

Barrier Management Symposium

Firestopping DIIM

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Firestop Contractors International Association



MISSOURI SOCIETY FOR HEALTHCARE ENGINEERING

Member of ASHE since 1972

mosheonline.org

FREE Resources From FCIA.....

- **Webinars**
- **PDF MOP**
- **07-84-00 SPECIFICATION**
- **Life Safety Digest**
- **MOSHE Facility Directors, Code Officials, Fire Marshals,**
- **& Specifiers with Design Firms**

Info@FCIA.org & www.FCIA.org



Outline

- FCIA – DIIM – Firestopping
 - Design – Specs, Codes, Testing, Products
 - Installation –
 - FM 4991, UL/ULC Qualified Firestop Contractor Programs
 - Inspection –
 - ASTM E2174 / E2393 Inspection Standards
 - IAS AC 291, Inspector Qualifications
 - Maintain Protection – Fire Codes; Barrier Management
 - Firestopping for Safety –
 - Repairs??

D-DESIGN

Specs,
Code,
Standards

BARRIER MANAGEMENT

Fire Codes
NFPA 101, 1, IFC
Barrier Management System

**QUALITY
PROCESS**

I-INSTALLATION

FM4991/UL QFCP
MS Programs (Co)

FCIA FCAEP AND
Mfr. Education
(Worker)

I – INSPECTION

IBC Ch. 17
NFPA 80
NFPA 1

“DIIM” – Design, Install, Inspect, Maintain

- Fire Resistance & Smoke Resistant Firestopping
 - Properly *Designed* Building Codes
 - FCIA - 07-84-00 – Specification – **CCS**
 - **Tested and Listed Systems** –
 - ASTM E814, UL 1479, ASTM E1966, UL 2079, E2307, E2837, E3037
 - **Movement, (M) Smoke (L), Water (W)**
 - Professional *Installation* –
 - FCIA Member, ULC Qualified Contractors, FM 4991 Approved
 - Properly *Inspected* –
 - ASTM E2174 / E2393, by IAS AC 291 Agencies, ULC, IFC, FM Exams
 - **Protection Maintained** – Annually – by FCIA Members

Barrier Continuity SYSTEMS

- **Products Become Systems – Test Standards**
 - **Fire & Smoke Barriers – Fire Separations**
 - ASTM E119, UL 263
 - **Firestopping –**
 - UL 1479, ASTM E814, UL 2079, E1966, E2307, E2837, E3037...test methods...”
 - **Swinging/Rolling Fire Doors – UL 10B & UL 10C....NFPA 252**
 - **Fire Rated Glazing – UL 9, NFPA 257, UL 263, ASTM E119**
 - **Fire/Smoke Dampers – UL 555, UL 555S, UL 555C**
- **SYSTEM Testing = Suitability Statement**

Great Installation / Inspection starts @ SPEC...

New & Existing Buildings - Maintain Protection

- **NEW Buildings – 07-84-00 Specs**
 - **www.FCIA.org & FCIA MOP**
- **Part I – Products...but**
 - **Systems**
 - **Product Properties**
 - **Manufacturers**
- **“Single Manufacturer to the greatest extent possible” – EJ/EFRRRA’s**



Specs – Key Parts Relating to Installation

- **Part II– Contractor/Installer 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**



Specs – Key Parts Relating to Inspection

- **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**
 - **ICC Certificate of Learning Achievement**
 - **FCIA Certificate of Achievement Education Program**



Specs – Key Parts Relating to Execution

- **NEW Buildings – 07-84-00 Specs**
- **Part III – Execution**
 - **Special Inspection**
 - **ASTM E2174 – Penetrations**
 - **ASTM E2393 – Joints**

Specs – Don't Forget Division 1 Documentation **for Building Life Cycle**

- **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**

Fire-Resistance-Rated Construction

Establishing
Fire-Resistance Ratings



UL Image

Standards

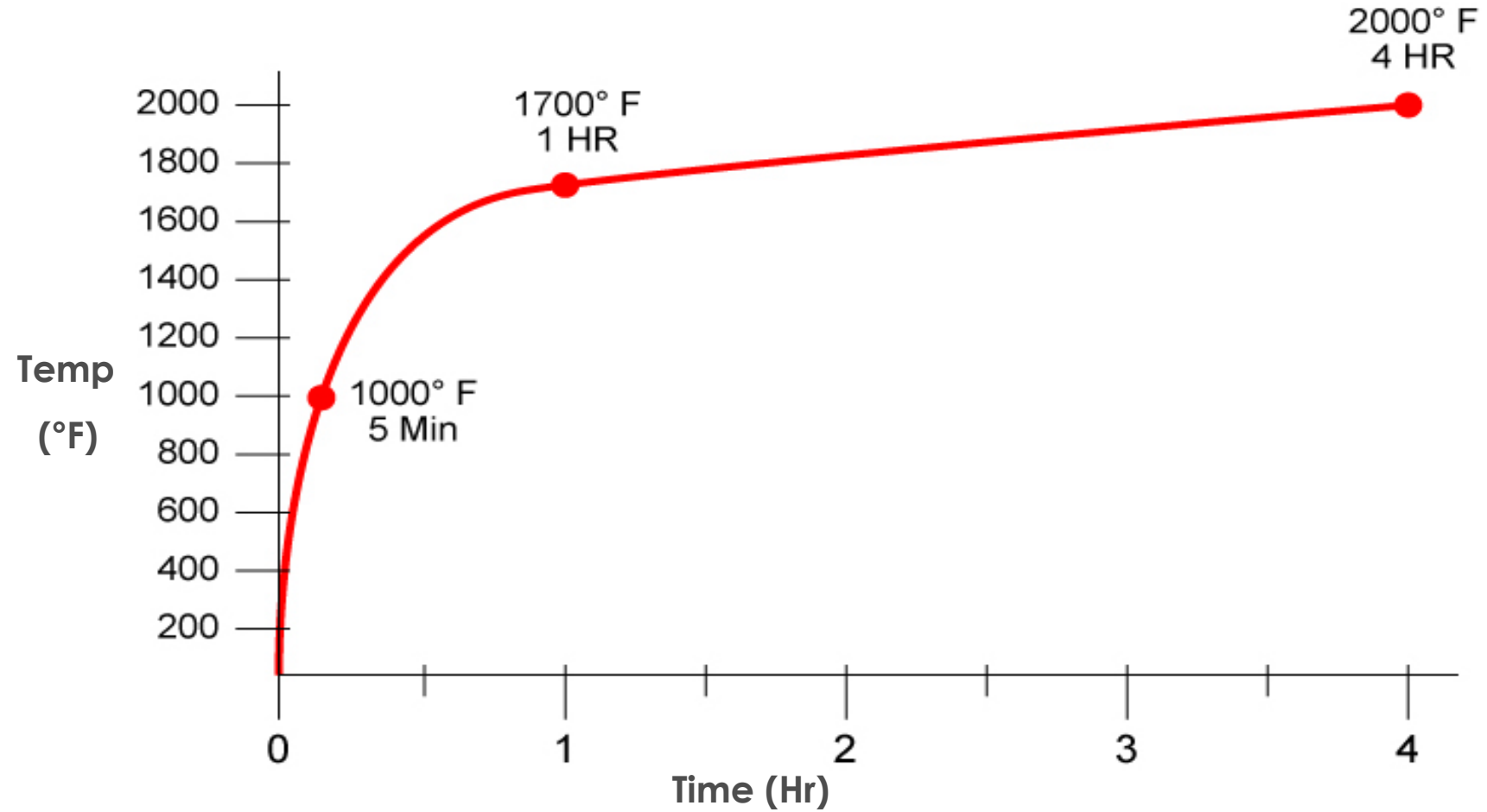
- US
 - ASTM E119
 - NFPA 251 (Withdrawn)
 - UL 263
- Canada
 - ULC-S101



Building Components

- Columns
- Beams
- Floor/Ceilings or Roof/Ceilings
- Walls

Time – Temperature Curve





UL Image

Conditions of Acceptance – Columns

- 1000°F / 1200°F

OR

Tested load bearing



UL Image

Beams

- Sample size – Minimum 12 ft
- Load applied – Per design



UL Image



UL Image



UL Image



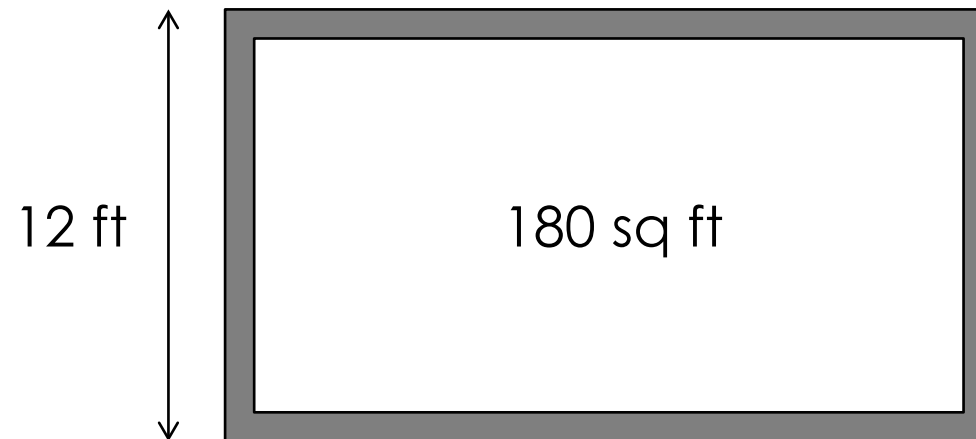
UL Image

Conditions of Acceptance – Beams

- Support load
- 1100°F / 1300°F

Floor/Ceiling or Roof/Ceilings

- Sample size – 180 sq ft / 12 ft
- Load applied – Per design





UL Image

Conditions of Acceptance Floor/Ceilings or Roof/Ceilings

- Support load
- Flame passage
- 250°F / 325°F
- Support temperatures



Systems & Materials ...

Structural & Effective Compartmentation





DO NOT REMOVE
IF THIS SEAL REQUIRES REPAIRS OR IS DAMAGED
CALL 1-800-368-2772

Affinity Firestop Photo

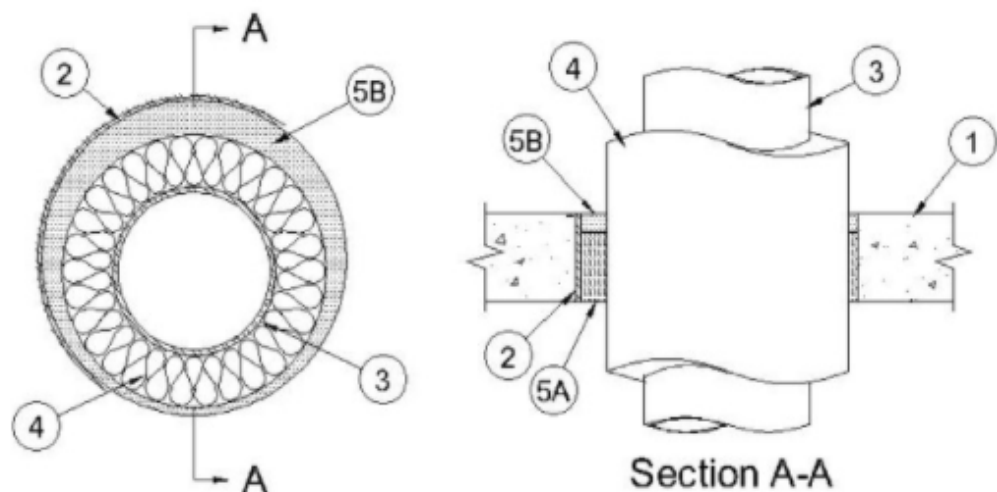


**Possible UL
System Nos.:
C-AJ-5138,
C-AJ-5209,
W-J-5091,
Etc.**

Affinity Firestop Photo

F Ratings — 1 and 2 Hr (See Item 3)

T Ratings — 0, 3/4 and 1 Hr (See Item 4)



1. **Floor or Wall Assembly** — Min 2-1/2 in. (64 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600 - 2400 kg/m³) concrete floors or min 3 in. (76 mm) thick reinforced lightweight or normal weight concrete walls. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening 9 in. (229 mm).

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

2. **Steel Sleeve** — (Optional) - Nom 9 in. (229 mm) diam (or smaller) Schedule 10 (or heavier) steel sleeve cast or grouted into floor or wall assembly. Steel sleeve may be installed flush or may project max 2 in. (51mm) beyond the floor or wall surfaces. As an alternate, nom 9 in. (229 mm) diam (or smaller) sleeve fabricated from nom 0.019 in. (0.48 mm) thick galv steel cast or grouted into floor or wall assembly flush with floor or wall surfaces.

3. **Through Penetrants** — One metallic pipe to be installed concentrically or eccentrically within opening. Penetrant to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes may be used:

A. **Steel Pipe** — Nom 4 in. (102 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.

B. **Iron Pipe** — Nom 4 in. (102 mm) diam (or smaller) cast or ductile iron pipe.

C. **Copper Tubing** — Nom 2 in. (51 mm) diam (or smaller) Type L (or heavier) copper tubing.

D. **Copper Pipe** — Nom 2 in. (51 mm) diam (or smaller) Regular (or heavier) copper pipe.

F Rating is 2 Hr for Penetrants A and B. F Rating is 1 Hr for Penetrants C and D.

4. **Pipe Covering*** — Nom 1-1/2 in. (38 mm) thick (or less) hollow cylindrical heavy density glass fiber units jacketed on the outside with an all service jacket. Longitudinal joints sealed with metal fasteners or factory-applied self-sealing lap tape. Transverse joints secured with metal fasteners or with butt tape supplied with product. Annular space between the pipe covering and periphery of opening or sleeve shall be min 1/2 in. to max 1 in. (13 mm to 25 mm).

See **Pipe and Equipment Covering - Materials** - (BRGU) category in the Building Materials Directory for names of manufacturers. Any pipe covering material meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a smoke Developed Index of 50 or less may be used.

T Rating is 3/4 Hr for nom 1-1/2 in. (38 mm) thick pipe covering for penetrants A and B. T Rating is 1 Hr for nom 1-1/2 in. (38 mm) thick pipe covering for Penetrants C and D. T Rating is 0 Hr for all Penetrants when pipe coverings less than nom 1-1/2 in. (38 mm) thick.

