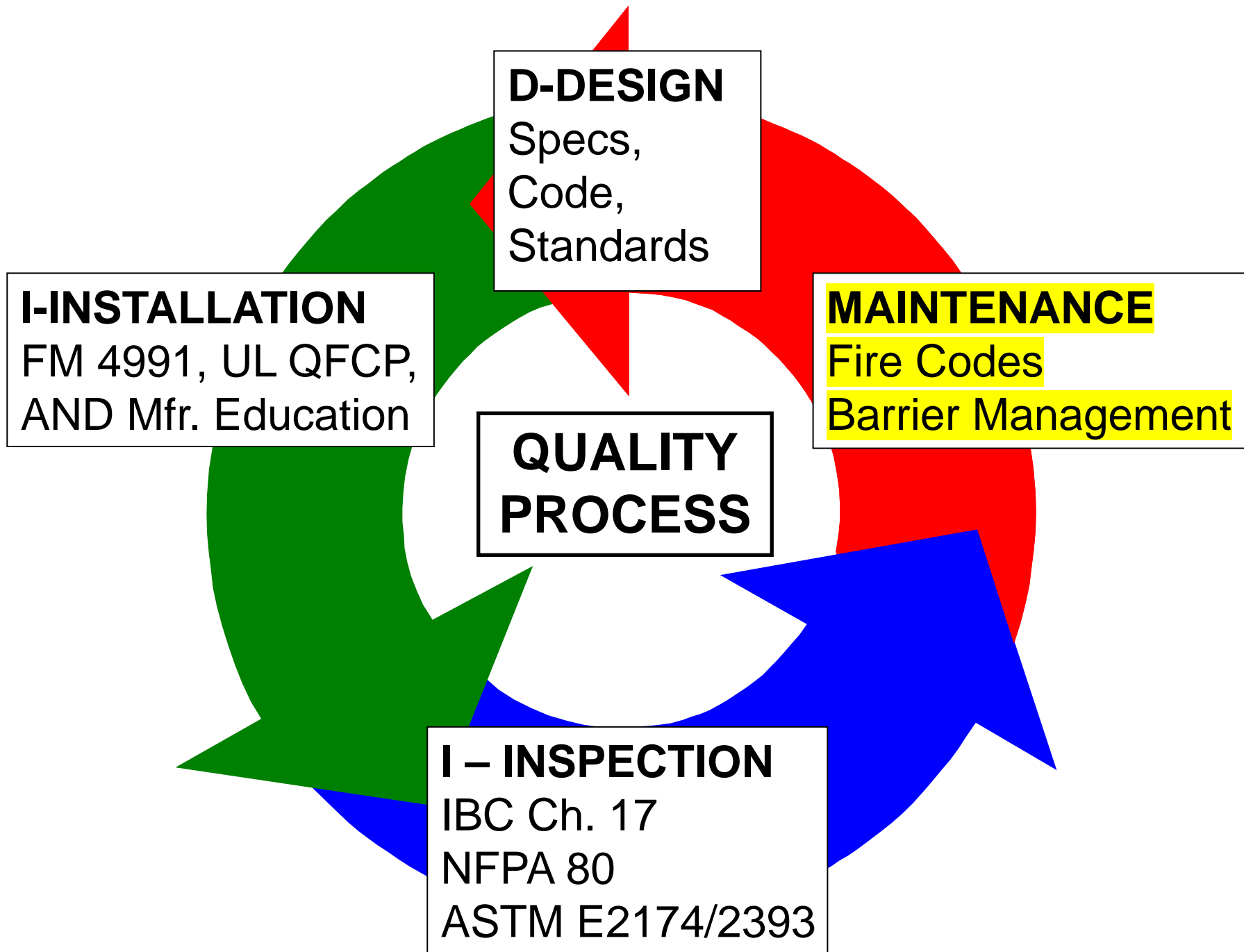


**FCIA  
FIRESTOP  
DIIM**

Design  
Installation  
Inspection  
**Maintaining Protection  
& Management**

**Bill McHugh, FCIA  
Rich Walke, CTI for FCIA**



# Firestopping for Safety “DIIM”

---

- Properly **Designed** and Specified Firestopping
  - FCIA – 07-84-00 - Specification
- **Tested and Listed Systems** – ASTM E814 / UL 1479, ASTM E1966 / UL 2079, FM 4990, ULC-S115, ASTM E2837, E2307, E3037, more
- Professional **Installation** – FCIA Member, FM 4991 Approved, UL/ULC Qualified Contractors
- Properly **Inspected** – ASTM E2174 / 2393 Processed by IAS AC 291 Accredited Inspection Agencies, Inspectors w/FM, UL, ULC,IFC Exam Success
- **Protection Maintained & Managed** – Annually – FCIA Members – NFPA 1, 101, International Fire Code – UAE Fire and Life Safety Code of Practice, Saudi Arabia, Qatar, Oman, etc...

# 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
- Saudi Building and Fire Code
- **Many other Country Codes...**
- ***Minimum Requirements – Construction & Maintenance*** <sup>4</sup>

# Building & Fire Code Requirements

---

**[BF] FIRE RESISTANCE.** That property of materials or their assemblies that prevents or retards the passage of excessive heat, hot gases or flames under conditions of use. [IBC 2018 202]

**[BF] FIRE-RESISTANCE RATING.** The period of time a building element, component or assembly maintains the ability to confine a fire, continues to perform a given structural function, or both, as determined by the tests, or the methods based on tests, prescribed in Section 703. [IBC 2018, 202]

# Fire Resistance

---

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

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

# Building & Fire Code Requirements

---

- Fire-Resistance Rated Barriers – Defined Terms
  - *Exterior Walls*
  - *Fire Walls*
  - *Fire Barriers*
  - *Fire Partitions (Not NFPA)*
  - *Smoke Barriers*
  - *Smoke Partitions*
  - *Archaic Assemblies*

# Existing Buildings

---

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



# Smoke Barriers & Firestopping

---

- Smoke Barriers differ from Smoke Partitions?
  - **Smoke Barrier** –
    - **IBC** – Hourly Rated, Quantified Firestop “L” Rating
      - < 5cfm/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*....

