Firestopping DIIM

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Past President of Firestop Contractors International Association

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www.fcia.org

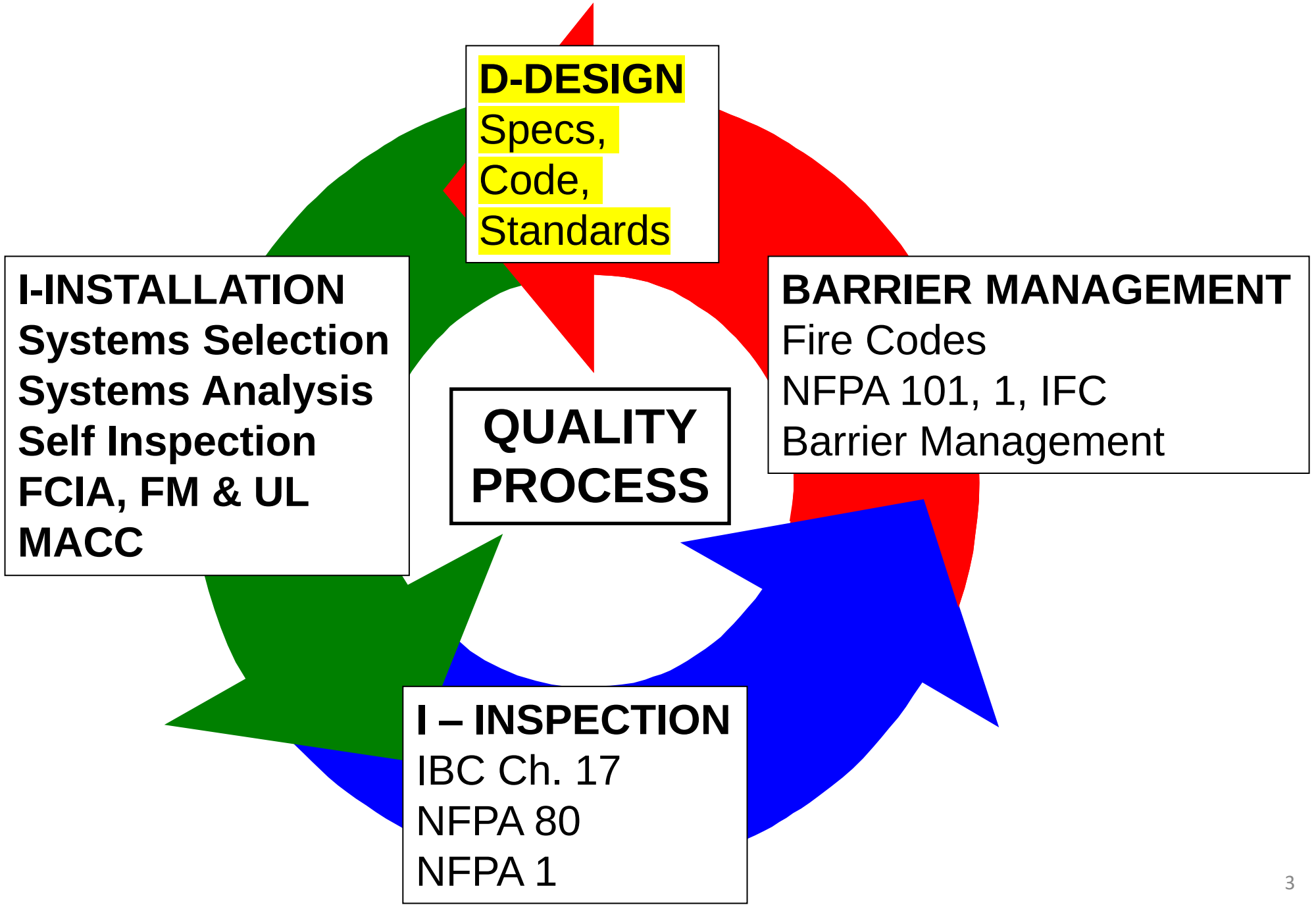
www.performance-firestop.com

FCIA
Firestop Contractors International Association

PERFORMANCE FIRESTOP

“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*** –
    - UL/ULC Qualified Contractors, FM 4991 Approved Contractor
  - Properly ***Inspected*** –
    - ASTM E2174 / E2393, by IAS AC 291 Agencies, UL, IFC, FM Exams
  - ***Protection Maintained*** – Annually – by Qualified Contractor


D-DESIGN
Specs,
Code,
Standards
I-INSTALLATION
Systems Selection
Systems Analysis
Self Inspection
FCIA, FM & UL
MACC
QUALITY
PROCESS
BARRIER MANAGEMENT
Fire Codes
NFPA 101, 1, IFC
Barrier Management
I – INSPECTION
IBC Ch. 17
NFPA 80
NFPA 1

