

# Inspection & Firestop Systems

Bill McHugh, FCIA

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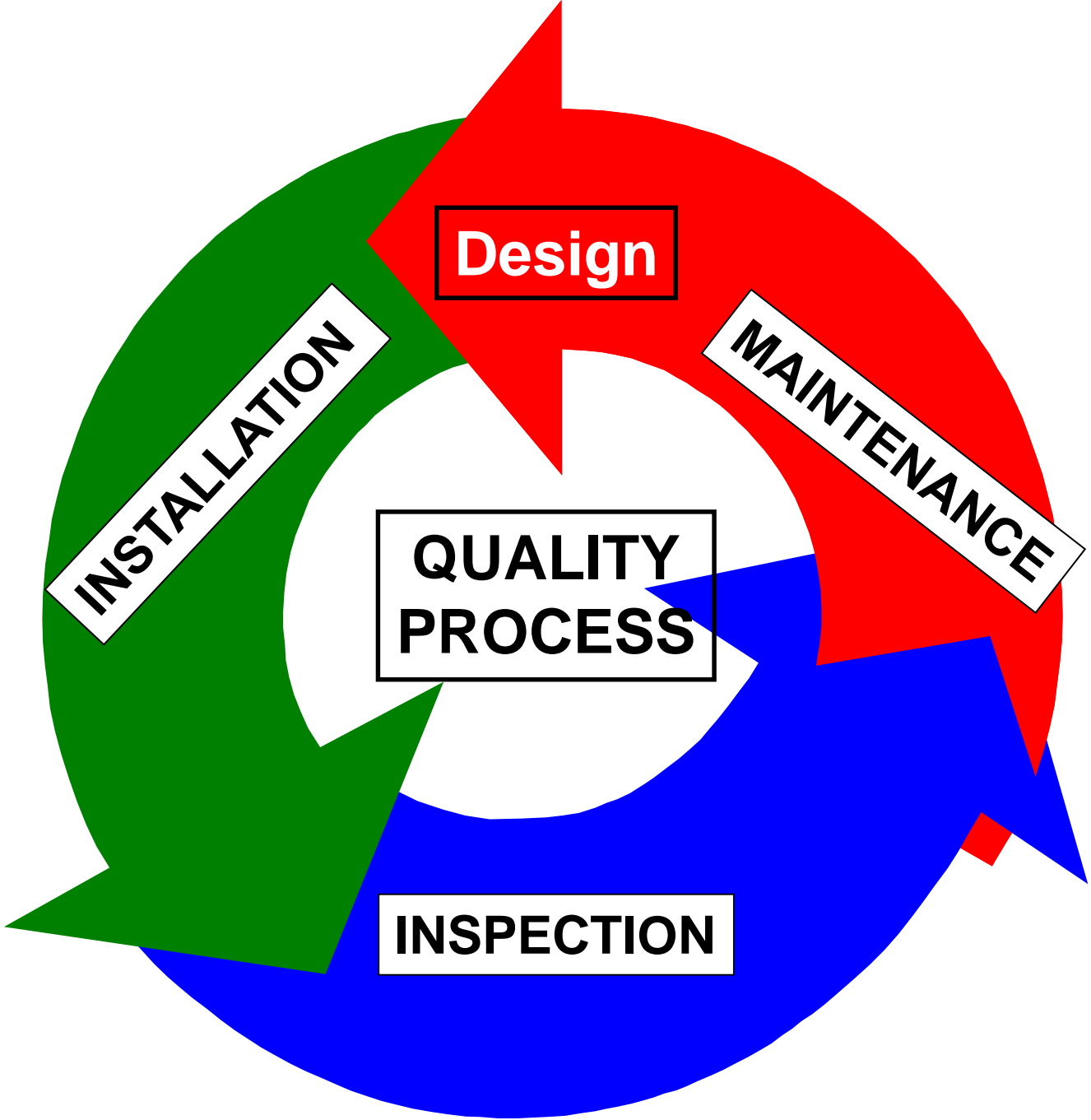
# Outline

- FCIA – A Trade Association
  - Total Fire Protection & Effective Compartmentation
  - Codes, Testing, Products - Materials
  - Firestopping for Safety – A Quality Protocol
    - DIIM



# “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
  - 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



**Design**

**MAINTENANCE**

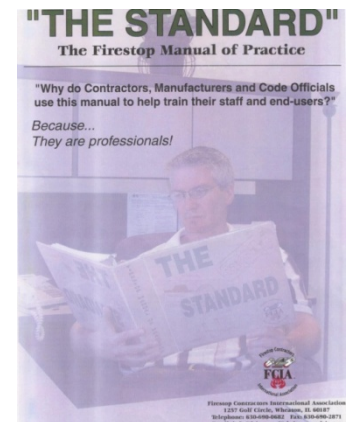
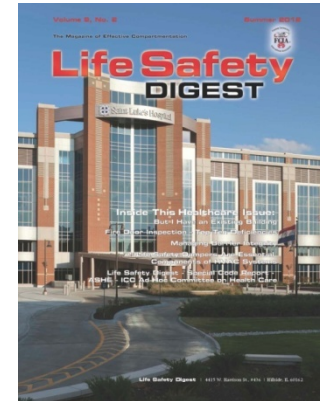
**QUALITY  
PROCESS**

**INSPECTION**

**INSTALLATION**

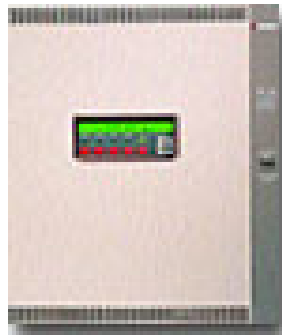
# Firestop Contractors International Association

- FCIA – Worldwide Association
  - Firestop Contractors, Manufacturers, Consultants, Reps, Distributors,
  - Life Safety Digest
  - FCIA Website Resources - FREE
  - FCIA MOP on PDF FREE to Specifiers, Architects, Governmental Bldg./Fire Officials, worldwide..
- [www.fcia.org](http://www.fcia.org)



# “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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# Building & Fire Code Requirements

- NFPA 5000 – 101
- National Building Code – Canada
- UAE Fire and Life Safety Code
- 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
  - *Exterior Walls*
  - *Fire Walls*
  - *Fire Barriers*
  - *Fire Partitions (Not NFPA)*
  - *Smoke Barriers*
  - *Smoke Partitions*
  - *Fire Separations (CANADA)*

# Building & Fire Code Requirements

- Smoke Barriers
  - Healthcare
  - Other Occupancies
- NFPA 101 -
  - Quantified L Rating for Firestops, not in Occupancy Chapters
- 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’ ...  
**Quantified “L” Rating ... not in Occupancy Chapters**
      - 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 hygenist**
  - **How to Regulate for Unexpected Events?**
  - **Due Diligence - Review Required by code?**

# 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

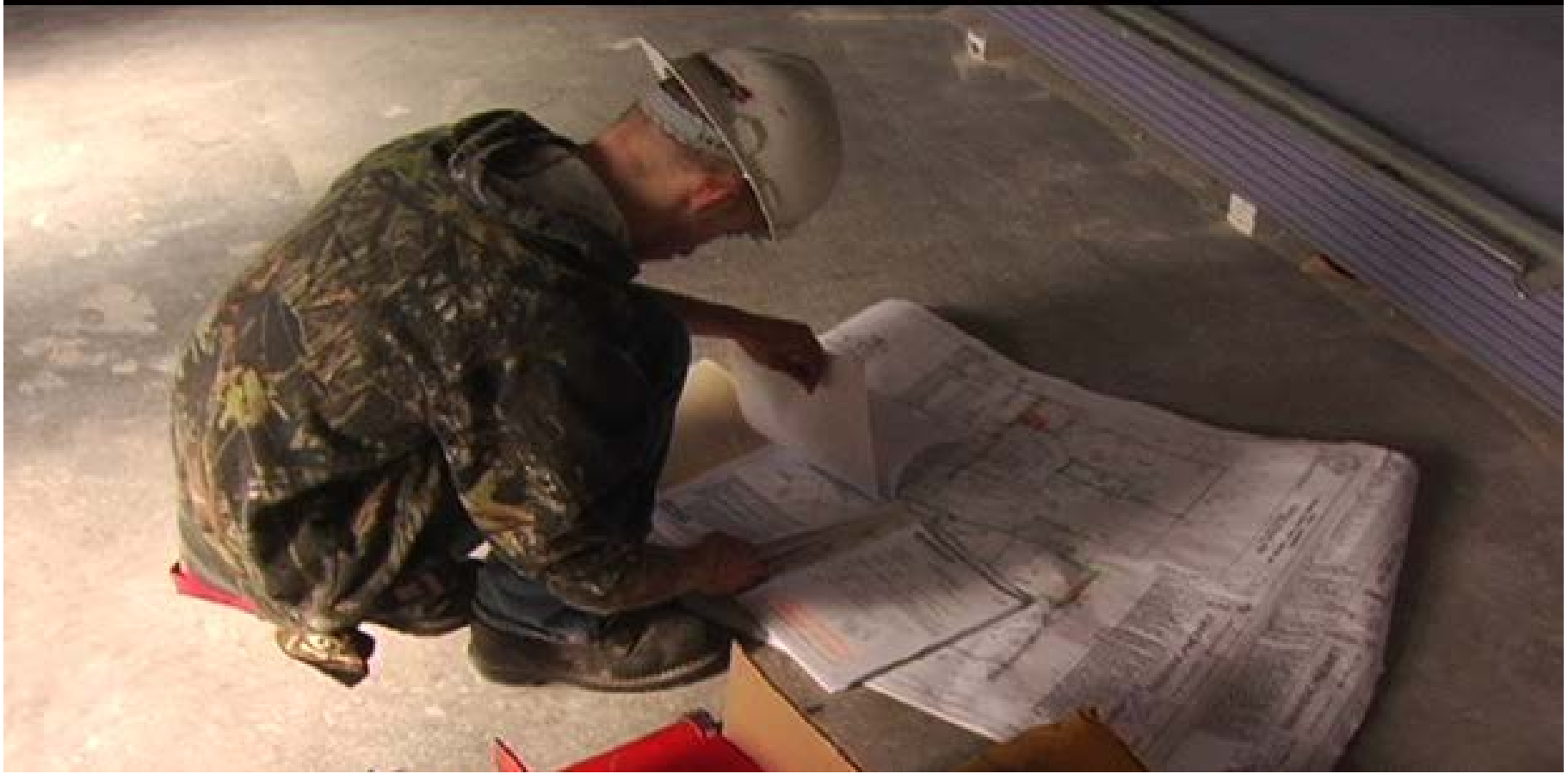
***“Tested & Listed Wall/Floor Systems”***