# 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

---

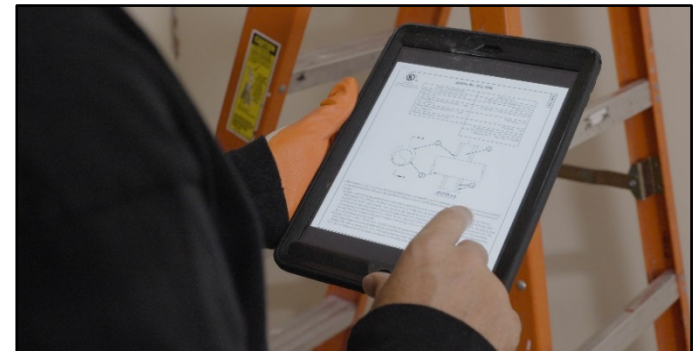
- **Part II– Contractor/Installer Qualifications**
  - **FCIA Member in Good Standing, AND**
  - **FM 4991, Standard for the Approval of Firestop Contractors, OR**
  - **UL Qualified Firestop Contractor Program**
  - **AND**
  - **Manufacturer Accredited, Approved, Trained**



# Specs – Key Parts Relating to Inspection

---

- **NEW Buildings – 07-84-00 Specs - [www.FCIA.org](http://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

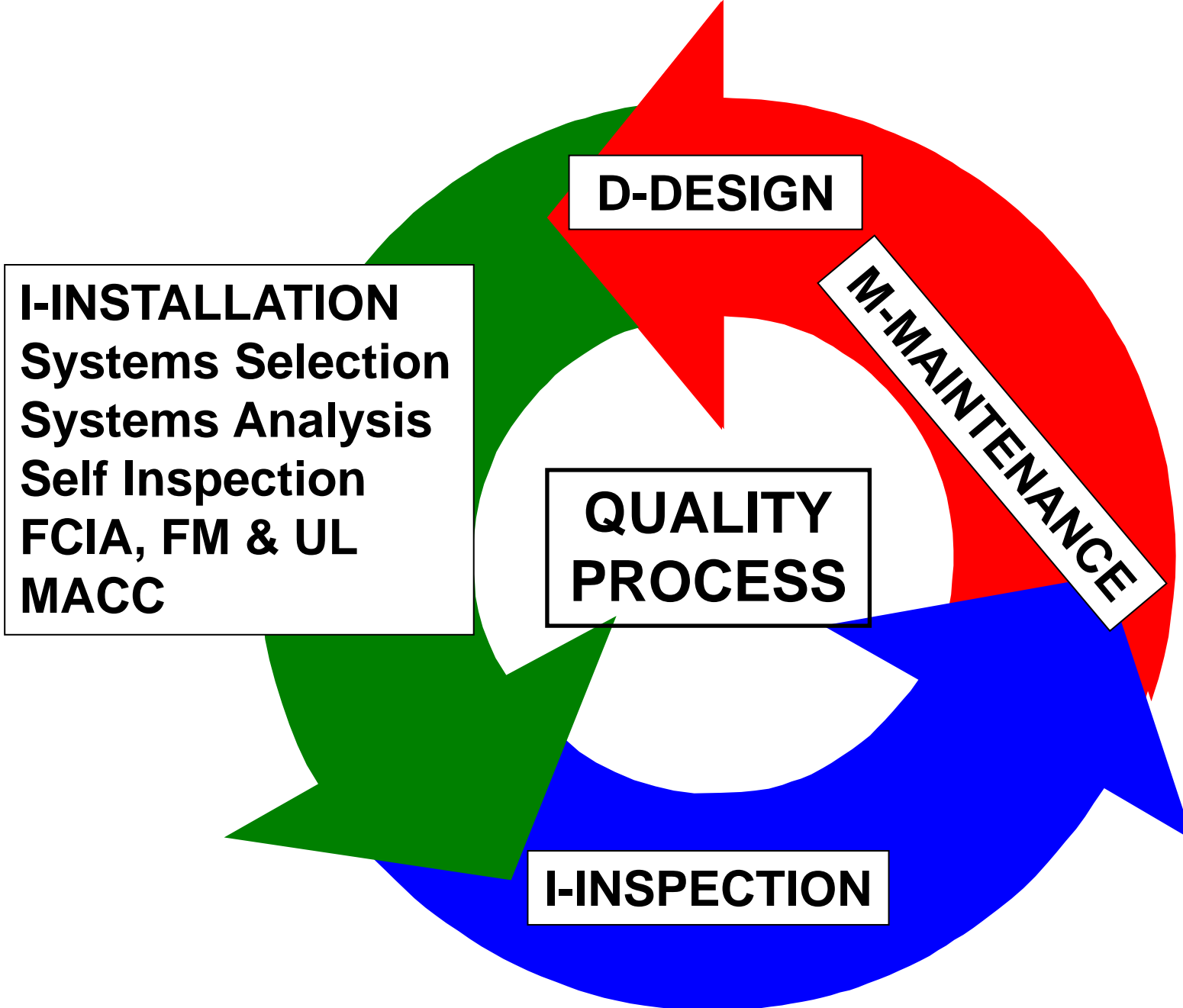
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- **NEW Buildings – 07-84-00 Specs**
- **Part III – Execution**
  - **Special Inspection**
    - **ASTM E2174 – Penetrations**
    - **ASTM E2393 – Joints**