Fire-Resistance-Rated Construction

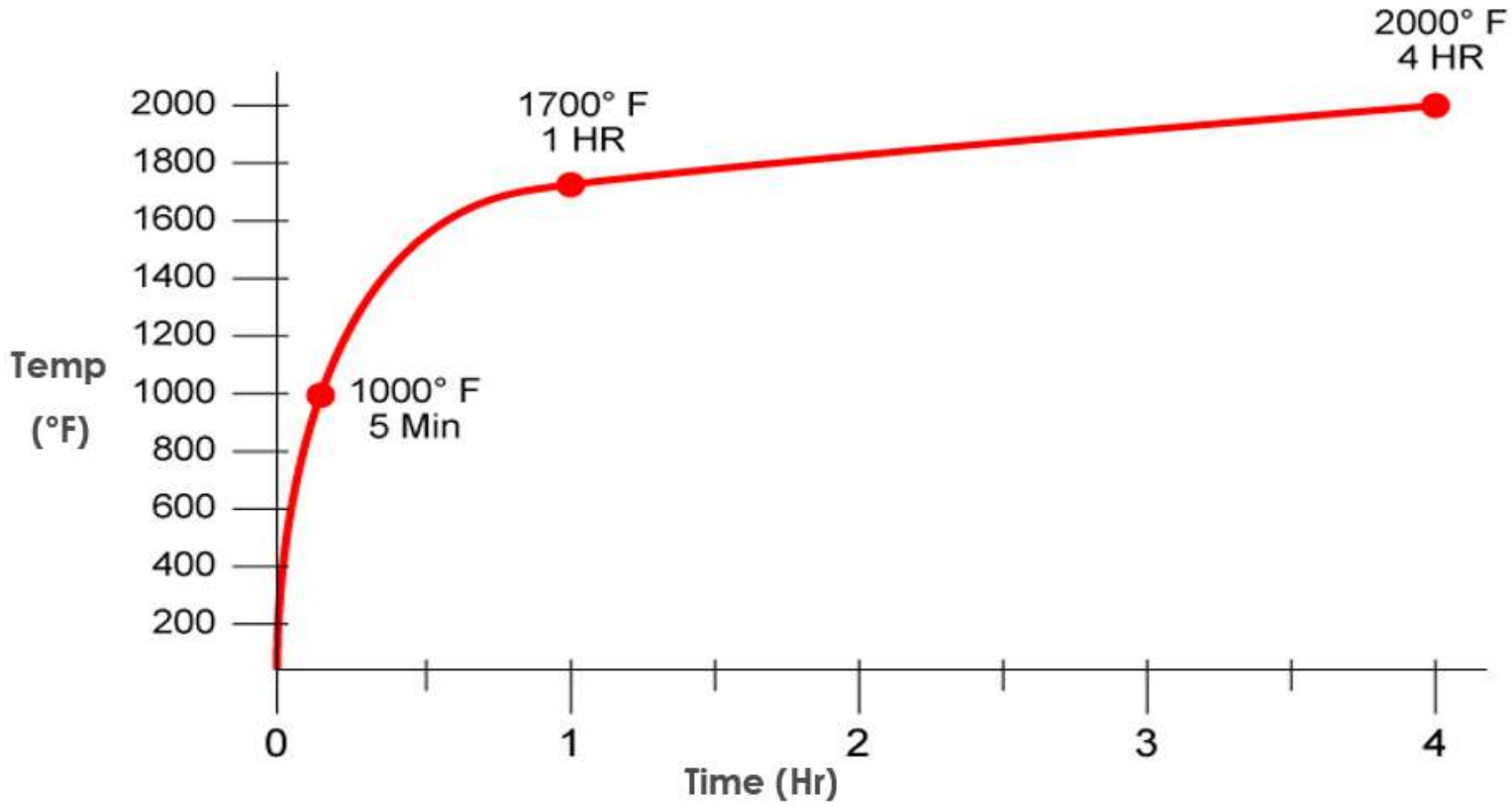
Establishing
Fire-Resistance Ratings

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

UL Image

Standards

- US
  - ASTM E119
  - UL 263



Columns

- Sample size – Minimum 9 ft
- Tested unloaded

Conditions of Acceptance

- 1000ºF / 1200ºF

  OR

- Tested load bearing

Beams

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

UL Image

UL Image

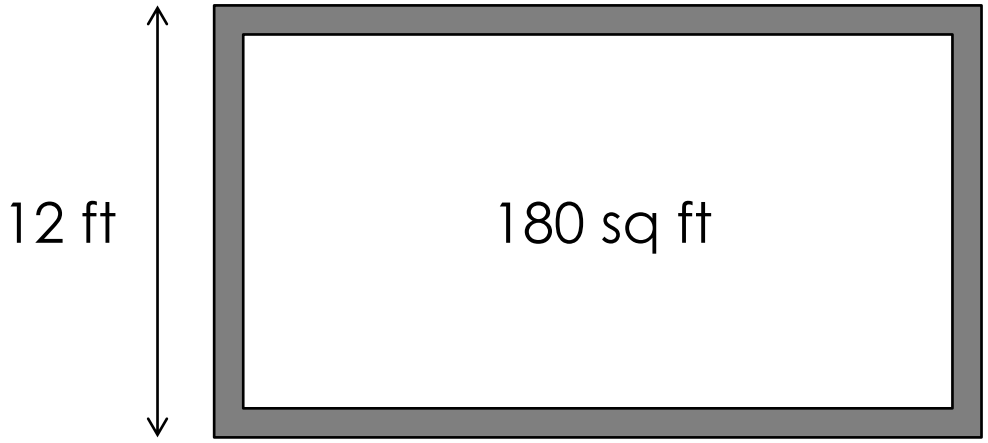
Conditions of Acceptance – Beams

- Support load
- 1100ºF / 1300ºF

UL Image

Floor/Ceiling or Roof/Ceilings

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



Conditions of Acceptance
Floor/Ceilings or Roof/Ceilings

- Support load
- Flame passage
- 250ºF / 325ºF
- Support temperatures

Building & Fire Code Requirements

- Fire Smoke Compartments -
  - ***Exterior Walls***
  - ***Fire Walls***
  - ***Fire Compartment***
  - ***Fire Barriers***
  - ***Fire Partitions (Not in NFPA)***
  - ***Smoke Barriers***
  - ***Smoke Partitions***
  - ***Archaic Assemblies***

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***….