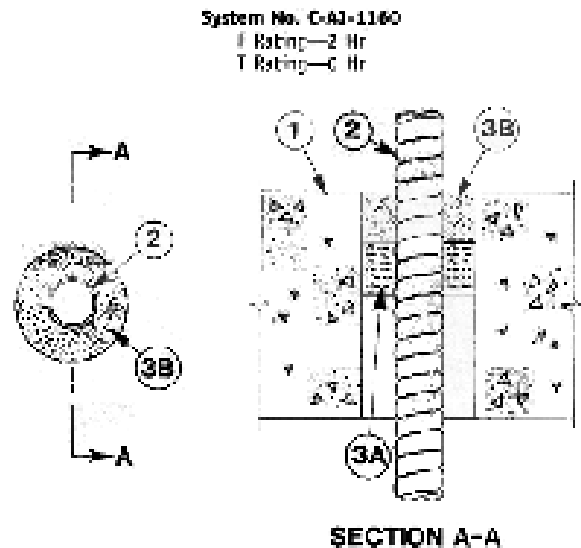
# Firestopping for Continuity

## I – Listed Systems



# Firestopping for Continuity

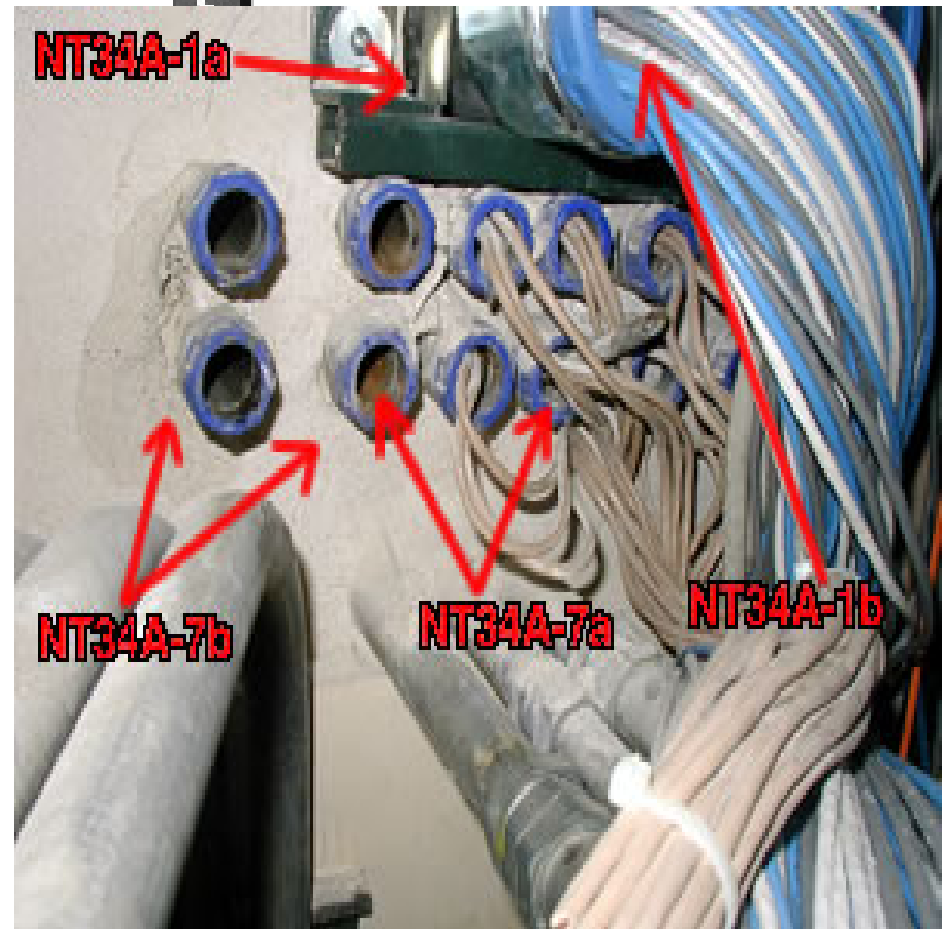
## I – Classified Systems



- Floor or Wall Assembly**—Min. 4-1/2 in. thick lightweight or normal weight (100 to 150 pcf) concrete. Will also be constructed of any UL Classified Concrete Block\*. Diam. of circular 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 (CAC) category in the Fire Resistance Directory for names of manufacturers.
- Through Penetrating Product**—Max. 4 in. diam. (or smaller) pipe, or max. 3/4 in. diam. (or smaller) aluminum Flexible Metal Conduit. Max. 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.
- Packing Material**—Max. 1 in. thickness of organic (plum tree silk) fiber Matul or mineral wool batt insulation. Insulation to be secured into 1 in. from top surface of floor or from both surfaces of wall.
- FILL Void or Cavity Material**—Caulk—Applied to fill the annular space around the flexible metal conduit. In floors, a min. 2 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.

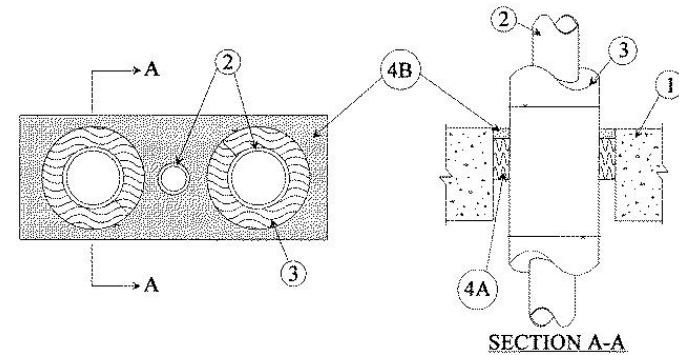
Minnesota Mining & Mfg. Co.—TF 2500\*

\*Bearing the UL Classified Listing Mark  
 (Bearing the UL Listing Mark)



# Firestopping for Continuity

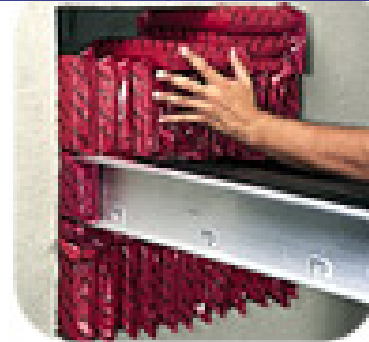
- **Firestop Products Become Firestop Systems --**
  - “A Specific field erected construction, consisting of an assemblage of materials to prevent the spread of fire through openings in fire rated walls and floors using ASTM E 814 / UL 1479 / **FM 4990**, ULC-S-115, UL 2079, **E-2307 E-2837**, as the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



# 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



# Firestop Materials, Systems & Physical Properties

- **Serve Building Needs**
  - Smoke
  - Germs
  - Chemical Resistance – Cleaning?
  - Chemical, Biological, Radiation?
- **Product Types**
  - Intumescent, Latex, Silicone
  - Ablative
  - Endothermic



