competitor, Supplier...
  - **‘Not a Competitor** of the Installer, contractor,  
manufacturer, or supplier ....
  - **Other than the contractor...**
  - **Submit notarized statements of ...**

# Inspection Firm & Individual Qualifications

## ASTM E 2174 - ASTM E 2393

- Inspector Personnel meet at least one criteria.....
  - 2 years experience (Construction, Field), education, and credentials acceptable to AHJ
  - Accredited by AHJ
  - Meet ASTM E699
- **NEW Inspection Agency Company Qualification**
  - **IAS AC 291 – W/Individual Certs.**

# Firm and Individual Qualifications - IAS AC 291

- Inspector Firm shall have at least one staff..
  - PASS UL or FM Firestop Exam, IFC Exam
  - 1 year Quality Assurance
  - Or...*
  - PASS UL/FM Firestop Exam, IFC Firestop Exam, *and* PE, FPE, Registered Architect, or
  - PASS UL/FM Firestop Exam, IFC Firestop Exam, *and* Education by Certified Agency

# Firm and Individual Qualifications - IAS AC 291

- **Specify IAS AC 291 –**
  - Quantified Qualifications
  - Helps AHJ with “Approved Agency”
  - Not in ASTM Standards, Code
- **Specify Individual Certifications**
  - 3<sup>rd</sup> Party, Independent Exams verify Knowledge
    - FM Firestop Exam
    - UL Firestop Exam
    - IFC Exam



# Inspection Process

## ASTM E 2174 - ASTM E 2393

- Inspection Agency & Inspector
  - Independent
  - Hired after systems submitted, etc.
  - Hired by Building Owner and Manager or Representative
  - Scope of Work dictates authority
  - AHJ Approved

# Inspection Process

## ASTM E 2174 - ASTM E 2393

- Pre Construction Meeting
  - Review Documents – Identify Conflicts
  - Review Materials – SYSTEMS
    - **ASTM E 814 or UL 1479, FM 4990, ASTM E 1966, UL 2079, ASTM E 2307 Systems, ULC S-115**
  - Inspection Documents
    - Manufacturer Product Data Sheets & Installation Instructions
    - Tested and Listed Systems & EJ's/EFRRA's
    - Safety Data Sheets

# Inspection Process

## ASTM E 2174 - ASTM E 2393

- Pre-Construction Meeting
  - Mock Ups – **Identification Systems??**
  - Destructive Testing
  - Installation Measurements
  - Discuss Inspection Method
- Meeting Required
  - During/Post Inspection Methods

# Inspection Process

## ASTM E 2174 - ASTM E 2393

- Installer Firestop Contractor ...
  - Notify Inspector.
  - Inspection within 2 days
  - Inspector verifies ...
    - In accordance with Documents, Manufacturers Installation Instructions

# Inspection Methods

## ASTM E 2174 - ASTM E 2393

- During Construction - Random witness, Each Floor...
  - **2174 - 10%**, each **type** of Penetration Firestop
    - Type = By System, By Contractor
  - **2393 - 5% of Total Lineal Feet** of Fire Resistance Rated Joint System, each type.
    - Type = By System, By Contractor



Adler Photo

# Inspection Methods

## ASTM E 2174 - ASTM E 2393

- Post Construction - Destructive Testing
  - 2174 - Minimum 2% , no less than 1, each type per 10,000 SF of floor area
    - Type = By System, By Contractor
  - 2393 - Minimum 1 / 500 LF of Joint Area, by type, mandatory; Exception mechanical joints
    - Type = By System, By Contractor



# Inspection Methods

## ASTM E 2174 - ASTM E 2393

- Variances....
  - ASTM E 2174 & ASTM E 2393
    - One Day Notice after discovery to Contractor
  - International Building Code 1704.2.4
    - ‘Brought to IMMEDIATE attention of contractor’
    - ‘If not corrected, Building Official AND RDP... prior to completion of that phase’



Adler Photo

# Inspection Methods

## ASTM E 2174 - ASTM E 2393

- Both Methods...
  - If any Type does not comply
    - Repair
    - Replace
    - 1 additional inspection
  - If 10% variance per firestop type
    - Inspection stops
    - Installer inspects, repairs
    - Inspector reinspects
- Document all Deficiencies



# Inspection Methods

## ASTM E 2174 - ASTM E 2393

- Both Methods...
  - Inspector Shall not Supervise Workers...
  - Inspect @ Firestop Installation Start
  - Manufacturers Installation, Inspection Instructions
  - Listings

# Inspection

## ASTM E 2174 - ASTM E 2393

- Equipment – NOT MICROMETERS



# Evaluation & Repairs

- Evaluations
  - Manufacturers Evaluation Instructions
  - Acceptable Methods?
  - Listings

# Evaluation & Repairs

- Repairs
  - Manufacturers Repair Instructions
  - Manufacturers Installation Instructions
  - Listings
  - “Patch”??
    - Adhesion
    - Movement
    - L Ratings?
    - W Ratings?

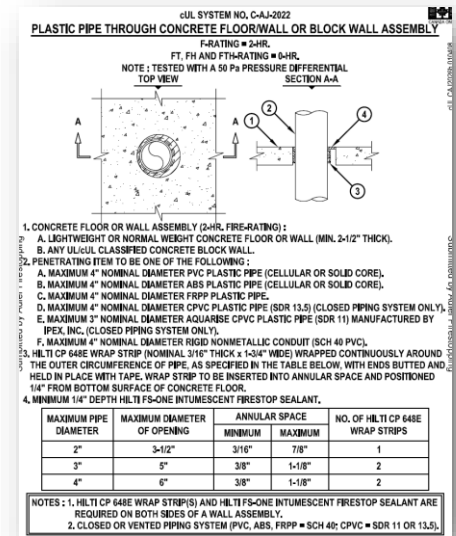
# Inspection Forms Variance Notices

- One for each type of firestop
- ASTM E 2174, 2393 - Submit 1 day after Inspection to Authorizing Agency
- IBC requires IMMEDIATE NOTICE
- Numbered – Controlled
- Required – During/Post Construction Methods

# Inspection Final Report

## ASTM E 2174 - ASTM E 2393

- Name, address, location – project, installer (firestop contractor, prime contractor), inspector, AA, AHJ
- Type and quantity of firestops inspected
- Verification method
- Percentage Deviation
- Copies of all documents sent to Authorizing Agency



# Special Inspection

## ASTM E 2174 - ASTM E 2393

- Inspection Documents
  - Identify System, Materials
- Identification Systems (Labels)
  - Speeds System Evaluation

cUL SYSTEM NO. C-AJ-2022

**PLASTIC PIPE THROUGH CONCRETE FLOOR/WALL OR BLOCK WALL ASSEMBLY**

F-RATING # 2-HR,  
FT. FH AND FTH-RATING # 0-HR.

NOTE: TESTED WITH A 50 P<sub>a</sub> PRESSURE DIFFERENTIAL

1. CONCRETE FLOOR OR WALL ASSEMBLY (2-HR, FIRE-RATING):  
 A. LIGHTWEIGHT OR NORMAL WEIGHT CONCRETE FLOOR OR WALL (MIN. 2-1/2" THICK).  
 B. ANY UL/ULC CLASSIFIED CONCRETE BLOCK WALL.