Existing Buildings

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

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
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

Conditions of Acceptance
F Rating - MANDATORY

- Passage of Flame
- Hose Stream

Conditions of Acceptance
T Rating MANDATORY

- Passage of Flame
- 325ºF (180ºC) Temperature Rise
- Hose Stream

L Rating (Optional) – 1479 ONLY

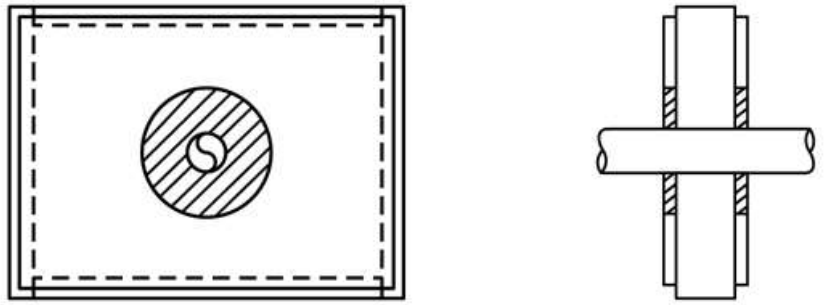
- Air Leakage Rate at Ambient Temperature
- Air Leakage Rate at 400ºF (204ºC)

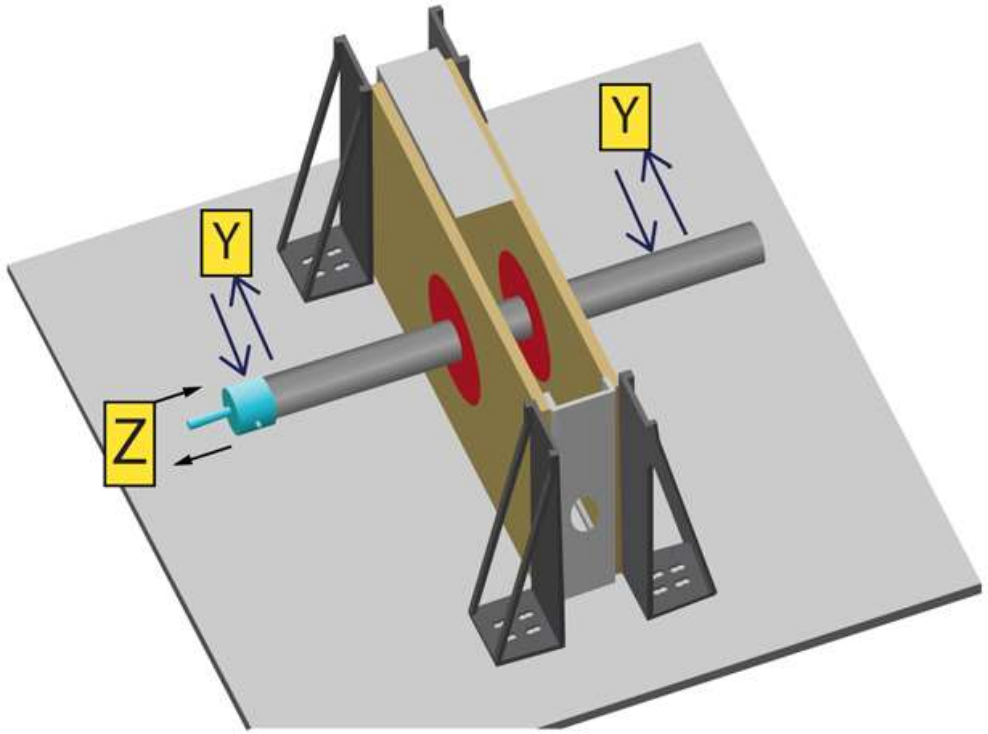
W Rating (Optional) 1479 ONLY

- Optional program, applicable to incidental water
- 3 Ft. WC (0.91 M WC) Pressure Head / 72 Hr Exposure
- Firestop subjected to water exposure, followed by standard fire and hose stream tests
- Firestop systems assigned a W Rating

M Rating (Optional) ASTM E3037

- Applicable to movement of penetrating item/Assembly
- Penetrating item move perpendicular and/or in plane of barrier - ASTM E3037
- After movement, fire and hose stream test
- Firestop systems - M Rating
  - Rating within plane based on percentage of annular space
  - Rating perpendicular to barrier based on dimension