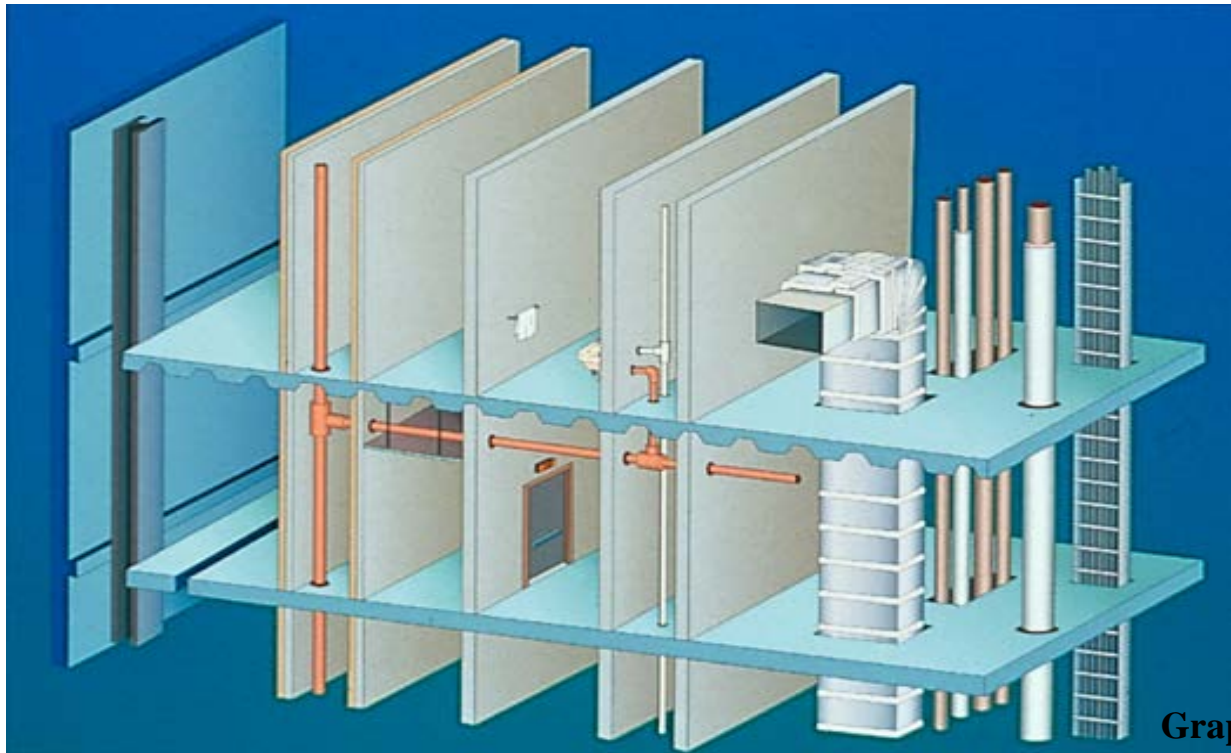


# D- Design

## 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



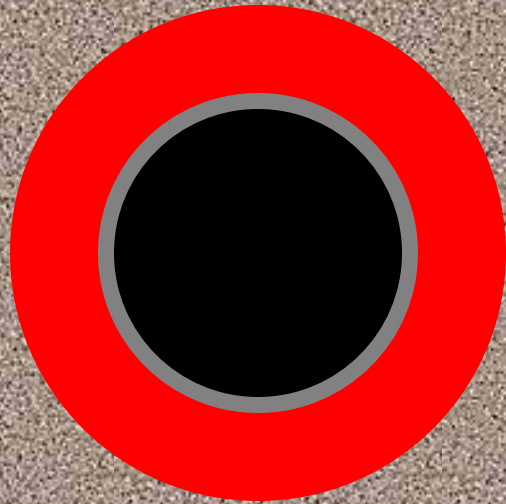


# How do Contractors Select Systems & Inspection Agencies Analyze?

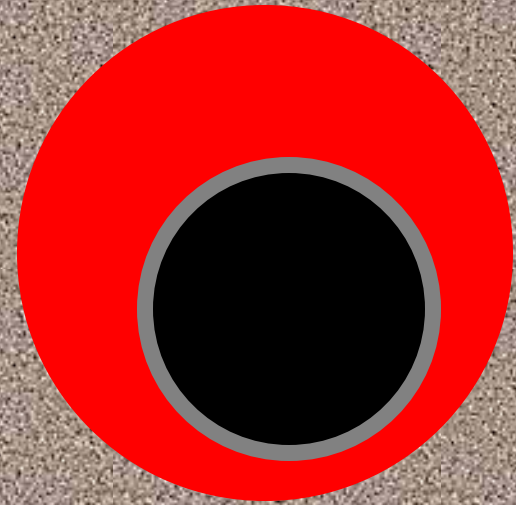
- Wall or Floor Construction Type, Rating
- Wall or Floor Thickness
- Penetrating Item, Coverings
- Size, Type, Thickness
- Annular Space Sizes
- Joint / Gap Sizes
- Backing Materials
- Fill Material(s)

***= Rated Firestop System***

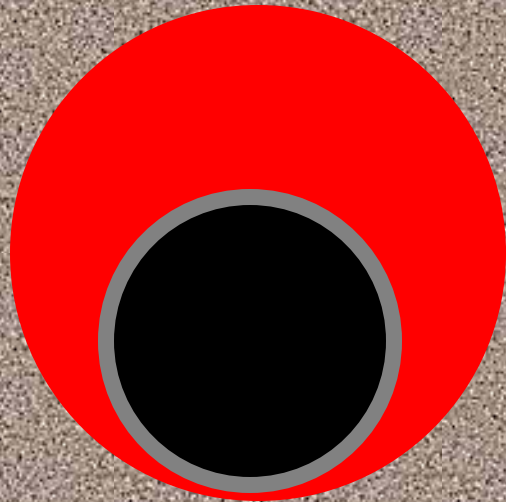




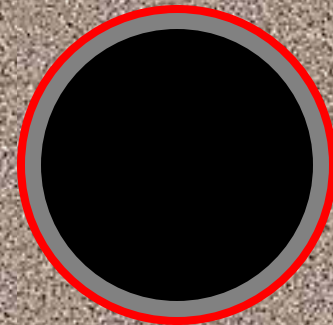
1. Centered



2. Off-Centered



3. Point Contact



4. Continuous Point Contact





# Firestopping - Products Become *SYSTEMS*

# Engineering Judgments/EFRRA

- 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 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