2. PENETRATING ITEM TO BE ONE OF THE FOLLOWING:  
 A. MAXIMUM 4" NOMINAL DIAMETER PVC PLASTIC PIPE (CELLULAR OR SOLID CORE).  
 B. MAXIMUM 4" NOMINAL DIAMETER ABS PLASTIC PIPE (CELLULAR OR SOLID CORE).  
 C. MAXIMUM 4" NOMINAL DIAMETER FRPP PLASTIC PIPE.  
 D. MAXIMUM 4" NOMINAL DIAMETER CPVC PLASTIC PIPE (SDR 13.5) (CLOSED PIPING SYSTEM ONLY).  
 E. MAXIMUM 3" NOMINAL DIAMETER AQUARISE CPVC PLASTIC PIPE (SDR 11) MANUFACTURED BY IPEX, INC. (CLOSED PIPING SYSTEM ONLY).  
 F. MAXIMUM 4" NOMINAL DIAMETER RIGID NONMETALLIC CONDUIT (SCH 40 PVC).

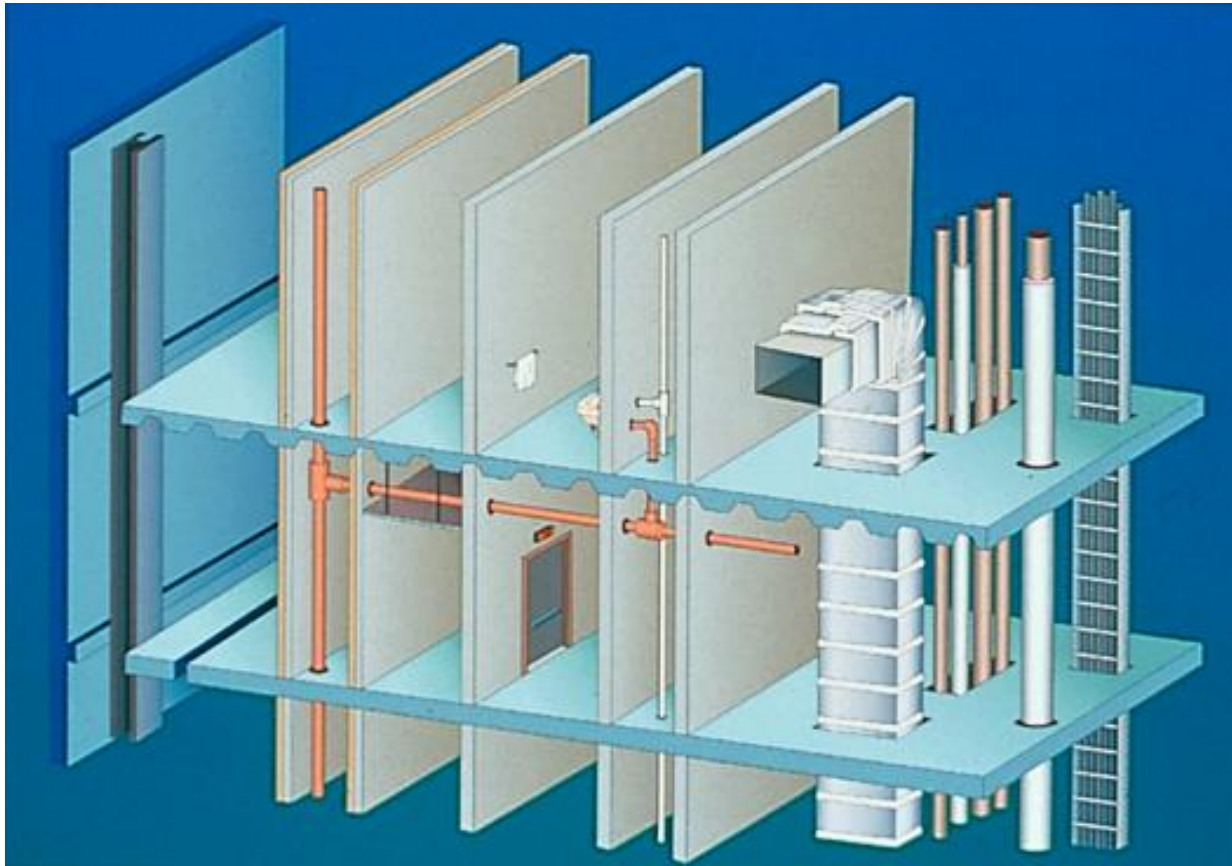
3. HILTI CP 648E WRAP STRIP (NOMINAL 3/16" THICK x 1-3/4" WIDE) WRAPPED CONTINUOUSLY AROUND THE OUTER CIRCUMFERENCE OF PIPE, AS SPECIFIED IN THE TABLE BELOW, WITH ENDS BUTTED AND HELD IN PLACE WITH TAPE. WRAP STRIP TO BE INSERTED INTO ANNULAR SPACE AND POSITIONED 1/4" FROM BOTTOM SURFACE OF CONCRETE FLOOR.

4. MINIMUM 1/4" DEPTH HILTI FS-ONE INTUMESCENT FIRESTOP SEALANT.

MAXIMUM PIPE DIAMETER	MAXIMUM DIAMETER OF OPENING	ANNULAR SPACE		NO. OF HILTI CP 648E WRAP STRIPS
		MINIMUM	MAXIMUM	
2"	3-1/2"	3/16"	7/8"	1
3"	5"	3/8"	1-1/8"	2
4"	6"	3/8"	1-1/8"	2

NOTES: 1. HILTI CP 648E WRAP STRIPS(S) AND HILTI FS-ONE INTUMESCENT FIRESTOP SEALANT ARE REQUIRED ON BOTH SIDES OF A WALL ASSEMBLY.  
 2. CLOSED OR VENTED PIPING SYSTEM (PVC, ABS, FRPP # SCH 40; CPVC # SDR 11 OR 13.5).

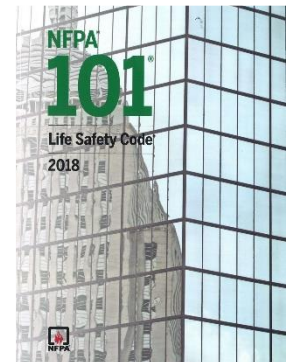
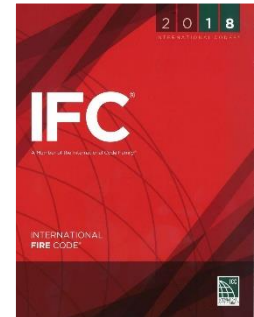
# M – Maintenance (& Management)





# Fire Codes Require Maintenance

- **NFPA 101**
- **NFPA 1**
- **International Fire Code**
- **Minimum Requirements Stated**
- **Frequency**



# National Fire Protection Association - NFPA 1-2018

- **12.2\* Construction.**
- 12.2.2 Fire safety construction features for new and existing occupancies shall comply with **this Code and the referenced edition of NFPA 101.**
- **12.3 Fire-Resistive Materials and Construction.**
- 12.3.1 The design and construction of fire walls and fire barrier walls that are required to separate buildings or subdivide a building to prevent the spread of fire shall comply with Section 12.3 and NFPA 221.

# National Fire Protection Association - NFPA 1-2018

- 12.3.3\* Maintenance of Fire-Resistive Construction, Draft-Stop Partitions, and Roof Coverings.

**12.3.3.1 Required fire-resistive construction, including fire barriers, fire walls, exterior walls due to location on property, fire-resistive requirements based on type of construction, draftstop partitions, and roof coverings, shall be maintained and shall be properly repaired, restored, or replaced where damaged, altered, breached, penetrated, removed, or improperly installed.**

# National Fire Protection Association - NFPA 1-2018

- 12.3.3.2 Where required, **fire-rated gypsum wallboard** walls or ceilings that are damaged to the extent that through openings exist, the damaged gypsum wallboard shall be **replaced or returned to the required level of fire resistance using a listed repair system or using materials and methods equivalent to the original construction.**
- 12.3.3.3 Where readily accessible, required fire-resistance rated assemblies in high-rise buildings shall be visually inspected for integrity at least once every 3 years.