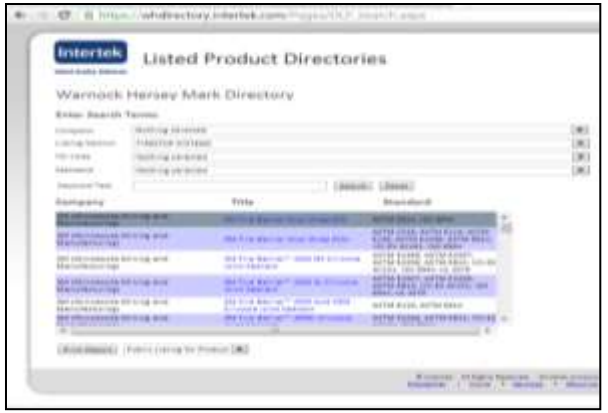




Barrier Continuity
Products become SYSTEMS

- **Fire Rated Systems Directories –**
  - **FM Approvals**
  - **Intertek**
  - **UL 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

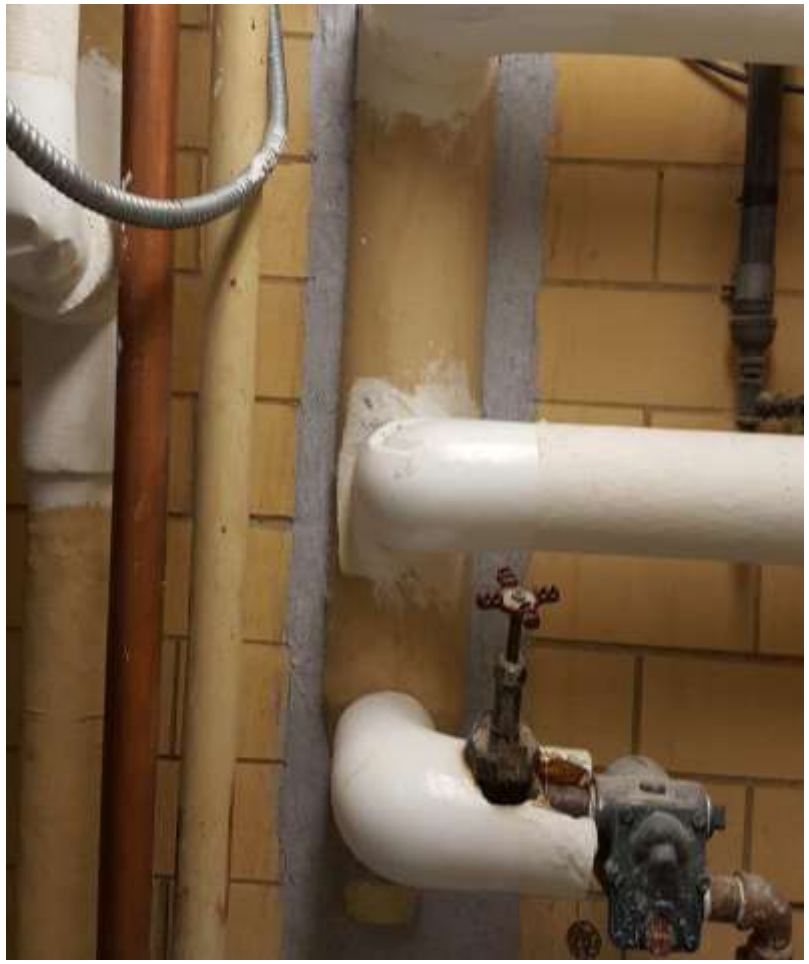
C. Zussman – Pepper Photo

Engineering Judgments/EFRRA

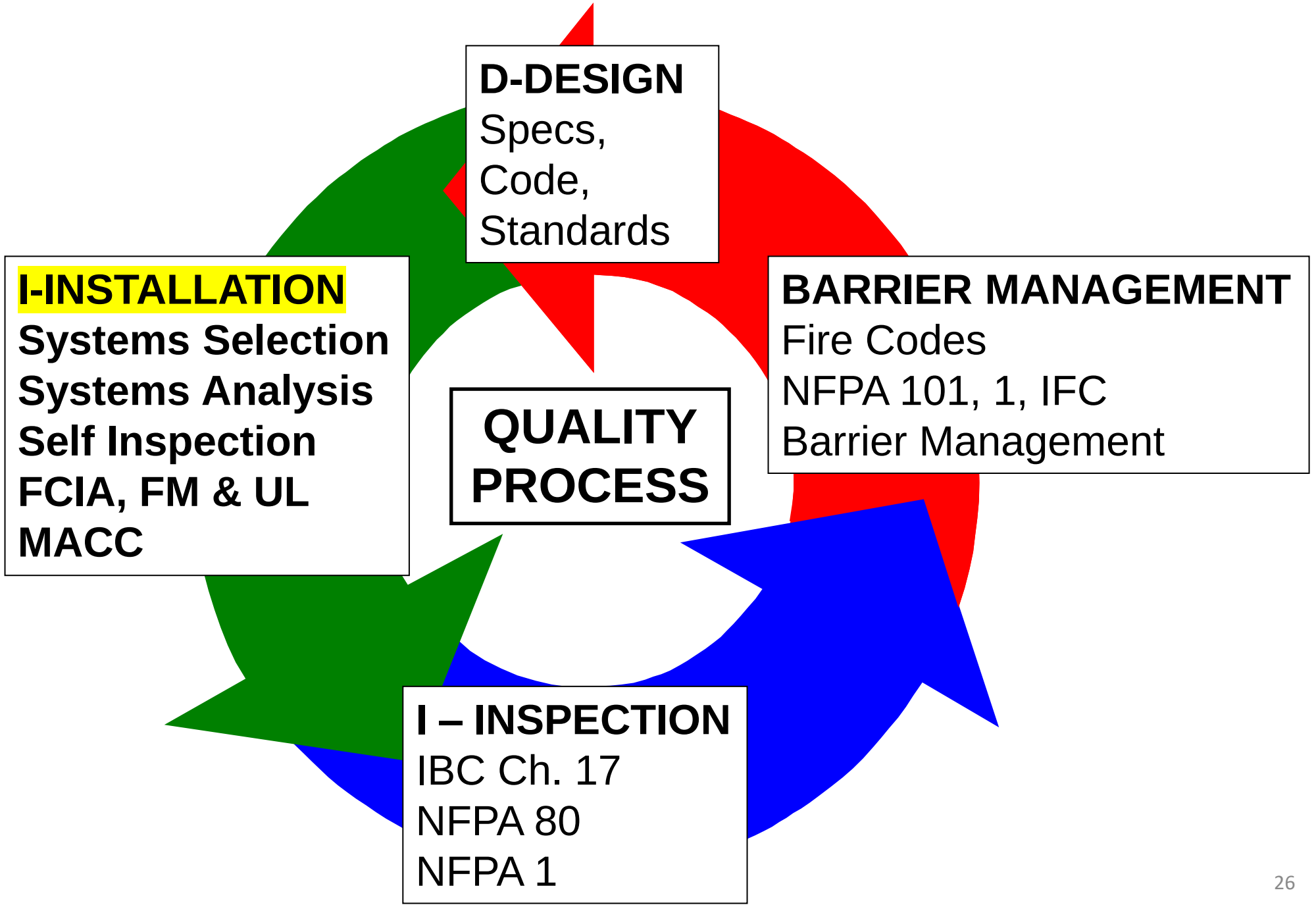
IFC EJ Guidelines for the Evaluation …

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



Engineering Judgments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Fire Codes
NFPA 101, 1, IFC