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

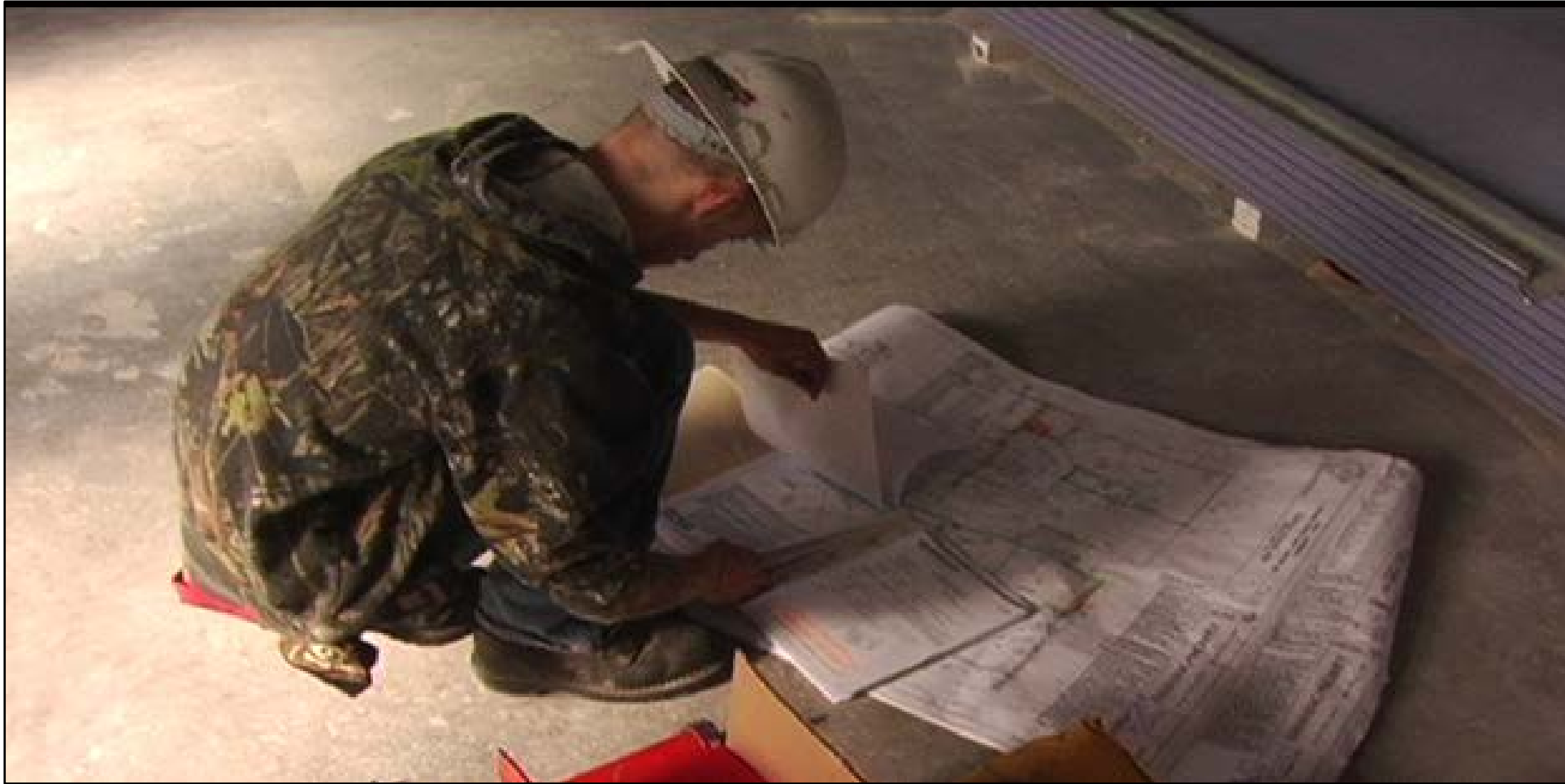
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- **Reference 01-78-00 Closeout Submittals**
  - **01 78 29 Final Site Survey**
  - **01 78 33 Bonds**
  - **01 78 36 Warranties**
  - **01 78 39 Project Record Documents**
  - **01 78 43 Spare Parts**
  - **01 78 46 Extra Stock Materials**
  - **01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



# Firestopping for Continuity I – Listed Systems

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# Systems & Materials....

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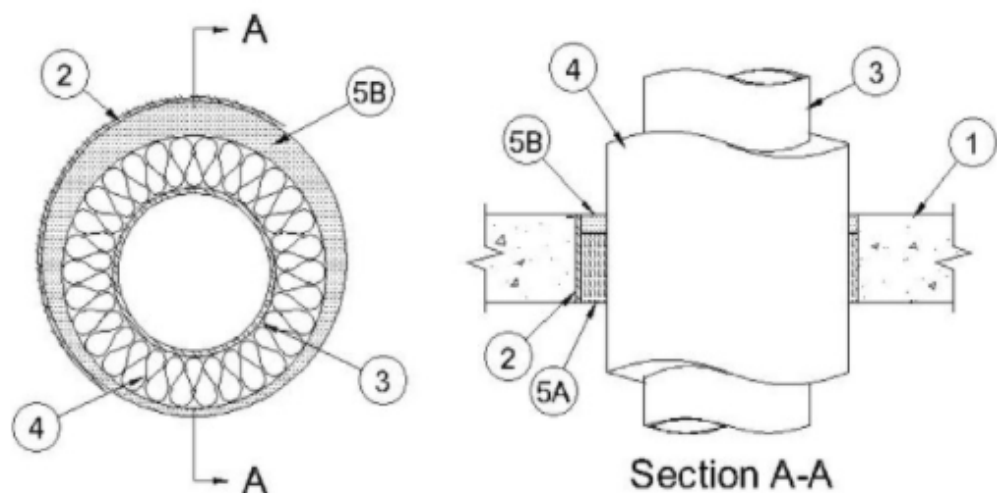


**Possible UL  
System Nos.:  
C-AJ-5138,  
C-AJ-5209,  
W-J-5091,  
Etc.**

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/m<sup>3</sup>) 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.**



1. 2. 3. 4. 5. 6.