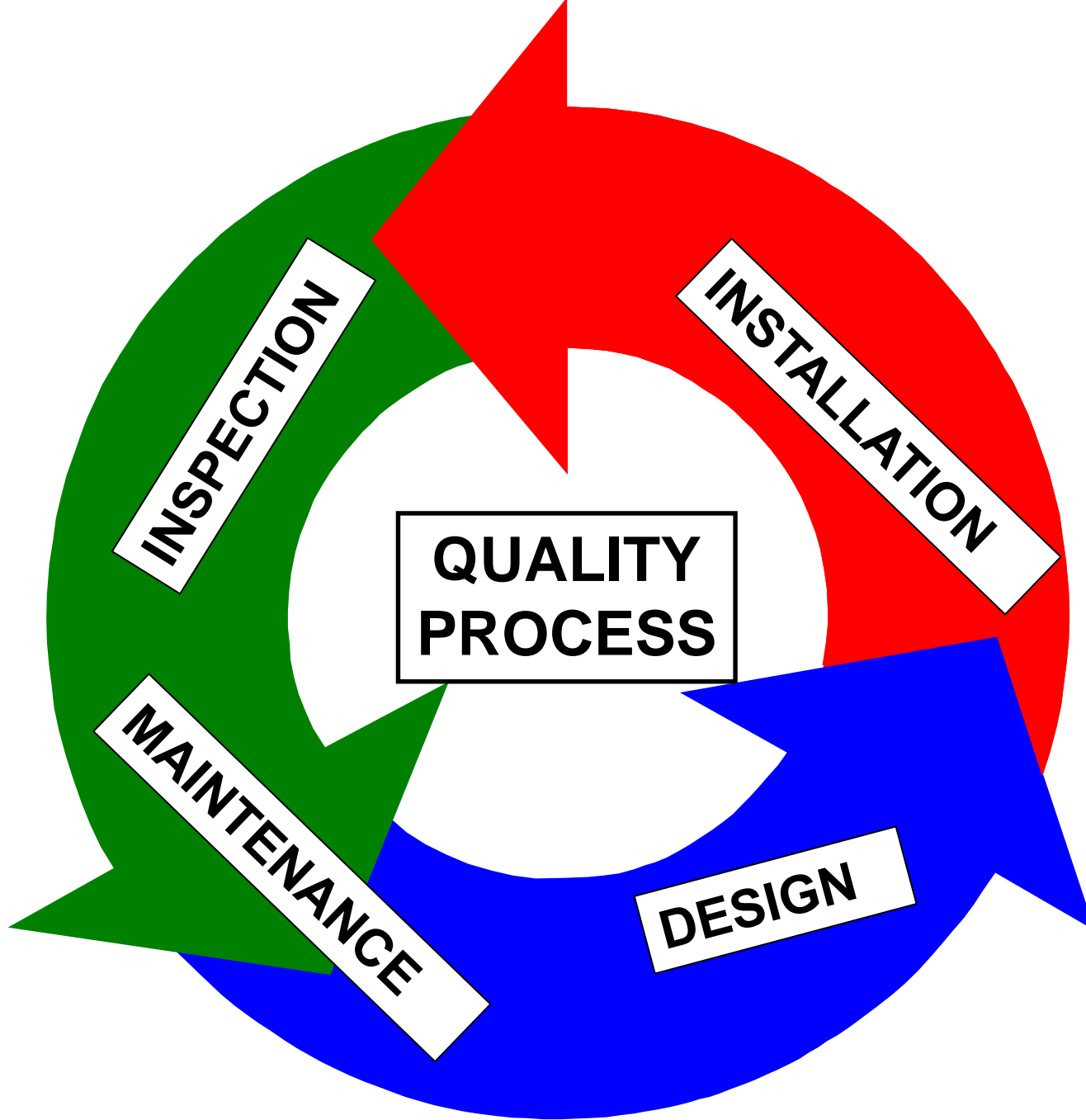
Tool/Smooth

3

Walls - BOTH SIDES

# Properly Tooled/Smoothed Firestop Sealants

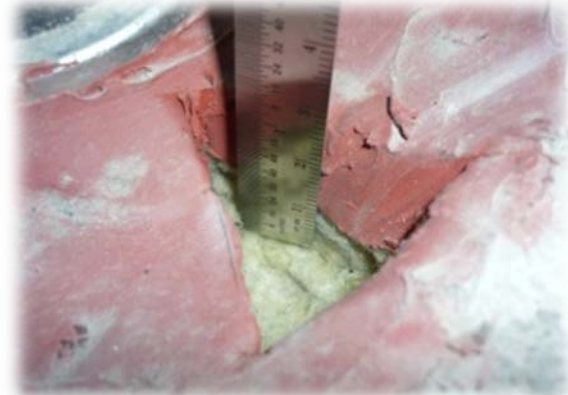






# Firestop Installation & Inspection

- ASTM E 2174/ ASTM E 2393 –



# Mineral Wool Installation



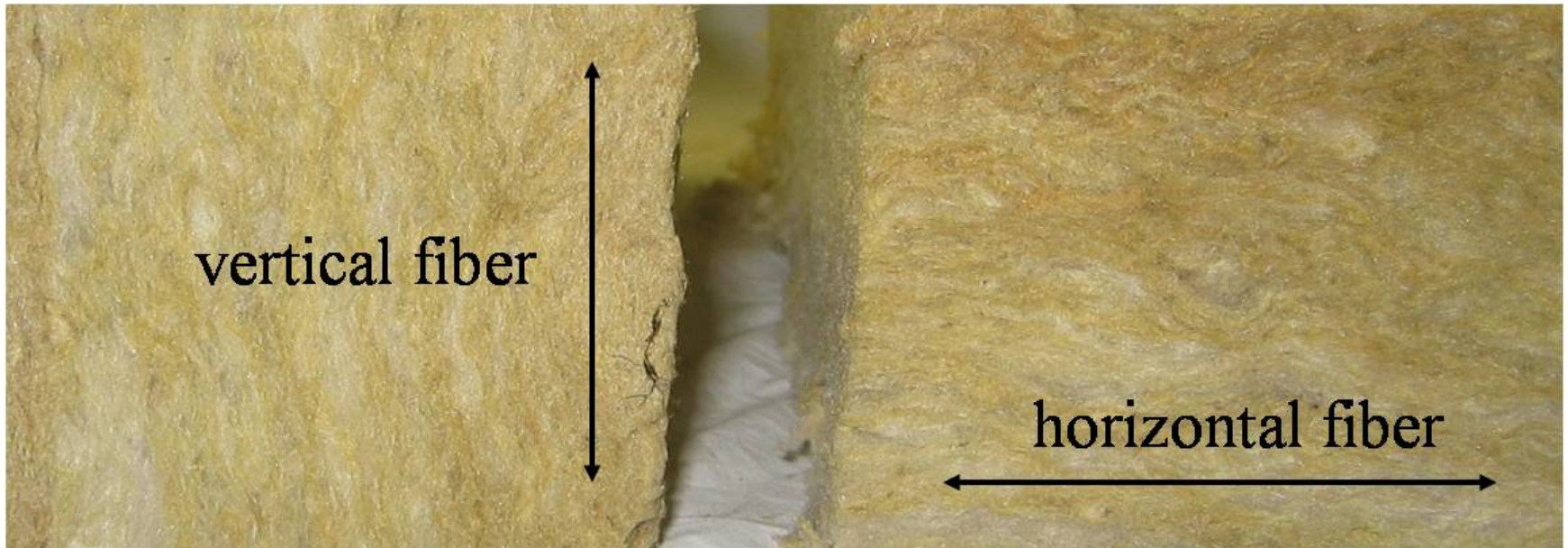
HILTI  
Photo



HILTI  
Photo

**Mineral Wool is installed with fiber direction oriented and compressed as described in the tested and / or listed system, and recessed as stated in the SYSTEM. “Tightly Packed”**

# Mineral Wool Fiber Orientation



Thermafiber, an Owens Corning Company photo.

**Fibers are oriented as stated in the tested and listed system  
Compression...critical.**



# Sleeved Pipes





# Field Fabricated Wrap Strips and Collars



Wrap Strip is cut and ends 'budded'.



Wrap strip does not have adhesive.



Annular space measurement and wrap strip application is critical.



Firestop Sealant is applied, then tooled/smoothed for wetting into the surfaces to finish the firestop.  
Hamilton Benchmark Photos

# Pre-Assembled Intumescent Firestop Collar Devices



**3M Photo**

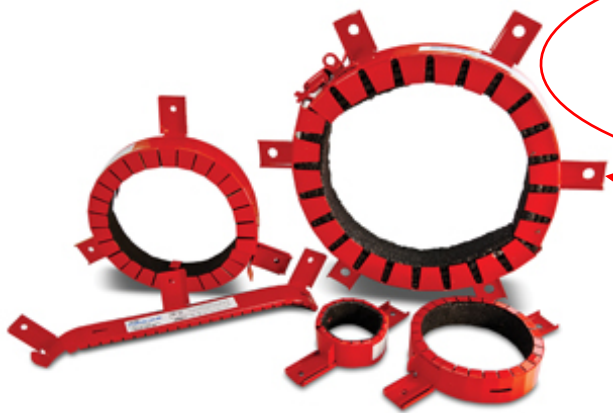


**STI, Inc. Photo**

**Special banding, integral fastening straps or steel tire wire bands are used to hold or 'close' the collar around the FCD device to hold the device around the penetrating item.**



# Fastening/ Anchoring



**Steel fasteners are used to anchor the tabs of the collar to a fire resistance rated wall or floor assembly.**



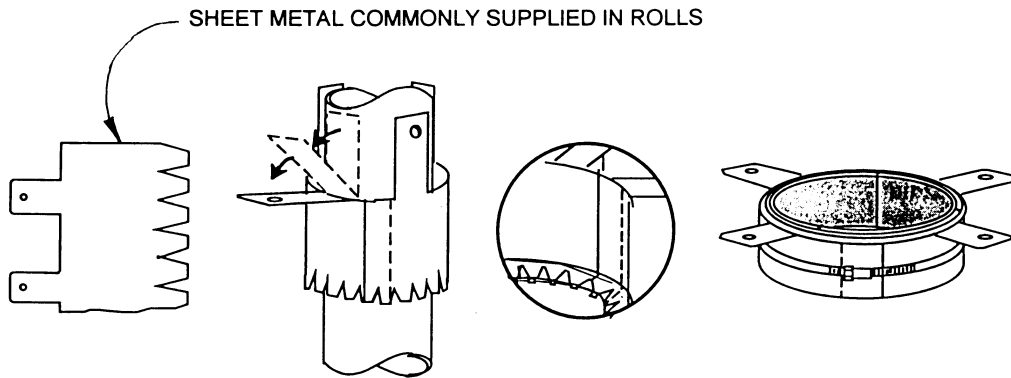
**Rectorseal  
Photo**

**Hilti Photo**

**Lead, plastic or aluminum anchoring systems are not used because they could melt during a fire allowing the collar to move, deflect, drop, or otherwise prevent the constant application of pressure around a fixed location on the penetrating items.**

# Intumescent Wrap Strips and Steel Collars

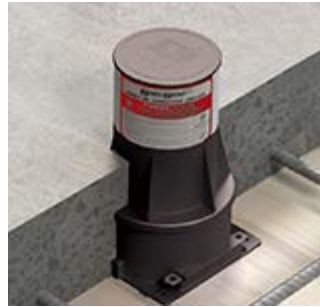
- **Key Points - Restricting Collars**
  - Fastening Tabs – 90 degree bends for expansion
  - Directional Tabs
  - Bands
  - Oops, no fasteners; Bands?



# Pre-arranged-in-Place Devices -Intumescent Systems-



**HILTI Photo**



**STI Photo**



**3M Photo**

**Pre-Arranged Firestop Devices, for plastic and metallic piping systems. The intumescent is molded into the device.**

# Pre-arranged-in-Place Devices -Intumescent Systems-



**Floor Drain stub  
extensions - HILTI  
Photo**



**Toilet Device - HILTI  
Photo**



**Drop-In-Device –  
HILTI Photo**

**Pre-Arranged Firestop Devices, for toilets and floor drains. The intumescent is molded into the device.**

**Once the concrete floor slab is poured and cured, the device provides a coupling for the rest of the plastic pipe plumbing system above and below the device to be installed.**



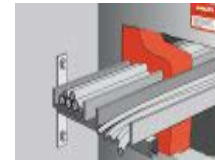
# Firestop Mortars



**Rectorseal Photo**



**3M Photo**



**Hilti Photo**



**STI Photo**



**Foam Concrete Firestop  
AD Fire Protection  
Products Photo**

# Intumescent Composite Sheets



**Rectorseal Photo**



**STI Photo**



**3M Photo**



# Intumescent Composite Sheets

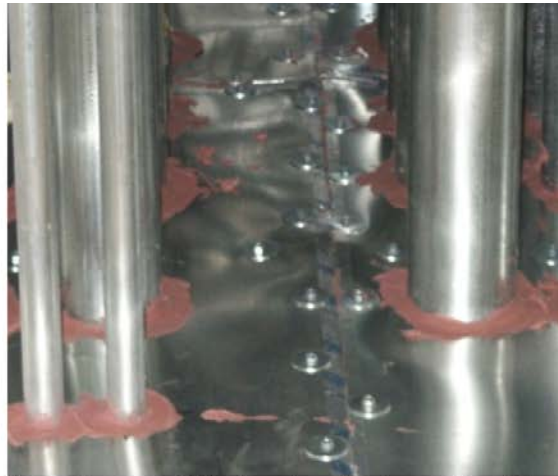


**Large Openings with multiple  
penetrating items. PPMI Photo**



**Composite sheet. PPMI Photo**

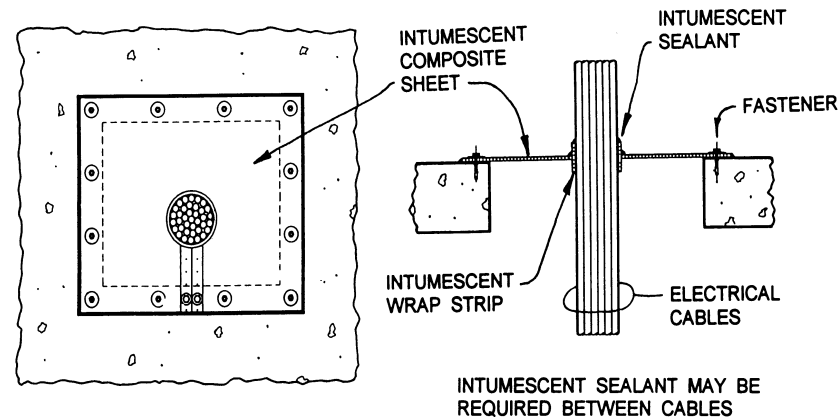
# Intumescent Composite Sheets



**Seaming and fastening is described in  
manufacturers' product data sheets  
and tested and listed systems. PPMI Photo**