Barrier Management
I – INSPECTION
IBC Ch. 17
NFPA 80
NFPA 1

Firestopping for Continuity – Firestop Products

- Sealants
  - Silicone, Acryic/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

AstroFlame, Fischer, Promat, STI, 3M, AD, HILTI, Nelson Photos

How do Contractors Select/Analyze Systems?

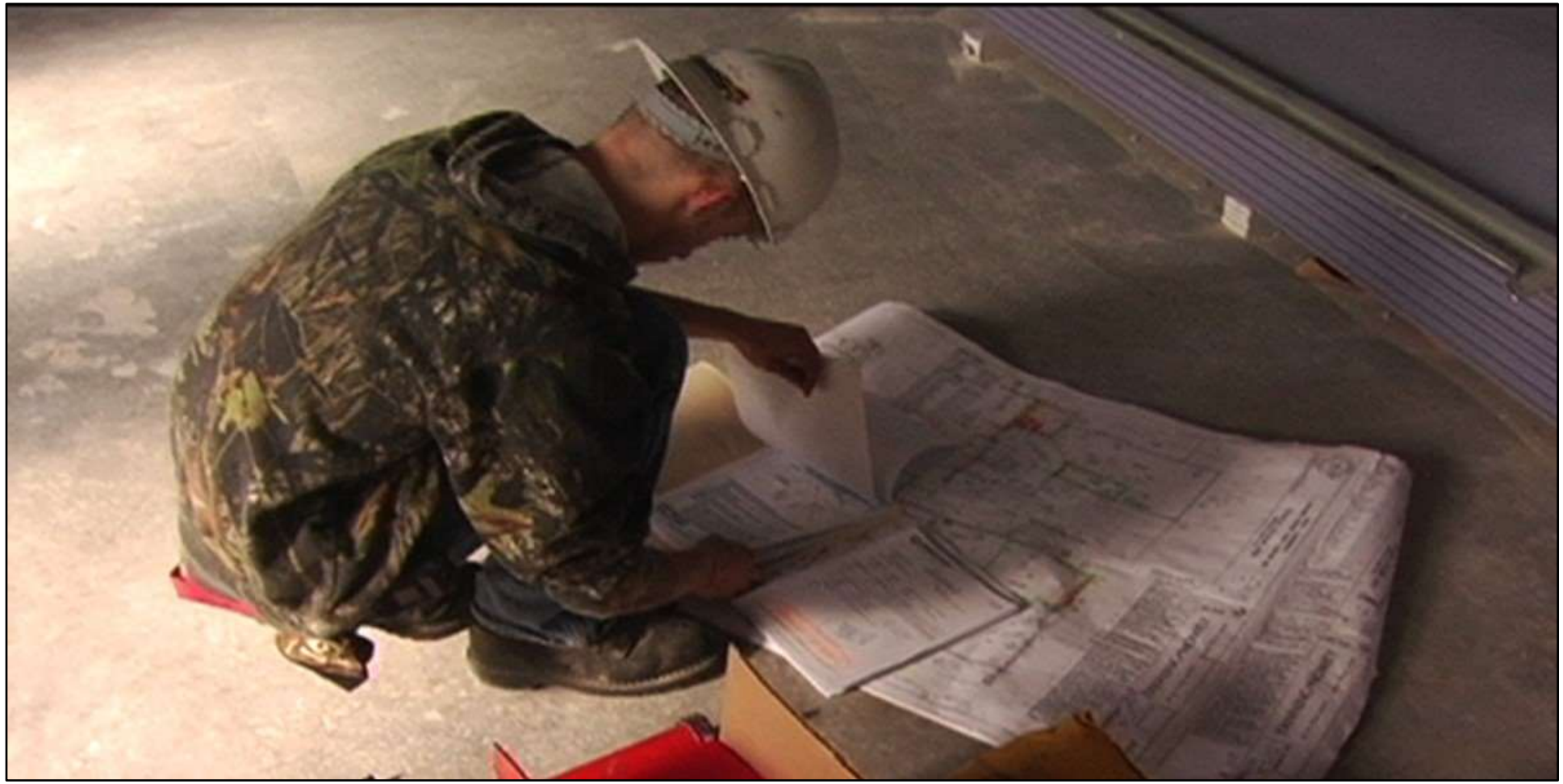
- Wall or Floor Construction Type, Rating
- Wall or Floor Thickness
- Penetrating Item, Coverings
- Size, Type, Thickness
- Annular Space, Joint, Breach Sizes
- Packing/Damming/Backing Materials
- Fill Material(s)