IBC - Install in Accordance with Listing & Manufacturers Installation Instructions



Firestopping & Compartmentation

Do we have a Problem, need Inspection??

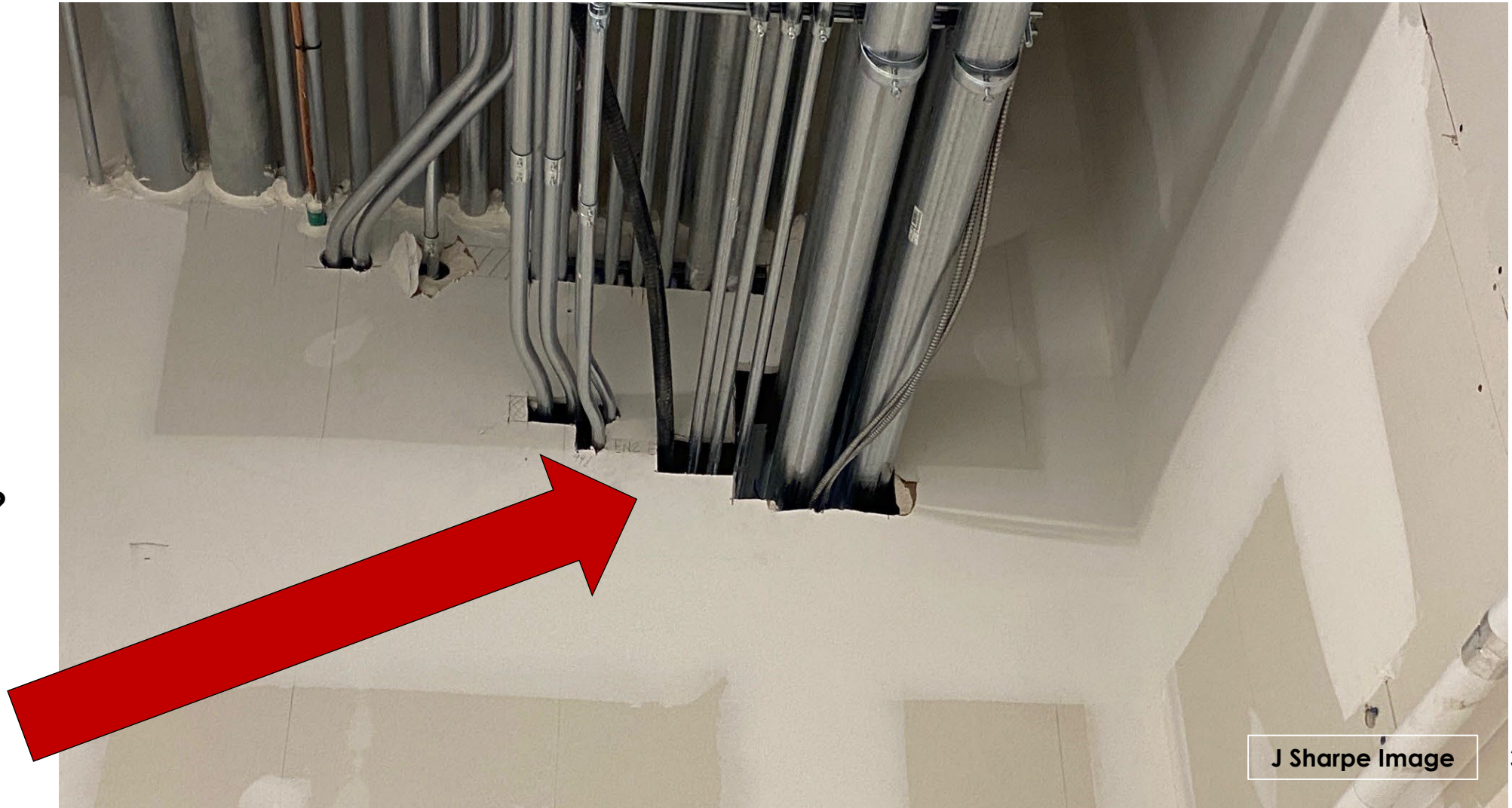
FOAM STILL???



Firestopping & Compartmentation

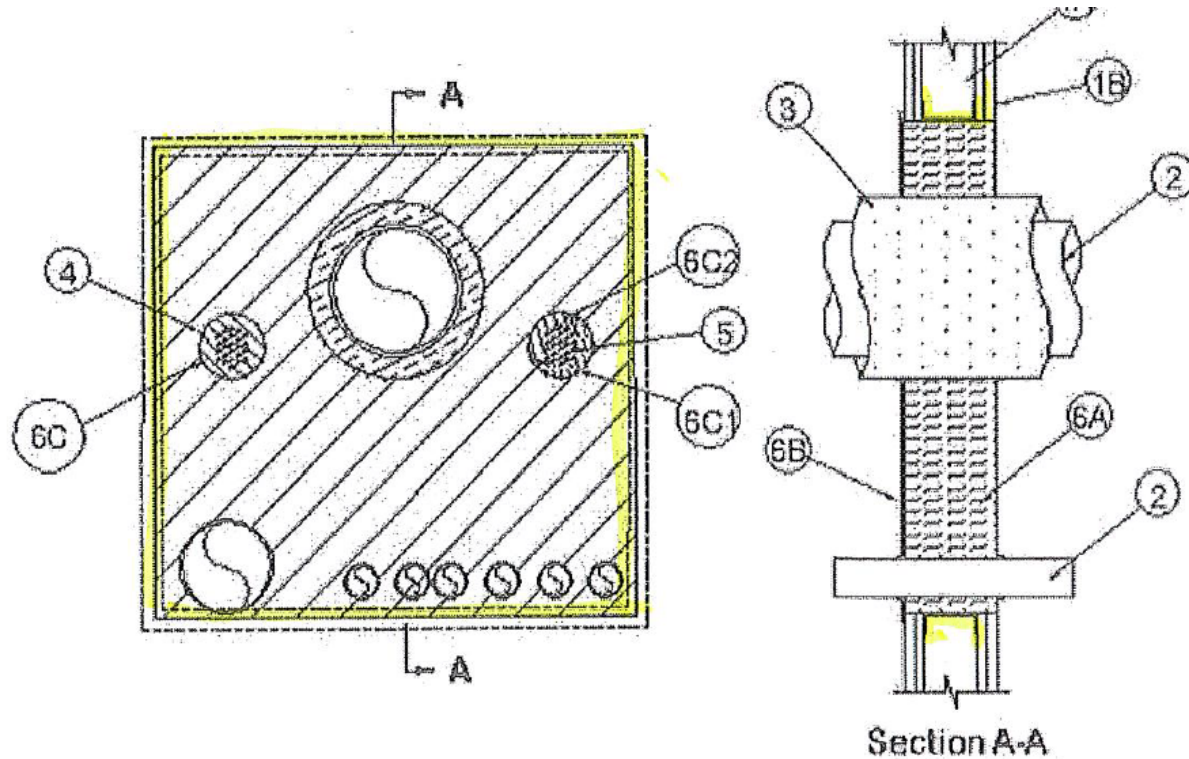
Do we have a Problem??

FRAMING?



Firestopping & Compartmentation

Do we have a Problem??



1. **Wall Assembly** — The 1 or 2 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs** — Wall framing may consist of either wood studs or channel shaped steel studs. Wood studs to consist of nom 51 by 102 mm (2 by 4 in.) lumber spaced max 406 mm (16 in.) OC. Steel studs to be min 89 mm (3-1/2 in.) wide and spaced max 610 mm (24 in.) OC. **Additional framing members shall be located to completely frame the opening.**

Firestopping & Compartmentation

Do we have a Problem??

∴ Additional framing members shall be located to completely frame the opening.

Firestopping & Compartmentation

Do we have a Problem??

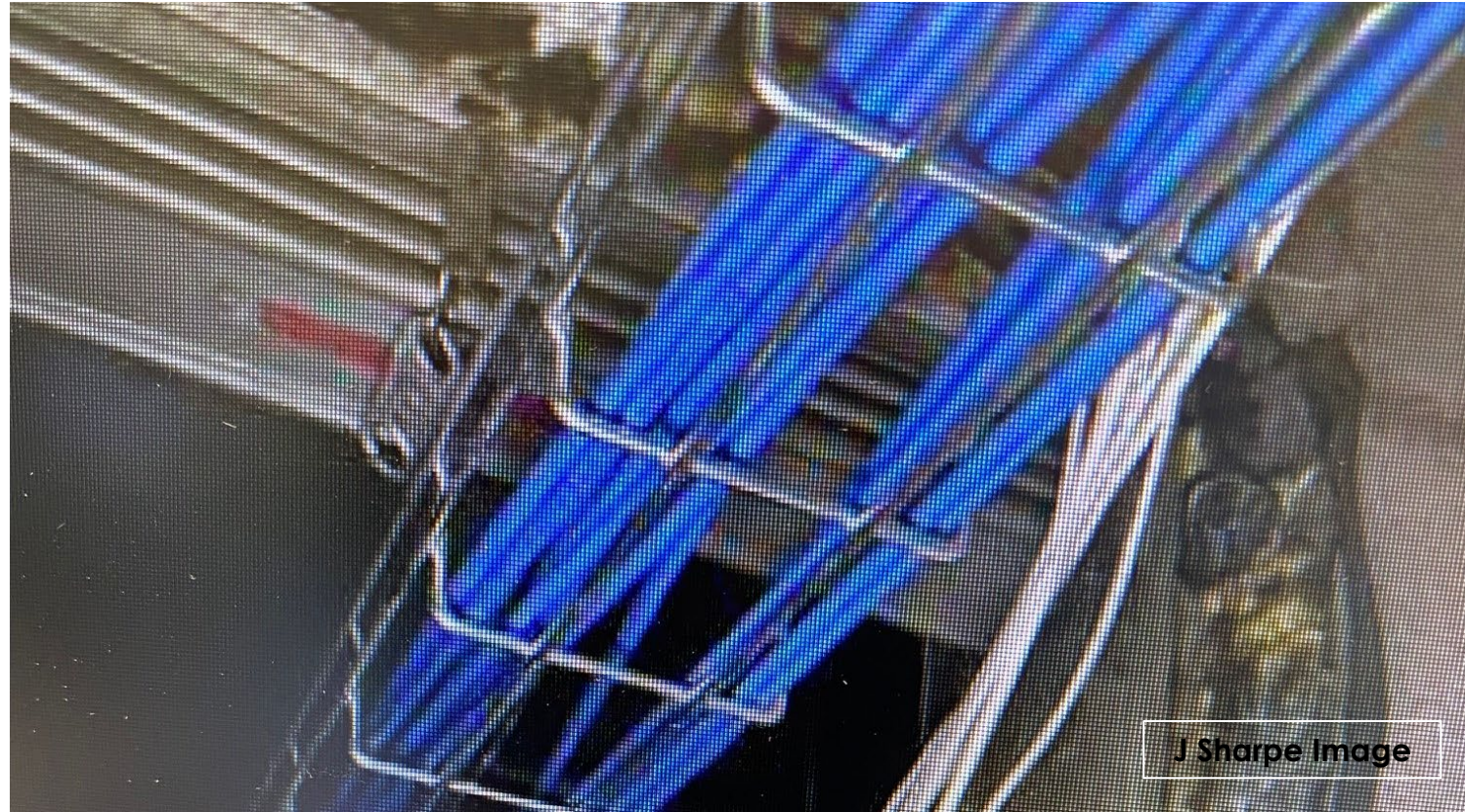


J Sharpe Image

Firestopping & Compartmentation

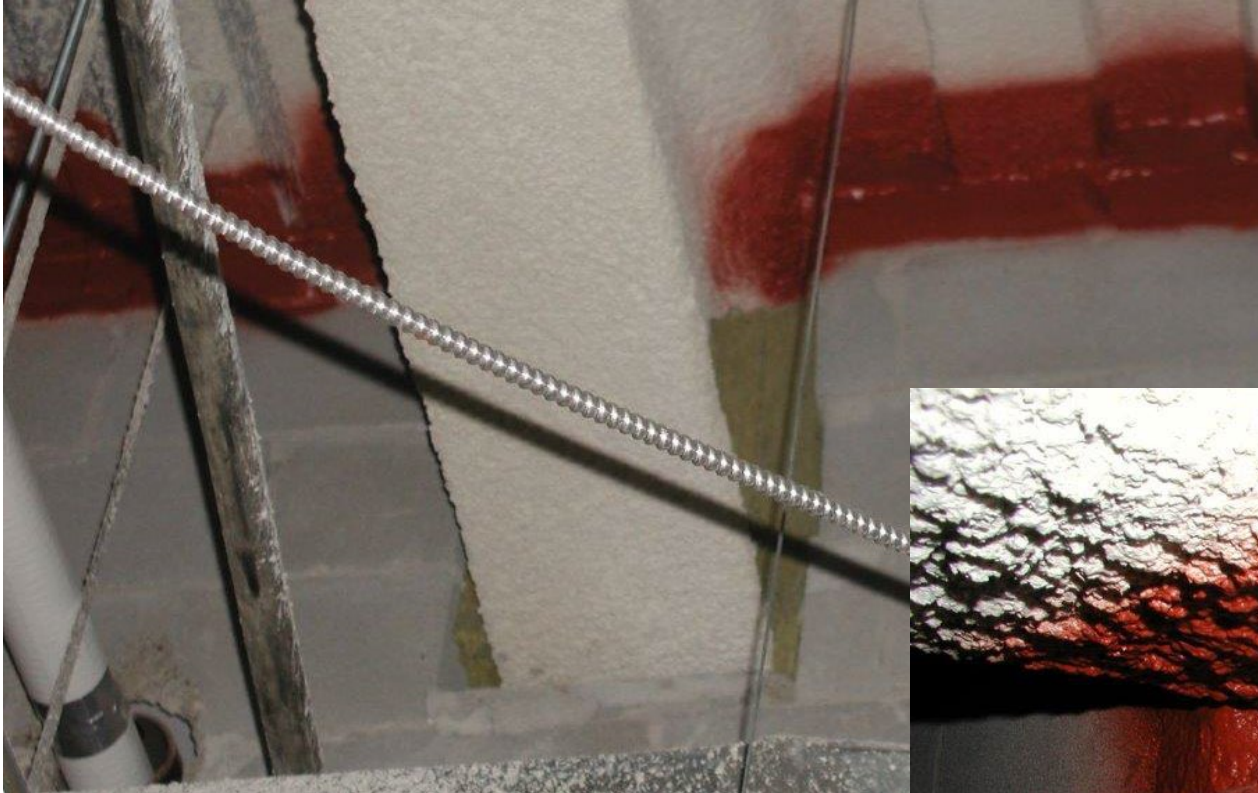
Do we have a Problem??