# National Fire Protection Association - NFPA 1-2018

- 12.3.3.3.1 The person responsible for conducting the visual inspection shall demonstrate appropriate **technical knowledge and experience in fire-resistance-rated design and construction** acceptable to the AHJ.
- **12.3.3.3.2 A written report prepared by the person responsible for conducting the visual inspection shall be submitted to the AHJ documenting the results of the visual inspection.**

# National Fire Protection Association - NFPA 101-2012

- **SECTION 4.5.8 Maintenance, Inspection, and Testing.**
- **4.5.8.1 Whenever or wherever any device**, equipment, system, condition, arrangement, level of protection, fire-resistive construction, or any other feature **is required for compliance** with the provisions of this Code, **such device**, equipment, system, condition, arrangement, level of protection, fire-resistive construction, or other feature **shall thereafter be continuously maintained** in accordance with applicable NFPA requirements or requirements developed as part of a performance-based design, or as directed by the AHJ. [101:4.6.12.1]

# National Fire Protection Association - NFPA 101-2012

- **4.5.8.2** No existing life safety feature shall be removed or reduced where such feature is a requirement for new construction. [101:4.6.12.2]
- **4.5.8.3\*** Existing life safety features **obvious to the public**, if not required by the Code, shall be either maintained or removed. [101:4.6.12.3]
- **4.5.8.4** Any device, equipment, system, condition, arrangement, level of protection, fire-resistive construction, or any other feature **requiring periodic testing, inspection, or operation** to ensure its maintenance shall be tested, inspected, or operated as specified elsewhere in this Code or as directed by the AHJ. [101:4.6.12.4]
- **4.5.8.5** Maintenance, inspection, and testing shall be performed under the supervision of a responsible person who shall ensure that testing, inspection, and maintenance are made at specified intervals in accordance with applicable NFPA standards or as directed by the AHJ. [101:4.6.12.5]

# International Fire Code Maintenance



## SECTION 703 FIRE-RESISTANCE-RATED CONSTRUCTION

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

**Openings** made therein for the passage of pipes, electrical conduit, wires, ducts, air transfer openings, **and holes** made for any reason shall be protected with approved methods capable of resisting the passage of smoke and fire.



# 2015 International Fire Code Maintenance

## SECTION 703

### FIRE-RESISTANCE-RATED CONSTRUCTION

**703.1 Maintenance.** The required *fire-resistance rating* of fire-resistance-rated construction, including, but not limited to, 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. Such elements **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.**



# 2015 International Fire Code Maintenance

## SECTION 703

### FIRE-RESISTANCE-RATED CONSTRUCTION

**703.1 Maintenance. (continued)** Where concealed, such elements shall not be required to be visually inspected by the *owner* unless the concealed space is accessible by the removal or movement of a panel, access door, ceiling tile or similar movable entry to the space. Openings made therein for the passage of pipes, electrical conduit, wires, ducts, air transfer openings and holes made for any reason **shall be protected with *approved* methods** capable of resisting the passage of smoke and fire. Openings through fire-resistance-rated assemblies shall be protected by self- or automatic-closing doors of *approved* construction meeting the fire protection requirements for the assembly.



# 2015 International Fire Code Maintenance

## SECTION 703

### FIRE-RESISTANCE-RATED CONSTRUCTION

#### 703.1 Maintenance. (continued) 703.1.1 Fireblocking and draftstopping.

Required *Fireblocking* and draftstopping in combustible concealed spaces shall be maintained to provide continuity and integrity of the construction.

**703.1.2 Smoke barriers and smoke partitions.** Required *smoke barriers* and smoke partitions shall be maintained to prevent the passage of smoke.

Openings protected with *approved* smoke barrier doors or smoke dampers shall be maintained in accordance with NFPA 105.

#### 703.1.3 Fire walls, fire barriers and fire partitions.

Required *fire walls, fire barriers* and *fire partitions* shall be maintained to prevent the passage of fire. Openings protected with *approved* doors or fire dampers shall be maintained in accordance with NFPA 80.



# 2018 International Fire Code

- **701.6 Owner's responsibility.** The **owner** **shall maintain an inventory of all** **required** *fire-resistance-rated and smoke resistant* construction, and the construction included in Sections 703 through 707 and such construction shall be visually inspected by the *owner annually and properly repaired, restored or replaced where damaged, altered, breached or penetrated.*

# 2018 International Fire Code

- **701.6, Continued...PC2**
- **Records of inspections and repairs** shall be maintained. Where concealed, such elements shall not be required to be visually inspected by the *owner unless the concealed space is accessible by the removal or movement of a panel, access door, ceiling tile or similar movable entry to the space.*

# 2018 International Fire Code

- **703.1 Maintaining protection. Materials and firestop systems used to protect membrane- and through-penetrations in fireresistance- rated construction and construction installed to resist the passage of smoke shall be maintained.**

# 2018 International Fire Code Documentation Required

- **703.1 ... Continued.**

The materials and firestop systems shall be securely attached to or bonded to the construction being penetrated with no openings visible through or into the cavity of the construction. Where the system design number is known, the system shall be inspected to the listing criteria and manufacturer's installation instruction.

# UAE Fire and Life Safety Code of Practice

## Maintenance & Management

### Chapter 1, SECTION 21 Firestopping

21.15.2 The required fire resistance rating of installed firestop systems shall be ***visually inspected by the owner or owner's inspection agency annually.*** Damaged, altered or breached firestop systems shall be properly repaired, restored or replaced to comply with applicable codes as per the guidelines of Civil defense.

21.15.3 Any new **Openings** made therein for the passage of through penetrants, **shall be protected with approved firestop system** to comply with applicable codes as per the guidelines of Civil defense.



# National Fire Code of Canada

## National Fire Code of Canada

- *Division B – Part 2, Building and Occupant Fire Safety*  
**2.2.1.2 – Damage to Fire Separations** – where *fire separations* are damaged so as to affect their integrity, they shall be repaired so that the integrity of the *fire separation* is maintained...
- **FCIA Manual of Practice – Appendix, Maintenance**  
FCIA recommends Barrier Management for Effective Compartmentation and Structural Protection



# Firestop Maintenance

- **Maintenance**
  - Code Required
  - How??
- **How to keep Track – Barrier Management Initiative**
  - Paper
  - Software
  - Labeling



# M–Barrier Management Systems

- **Why Manage Barriers & Structural Elements?**
  - **International Fire Code**
  - **International Property Maintenance Code**
  - **NFPA 101**
  - **NFPA 1**
- **It makes Fire and Life Safety Sense**

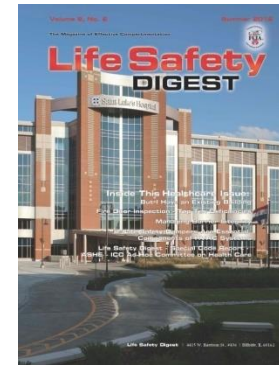
# M–Barrier Management Systems

## Policy Topics

- **Advise Clients – Create a Budget to Meet Code Requirements**
- **Inventory – What Info?**
- **Implement Fire Resistance Management**
  - **In House (Rules)**
  - **Outside Contractor (Rules)**
- **Monitor Process**