= Rated Firestop System

Manufacturers Instructions, Tested and Listed Designs

STI Graphic

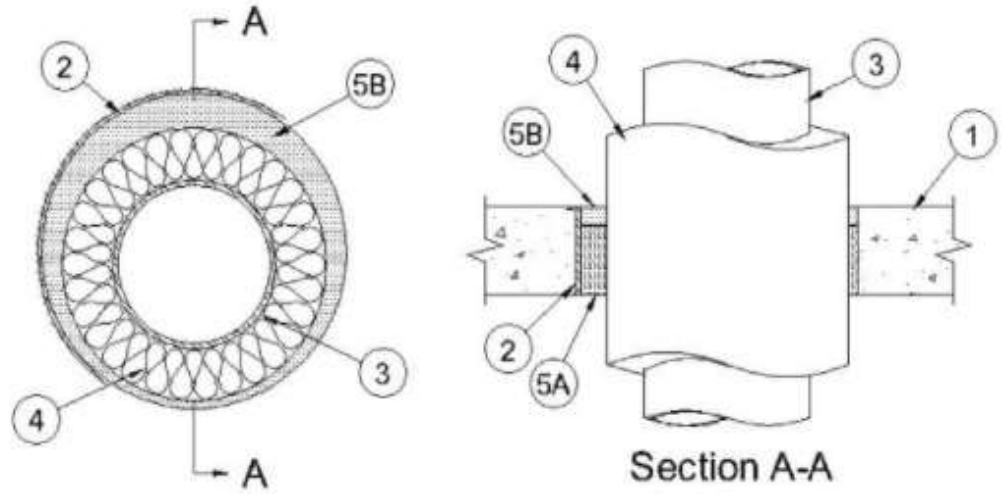
Barrier Continuity
I – Installation – Listed Systems



Systems & Materials….

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^3) 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).

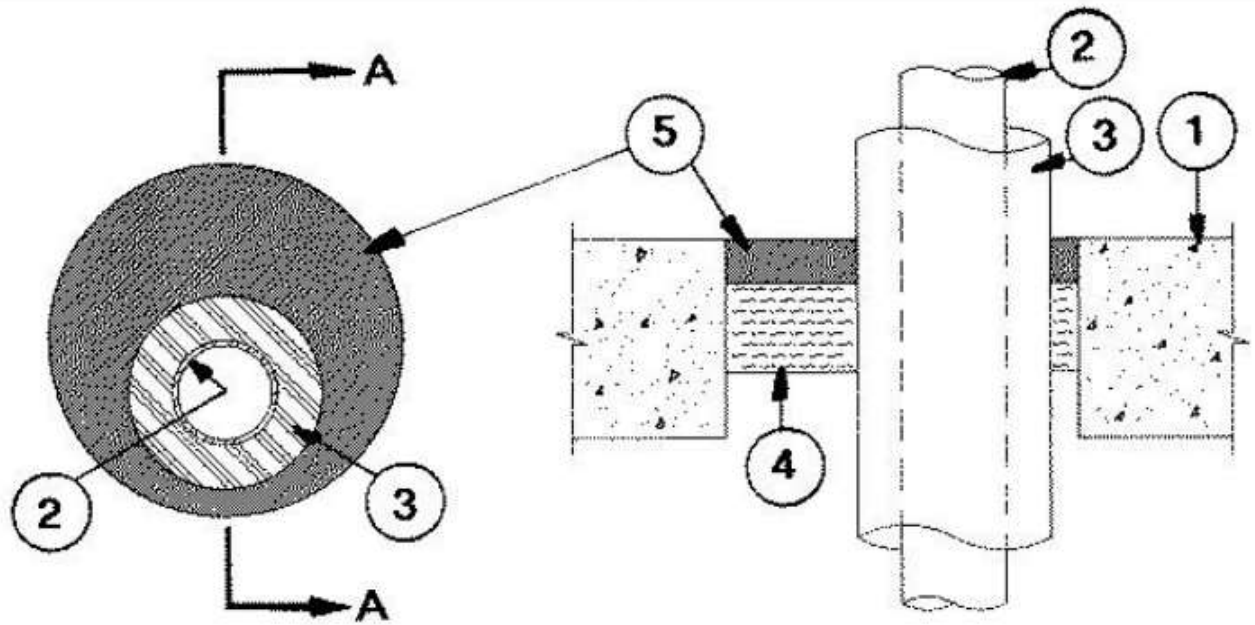
See **Pipe and Equipment Covering - Materials** - (BRGU) category in the Building Materials Directory for names of manufacturers. Any pipe covering material meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a smoke Developed Index of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