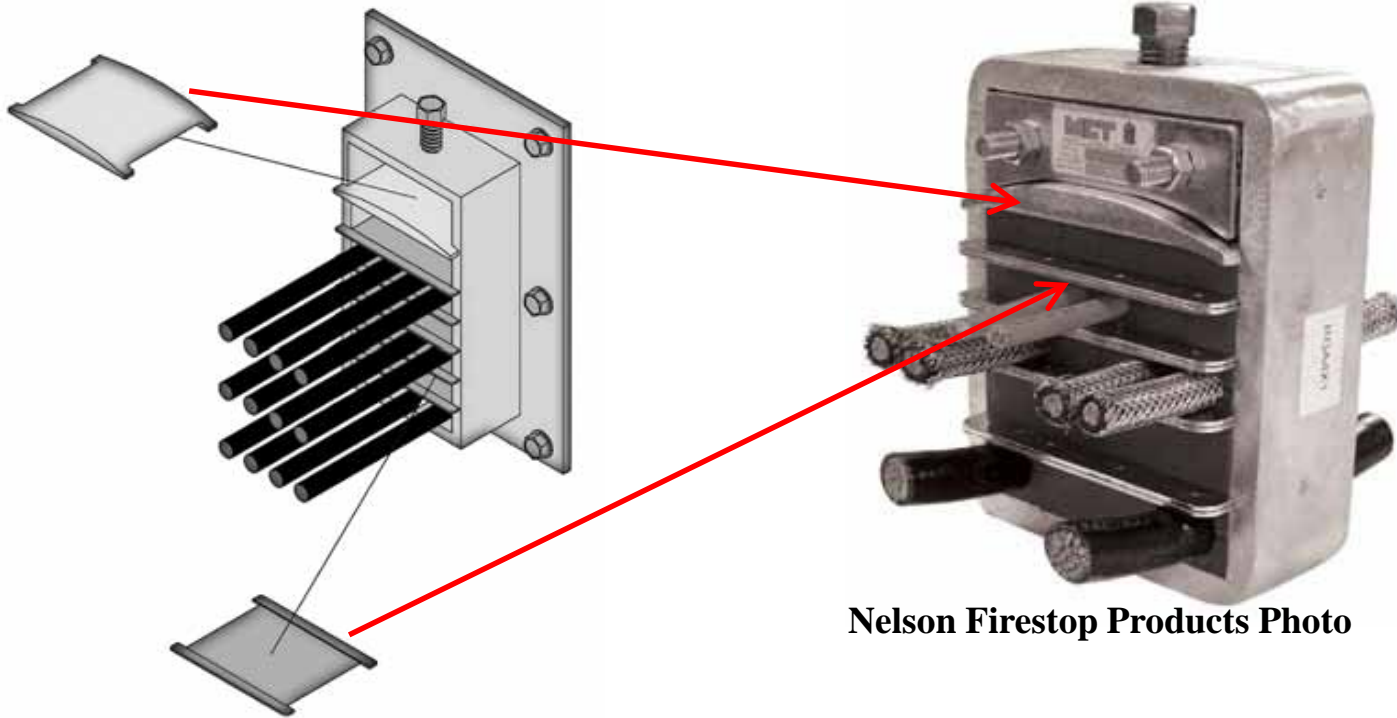
# Intumescent Composite Sheets

**FIGURE 3-14.1 – INTUMESCENT COMPOSITE SHEET**



**Figure 3-14.1 shows a combination of intumescent composite sheet, intumescent wrap strip and intumescent sealant providing firestopping for a floor opening containing a bundle of cables as the penetrating items. Refer to a tested and listed system detail for other allowable penetrant types and specific size of openings and additional firestop product requirements.**

# Pre-Fabricated MCT Firestop Devices



**Compression Plates**  
**Nelson Firestop Products Photo**

**Nelson Firestop Products Photo**

**Steel bolts and plates compress  
and anchor the inserts by applying pressure to the interior of  
the steel frame.**

# Open Path Electrical Firestop Devices



**STI Photo**



**HILTI Photo**



**Rectorseal Photo**



**3M Photo**





Affinity Firestop Photo





DATE

|  |  |  |  |  |  |  |  |  |  |
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|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

GARDER HORS DE PORTEE DE  
hygienique. En cas de contact acci  
faide de diluant de peinture sur les  
minérale ou végétale pour libérer les  
KEEP OUT OF REACH OF CHILDREN  
case of accidental contact with adhesion  
floors. Use ice, vegetable or mineral oil  
SOUZI HUMANTAIRE: les animaux p