# M–Barrier Management Systems Starts @ NEW CONSTRUCTION

- **NEW Buildings – 07-84-00 Specs**
  - **www.FCIA.org**
- **Part I – Focus on**
  - **Systems**
  - **Not Products**
  - **Manufacturers**
- **“Single Manufacturer to the greatest extent possible” – EJ’s**



# M–Barrier Management Systems Starts with CONSTRUCTION

- **NEW Buildings – 07-84-00 Specs**
  - **www.FCIA.org**
- **Part II – Qualifications**
  - **FCIA Member in Good Standing, AND**
  - **FM 4991, Standard for the Approval of Firestop Contractors, OR**
  - **UL Qualified Firestop Contractor Program**
  - **AND**
  - **Manufacturer Accredited, Approved, Trained**

# **M–Barrier Management Systems Starts with CONSTRUCTION**

- **NEW Buildings – 07-84-00 Specs**
  - **www.FCIA.org**
- **Part II – Qualifications – Special Inspection**
  - **Special Inspection Agency –**
    - **IAS AC 291 Accredited Special Inspection Agencies**
  - **Special Inspector Qualifications**
    - **FM Firestop Exam**
    - **UL Firestop Exam**
    - **AND**
    - **IFC Exam – ASTM E 3038**

# M–Barrier Management Systems Starts with CONSTRUCTION

- **NEW Buildings – 07-84-00 Specs**
- **Part III – Execution**
  - **Special Inspection**
    - **ASTM E 2174 - Penetrations**
    - **ASTM E 2393 - Joints**



# Built Right = Maintain Right WHEN SPECIFIED

- **Reference 01-78-00 Closeout Submittals**
  - **01 78 13 Completion and Correction List**
  - **01 78 19 Maintenance Contracts**
    - **On Labels.... Call for Annual Survey**
  - **01 78 23 Operation and Maintenance Data**
  - **01 78 23.13 Operation Data**
  - **01 78 23.16 Maintenance Data**
  - **01 78 23.19 Preventative Maintenance Instructions**

# Built Right = Maintain Right WHEN SPECIFIED

- **Reference 01-78-00 Closeout Submittals**
  - **01 78 29 Final Site Survey**
  - **01 78 33 Bonds**
  - **01 78 36 Warranties**
  - **01 78 39 Project Record Documents**
  - **01 78 43 Spare Parts**
  - **01 78 46 Extra Stock Materials**
  - **01 78 53 Sustainable Design Closeout Documentation**

# Built Right = Maintain Right WHEN SPECIFIED

- **Why Specifications Division 01-78-00?**
  - **Fire Resistance Inventory REQUIRED** -
  - **F-113-16 – 2018 International Fire Code**
  - **Section 703.1 becomes 701.1**
    - **Fire Rated Walls & Floors**
    - **Firestop Systems**
    - **Fire & Smoke Dampers**
    - **Fire Rated Rolling & Swinging Doors**
    - **Fire Rated Glazing**

# M–Barrier Management Systems

- **Why Manage Barriers?**
- **International Fire Code**
- **International Property Maintenance Code**

# M–Barrier Management Systems

## ICC's IPMC

### **IPMC SECTION 703**

**[F] 703.1 Fire-resistance-rated assemblies.** The required fire-resistance rating of fire-resistance-rated walls, fire stops, shaft enclosures, partitions and floors shall be maintained.

**[F] 703.2 Opening protectives.** Required opening protectives shall be maintained in an operative condition. Fire and smokestop doors shall be maintained in operable condition. Fire doors and smoke barrier doors shall not be blocked or obstructed or otherwise made inoperable.

**International Existing Building Code**

# M–Barrier Management Systems Policies

- **Barrier Management Policy**
  - **Inventory**
  - **Monitor**
  - **Permits**
  - **Management**
  - **Request Budget to Meet Code Requirements**
  - **Implement Maintenance**
    - **In House (Rules)**
    - **Outside Contractor (Rules)**

# M–Barrier Management Systems Policies

- **Barrier Management Policy**
  - **Inventory - Items to Survey**
  - **Fire-Resistance-Rated Walls and Floors**
    - **Breaches for Penetrations, Joints, Doors, etc.**
    - **Wall not completed at new construction?**
    - **Wall removed above ceiling?**

# M–Barrier Management Systems Policies

- “Where concealed, such elements shall not be required to be visually inspected by the *owner unless the concealed space is accessible by the removal or movement of a panel, access door, ceiling tile or similar movable entry to the space.*
- **[IFC 2015, 703.1]**



# M–Barrier Management Systems Starts with CONSTRUCTION

- **Fire-Resistance-Rated Walls & Floors**
  - Walls - U, V 400, 900 Designs
  - Floors – P Designs
  - Calculated Fire Resistance
  - Code Defined Fire Resistance - 720
    - Firestop Systems
    - Fire & Smoke Dampers
    - Fire Rated Rolling & Swinging Doors
    - Fire Rated Glazing

# M–Barrier Management Systems Operations

- **Items to Survey**
- **Fire-Rated Doors – Annually – NFPA 80**
  - **Close and Latch**
  - **Holes**
  - **Attach at Frame**
  - **Undercut & Astragals**
  - **Labels Legible**
  - **Labels recertified, requirements of 3<sup>rd</sup> party certification agency**

# M–Barrier Management Systems Operations

- **Firestop Systems – Not Concealed Only**
- **Through & Membrane Penetrations**
  - **Joints**
    - **Wall to Wall**
    - **Floor to Floor**
    - **Head – Bottom of Wall**
    - **Continuity Head of Wall**
  - **Perimeter Fire Containment**

# M–Barrier Management Systems Operations

- **Firestop Systems – SYSTEMS**
  - Visibly Comply with System
  - Visibly ‘sealed’
  - Without openings
  - Firestop Materials & Systems
  - Securely Attached

# M–Barrier Management Systems

## Items to Survey

### **Fire & Smoke, Ceiling, Radiation Dampers**

- **NFPA 80 –**
- **Initial Installation**
- **At 1 year, each 4 years,**
- **6 years *Hospitals Only***
  - **Fire Dampers**
  - **Smoke Dampers**
  - **Combination Fire/Smoke Dampers**
  - **Ceiling Dampers**

# M–Barrier Management Systems

## Items to Survey

- **Fire Rated Glazing**
  - Verify it's still fire rated
  - Glazing / Frame Attachment
  - Frame attached to wall
  - Glazing Marking as Built

# M–Barrier Management Systems

## Items to Survey

- **Fire Resistance Inventory Systems**
  - Paper & Files
  - Spreadsheets
  - Software