**ANALISTA DE DISEÑO**  
 PROYECTO: \_\_\_\_\_  
 FECHA: \_\_\_\_\_  
 DISEÑO: \_\_\_\_\_  
 REVISADO: \_\_\_\_\_  
 APROBADO: \_\_\_\_\_

1. 2. 3. 4. 5. 6.

**Nota:** Este documento es propiedad de la empresa y no debe ser reproducido ni distribuido sin el consentimiento escrito de la misma.

**Objetivo:** Este documento tiene como objetivo definir los requisitos de diseño para la fabricación de la pieza.

**Alcance:** Este documento aplica a la fabricación de la pieza en el taller de producción.

**Referencias:**

**Revisión:**

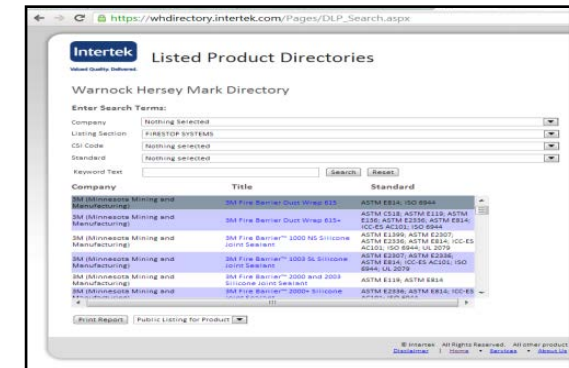
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# Firestopping for Continuity Products Become Systems

- Firestop Systems Directories –
  - UL Product iQ
  - Intertek
  - FM Approvals
  - Others