Affinity Firestop Photo



Affinity Firestop Photo





Affinity Firestop Photo

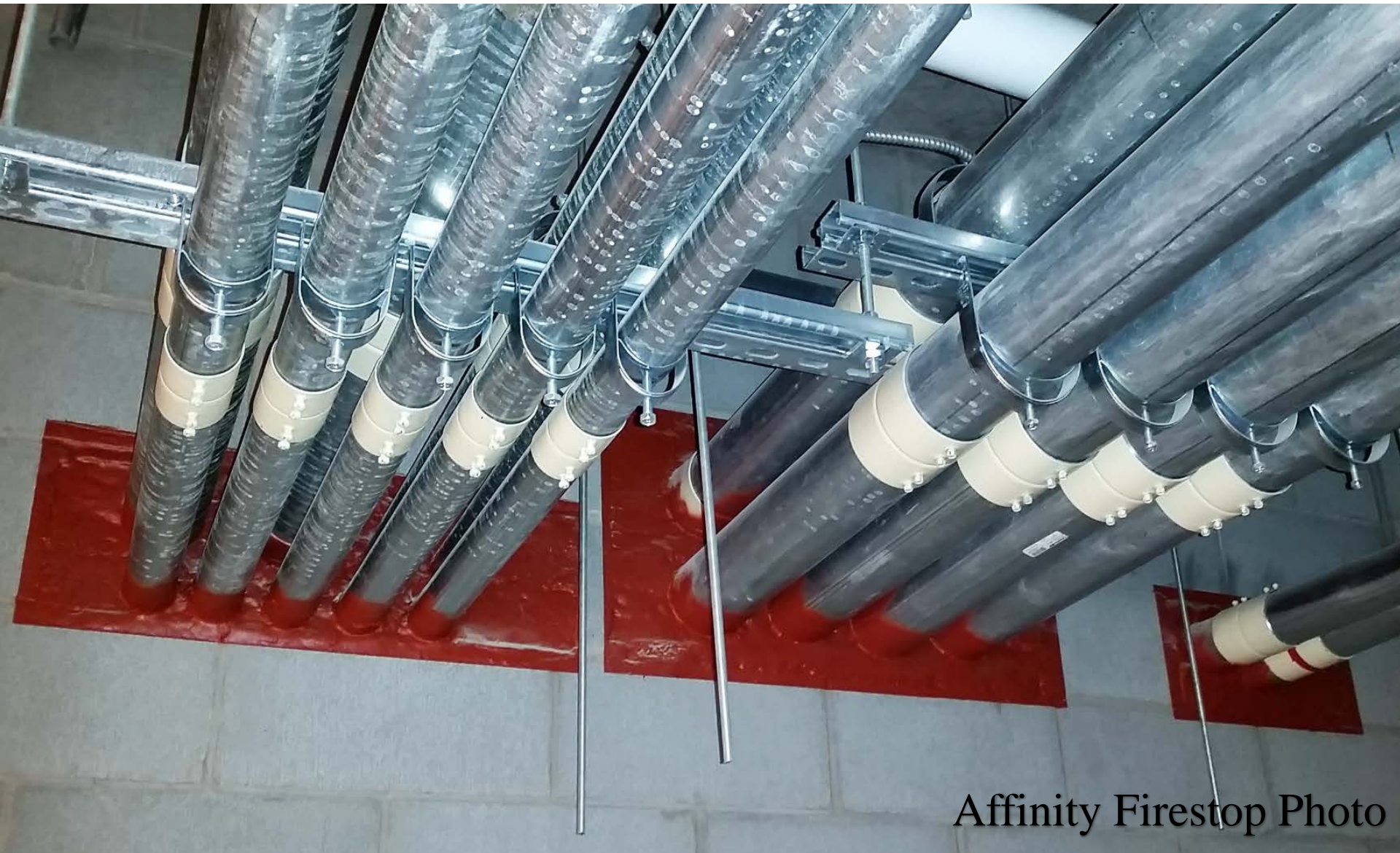


Affinity Firestop Photo



Affinity Firestop Photo





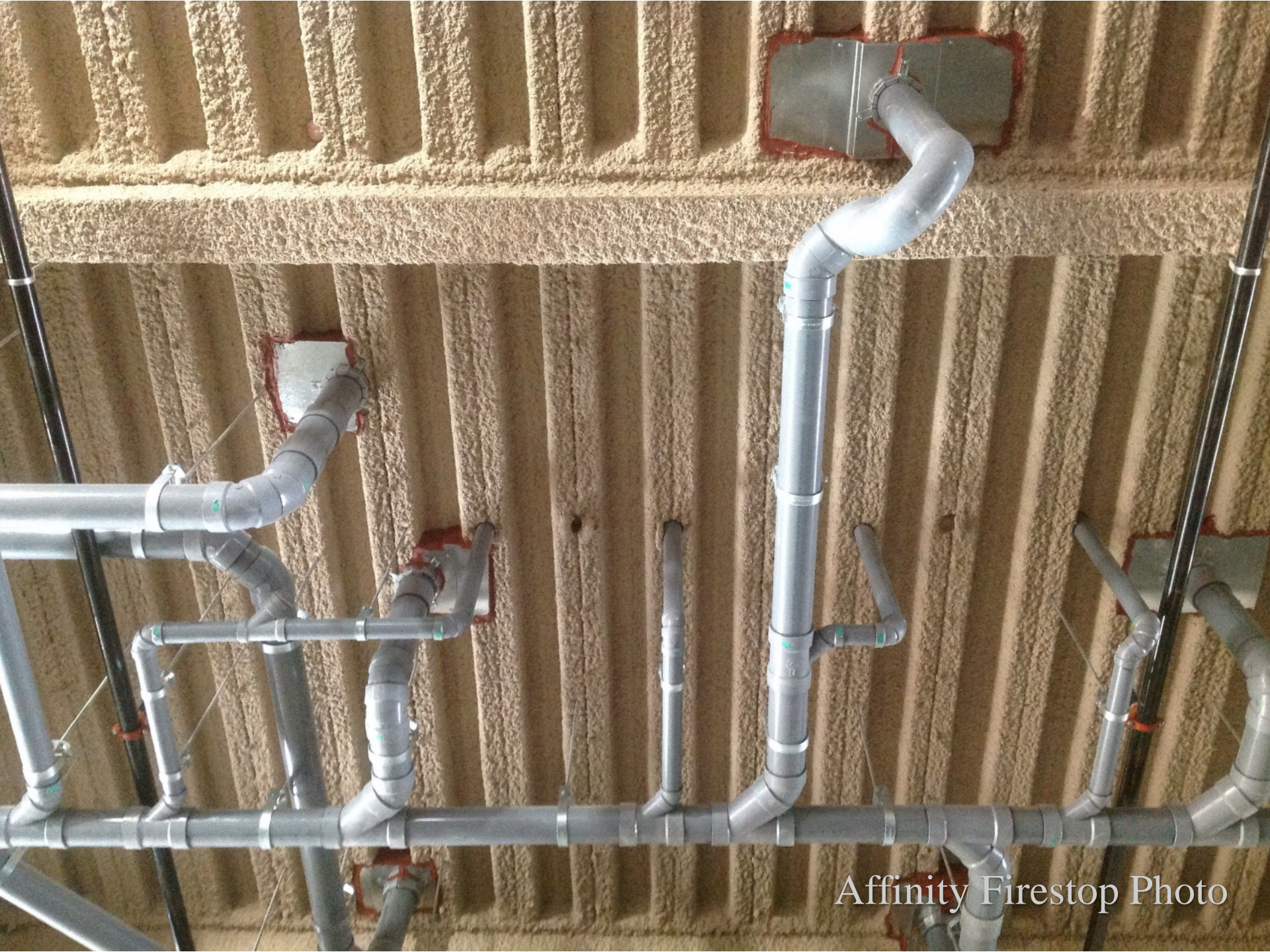
Affinity Firestop Photo





Affinity Firestop Photo





Affinity Firestop Photo



# 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



# Firestop Joint Systems Definition

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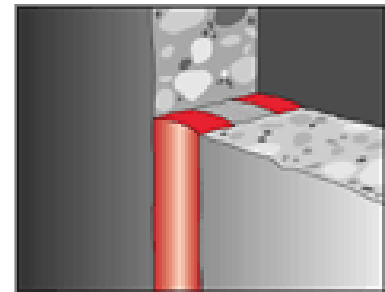
- UL 2079, ASTM E 1966, ULC-S-115
  - “A joint system is a **specific construction** consisting of adjacent **wall and floor assemblies**, *and* the materials designed to prevent the spread of fire through a linear opening between the wall and / or floor assemblies”
  - Definition
    - Joint?
    -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



# Joints and Seams

## I-Beam to Fluted Deck



# 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 ???*



# Firestop Perimeter Fire Containment Systems



Graphic – Intertek

# *NFPA 285 & ASTM E 2307?*



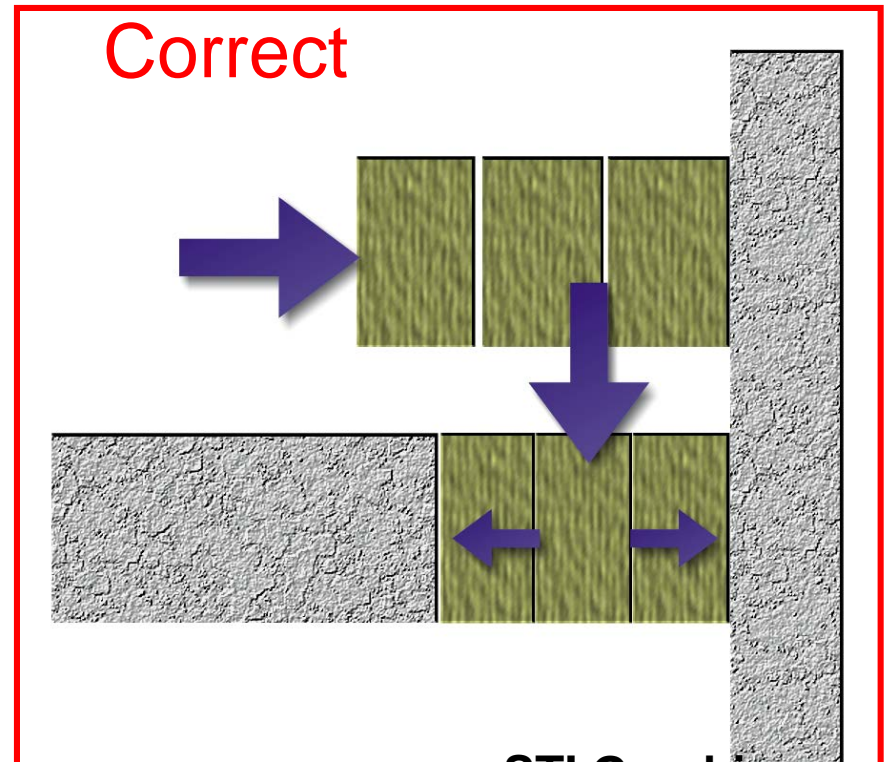
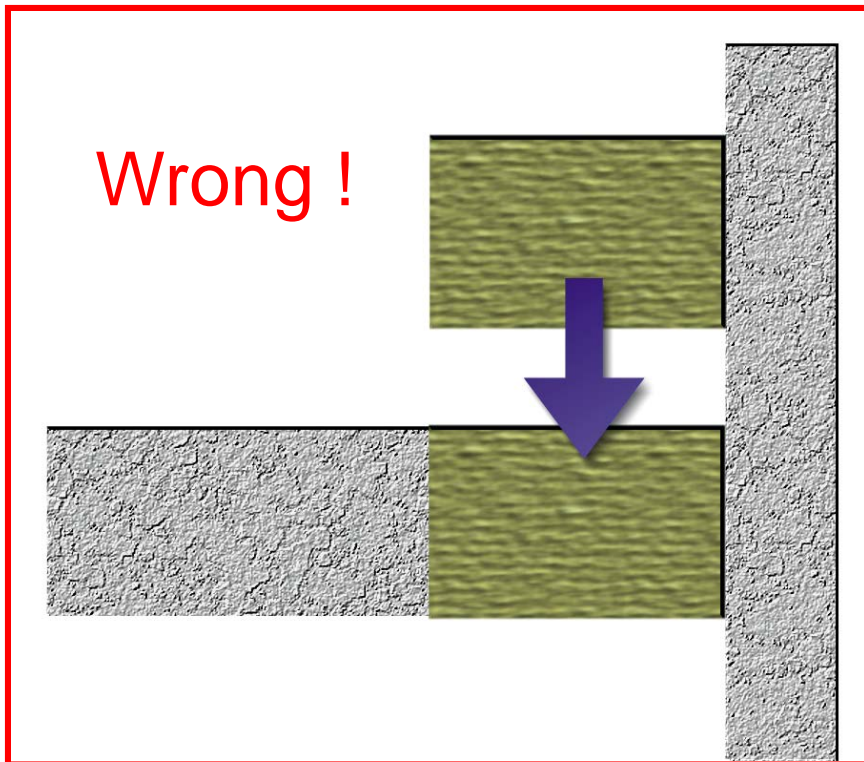
**Intertek Image**



**Thomas Bell-Wright International Consultants**

# Proper Installation of Mineral Wool

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



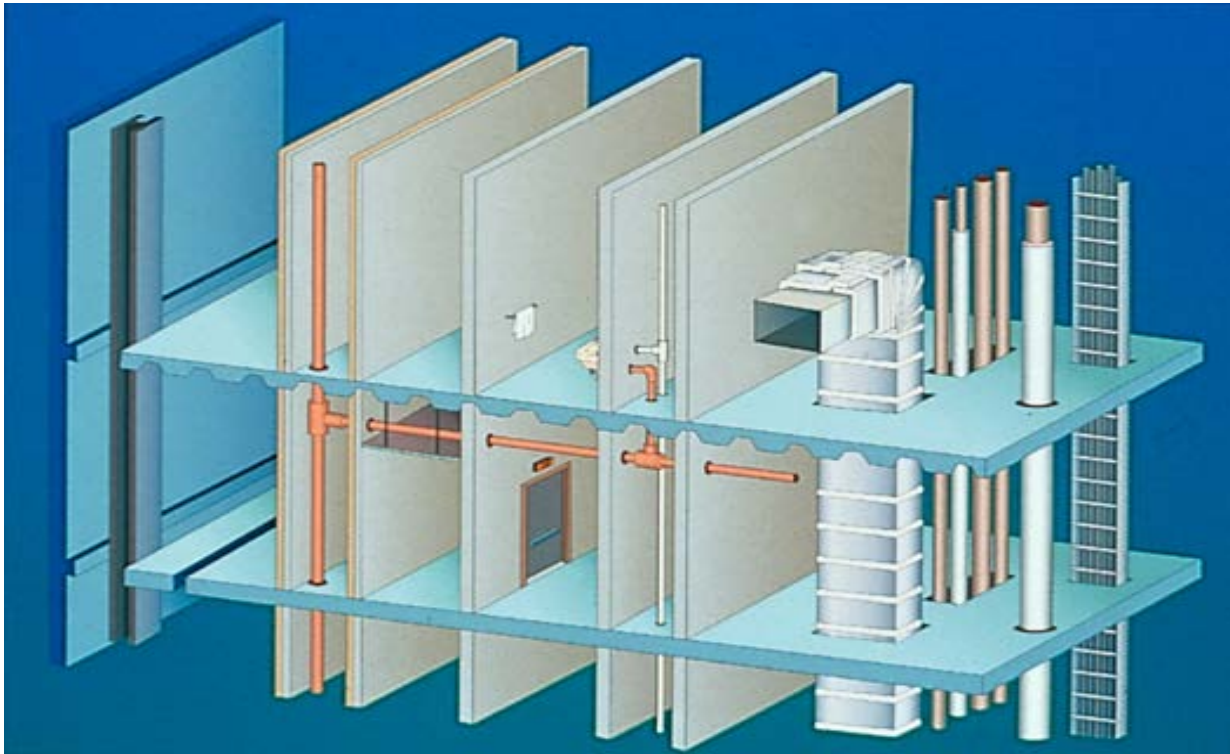
# Firestop Products Become Systems when Installed to SYSTEM