# M–Barrier Management Systems Building Operational

- **Barrier Management Policy**

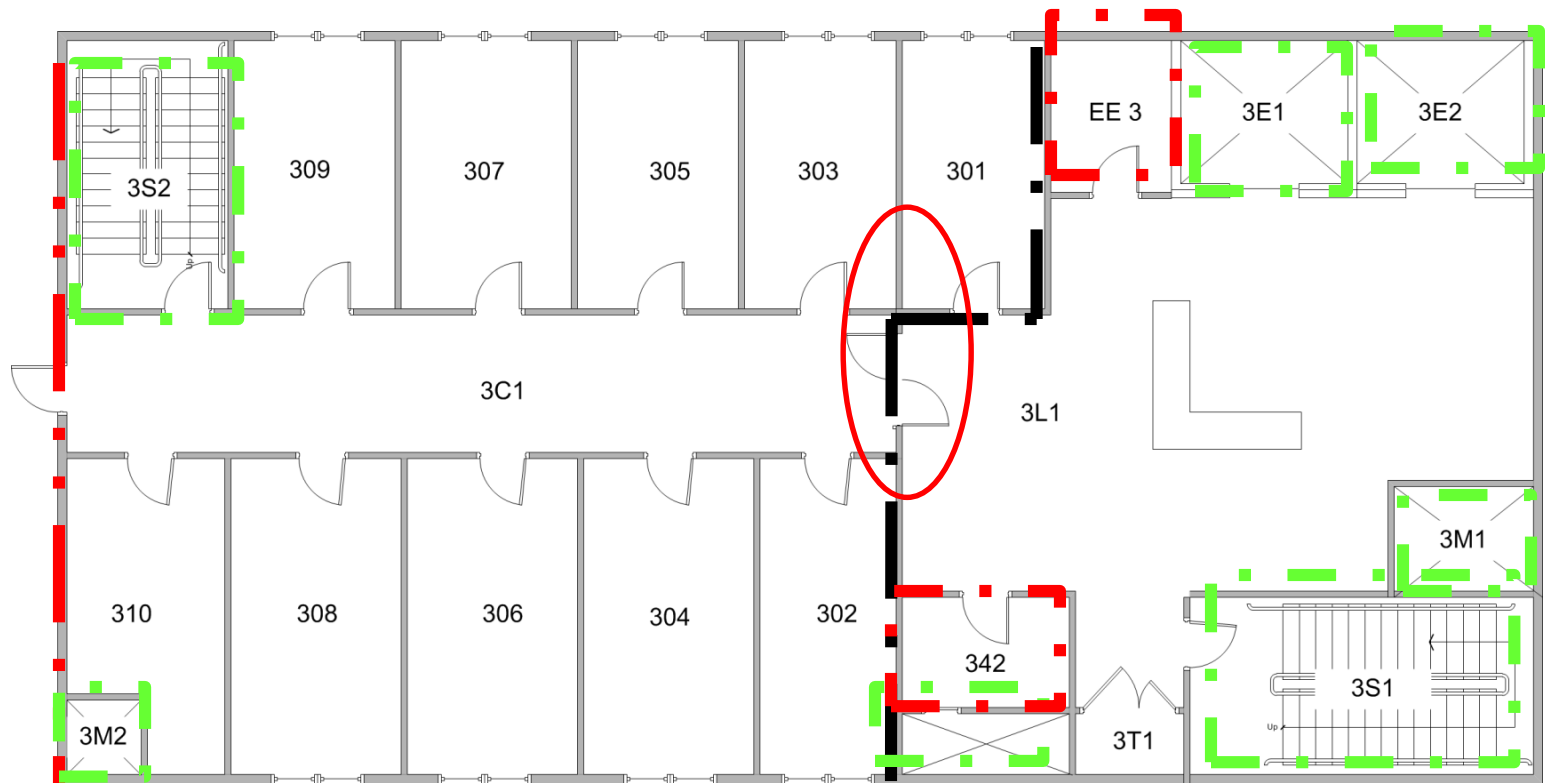
- **Repairs**

- **As originally permitted and *approved***
    - ***As required by Fire Code, Existing Building Code***
    - **If SYSTEMS required, SYSTEMS REPAIRS**
    - **If no Systems, original materials.**
    - **Fire Official**
    - **Insurance Company**



# M-Barrier Management Systems

- **Now it's your building....**



- **Gleeson Powers Graphic**

# M–Barrier Management Systems

- **Barrier Management**
  - **Issues...Budget???**
  - **Other Occupancies---Big Problem**
  - **Constant issues**
  - **Control?**
  - **Staff?**
  - **Manage?**

# Barrier Management HUB

- **The HUB is Facility Director!**
- **HUB Controls Actions**
  - **C-Suite Execs – Budgeted Yearly**
  - **Construction –**
    - **In House Crews**
    - **Outside Contractors**
  - **I-T Department –**
    - **In House Crews & Outside Contractors**

# Barrier Hub = Facility Director?

- **Answer to...**
  - **Other AHJ's**
  - **C-Suite**
  - **Occupants, Students, Faculty, Patients**
  - **Building Official, Fire Marshal**
  - **Insurance Company**
  - **The Joint Commission**
  - **CMS Inspectors**

# Barrier Management Policy Contents

- *Annual Line Item Budget*
- **Rules of Engagement in Contracts**
  - Internal Contracts
  - External Contracts
- **Pre Construction Meetings**
- **Barrier Warnings - Markings**
- **Violation Consequences**
- **Ongoing Management**
- **Staff - Occupant Education**



# **Barrier Management Policy Tool**

- **Contracts = Rules**
  - **Internal Contracts -**
    - **In House Departments similar to Outside Contractors**
  - **External Contracts**
    - **AIA Contract**
    - **Marked Fire - Smoke Barrier Actions**
    - **Barrier Permits**
    - **Documentation Systems**
    - **Report**

# M–Barrier Management Systems

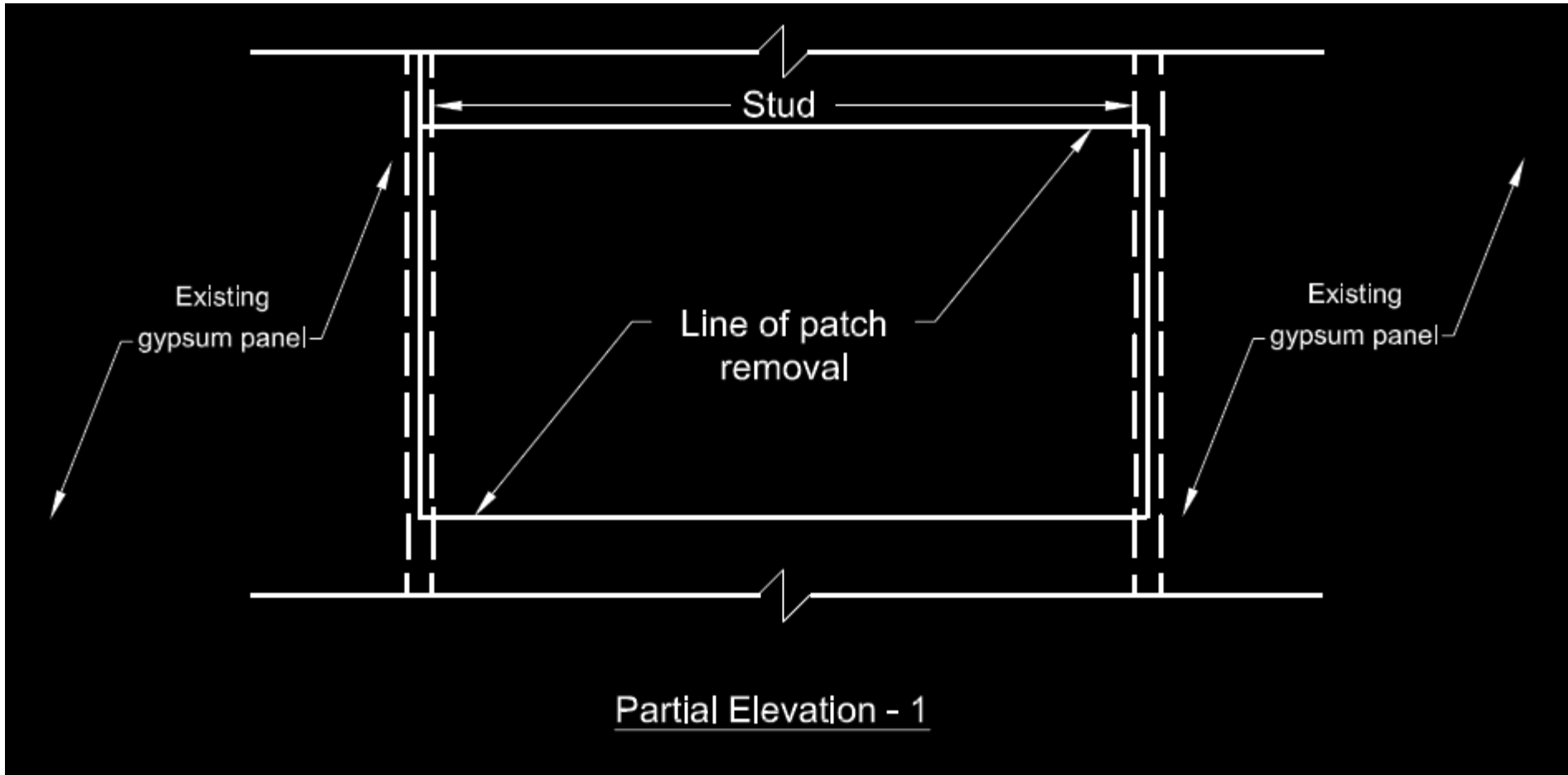
- **Barrier Inventory Elements**
  - **Life Safety Drawings**
  - **Existing Conditions Documented**
  - **Ongoing Survey Records**
  - **Deficiency Reports**
  - **Systems Documentation Control, Retrieval**
- **ALL FIRE PROTECTION FEATURES**