Cable Tray through
a FIRE DAMPER?

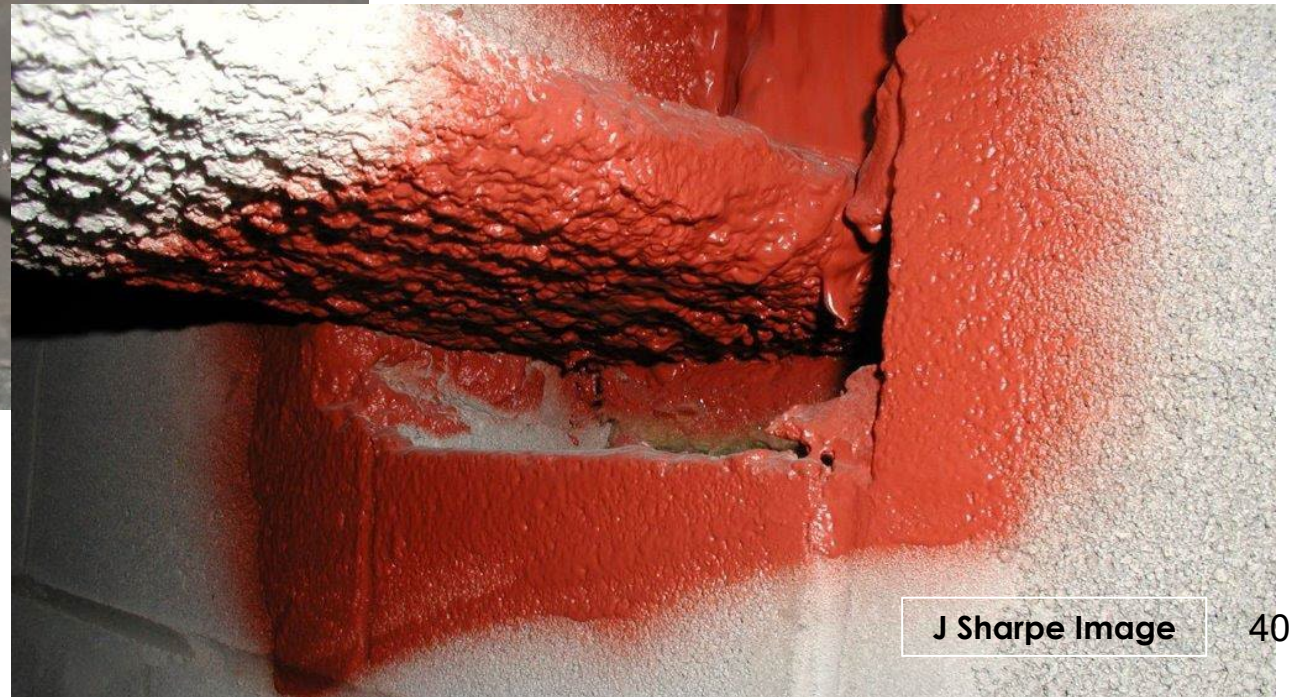


Firestopping & Compartmentation

Do we have a Problem??



Beam Pocket SYSTEM NOT COMPLETED?



J Sharpe Image

Firestopping & Compartmentation

Do we have a Problem??



J Sharpe Image

Firestopping & Compartmentation

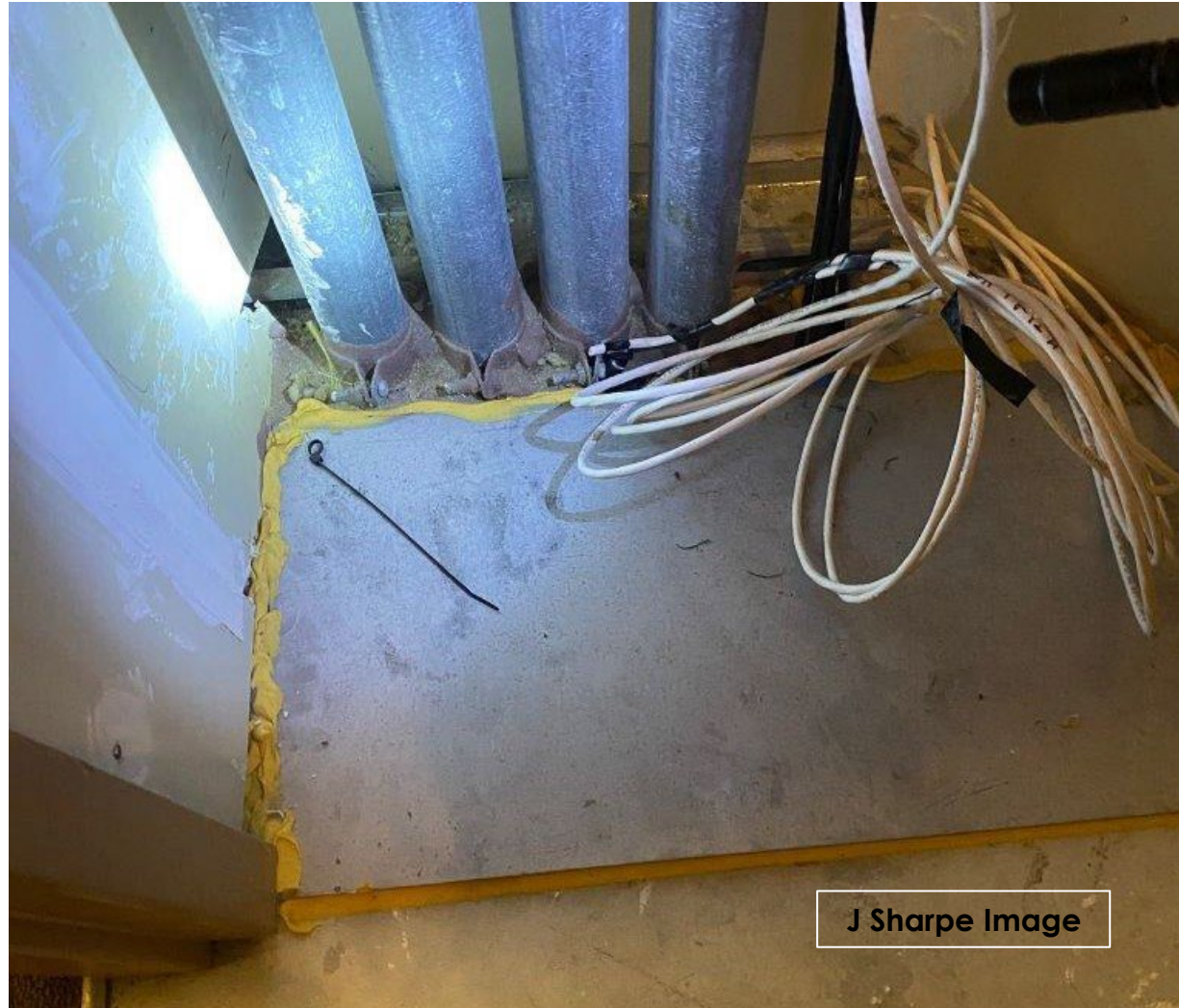
Do we have a Problem??

Scab Patch?

Sealant not
TOOLED

Sealant under
Anchors?

SYSTEM??



J Sharpe Image

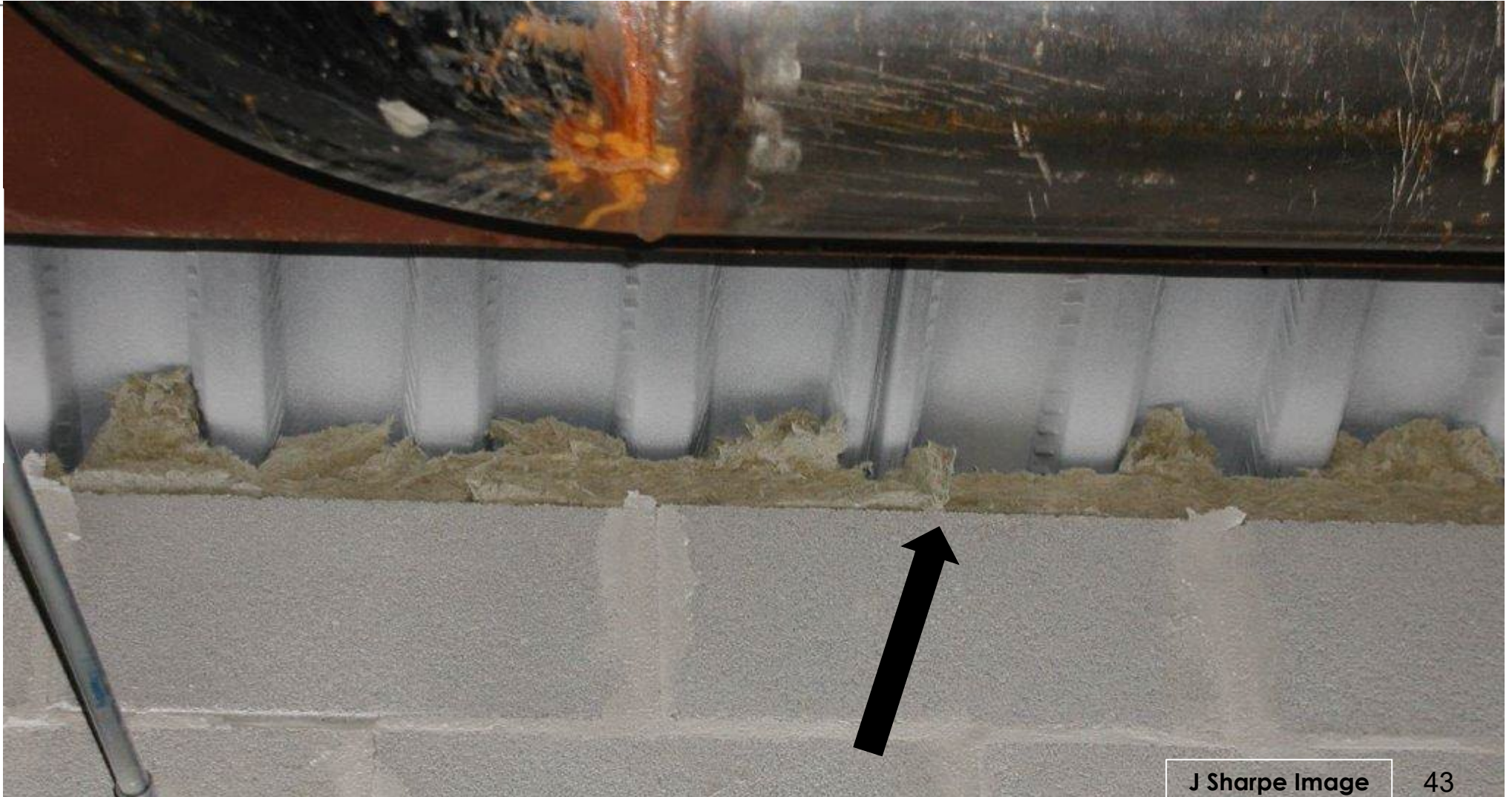
Firestopping & Compartmentation

Do we have a Problem??

Mineral Wool
with NOTHING?

Continuity?

SYSTEM?



Firestopping & Compartmentation

Do we have a Problem??

Mineral Wool

- Flat
- Compressed
- Spray Even

**SYSTEM STATES
COMPRESSION**



I-Beam to Fluted Deck OVER WALL Beam is a WALL TOO!



Firestop Solutions Photo

Firestopping & Compartmentation

Do we have a Problem??

Firestop Spray?

Show Me the SYSTEM!
Show me the LISTING!



Firestopping & Compartmentation

Do we have a Problem??



Firestopping & Compartmentation

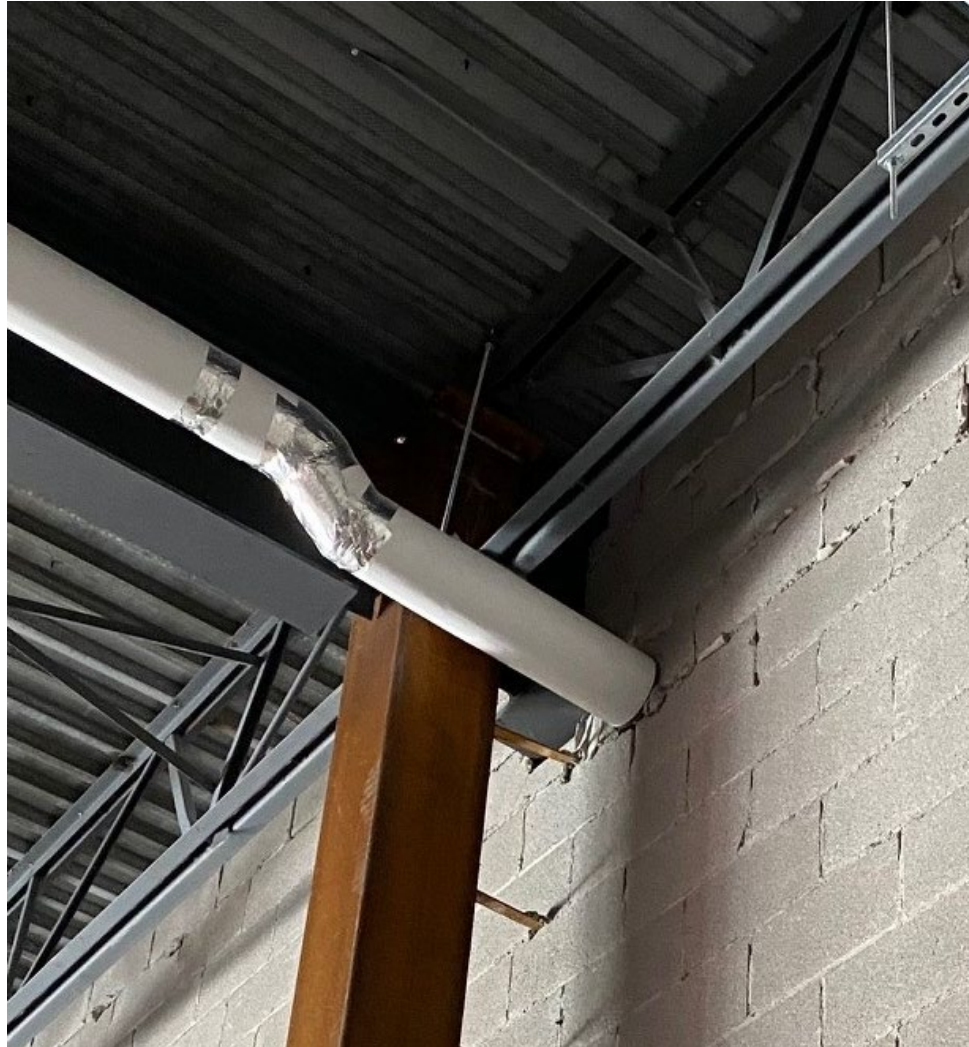
Do we have a Problem??