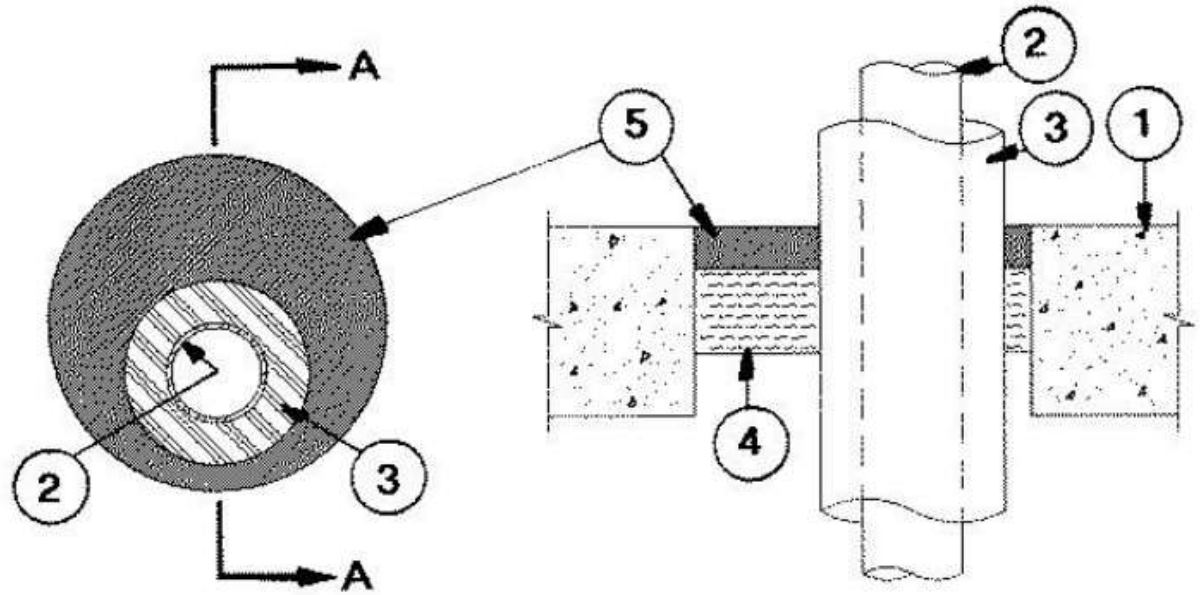
System No. C-AJ-5047

January 13, 2015

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Rating — 2 Hr	F Rating — 2 Hr
T Rating — 2 Hr	FT Rating — 2 Hr
L Rating At Ambient — 4 CFM/sq ft	FH Rating — 2 Hr
L Rating At 400 F — Less Than 1 CFM/sq ft	FTH Rating — 2 Hr
	L Rating At Ambient — 4 CFM/sq ft
	L Rating At 400 F — Less Than 1 CFM/sq ft



SECTION A-A



SECTION A-A

1. **Floor or Wall Assembly —** Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete floor. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 8 in. (203 mm).
See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Steel Pipe —** One 2 in. (51 mm) diam (or smaller) Schedule 40 (or heavier) steel pipe installed either concentrically or eccentrically within the firestop system. Pipe to be rigidly supported on both sides of floor or wall assembly.

3. **Pipe Covering* —** Nom 1 in. (25 mm) thick hollow cylindrical heavy density (min 3.5 pcf or 56 kg/m^3) 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 the product. The annular space shall be min 5/8 in. (16 mm) to max 3-1/8 in. (79 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.

4. **Packing Material —** Min 2 in. (51 mm) thickness of min 4.0 pcf (64 kg/m^3) mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or from both surfaces of wall as required to accommodate the required thickness of fill material.