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



# 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 Sizes
- Joint / Gap Sizes
- Backing Materials
- Fill Material(s)

**= *Rated Firestop System***



STI Graphic

# 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



3M Photo

# 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**

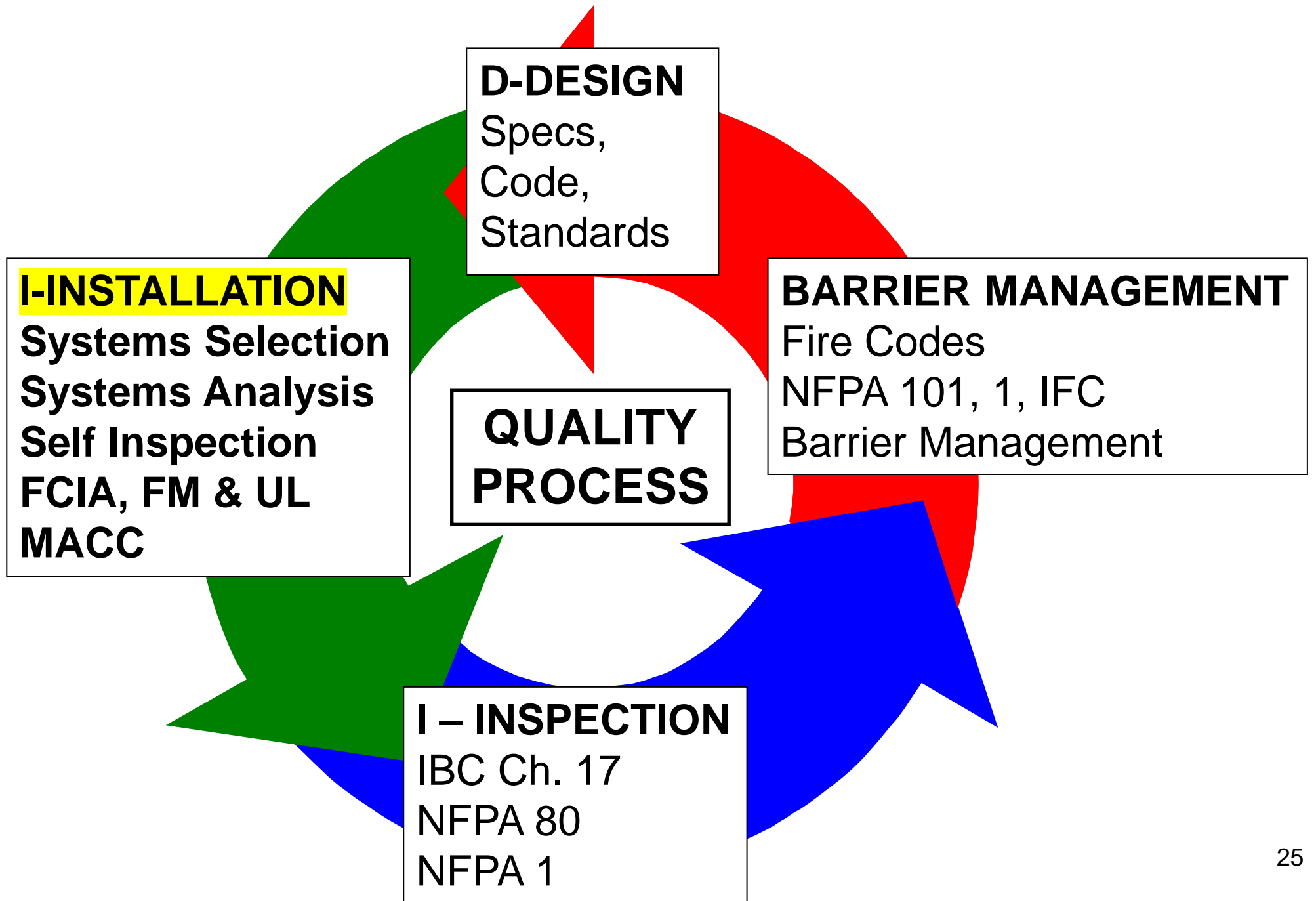


J. Sharp – ProFirestop Photo



C. Zussman – Pepper Photo





# 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)



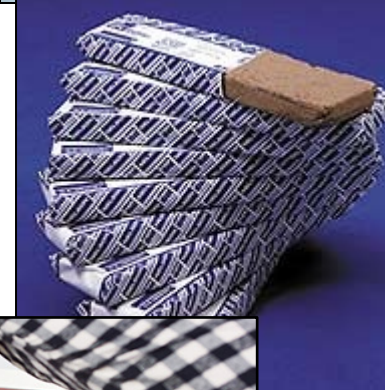
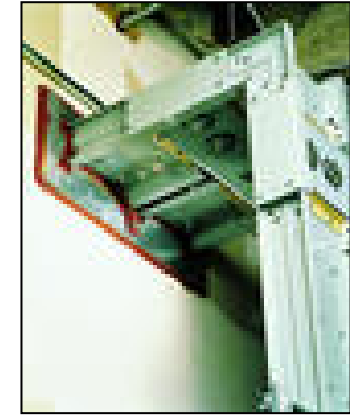
STI Graphic

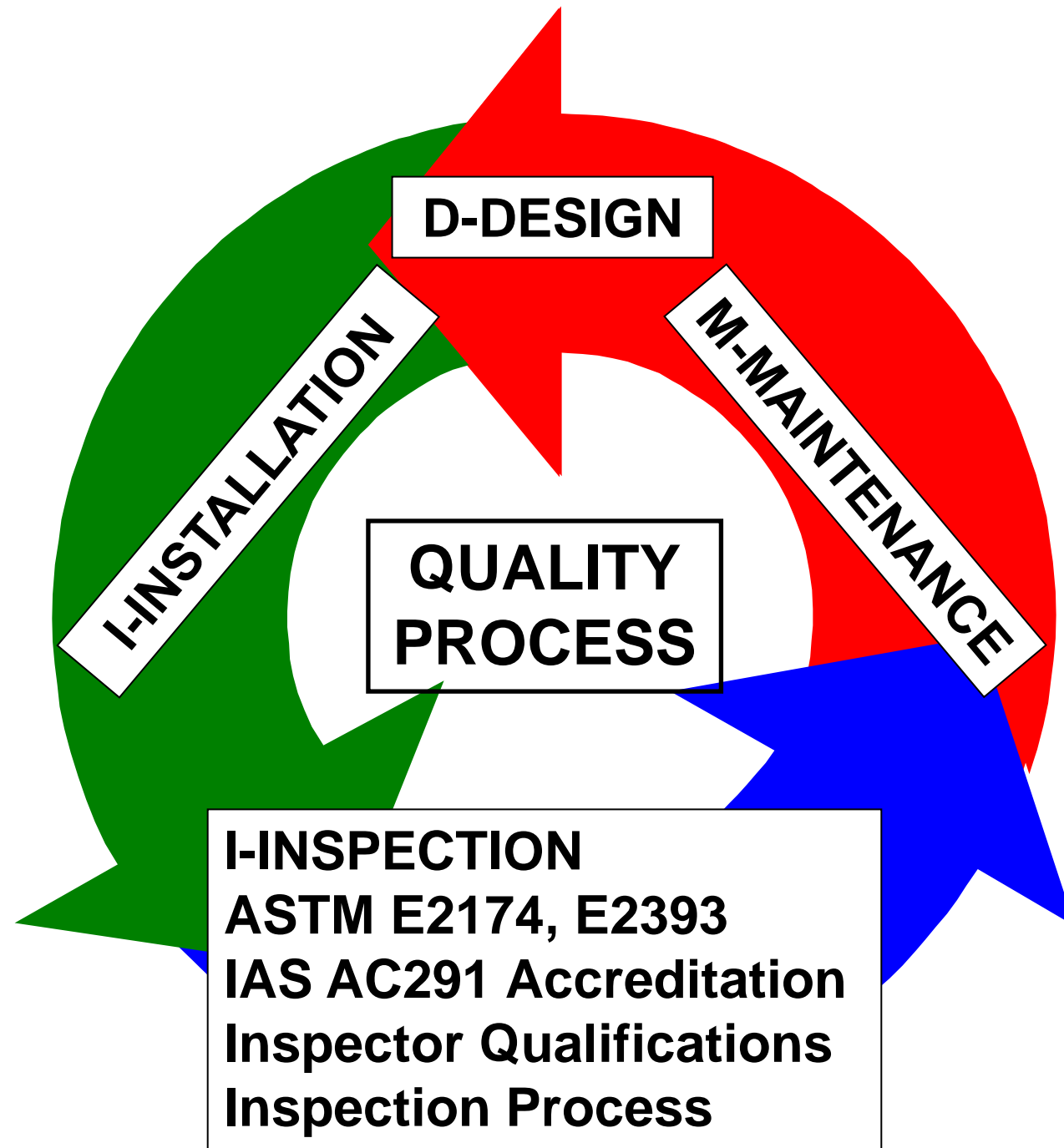
**= *Rated Firestop System***

***Manufacturers Instructions, Tested and Listed Designs***

# 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





# Inspection in Codes

## ASTM E2174 – ASTM E2393

---

- NFPA 101 / 5000 – Chapter 8 – Annex
- 2012 International Building Code
  - CH 17 – Special Inspections (FCIA Proposals)
    - Buildings 75' & higher above Fire Department Access
    - Occupancy Type III, IV, Chapter 16 Table 1604.5
    - Residential > 250 Occupants – 2021 (FCIA Proposal)
- Abu Dhabi International Building Code