**Insulation
HIDING
Penetrating
Item**

**BIG Plastic
Pipes
NEED
COLLARS**

**Insulated
Metal
NEED
SEALANT
ONLY - MOST
CASES**

**BIG \$\$\$\$
Difference**



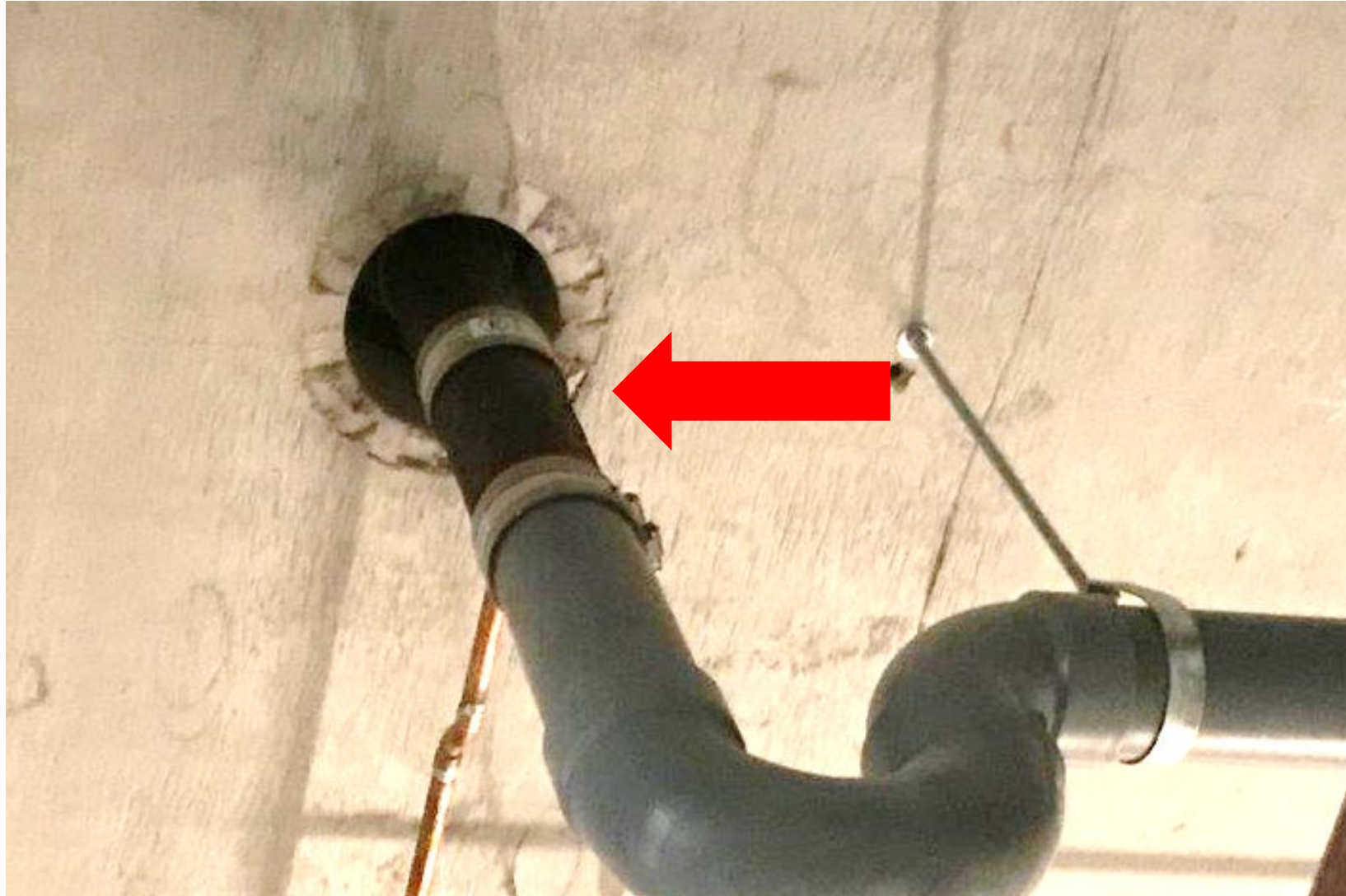
Firestopping & Compartmentation

Do we have a Problem??

Transitions

Metal Pipe
Plastic Pipe

UNSAFE



Firestopping & Compartmentation

Do we have a Problem??

Transitions

Metal Pipe
Plastic Pipe

UNSAFE



Firestopping & Compartmentation

Do we have a Problem??



Sheet Metal? Composite Sheet?

Firestopping & Compartmentation

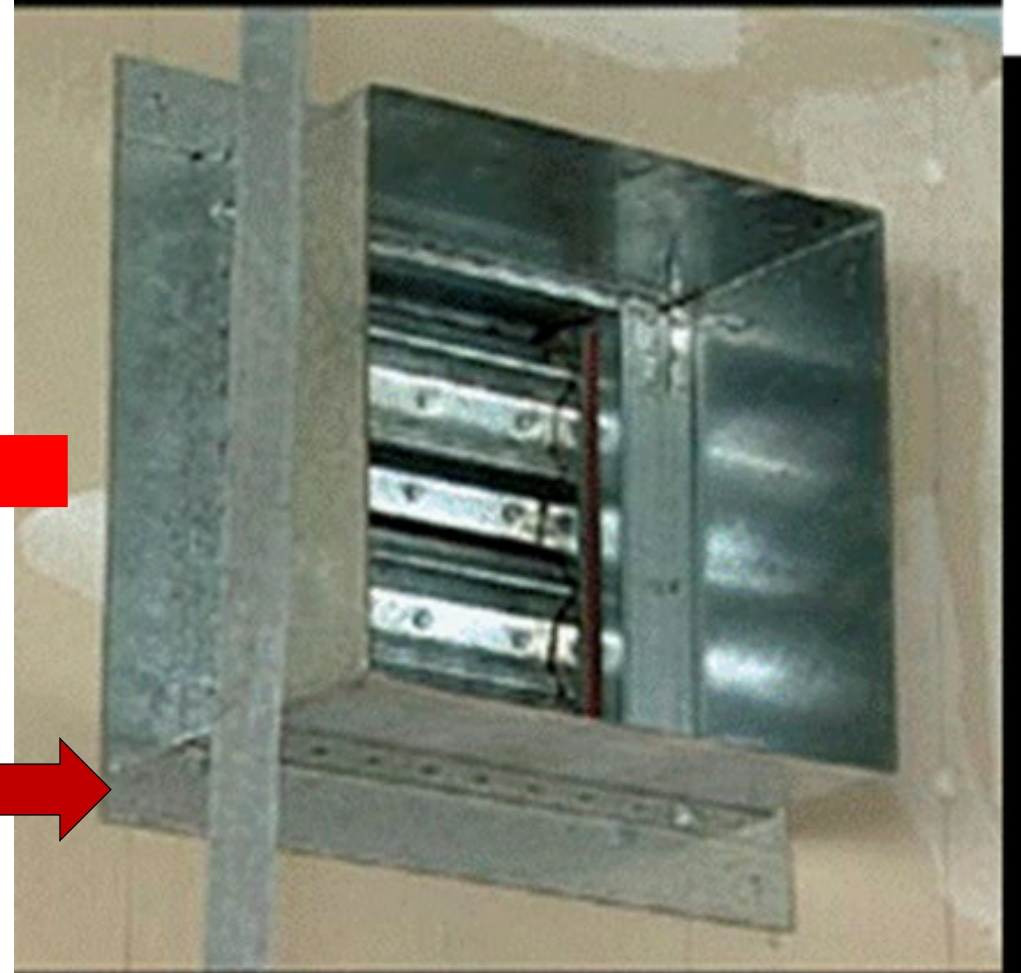
Do we have a Problem??

Nothing...



Firestopping & Compartmentation

Do we have a Problem??



Fire Damper Annular Space?

Firestopping & Compartmentation

Do we have a Problem??

Annular
Space
Control

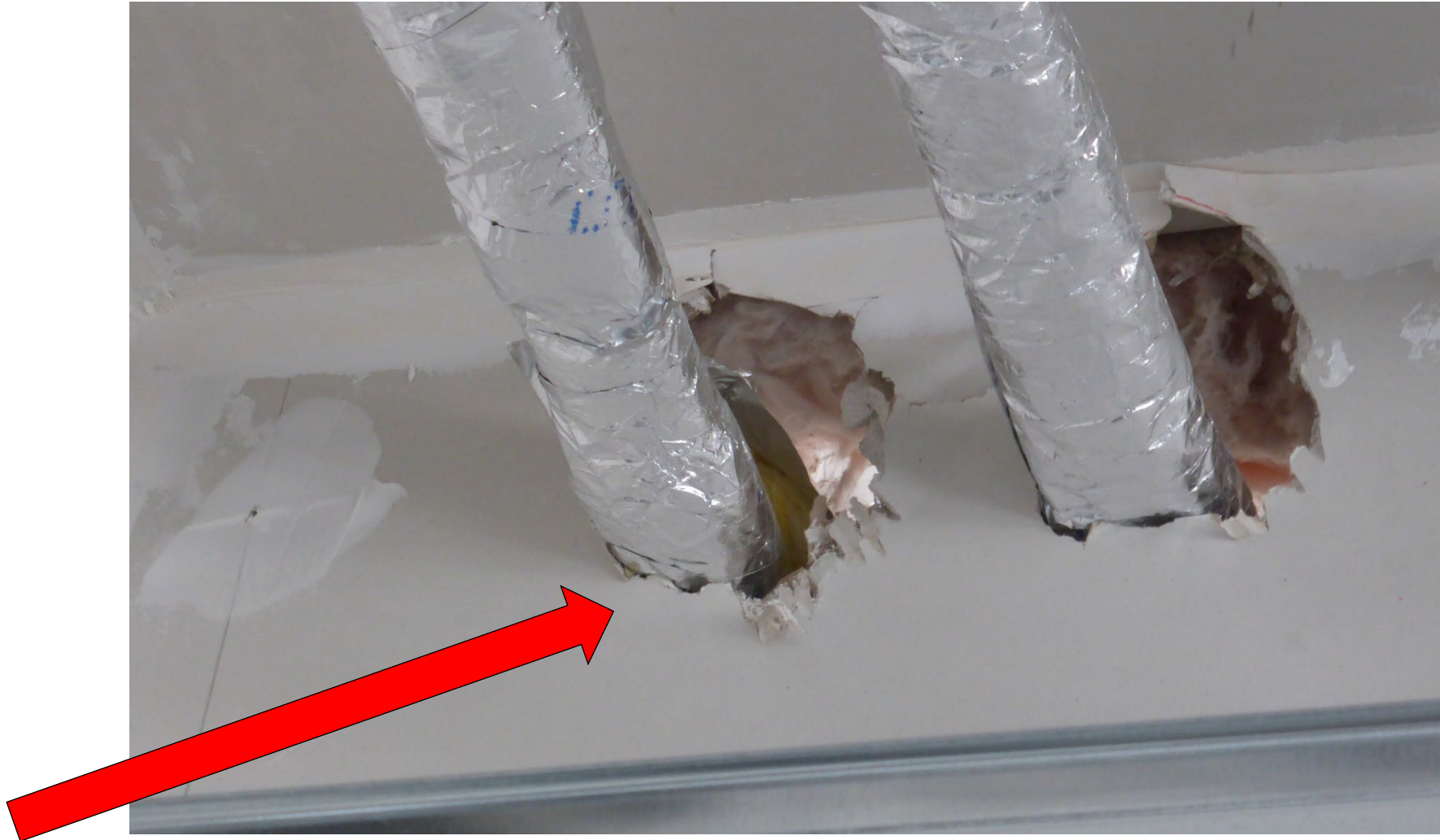
System
LIMITS
ANNULAR
SPACE



Firestopping & Compartmentation

Do we have a Problem??

Annular
Space
Control?



Firestopping & Compartmentation

Do we have a Problem??

What's this?



Firestopping & Compartmentation

Do we have a Problem??

FOAM AGAIN?

Multiple Pens

**SYSTEM?
Manufacturers
Instructions?**



Firestopping & Compartmentation

Do we have a Problem??



Firestopping & Compartmentation

Do we have a Problem??

Lots of
Gypsum
Wallboard
Compound
& NO
FIRESTOP
SYSTEM



Firestopping & Compartmentation

Do we have a Problem??

Surface
Patches?

Red STUFF?



New Developments....