# 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*

# 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



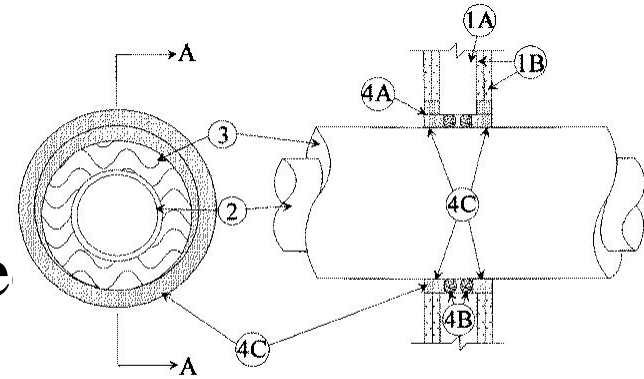
# **1. Office Audit of Company Management System Manual**

- 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)**

# *Management System–FM,UL,IAS*

- **Facility Tour**
- **Review MS Manual**
- **Construction Documents Reqt's and Review**
  - **Systems Selection & Analysis**
- **Procurement**
- **Storage, Handling, Preservation and Delivery**
- **Installation, Application and Field Quality Assurance Procedures**
  - **Systems Installation, Self Inspection/Survey**



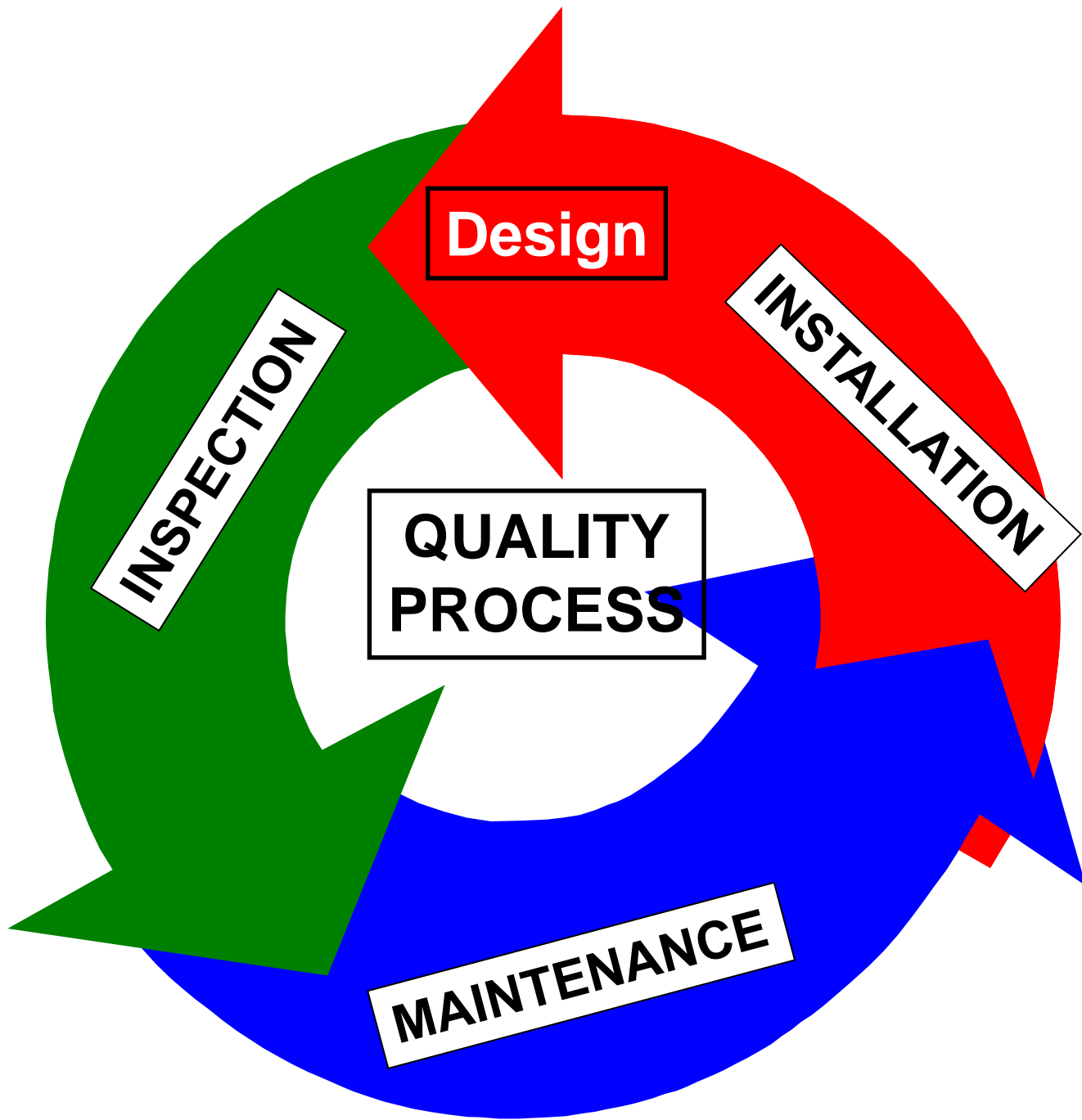
# *Management System*

- **Inspection, Testing and Calibration**
  - **Tape Measures**
- **Control of Nonconforming Product**
- **Training and Qualification of Staff**
  - **DRI's, Workforce**
- **Corrective/Preventive Action**
- **Quality System Monitoring and Improvement**
- **Documentation and Record Keeping**
  - **7 years**

# 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



# 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

# Firestop Inspection Process

- Inspection Agency & Inspector
  - Independent
  - Hired after systems submitted, etc.
  - Hired by building Owner and manager or representative
  - Scope of work directed by AA
  - AHJ approval



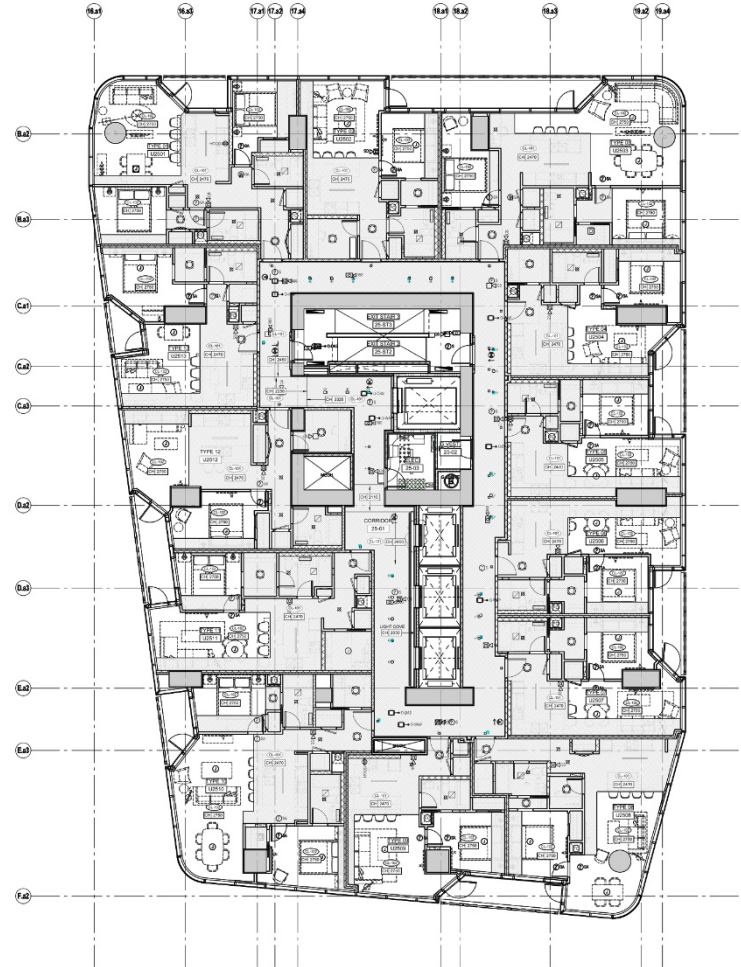
Affinity Firestop  
Photo



# Firestop 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**



# Firestop Inspection Process

## ASTM E 2174 - ASTM E 2393

- Inspection Documents
  - Specifications and Drawings
  - Manufacturer Product Data Sheets and Installation Instructions
  - Listed Systems and EJ's/EFRRAs

| FIRESTOP CONTRACTOR<br>(204) 555-0101  |                                       |  |
|--|---------------------------------------|---|
| <b>WARNING</b><br>This is an approved Firestop System and shall NOT be disturbed except by Authorized Personnel. |                                       |   |
| Wall Plate Penetration No.: <u>M-2101-1</u>  | Fire Rating Required: <u>1.0 F</u>    |   |
| Floor Level: <u>LEVEL 200</u>  | Room No.: <u>201</u>                  |   |
| Installer's Name: <u>JOHN SMITH</u>  | Product: <u>FS-ONE</u>                |   |
| Installation Date: <u>APRIL 1, 2013</u>  | System Design No.: <u>(L-A)-1022a</u> |   |
| Re-penetrated by:  |                                       |   |
| Company  | Installer                             | Date  |
| _____  | _____                                 | _____   |
| _____  | _____                                 | _____   |



# 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

# Firestop Inspection Process

## ASTM E 2174 - ASTM E 2393

- Pre-Construction Meeting
  - Mock Up Review
  - Observation or Destructive Review (Testing)
  - Inspection Type Methodology
    - Frequency of reviews
    - Description of reviews
    - Specification and drawings
- Meeting(s) are required
  - During and Post Inspection



Affinity Firestop  
Photo

# Firestop Inspection Process

## ASTM E 2174 - ASTM E 2393

- Inspection Schedule
  - Notifies Inspector
  - Inspections within 2 days
  - Inspector verifies installation
    - Is in accordance with Documents
    - Meets Manufacturers Installation Instructions



Affinity Firestop  
Photo

# Inspection Methods

## ASTM E 2174 - ASTM E 2393

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

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
    - By Contractor – All are Inspected



# 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’



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# Firestop Inspection Process

## ASTM E 2174 - ASTM E 2393

- Inspectors shall
  - Not supervise or direct FS Contractors
  - Commence reviews at the start of FS installation
  - Review installation based on manufacturers and system requirements



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Photo

# 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 WITH SOFT SEALANTS



# Firestop Evaluation & Repairs

- Evaluations of Manufacturers Installation Instructions
  - Manufacturers instructions evaluating installed systems
  - Acceptable methods to review installed systems
  - Listed SYSTEM requirements for installations
  - *IFC Document on Sealant Thickness Measurement*





# Evaluation & Repairs

- Repairs
  - Manufacturers Repair Instructions
  - Manufacturers Installation Instructions
  - Listings
  - “Patch” Infilling
    - Adhesion
    - Movement
    - T, L W Ratings?
  - Who Patches?