# Firestop Systems Inspection

## ASTM E2174 – ASTM E2393

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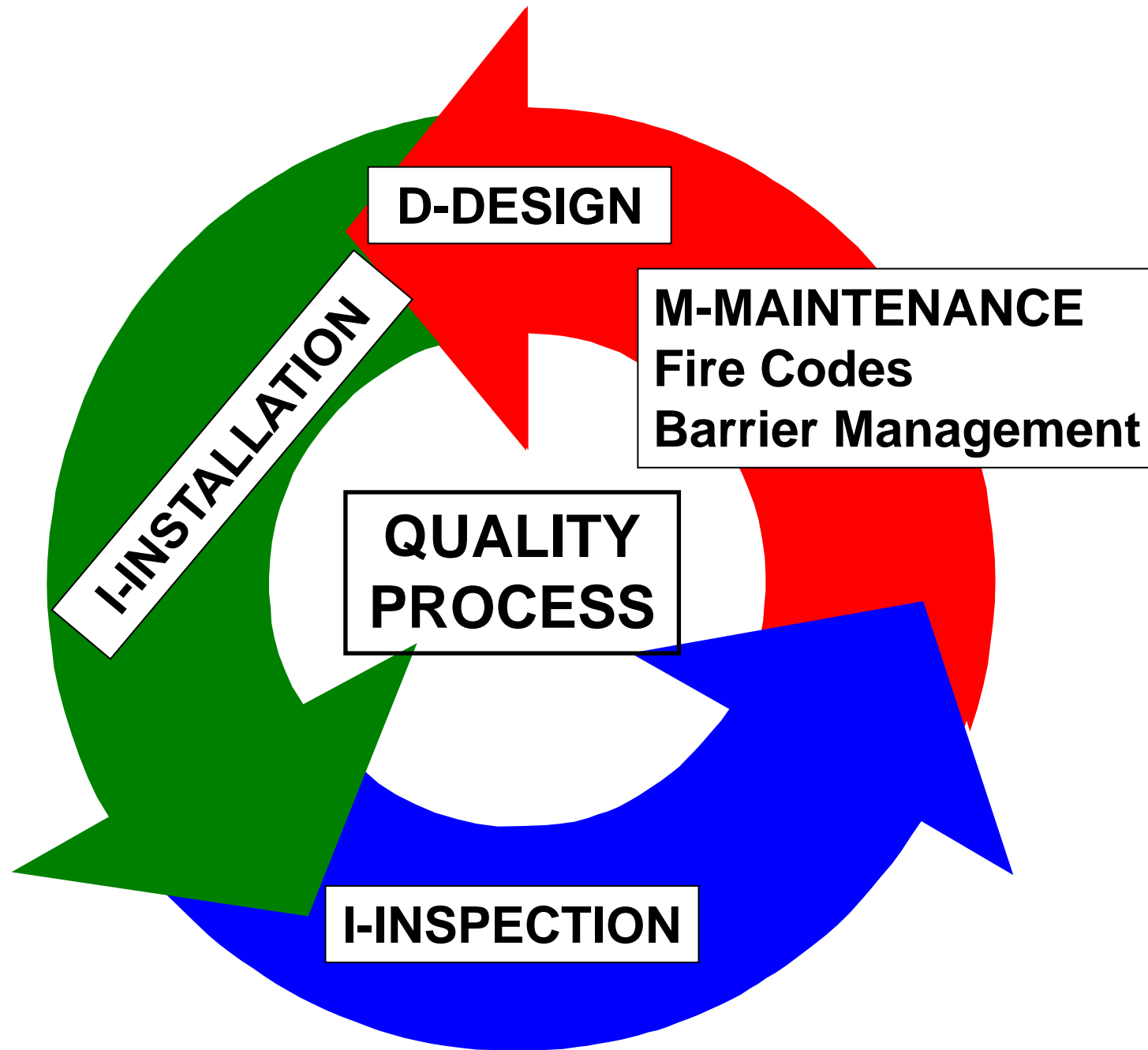
- “Standard Practice for On-Site Inspection of Installed Fire Stops – Penetrations - Joints”
  - Standard Inspection Procedure
  - Special Inspection Agency Companies
  - Independent
  - Hired by & Reports to..
    - Building Owner, Architect, Owners Rep, other than GC  
= Authorizing Authority