**CROSS
LAMINATED
TIMBER (CLT)**

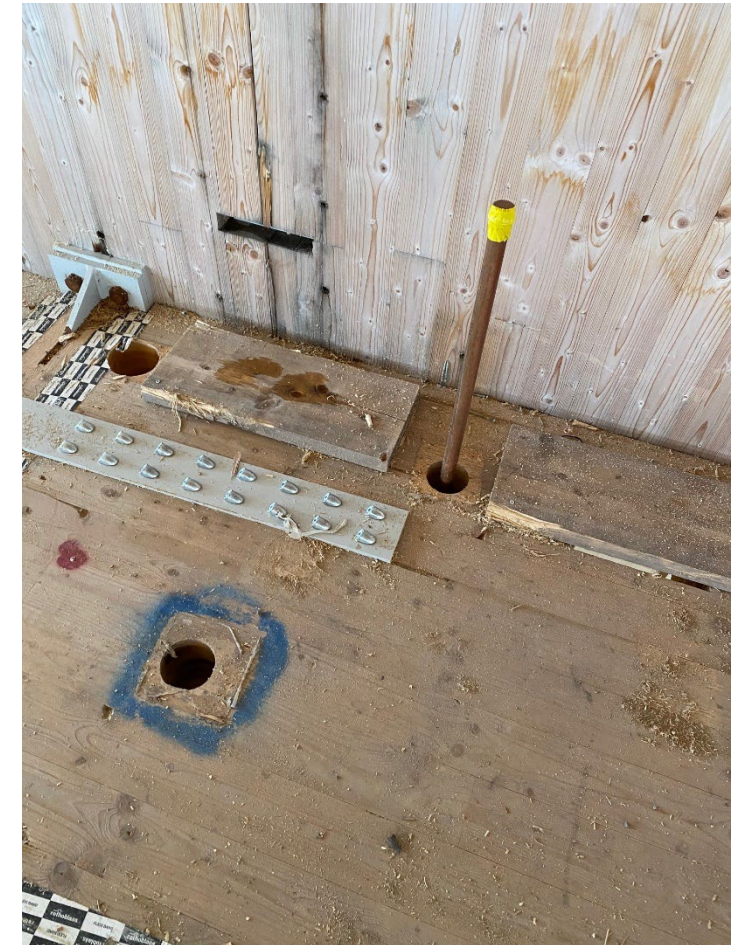
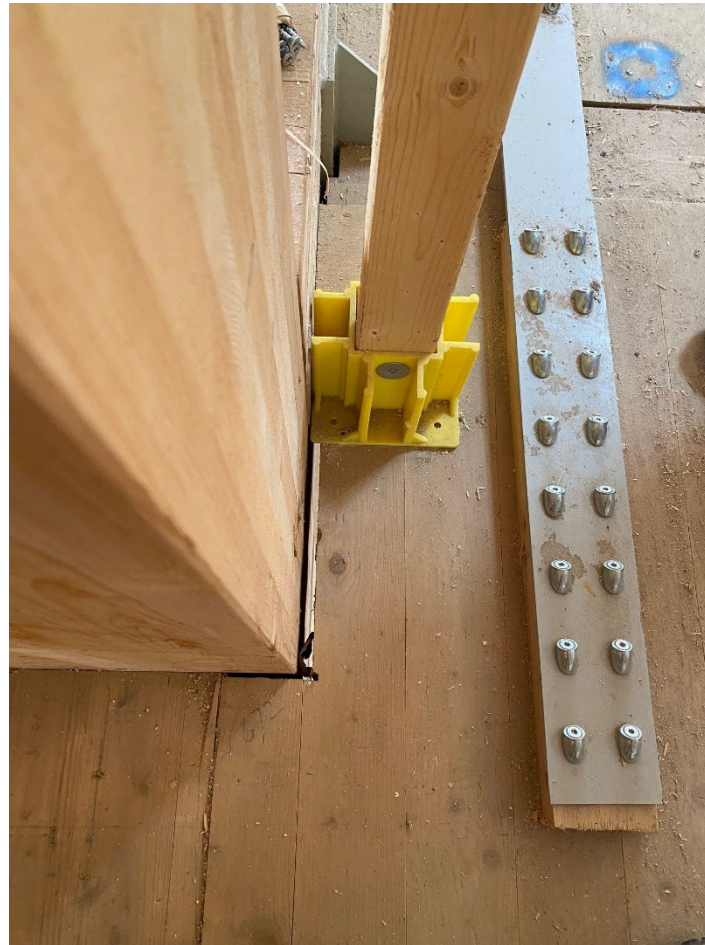
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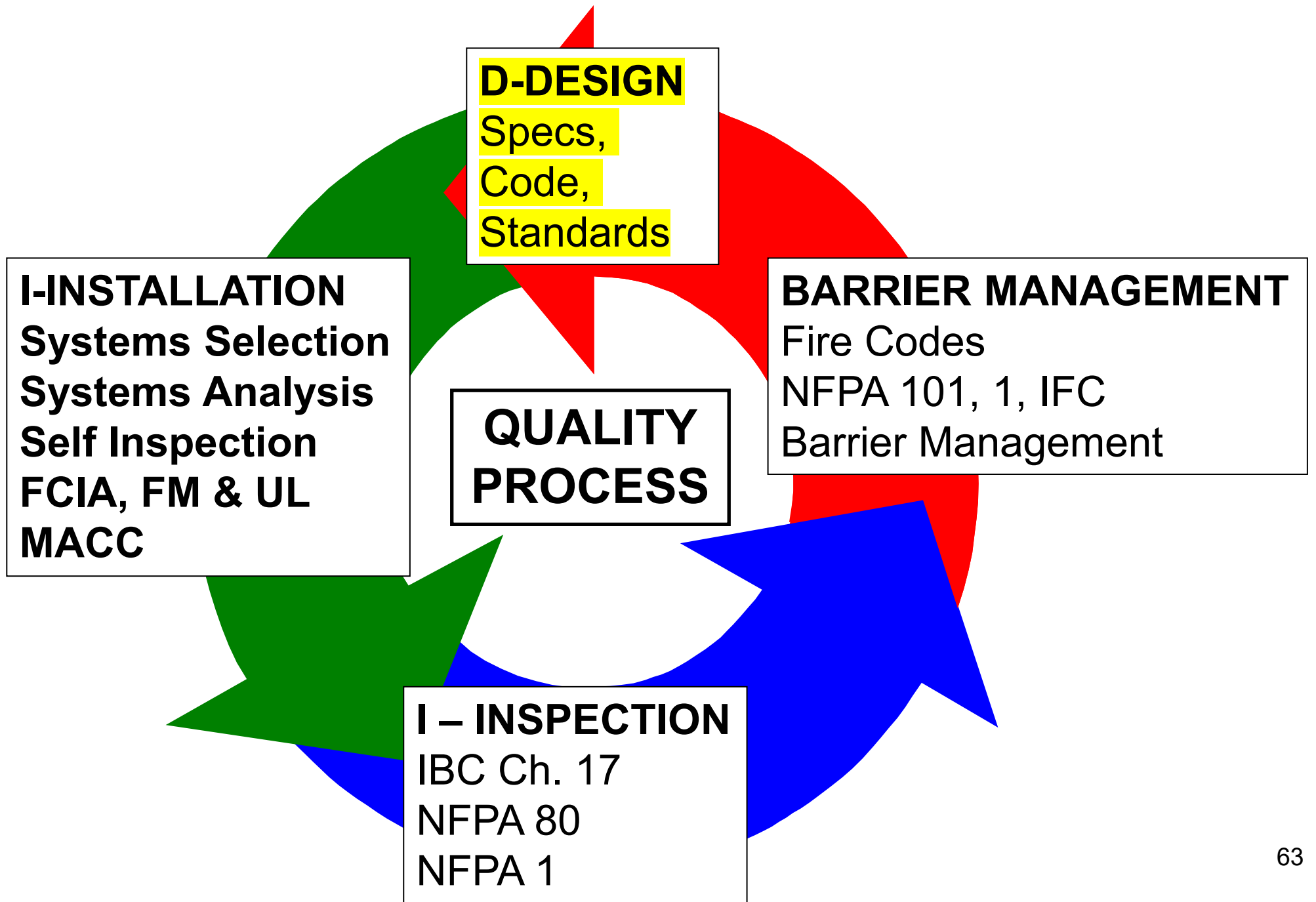
Firestopping



New Developments....

Any Tested and Listed Systems For CLT Structural or Penetrations/Joints?



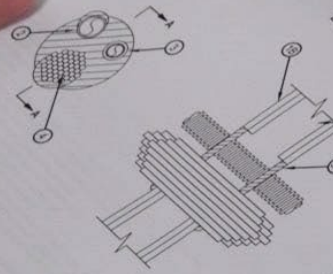




FAMILY OF PRODUCTS	
GROUP	
TYPE	
MODEL	

SERIES	
GROUP	
TYPE	
MODEL	

MODEL	
GROUP	
TYPE	
MODEL	



Attenzione: La T1 è il prodotto per la protezione termica e acustica delle tubazioni. La sua installazione deve essere eseguita in modo corretto, rispettando le norme tecniche e le istruzioni di montaggio. La T1 è un prodotto a base di polimeri e deve essere installato in un ambiente a temperatura ambiente. La T1 è un prodotto a base di polimeri e deve essere installato in un ambiente a temperatura ambiente. La T1 è un prodotto a base di polimeri e deve essere installato in un ambiente a temperatura ambiente.

Building & Fire Code Requirements

- International Codes –
 - New and Existing Buildings International Building Code – Chapter 7
 - International Fire Code – Chapter 7
- NFPA 5000 – 101 – Chapter 8
- National Building Code of Canada
- UAE Fire and Life Safety Code
- National Building Code of India
- Other Worldwide Codes.....

- ***Minimum requirements - Construction & Maintaining Protection***

Building & Fire Code Requirements

- Fire Smoke Compartments – **IBC/NFPA = USA**
 - *Exterior Walls*
 - *Fire Walls (IN-Fire Wall or Fire Separating Wall)*
 - *Fire Compartment (UK/IN)*
 - *Fire Barrier (IN-Fire Resisting Barrier)*
 - *Fire Partitions (Not in NFPA)*
 - *Fire Separations (CAN)*
 - *Smoke Barriers*
 - *Smoke Partitions*
 - *Archaic Assemblies*

Existing Buildings

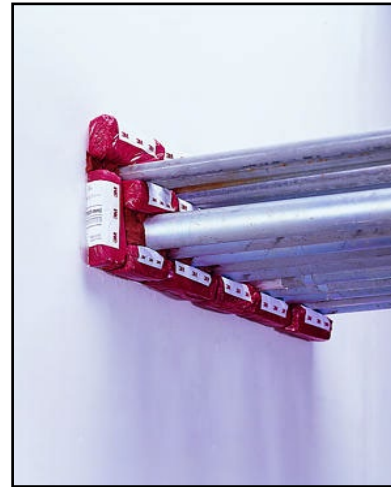
- **Archaic Assemblies**
 - **Clay Tile Block**
 - **Gypsum Block**
 - **Plaster**
 - **Clay Tile/Concrete**
 - **Unidentified Assemblies**
- **Tested ... Calculated ... Prescriptive**
- **ALL EJ/EFRRAs**

Smoke Barriers & Firestopping

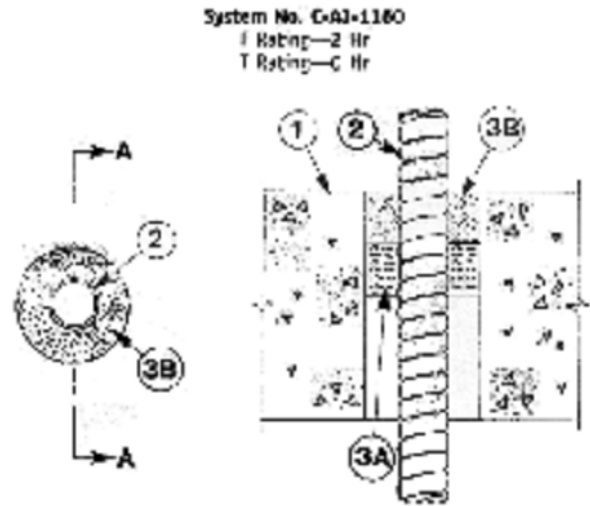
- Smoke Barriers differ from Smoke Partitions?
 - **Smoke Barrier** –
 - **IBC – Hourly Rated, Quantified Firestop “L” Rating**
 - < 5 cfm/sf (IBC 2006)
 - < 50 cfm, 100 sf of Wall Area (IBC 2009)
 - **NFPA** – ... ‘restricting the passage of smoke’...
 - Hourly Rated, Quantified Firestop L Rating Chapter 8
 - NO quantified “L” Rating ... Healthcare Chapter
 - Continuous, Barrier to Barrier, ... through concealed spaces
 - Not always fire-resistance-rated
 - **Smoke Partition** –
 - **IBC** – Continuous barrier, not fire rated... ‘retard’
 - **NFPA** – Continuous membrane that is designed to form a barrier to *limit the transfer of smoke*....

Continuity

Effective Compartmentation Features



Firestopping for Continuity I – Classified Systems

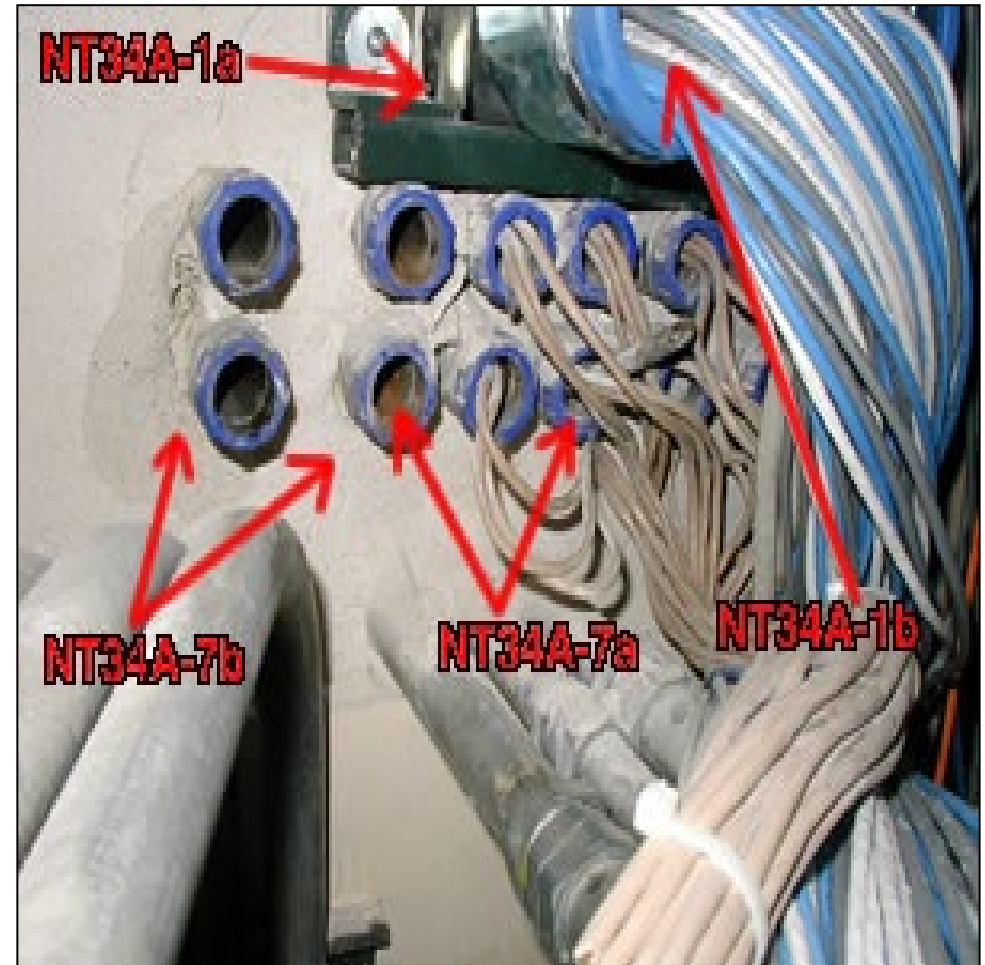


SECTION A-A

- 1. Floor or Wall Assembly**—Min. 4-1/2 in. thick lightweight or normal weight (1100 to 150 pcf) concrete. Will may also be constructed of any A Classified Concrete Blocks*. Diam. of circ. or through opening in floor or wall assembly to be 1/2 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 (CAJ) category in the Fire Resistance Directory for names of manufacturers.
- 2. Through Penetrating Product**—Max. 4 in. diam. (or smaller) size, or max. 3/4 in. diam. (or smaller) diameter flexible metal conduit. Max. one flexible metal conduit to be installed rear 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.
Alliance Cable Corp.
- 3. Packing Material**—Nom. 1 in. thickness of ceramic (aluminum silicate) fiber blanket or mineral wool batt insulation. Fully packed into opening on 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**—Gauze—Applied to fill the annular space around the flexible metal conduit. In floor, 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 27406