# M–Barrier Management Systems

- **Barrier Repair Examples**



# Gypsum Wallboard Repair Large Holes



- USG Photo

# M–Barrier Management Systems

- **Electronic Best Practice Elements**
  - **Action Oriented**
    - **Projects - Specifications**
    - **Ongoing Surveys – FCIA RPPS 2010-1**
  - **Action Reminders**
  - **In Process Status**
  - **Record Retrieval**





Demo Hospital

Permit No.: 2011-005

Area (\*): 3C1/3L1

Side 1: 3C1

Side 2: 3L1

LSR ID: LST-B1-03-007

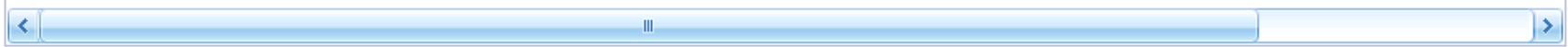
Compliance Status: ● Non-compliant

Survey ID:

LSR Group:

Life Safety Details | Surveys | Photos | Floor Plan Diagrams

LSR Deta...	Status	Latest Ph...	Detail Description	Life Safety T...	Life Safety Sub ...	Letters	Numbers	LSR Count	Notes
> 001	<span style="color: red;">●</span> Non-com...		Firestopping Through Wall Penetration - Firestop	Firestopping	Through Wall Pe...	WL	1000-1999	1	
002	<span style="color: green;">●</span> Compliant		Firestopping Through Wall Penetration - Firestop	Firestopping	Through Wall Pe...	WL	1000-1999	0	
003	<span style="color: green;">●</span> Compliant		Firestopping Through Wall Penetration - Firestop	Firestopping	Through Wall Pe...	WL	5000-5999	1	
004	<span style="color: green;">●</span> Compliant		Firestopping Through Wall Penetration - Firestop	Firestopping	Through Wall Pe...	WL	3000-3999	1 EZ Path	



Add New Life Safety Detail Entry | Edit Selected Life Safety Detail Entry

Edit | Save | Save & Add Another | Save & Close | Delete Record | Cancel

Edit Selected Permit | Delete Selected Row | View/Print Permi | Close Form

# Corrective Action Report

Building/Floor/Area:  
Building 1 \ 3rd Floor \ 3C1/3L1

LSR # - Detail#:  
LST-B1-03-007 - 001

Life Safety Type: Firestopping

Life Safety Sub Type: Through Wall Penetration - Firestop Systems

Penetration Type: EMT or Conduit

Penetration Size: Max 1"

Annular Space: MIN: 0 to .50", MAX:

Wall Rating Type:

Date Completed: May-02-2011

Classified System:

Survey #: Survey

Survey Date:

Deficiency Description: No firestopping

Suggested CA Notes: Install UL Listed Firestopping System at penetration/joint

Survey Notes:

CA Notes:

Survey Photo



Side: 37296

Photo ID: 37296

Survey Photo



Side: 2: 3L1

Photo ID: 37297

Corrective Action Photo



Side: 1: 3C1

Photo Notes:

Photo ID: 37298

Corrective Action Photo



Side: 2: 3L1

Photo Notes:

Photo ID: 37299

# Barrier Management Policy

## Code Guidance

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

1. Be located in accessible concealed floor, floor-ceiling or *attic spaces*;
2. Be located 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; and
3. 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”**  
or other wording.

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

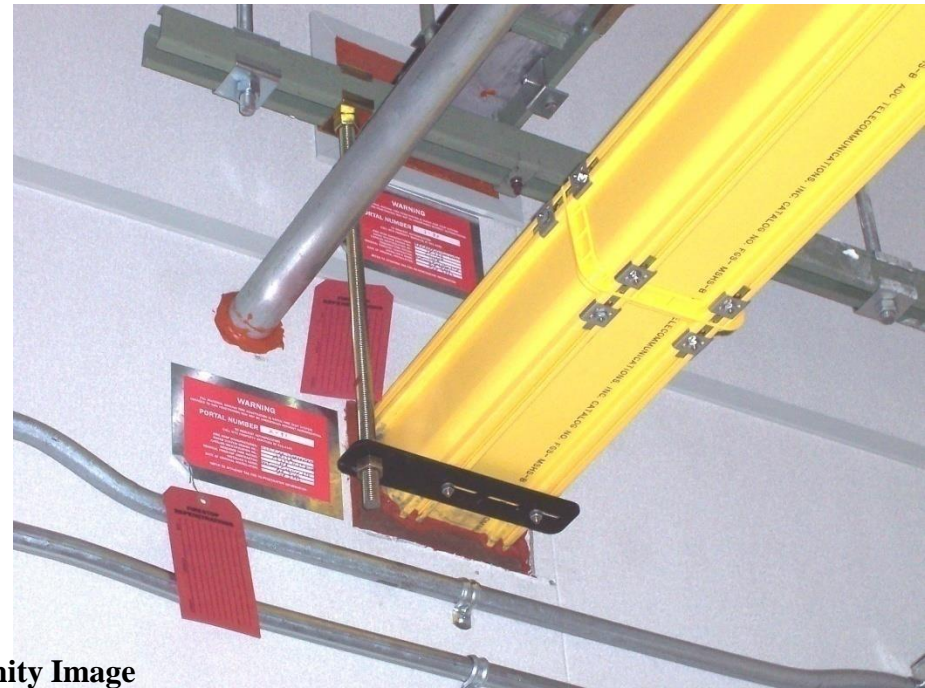


# Barrier Management Policy Tool

- Barrier Warnings on ASSEMBLIES
- International Building Code – 2009++



CL Downey Image



Affinity Image

# **Barrier Management Policy Tool**

- **Pre Construction Meetings - Education**
  - **Barrier Markings Mean...**
  - **Actions when at Barriers Required...**
    - **Permit required – Above Ceiling, Barrier Hole...**
    - **Infection Control Rules**
    - **Healthcare facility Rules**



# **Barrier Management Policy Tool**

- **Violation Consequences**
  - **In House** –
    - **2 strikes & work reassignment to cleaning...**
    - **Others...**
  - **Outside Contractors**
    - **2 strikes & not allowed to work above ceilings**
    - **Others...**