# Measure Sealant Thickness at Bond Lines to Pen./Assy. – Not Middle of Annular Space

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Adler Photos

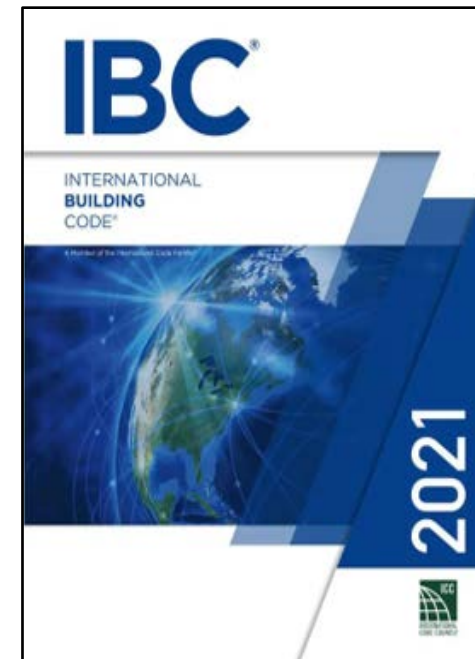




# Existing Buildings? Did you know...

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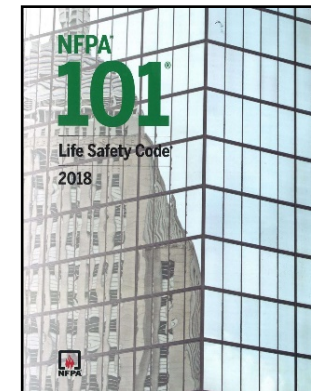
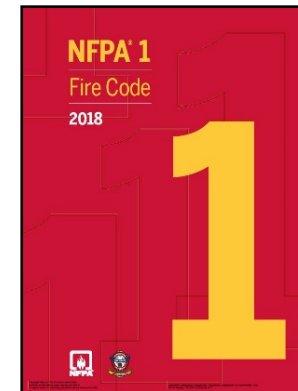
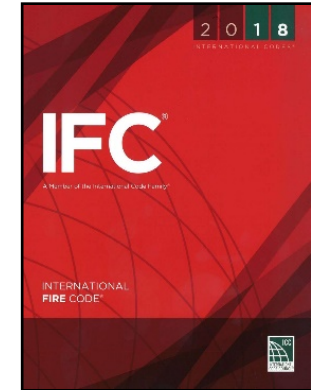
- **Fire, existing building codes have existed for decades**
- Fire Codes dictate maintaining protection of structural fire-protection and fire-resistance-rated compartmentation



# Fire Codes Require Maintenance

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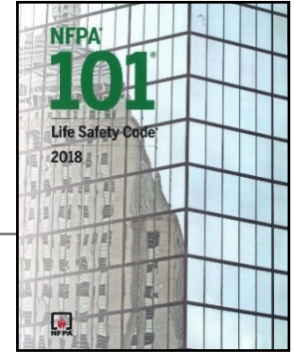
- NFPA 101
  - NFPA 1
  - International Fire Code
  - UAE Fire & Life Safety Code
- 
- Minimum Requirements Stated
  - Frequency
  - **What really happens?**



# National Fire Protection Association

## NFPA 101 – 2018

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- **SECTION 4.6.12 Maintenance, Inspection, and Testing.**

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

# National Fire Protection Association

## NFPA 1 – 2018

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- **12.3.3\* Maintenance of Fire-Resistive Construction, Draft-Stop Partitions, and Roof Coverings.**
  - **12.3.3.1 Required fire-resistive construction**, including fire barriers, fire walls, exterior walls due to location on property, fire-resistive requirements based on type of construction, draftstop partitions, and roof coverings, *shall be maintained and shall be properly repaired, restored, or replaced where damaged, altered, breached, penetrated, removed, or improperly installed.*

FCIA Added Emphasis



# National Fire Protection Association

## NFPA 1 – 2018

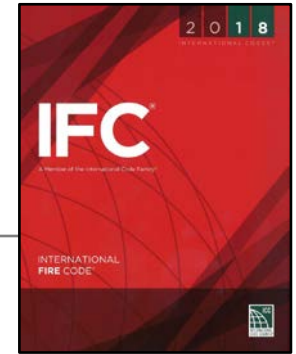
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- 12.3.3.3.1** The **person responsible** for conducting the visual inspection shall demonstrate appropriate **technical knowledge and experience in fire-resistance-rated design and construction** acceptable to the AHJ.
- 12.3.3.3.2** A written report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

FCIA Added Emphasis



# 2018 International Fire Code Maintenance

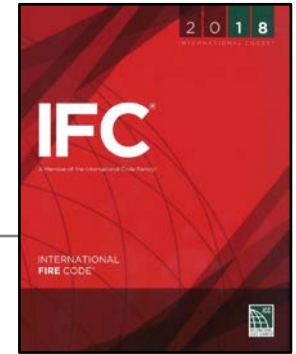


## SECTION 701 GENERAL

- **701.1 Scope.** The provisions of this chapter shall govern the **inspection and maintenance of** the materials, systems and assemblies used for **structural fire-resistance, fire-resistance-rated construction separation of adjacent spaces and construction** installed to resist the passage of smoke to safeguard against the spread of fire and smoke within a building and the spread of fire to or from buildings. New buildings shall comply with the *IBC*.

FCIA Added Emphasis

# 2018 International Fire Code Maintenance



## SECTION 701 GENERAL

- **701.6 Owner's responsibility.** The **owner shall maintain an inventory** of all required fire-resistance-rated construction, construction installed to resist the passage of smoke and the construction included in Sections 703 through 707. **Such construction shall be visually inspected by the owner annually and properly repaired, restored or replaced where damaged, altered, breached or penetrated.**
- **FCIA Initiative with Koffel Assoc. – 'Inventory'...**

FCIA Added Emphasis

# 2018 International Fire Code Maintenance

---



## SECTION 701 GENERAL

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

FCIA Added Emphasis



# National Fire Code of Canada

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## National Fire Code of Canada

- ***Division B – Part 2, Building and Occupant Fire Safety***

- ***2.2.1.2 – Damage to Fire Separations*** – Where *fire separations* are damaged so as to affect their integrity, they shall be repaired so that the integrity of the *fire separation* is maintained...

- **FCIA Manual of Practice – Appendix, Maintenance**

FCIA recommends Barrier Management for Effective Compartmentation and Structural Protection



# UAE Fire & Life Safety Code of Practice

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## 3.7. Maintenance & Management

**3.7.1.** Provide protection and maintain conditions during & after installation that ensure installed firestop systems are without damage or deterioration at the time of Substantial Completion. If, despite such protection, damage or deterioration occurs, damaged/deteriorated systems shall be removed and replaced with new ones.

# UAE Fire & Life Safety Code of Practice

---

## 3.7. Maintenance & Management

**3.7.2.** The condition of installed firestop systems shall be visually inspected by the owner or owner's representative annually. Damaged, altered or breached firestop systems shall be properly repaired, restored or replaced to comply with applicable codes as per the guidelines of Civil Defense.