*Bearing the UL Classified Mark
Bearing the UL Listing Mark



Breaches in Fire-Resistance-Rated Construction

Firestop Systems

Penetration Firestop Systems

Joint Firestop Systems

Perimeter Joint Firestop Systems

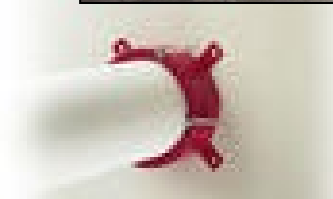
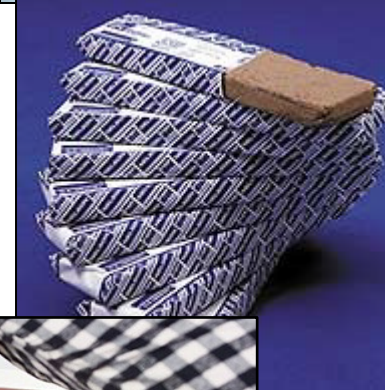
Opening Protectives

Ducts and Air Transfer Openings



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
- Tapes



“DIIM” – Design, Install, Inspect, Maintain

- Fire Resistance & Smoke Resistant Firestopping
 - Properly *Designed* Building Codes
 - FCIA - 07-84-00 – Specification – **CCS**
 - **Tested and Listed Systems** –
 - ASTM E814, UL 1479, ASTM E1966, UL 2079, E2307, E2837, E3037
 - **Movement (M), Smoke (L), Water (W)**
 - Professional *Installation* –
 - FCIA Member, UL/ULC Qualified Contractors, FM 4991 Approved
 - Properly *Inspected* –
 - ASTM E2174 / E2393, by IAS AC 291 Agencies, UL, IFC, FM Exams
 - **Protection Maintained** – Annually – by FCIA Members

Firestopping for Continuity

Products become **SYSTEMS** Based on Testing

- ‘**Field Erected Construction...Tested to...**’
 - Standards –UL 1479, ASTM E814, UL 2079, ASTM E1966, ASTM E2837, ASTM E2307, FM 4990
 - F Rating – Flame
 - T Rating – Temperature
 - L Rating – Smoke
 - W Rating – Water
 - M Rating – Movement
 - H Hose Stream Test



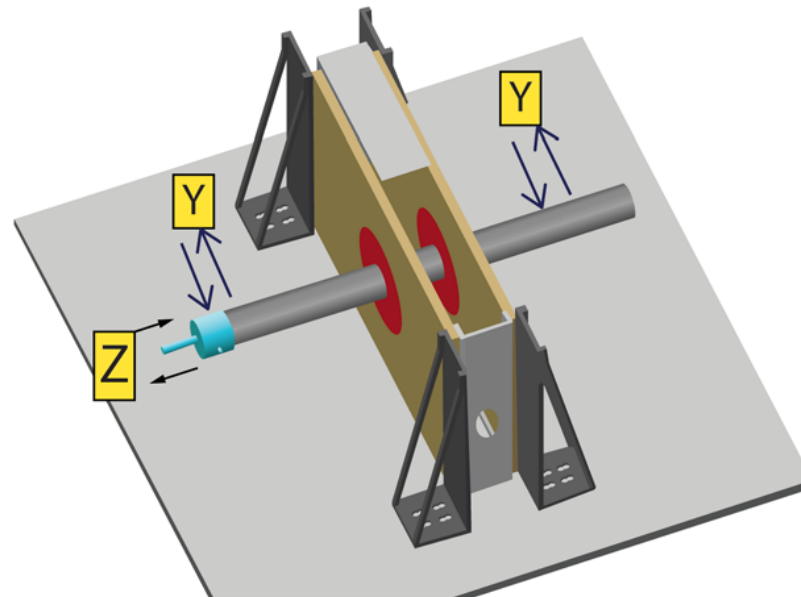
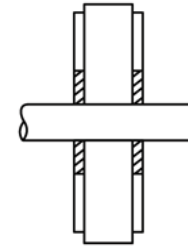
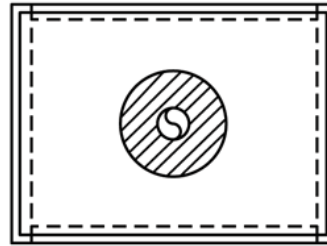
3M Photo

Hose Stream Test



UL Photo

M Rating (Optional – ASTM Image)



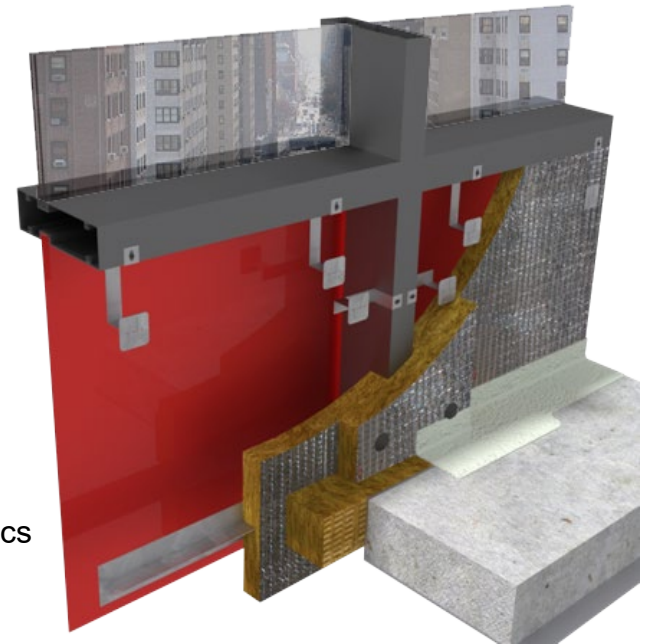
Building & Fire

Worldwide Code Requirements

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

IBC & Curtain Walls - **ASTM E2307**

- **Prevent Fire Spread – @ Interior Safing Slot**
 - Interior Flame
 - Exterior Flame Plume from Window
 - Time & Temperature
 - Tested Systems....
- **Leapfrog Testing - ASTM E2874**



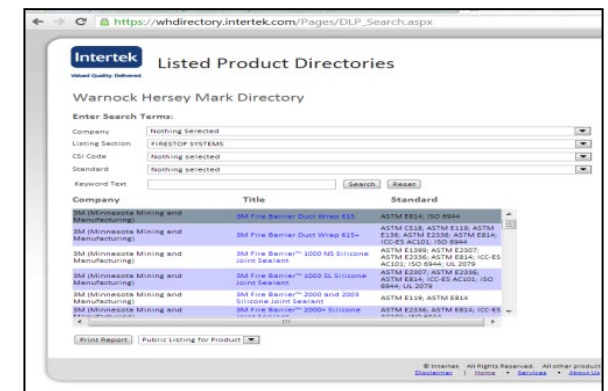
OCF/Thermafiber Graphics

Barrier Continuity Products become SYSTEMS

- Fire Rated Systems Directories –
 - FM Approvals
 - Intertek
 - UL/ULC Product iQ Online Directory



Systems Selection & Analysis...Not as easy as it looks...



Engineering Judgments/EFRRA

- Variances to Systems at Site?
 - **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***



J. Sharp – ProFirestop Photo



C. Zussman – Pepper Photo

Engineering Judgments/EFRRA

International Firestop Council – Manufacturers – www.firestop.org

IFC Recommended Guidelines for Evaluating Firestop Systems in Engineering Judgments.

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

ADD THIS TO EJ’s....“Manufacturer attests this EJ will pass applicable firestop fire test with hose stream test if subjected...”

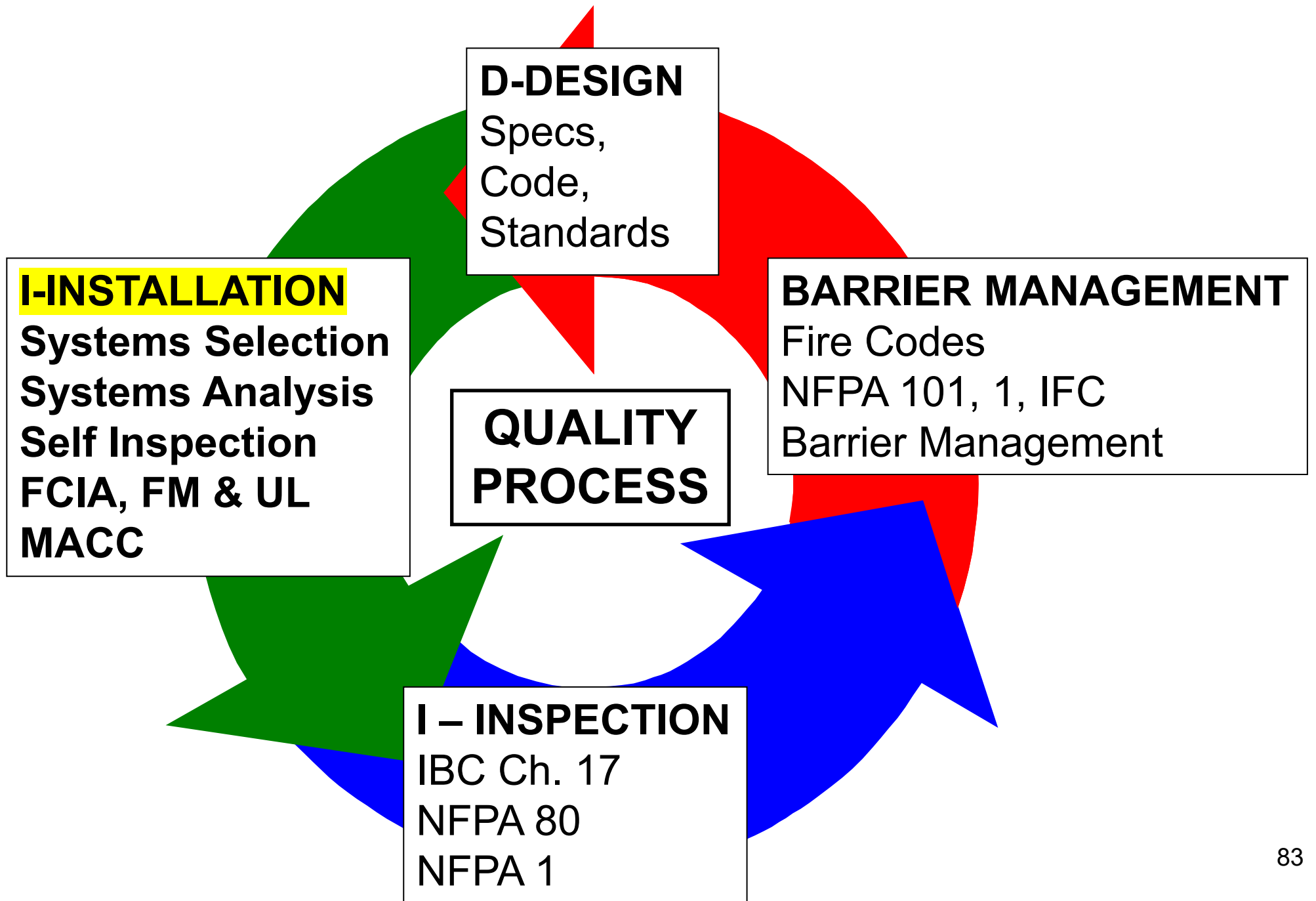
Engineering Judgments/EFRRA

IFC EJ Guidelines for the Evaluation ...

Engineering Judgments for firestop systems should:

- Not a substitute for existing designs
- Emphasizes importance of tested designs
- Should be issued only by those who know the components
- Based on sound engineering practices and knowledge of performance of the designs
- Based on interpolation of previous testing
- Issued only for a specific jobsite
- Presented in clear detail





How do Contractors Select/Analyze Systems & Inspection Agencies Analyze?