# **Barrier Management Policy Tool**

- **Find Violators....**
  - **Staff Awards**

# **Barrier Management Policy Tool**

- **Ongoing Management**
  - **Engineering Staff Reviews**
  - **User Staff Reviews**
  - **Inside Construction**
  - **Outside Contractor**

# **Barrier Management Policy Tool**

- **Education - Staff Repairs – Simple??**
  - **Fire Doors & Hardware – Simple things...**
    - **Close & Latch**
    - **Holes in Door**
  - **Ladder = ?? Permit Sticker?**
  - **Fire Rated Walls - Holes**
    - **Accidental**
    - **Workers**

# Barrier Management Policy Tool

- **Budgets...**
  - **Sprinkler Maintenance**
  - **Alarms Maintenance**
  - **Security**
  - **Fire and Smoke Resistant Assemblies**
    - **Doors**
    - **Dampers**
    - **Firestops**
    - **Glazing**
    - **Walls/Floors**

# Firestopping & Compartmentation for Safety

- Copies of all documents sent to Authorizing Agency
- Product Data Sheets
- ‘SYSTEMS’, Fire Rated Assemblies = As Built
- Inspection Docs
- Warranty Docs
- Maintenance Requirements
- Letters of Compliance
- FCIA Member in Good Standing Certificate

UL SYSTEM NO. C-AJ-2022  
**PLASTIC PIPE THROUGH CONCRETE FLOOR/WALL OR BLOCK WALL ASSEMBLY**  
 FIRE-RATING = 2-HR.  
 FT. FH AND FT+RATING = 0-HR.  
 NOTE: TESTED WITH A 50 Pa PRESSURE DIFFERENTIAL

1. CONCRETE FLOOR OR WALL ASSEMBLY (2-HR, FIRE-RATING):  
 A. LIGHTWEIGHT OR NORMAL WEIGHT CONCRETE FLOOR OR WALL (MIN. 2-1/2" THICK).  
 B. ANY UL-LISTED CLASSIFIED CONCRETE BLOCK WALL.

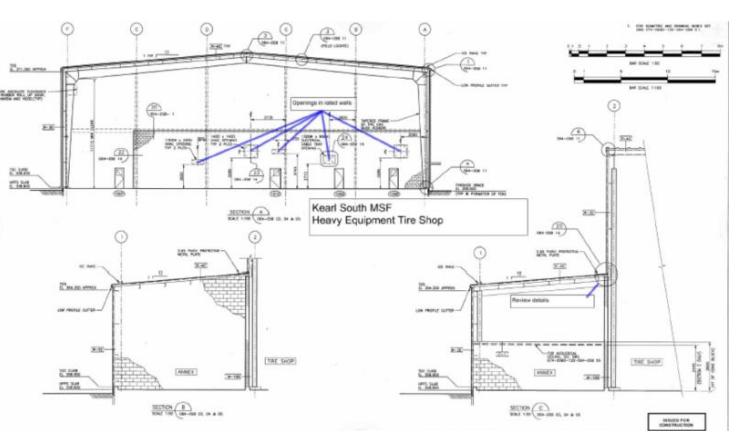
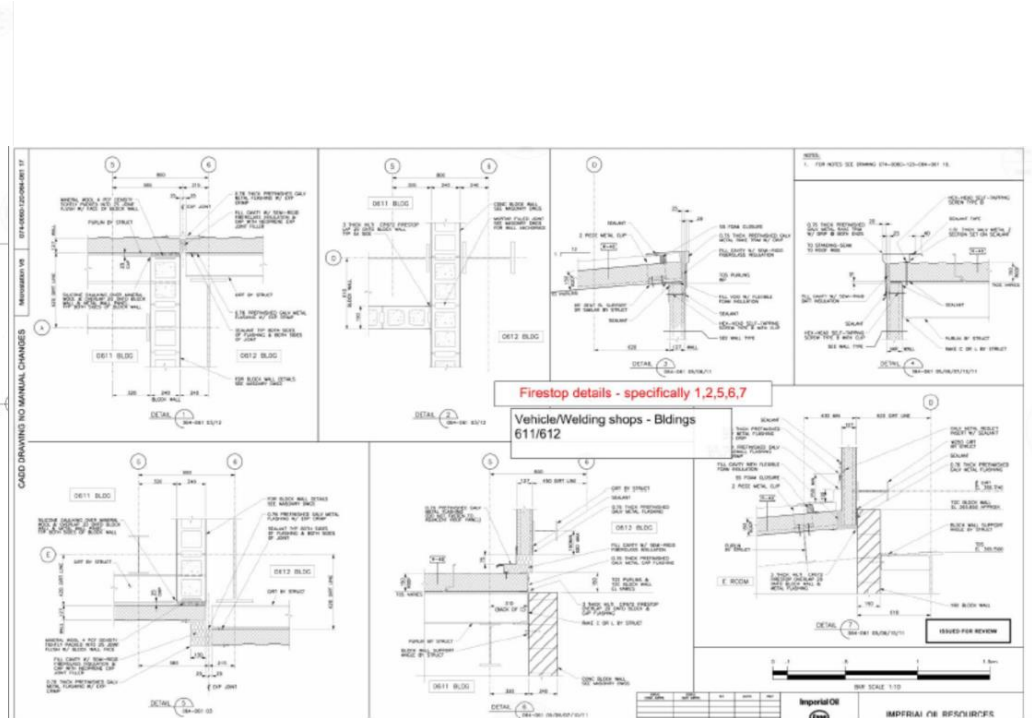
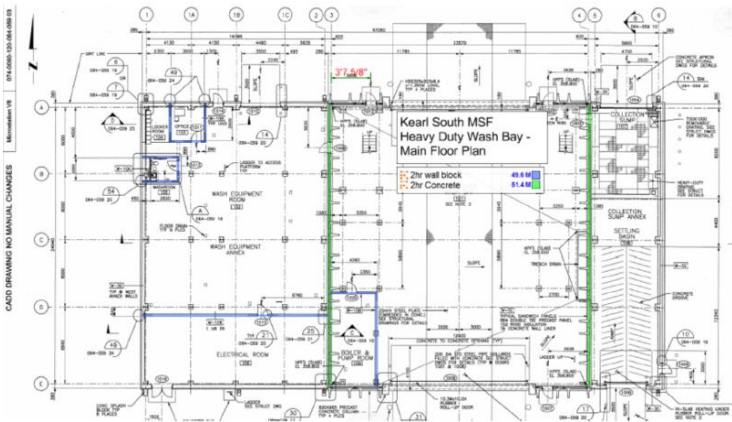
2. PENETRATING ITEM TO BE ONE OF THE FOLLOWING:  
 A. MAXIMUM 4" NOMINAL DIAMETER PVC PLASTIC PIPE (CELLULAR OR SOLID CORE).  
 B. MAXIMUM 4" NOMINAL DIAMETER ABS PLASTIC PIPE (CELLULAR OR SOLID CORE).  
 C. MAXIMUM 4" NOMINAL DIAMETER FRPP PLASTIC PIPE.  
 D. MAXIMUM 4" NOMINAL DIAMETER CPVC PLASTIC PIPE (SDR 13.5) (CLOSED PIPING SYSTEM ONLY).  
 E. MAXIMUM 3" NOMINAL DIAMETER AQUARBE CPVC PLASTIC PIPE (SDR 11) MANUFACTURED BY IPEX, INC. (CLOSED PIPING SYSTEM ONLY).  
 F. MAXIMUM 4" NOMINAL DIAMETER RIGID NONMETALLIC CONDUIT (SCH 40 PVC).  
 G. HILTI CP 648E WRAP STRIP (NOMINAL 3/16" THICK x 1-3/4" WIDE) WRAPPED CONTINUOUSLY AROUND THE OUTER CIRCUMFERENCE OF PIPE, AS SPECIFIED IN THE TABLE BELOW, WITH ENDS BUTTED AND HELD IN PLACE WITH TAPE. WRAP STRIP TO BE INSERTED INTO ANNULAR SPACE AND POSITIONED 1/4" FROM BOTTOM SURFACE OF CONCRETE FLOOR.