# Firestop Inspection Forms Variance Notices

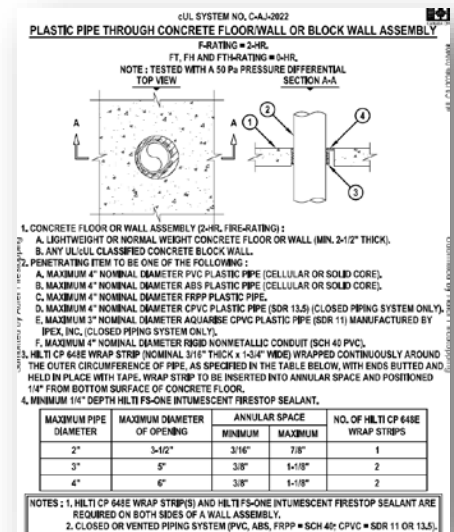
- Minimum one FS system for each type; *(Type By Contractor)*
- Submit reports one day after review to AA; ASTM E 2174 and ASTM E 2393 vs.
- **IBC requires IMMEDIATE NOTICE**
- Numbered – Controlled
- Required – During/post construction methods



# Inspection Final Report

## ASTM E 2174 - ASTM E 2393

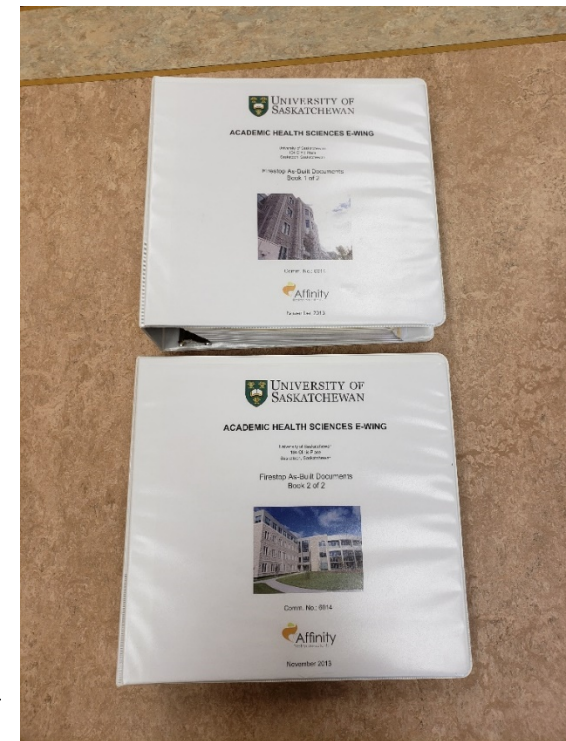
- Name, address, location – project, installer (firestop contractor, prime contractor), inspector, AA, AHJ
- Type and quantity of firestops inspected
- Verification method
- Percentage Deviation
- Copies of all documents sent to Authorizing Agency



# Firestop Inspection Final Report

## ASTM E 2174 - ASTM E 2393

- Project name and location
- Project team contact info
- Firestops reviewed (inspected)
  - Type and quantity
  - Verification method
  - Percentage of total deficiencies
- All documents submitted to AA



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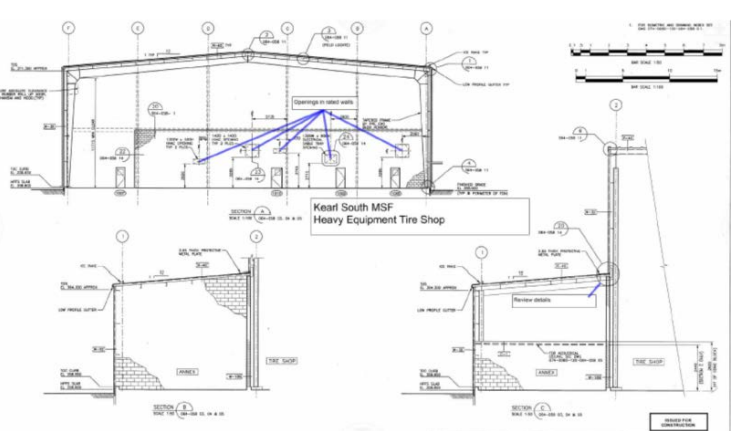
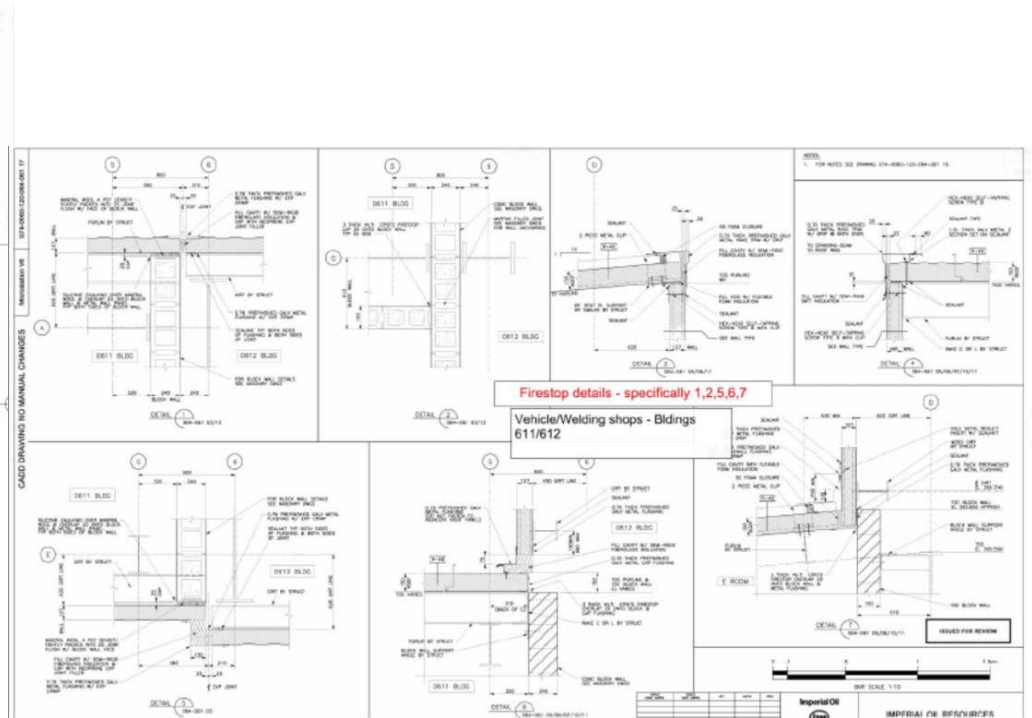
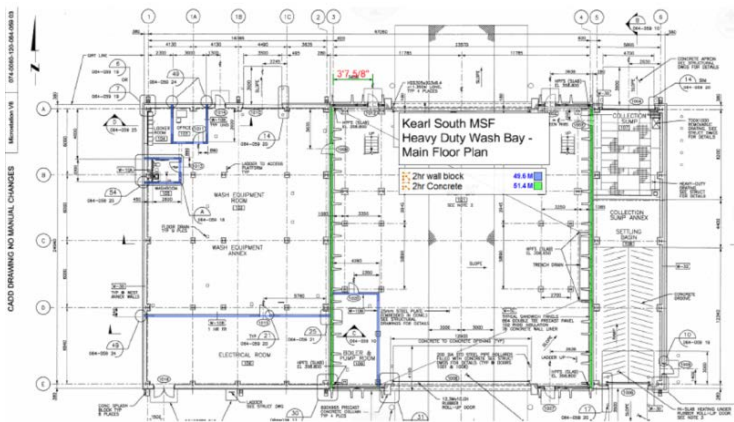
# Firestop Special Inspection

## ASTM E 2174 - ASTM E 2393

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



# Firestopping & Compartmentation for Safety





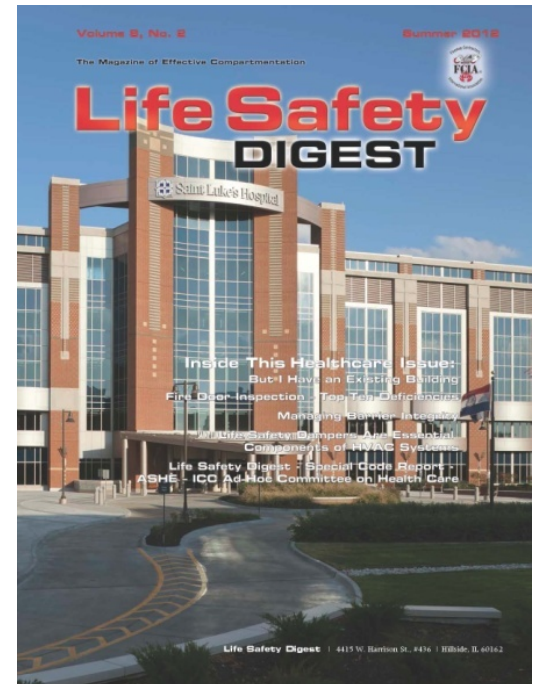
# FCIA DIIM & Firestopping

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



New UL test standards for Life Safety  
Dampers will take effect in July 2002





# Contacts

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# Inspection & Firestop Systems

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