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

= *Rated Firestop System*

Manufacturers Instructions, Tested and Listed Designs



STI Graphic

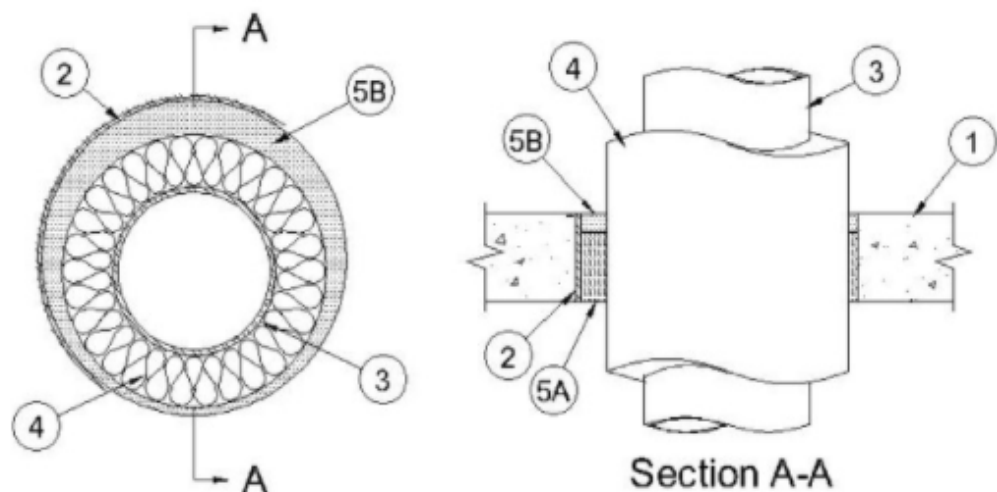


**Possible UL
System Nos.:
C-AJ-5138,
C-AJ-5209,
W-J-5091,
Etc.**

Affinity Firestop Photo

F Ratings — 1 and 2 Hr (See Item 3)

T Ratings — 0, 3/4 and 1 Hr (See Item 4)



1. **Floor or Wall Assembly** — Min 2-1/2 in. (64 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600 - 2400 kg/m³) concrete floors or min 3 in. (76 mm) thick reinforced lightweight or normal weight concrete walls. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening 9 in. (229 mm).

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

2. **Steel Sleeve** — (Optional) - Nom 9 in. (229 mm) diam (or smaller) Schedule 10 (or heavier) steel sleeve cast or grouted into floor or wall assembly. Steel sleeve may be installed flush or may project max 2 in. (51mm) beyond the floor or wall surfaces. As an alternate, nom 9 in. (229 mm) diam (or smaller) sleeve fabricated from nom 0.019 in. (0.48 mm) thick galv steel cast or grouted into floor or wall assembly flush with floor or wall surfaces.

3. **Through Penetrants** — One metallic pipe to be installed concentrically or eccentrically within opening. Penetrant to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes may be used:

A. **Steel Pipe** — Nom 4 in. (102 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.

B. **Iron Pipe** — Nom 4 in. (102 mm) diam (or smaller) cast or ductile iron pipe.

C. **Copper Tubing** — Nom 2 in. (51 mm) diam (or smaller) Type L (or heavier) copper tubing.

D. **Copper Pipe** — Nom 2 in. (51 mm) diam (or smaller) Regular (or heavier) copper pipe.

F Rating is 2 Hr for Penetrants A and B. F Rating is 1 Hr for Penetrants C and D.

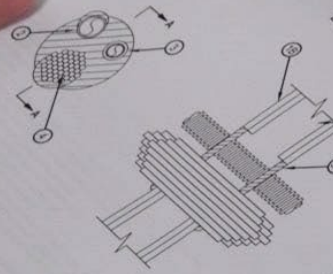
4. **Pipe Covering*** — Nom 1-1/2 in. (38 mm) thick (or less) hollow cylindrical heavy density glass fiber units jacketed on the outside with an all service jacket. Longitudinal joints sealed with metal fasteners or factory-applied self-sealing lap tape. Transverse joints secured with metal fasteners or with butt tape supplied with product. Annular space between the pipe covering and periphery of opening or sleeve shall be min 1/2 in. to max 1 in. (13 mm to 25 mm).

See **Pipe and Equipment Covering - Materials** - (BRGU) category in the Building Materials Directory for names of manufacturers. Any pipe covering material meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a smoke Developed Index of 50 or less may be used.

T Rating is 3/4 Hr for nom 1-1/2 in. (38 mm) thick pipe covering for penetrants A and B. T Rating is 1 Hr for nom 1-1/2 in. (38 mm) thick pipe covering for Penetrants C and D. T Rating is 0 Hr for all Penetrants when pipe coverings less than nom 1-1/2 in. (38 mm) thick.



FAMILY OF PRODUCTS	
SERIES	
MODEL	
SPECIFICATION	
DATE	
DRAWING NO.	



The drawing shows a cross-section of a pipe with a mesh and a multi-layered structure. The drawing includes labels and arrows indicating dimensions and components. The text below the drawing provides technical specifications and instructions for the installation and use of the product.

**FCIA Recommended
Professional Practice
Identification Systems**

“Labelling”

-On-

**Wall/Horizontal Assy.
Penetrating Item
Hanging**





Sleeved Pipes



Joints and Voids Head-of-Wall



Firestop Solutions Photo

Fire/Smoke Dampers & Firestops

- Dampers - UL 555, 555S
 - Listings – **Systems**
 - Installed to manufacturer's written instructions
 - Systems – Angles...no sealants required
- Firestop sealants – UL 1479, ASTM E814
 - Improper hole sizing or poor installation...

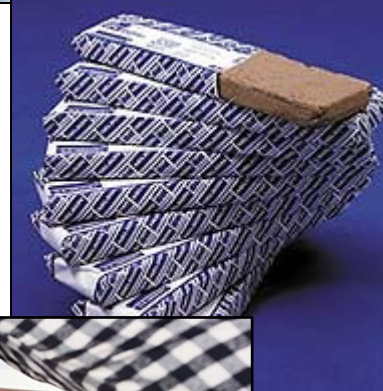
Consult the Damper
Manufacturer & the
Authority Having
Jurisdiction

Greenheck Photo



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
- Tapes



Review of UL Firestop and Joint Systems on UL Product iQ

- Review:

- U410

W-L-2154

- C-AJ-1155

W-L-5001

- C-AJ-3314

BW-S-0002

- C-AJ-4036

FF-D-1001

- C-AJ-8001

HW-D-0221

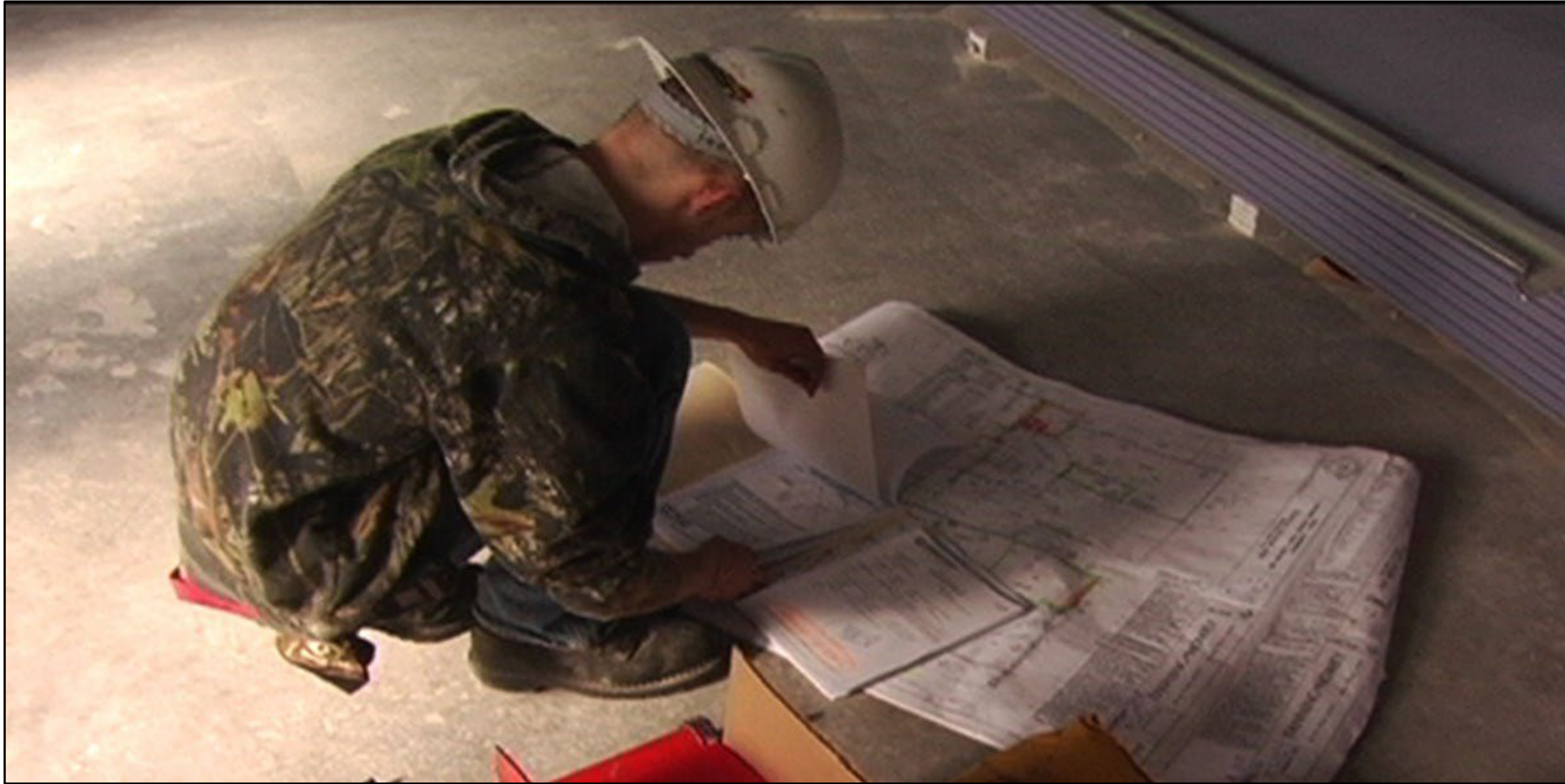
- W-L-1137

CW-D-1046

- W-L-2030

Barrier Continuity

I – Installation – Listed Systems



Firestopping for Continuity – Firestop Products

- Sealants
 - Silicone, Acrylic/Latex, Intumescent
- Wrap Strips & Collars
 - “Thick, Thin, Wide, Less Wide”
- Putties
- Pre Fabricated MCT Devices
- Fire Pillows
- Mortar
- Composite Sheets
- Bricks / Plugs
- Spray Products
- Tapes
- Cavity Barriers, Strips



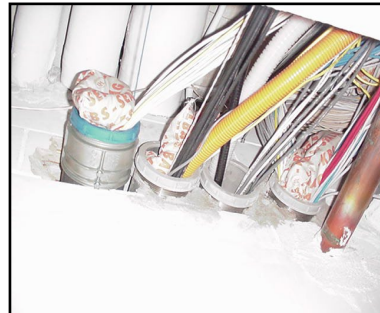
3 Firestop Installation Methods

- **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*

Installation – Who?

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

***Conclusion –
Without Single Firestop Installation
Contractor....
Fire & life safety risks***



Adler Photo

Why Contractor Qualifications?

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

Spec Contractor Qualifications

- **FM 4991 – Standard for the Approval of Firestop Contractors**
- **UL Qualified Firestop Contractors**
- **Other Industries???**
- ***FM 4991 / UL-ULC CONTRACTORS UNDERSTAND SYSTEMS, INVENTORY – DOCUMENTATION***



**FCIA Recommended
Professional Practice
Identification Systems**

“Labelling”

-On-

**Wall/Horizontal Assy.
Penetrating Item
Hanging**



Why Contractor Qualifications?

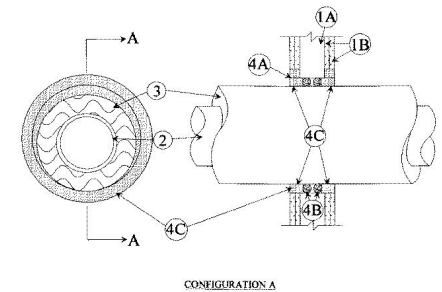
- **Built right the first time...**
- **Documentation = Inventory**
- **Fire-Resistance SYSTEMS Selection**
- **SYSTEMS Analysis & As Builts**
 - F, T, L, W, M Rated Systems
 - Tolerances - Annular Space Sizes, Angles
 - Gap Sizes - Undercuts - Framing
 - Anchors - Spacing – Hardware
 - Closers - Activation Sensors, more...

FM 4991 & UL/ULC QFC

- **FM, UL/ULC Firestop Exam @ 80% min.**
- **Management System (MS) Written**
- **MS Procedures implemented**
- **Audit**
 - Contractor Office – Records & Documents
 - Jobsite – Observation, possible destructive
- **DRI – Appointed by Contractor, CEU's**
- **Listed @ www.FCIA.org & www.UL.com**

Management System & Audit – UL, FM 4991

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



Management System & Audit – UL, FM 4991

- **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**

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.

UL Slide



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

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

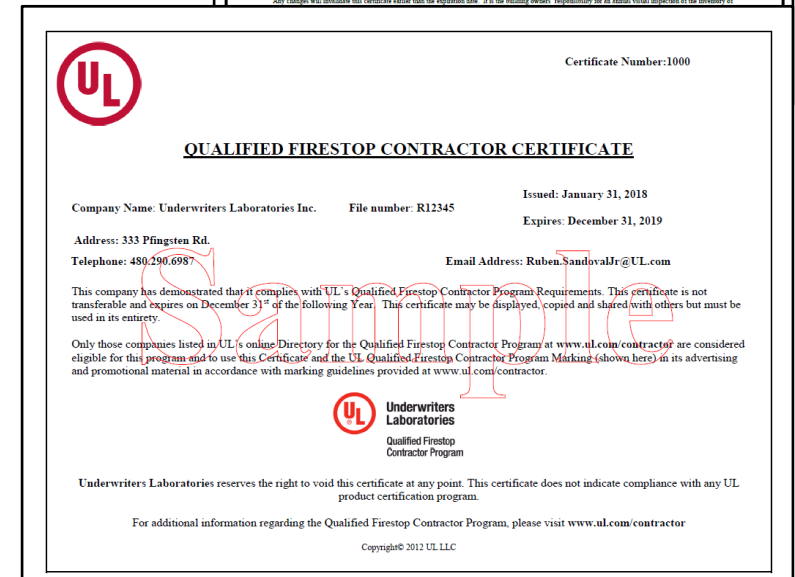
This certificate reports the findings of an audit by UL to the management system requirements of the Qualified Firestop Contractor Program. The audit was conducted to the requirements specified in the Qualified Firestop Contractor Program requirements. The UL qualified contractor was found to be in compliance 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: PCA
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 representation or warranty, 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 installing 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 Building Contractor, or any other party for any loss, which may result in future, incorrect installation, non-compliance with requirements, cancellation of this certificate, or withdrawal by the Qualified Building Contractor from the Qualified Firestop Contractor Program.
Any modification to any firestop system of the structure will affect the complete firestopping system and may render protection afforded by the system ineffective. Any changes will invalidate this certificate unless the building owners' responsibility for an annual visual inspection of the inventory of



UL Certificate Number: 1000

QUALIFIED FIRESTOP CONTRACTOR CERTIFICATE

Company Name: Underwriters Laboratories Inc. File number: R12345 Issued: January 31, 2018
Address: 333 Pfingsten Rd. Expires: December 31, 2019
Telephone: 480.290.6987 Email Address: Ruben.SandovalJr@UL.com

This company has demonstrated that it complies with UL's Qualified Firestop Contractor Requirements. This certificate is not transferable and expires on December 31st 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 are considered eligible for this 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.