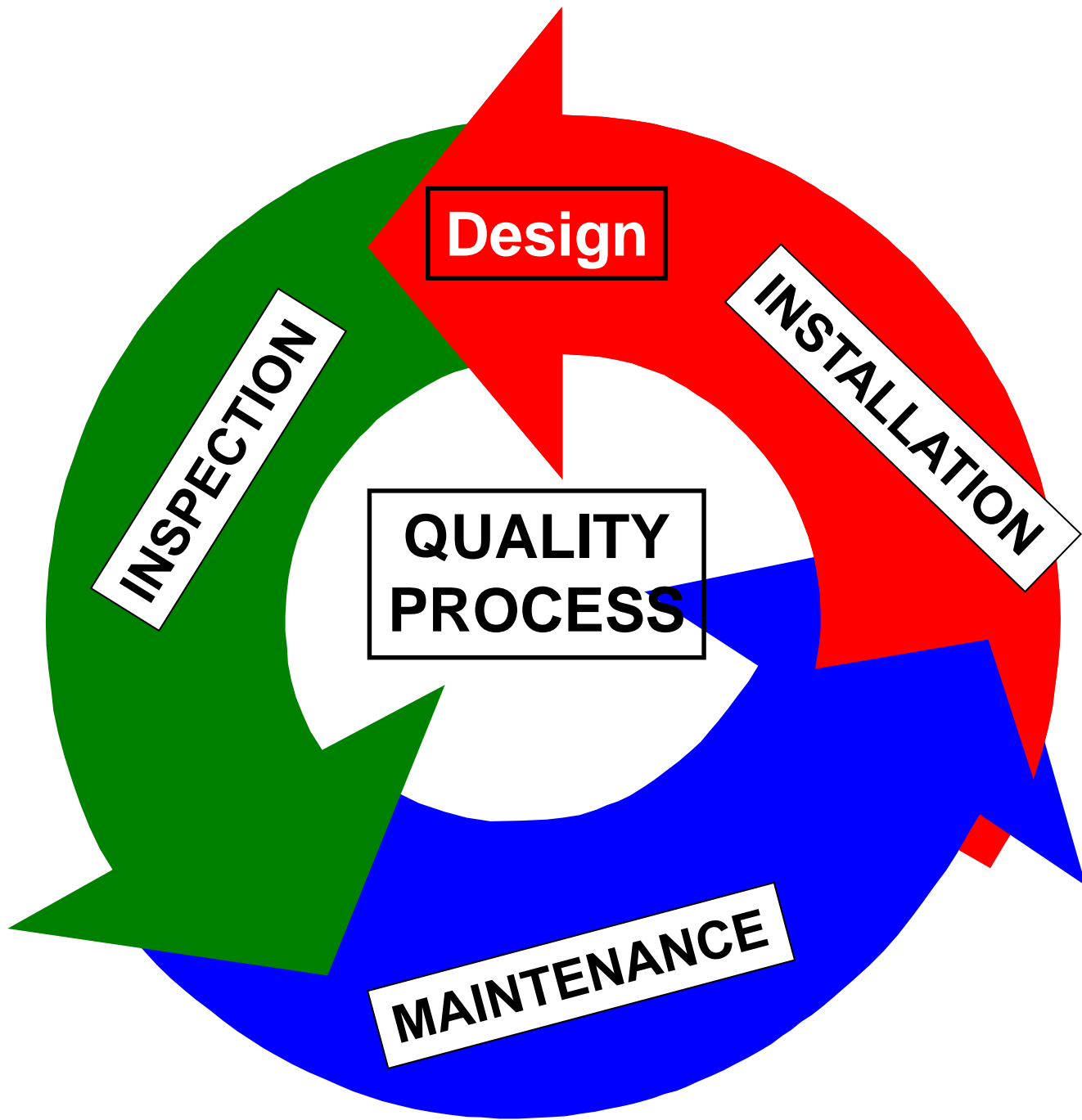
3. MINIMUM 1/4" DEPTH HILTI FS-ONE INTUMESCENT FIRESTOP SEALANT.

MAXIMUM PIPE DIAMETER	MAXIMUM DIAMETER OF OPENING	ANNULAR SPACE		NO. OF HILTI CP 648E WRAP STRIPS
		MINIMUM	MAXIMUM	
2"	3-1/2"	3/16"	7/8"	1
3"	5"	3/8"	1-1/8"	2
4"	6"	3/8"	1-1/8"	2

NOTES: 1. HILTI CP 648E WRAP STRIP(S) AND HILTI FS-ONE INTUMESCENT FIRESTOP SEALANT ARE REQUIRED ON BOTH SIDES OF A WALL ASSEMBLY.  
 2. CLOSED OR VENTED PIPING SYSTEM (PVC, ABS, FRPP = SCH 40; CPVC = SDR 11 OR 13.5).

# Firestopping & Compartmentation for Safety







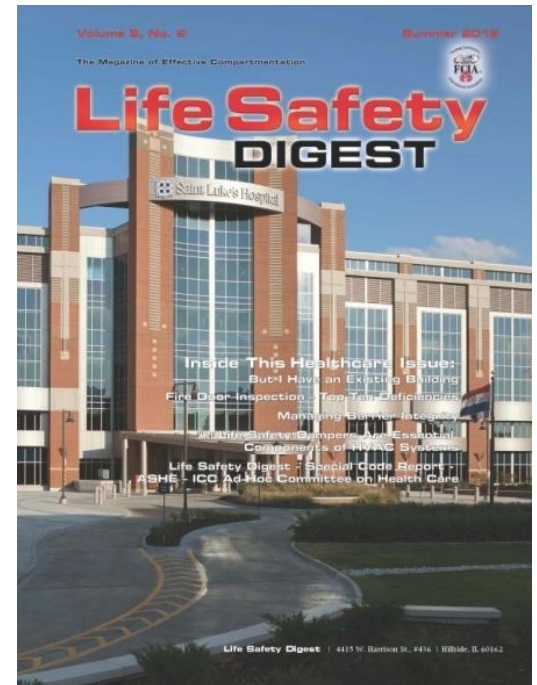
# FCIA DIIM & Firestopping

Proper ***DIIM*** Means Reliable Systems...

- **Properly *Designed*** - A/E - Consultant
  - Tested and Listed Systems, FCIA Member Mfr's., Compartments per IBC, NFPA Codes, SUBMITTALS....*Specified (CCS, CDT, RSW)*
- **Properly *Installed***
  - **FCIA Member, FM 4991, or UL *Qualified Contractors***
- **Properly *Inspected***
  - ASTM E 2174 & ASTM E 2393, by IAS *Qualified Inspectors at IAS AC 291 Accredited Inspection Firms*
- **Properly *Maintained & Managed*** –
  - FCIA Member, FM 4991, or UL Qualified Contractors.

# FCIA DIIM & Firestopping I & I - Inspection Webinar

- Free Subscription to Life Safety Digest
- Specifications @ FCIA.org,



# Effective Compartmentation is a SYSTEM





# Contacts

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# DIIM & Firestopping

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