# M–Barrier Management Systems

---

- **Visual Building Survey/Inspection....**
  - **Does it look like the assembly?**
    - Annular Space
    - Visible Breaches, unless listing allows
    - Joint Width
    - Penetrating Item Types, Coverings
    - # Penetrating Items, Types
    - Penetrations in Joints & Not in System/Listing...
    - Much more...
  - **Competent Personnel**

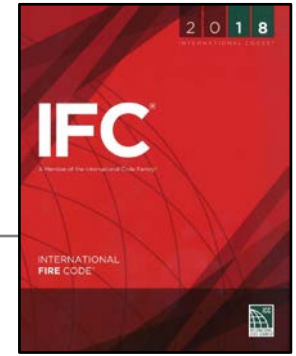
# Saudi Arabia Fire Code

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## **SECTION 107 MAINTENANCE**

**107.1 Maintenance of safeguards.** Where any device, equipment, system, condition, arrangement, level of protection, or any other feature is required for compliance with the provisions of this code, or otherwise installed, such device, equipment, system, condition, arrangement, level of protection, or other feature shall thereafter be continuously maintained in accordance with this code and applicable referenced standards.

# 2018 International Fire Code Maintenance



## SECTION 701 GENERAL

- **701.6 Owner's responsibility.** The **owner shall maintain an inventory** of all required fire-resistance-rated construction, construction installed to resist the passage of smoke and the construction included in Sections 703 through 707. **Such construction shall be visually inspected by the owner annually and properly repaired, restored or replaced where damaged, altered, breached or penetrated.**
- **FCIA Initiative with Koffel Assoc. – 'Inventory'...**

FCIA Added Emphasis

# M–Barrier Management System for Building Owners

---

- Life Safety **Drawings**
- Tested and Listed **Systems** (Listings), if not incorporated in the ....
- Manufacturers **Installation, Maintenance and Repair Instructions**
- Manufacturers **Product Data Sheets**
- **Safety Data Sheets**, where applicable.

# M–Barrier Management System for Building Owners

---

- Build an Action oriented **‘visual inspection’**, survey schedule.
- **Assign someone** – a fire-resistance/smoke resistant **champion** - to manage, and be responsible that inspections, repairs and recordkeeping take place on a timely basis.
- **Train** the inspection and repair staff.
- **FREE Barrier Management Symposium online is a start. Check it out at [www.FCIA.org](http://www.FCIA.org)**



# **M–Barrier Management System for Building Owners**

---

- **Keep easily retrievable records of ‘inventory’, inspections and repairs for AHJ’s**
  - **Paper**
  - **Electronic**
- **Repeat the process, for the life of the building.**

# **M–Barrier Management System for Building Owners**

---

- **Keep easily retrievable records of ‘inventory’, inspections and repairs for AHJ’s**
  - **Paper**
  - **Electronic**
- **Repeat the process, for the life of the building.**

# M-Barrier Management Systems

---

- **Visual Building Survey/Inspection....**
  - Tested and Listed Systems (Listings)
  - Manufacturers installation instructions

# 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 Sizes
- Joint / Gap Sizes
- Backing Materials
- Fill Material(s)

**= *Rated Firestop System***



STI Graphic

C-AJ-8XXXX???  
See Tag/Label  
Identification  
System



Affinity Firestop Photo

C-AJ-???



Affinity Firestop Photo

C-AJ-5209



Affinity Firestop Photo

C-AJ-8XXX?



Affinity Firestop Photo



W-L-2XXX???  
NOPE!!



Affinity Firestop Photo

W-L-2XXX  
Wallboard  
Patch??

NO!!



Affinity Firestop Photo

Good Luck!



Affinity Firestop Photo

# Firestop & Inspection & Survey

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Heckler Photo

# Firestop & Inspection & Survey

---



# Firestop & Inspection & Survey



# Firestop & Inspection & Survey

---



Heckler Photo

# Firestop Repairs

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- Repairs
  - Instruction requirements by manufacturer
  - Listed systems
  - Patching
    - Systems.....
    - Adhesion
    - Movement
    - T, L, W Ratings
    - ***As recommended by MFR***

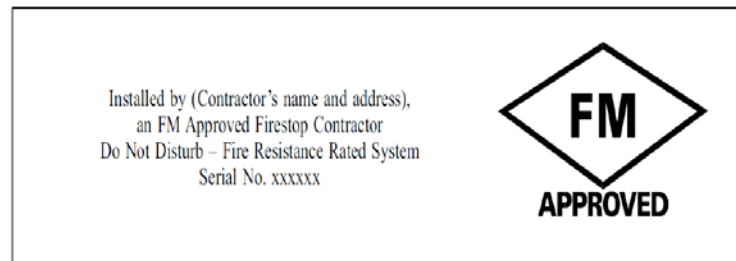


Affinity Firestop Photo



# Repairs Simplified with Labels...

- Identification Systems (Labels)
  - Firestop Contractor Installed
  - Speeds System Evaluation



# **M–Barrier Management Systems**

## **Building Owner’s Policy Topics**

---

- **Create a Budget to Meet Code Requirements**
- **Inventory – What Info?**
  - Life Safety Drawings
  - Manufacturers Instructions
  - Tested and Listed Systems (Listings)
- **Implement Fire Resistance Management**
  - In House Policy
  - Outside Contractor Policy
- **Monitor Process**
- **Annual Visual Inspection & Keep Records**
- **Show Fire Marshal....Insurance Company**

# Questions??



# Thanks for Attending!!!

Firestop Contractors International Association  
Hillside, IL – +1-708-202-1108 – office  
Bill@FCIA.org – Info@FCIA.org