UL Underwriters Laboratories
Qualified Firestop Contractor Program

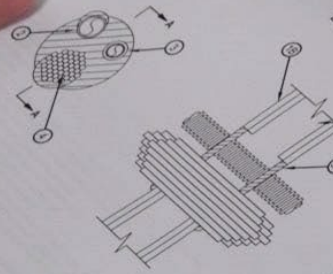
Underwriters Laboratories reserves the right to void this certificate at any point. This certificate does not indicate compliance with any UL product certification program.

For additional information regarding the Qualified Firestop Contractor Program, please visit www.ul.com/contractor

Copyright© 2012 UL LLC



FAMILY OF PRODUCTS	
SERIES	
MODEL	
PARTS LIST	
DATE	
DRAWN BY	
CHECKED BY	
APPROVED BY	

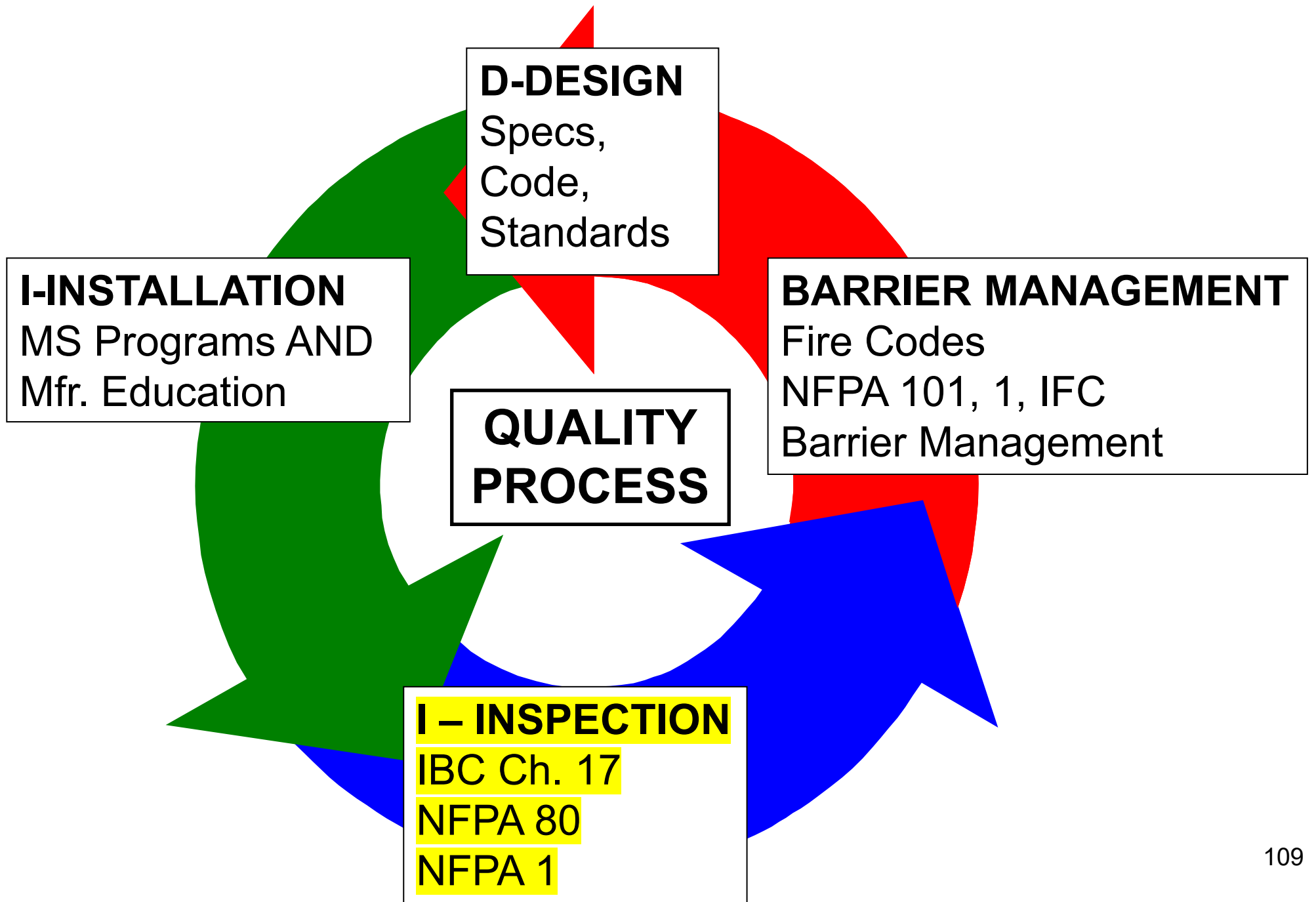


Attenzione: La T1 è il prodotto per la protezione termica e acustica. Per la massima efficienza, il prodotto deve essere installato in modo che la sua superficie sia rivolta verso l'interno del tubo. La T1 è adatta per essere installata su tubi di diametro compreso tra 114 e 127 mm.

Dimensioni: La T1 è disponibile in diverse dimensioni. Per la massima efficienza, il prodotto deve essere installato in modo che la sua superficie sia rivolta verso l'interno del tubo. La T1 è adatta per essere installata su tubi di diametro compreso tra 114 e 127 mm.

Materiali: La T1 è realizzata in polietilene ad alta densità (HDPE) e in fibra di vetro. Il prodotto è resistente ai raggi UV e all'umidità. La T1 è adatta per essere installata su tubi di diametro compreso tra 114 e 127 mm.

10/17



Firestop & Inspection

- ASTM E2174 / ASTM E2393 – “*Inspection Process*”



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 E2174 & ASTM E2393**
 - Independent 3rd Party
 - Destructive, Non Destructive
 - Specified Frequency

National Fire Protection Association

NFPA 1 – 2018

- 12.3.2.1 ... Penetrations ... shall be inspected in accordance with **ASTM E2174 ...**
- 12.3.2.2 ... Joint systems ... shall be inspected in accordance with **ASTM E2393 ...**
- FCIA INTIATIVE WITH KOFFEL ASSOC....**

FCIA Added Emphasis



Firestop Inspection in Codes ASTM E2174 – ASTM E2393

- NFPA 1 - Ch. 12
- NFPA 101 / 5000 - Chapter 8 – Annex
- 2012 – 2018 International Building Code
- IBC 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

FCIA & KOFFEL
2002-2020



Firestop 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 Assembly, Occupant Load > 300**
 - **Bldgs. Containing Elem., 2ndary', 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 [IBC 1604.5]

Firestop 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 Risk Category IV structures.*
 - [IBC 1604.5]

Firestop 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.*
 - [IBC 1604.5]

I – Inspection – IBC AHJ Approvals – x2

Definitions – Chapter 17, IBC

[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 – IBC AHJ Approvals – x2

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]

Firestop Systems Inspection Introduction

ASTM E2174 – ASTM E2393

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

Firestop Inspection Firm & Individual Qualifications – ASTM E2174 – ASTM E2393

- Inspection Firm & Inspectors are:
 - **‘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 independence statements**

Firestop Inspection Firm & Individual Qualifications – ASTM E2174 – ASTM E2393

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



Firestop Inspection Firm & Individual Qualifications – IAS AC 291

- **Inspection Firm shall have 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

Firestop Inspection 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**
 - 3rd Party, Independent Exams verify Knowledge
 - FM Firestop Exam,
 - OR
 - UL Firestop Exam,
 - AND
 - IFC Exam

Firestop Inspection Process

ASTM E2174 – ASTM E2393

- **Inspection Documents**

- 07-84-00 Specifications and Drawings
- Manufacturer Product Data Sheets and Installation Instructions
- Safety Data Sheets
- Listed Systems and EJ's/EFRRRA's



The image shows a warning label for a firestop system. It includes contact information for the contractor, a warning statement, and a table for recording re-penetration events.

FIRESTOP CONTRACTOR		
(204) 555-0101		
WARNING		
<small>This is an approved Firestop System and shall NOT be disturbed except by Authorized Personnel.</small>		
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>ES-ONE</u>	
Installation Date: <u>APRIL 1, 2013</u>	System Design No.: <u>S-AJ-1022a</u>	
Re-penetrated by:		
Company	Installer	Date
_____	_____	_____
_____	_____	_____

Firestop Inspection Process

ASTM E2174 – ASTM E2393

- **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 E2174 – ASTM E2393

- **Observation Reviews**
 - During construction
 - Witnessed randomly of the installed systems on each floor
 - **E2174 - 10%**, each **type** of Service Penetration Firestop System
 - **Type = By System, By Firestop Installation Contractor**
 - **E2393 - 5% of Total Lineal Feet** for each **type** of Fire Resistance Rated Joint System
 - **Type = By System, By Firestop Installation Contractor**



Affinity Firestop Photo

Firestop Inspection Process

ASTM E2174 – ASTM E2393

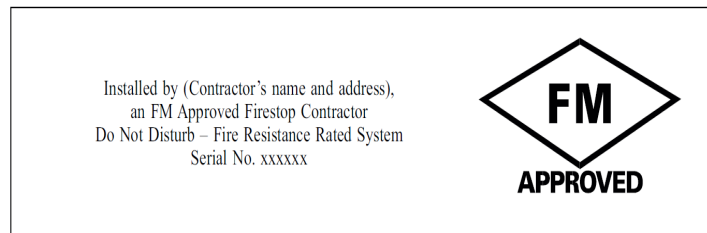
- Destructive Reviews (Testing)
 - Performed Post-Construction
 - **E2174** - Minimum 2%, no less than 1, each **type** per 930 m² (10,000 SF) of floor area
 - **Type = By System, By Contractor**
 - **E2393** - Minimum 1 / 152 LM (500 LF) of Joint Area, by **type**, mandatory; Exception mechanical joints
 - **Type = By System, By Contractor**



Affinity Firestop Photo

Firestop Special Inspection ASTM E2174 – ASTM E2393

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



Firestop Inspection Process

ASTM E2174 – ASTM E2393

- **Variances / Deviations**
- ASTM E2174 & ASTM E2393
 - FS Contractor is notified of any deficiencies within **one day**
- IBC 1704.2.4
 - Work is in conformance to the documents
 - Otherwise it is **immediately** brought to the attention of the FS Contractor
 - If not corrected, AHJ and AA will be informed to take action



Firestop Inspection Process

ASTM E2174 – ASTM E2393

- 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 re-inspects
- Document all Deficiencies



Affinity Firestop Photo

Firestop Inspection Process

ASTM E2174 – ASTM E2393

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



Affinity Firestop Photo

Firestop Evaluation & Repairs

- **Installation Evaluation basis...**
 - Manufacturers Installation instructions
 - Acceptable methods to review installed systems
 - Listed SYSTEM requirements for installations
- **BALLS & STRIKES**

Firestop Repairs

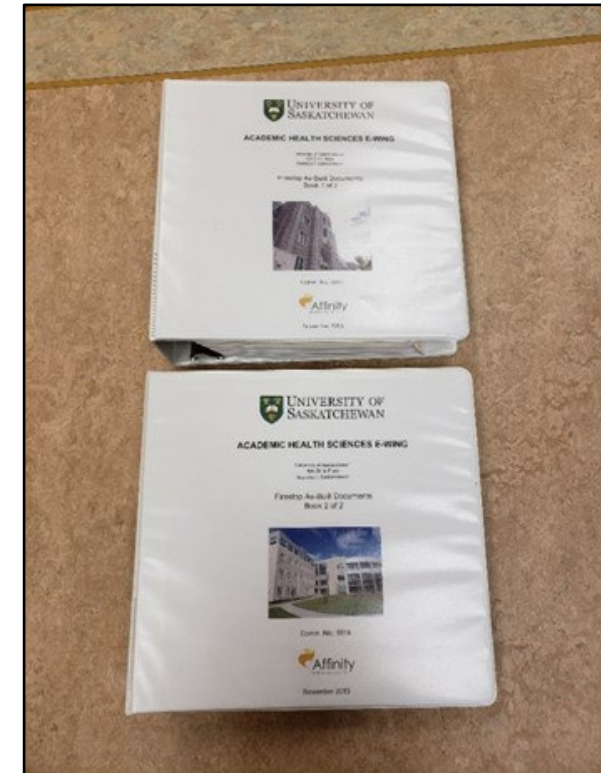
- Manufacturers Repair Instructions
- Listed systems
- Repair or Replace ??
 - Adhesion to Old Sealant
 - Dust, Debris?
 - **F, T, L, M, W Ratings??**
- ***As recommended by MFR***



Affinity Firestop Photo

Firestop Inspection Final Report ASTM E2174 - ASTM E2393

- 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



Affinity Firestop Photo

Where is Firestopping & Fire-Resistance Needed Most to Protect??

- Hospitals, nursing homes
- Apartments, Condos
- Universities
- Warehousing
- Manufacturing – Paper, others
- More

FREE Resources From FCIA.....

- **Webinars**
- **PDF MOP**
- **07-84-00 SPECIFICATION**
- **Life Safety Digest**
- **MOSHE Facility Directors, Code Officials, Fire Marshals,**
- **& Specifiers with Design Firms**

Info@FCIA.org & www.FCIA.org



Barrier Management Symposium

Firestopping DIIM

Bill McHugh, FCIA Executive Director
INFO@FCIA.org



Firestop Contractors International Association



MISSOURI SOCIETY FOR HEALTHCARE ENGINEERING

Member of ASHE since 1972

mosheonline.org