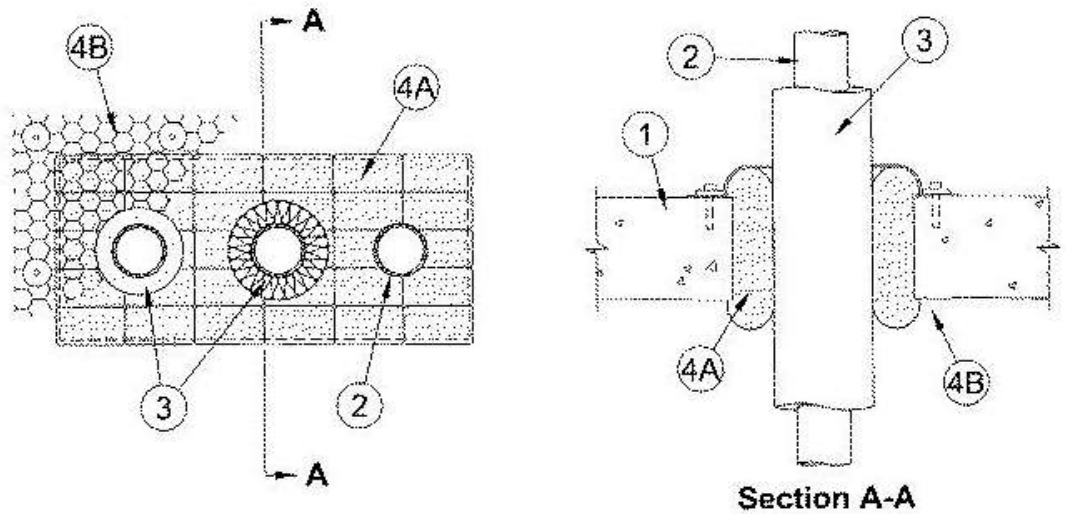
5. **Fill, Void or Cavity Material* — Sealant —** Min 1 in. (25 mm) thickness of fill material applied within the annulus, flush with top surface of floor or with both surfaces of wall.
HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-One Sealant or FS-ONE MAX Intumescent Sealant

System No. C-AJ-8052

January 02, 2001

F Rating — 2 Hr

T Rating — 0 Hr



Section A-A

1. **Floor or Wall Assembly —** Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks*.** Max area of opening is 144 sq. in. with max dimension of 18 in. See **Concrete Block** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Through-Penetrants —** One or more pipes, conduits or tubing may be installed within the opening. The space between pipes, conduits or tubing and the periphery of the opening shall be min 2 in. to max 4 in. The space between the pipes, conduits or tubing shall be a nom 2 in. Pipes, conduits or tubing to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:

A. **Steel Pipe —** Nom 2 in. diam (or smaller) Schedule 5 (or heavier) steel pipe.

B. **Iron Pipe —** Nom 2 in. diam (or smaller) cast or ductile iron pipe.

C. **Conduit —** Nom 2 in. diam (or smaller) steel electrical metallic tubing or nom 2 in. diam (or smaller) steel conduit.

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

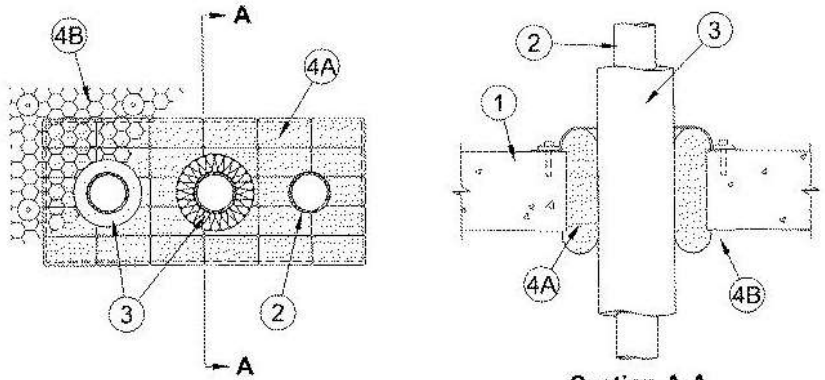
E. **Copper Pipe —** Nom 2 in. diam (or smaller) Regular (or heavier) copper pipe.

System No. C-AJ-8052

January 02, 2001

F Rating — 2 Hr

T Rating — 0 Hr



Section A-A

3. **Pipe Coverings* —** The following types of pipe coverings shall be used:

A. **Pipe and Equipment Covering Materials* —** Nom 2 in. thick hollow cylindrical heavy density (min 3.5 pcf) 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 the product.

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.

B. **Pipe Covering Materials* —** Nom 2 in. thick unfaced mineral fiber pipe insulation having a nom density of 3.5 pcf (or heavier) and sized to the outside diam of pipe or tube. Pipe insulation secured with min 8 AWG steel wire spaced max 12 in. OC.

INDUSTRIAL INSULATION GROUP L L C — High Temperature Pipe Insulation 1200, High Temperature Pipe Insulation BWT or High Temperature Pipe Insulation Thermaloc

C. **Sheathing Material* —** Used in conjunction with Item 3B. Foil-scrim-kraft or all service jacket material shall be wrapped around the outer circumference of the pipe insulation (Item 3B) with the kraft side exposed. Longitudinal and transverse joints sealed with metal fasteners or butt tape.

See **Sheathing Materials** (BVDV) category in the Building Materials Directory for names of manufacturers. Any sheathing 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.

D. **Tube Insulation — Plastics+ —** Nom 3/4 in. thick acrylonitrile butadiene/polyvinyl chloride (AB/PVC) flexible foam furnished in the form of tubing.

See **Plastics+** (QMFZ2) category in the Recognized Component Directory for names of manufacturers. Any Recognized Component tube insulation material meeting the above specifications and having a UL 94 Flammability Classification of 94-5VA may be used.

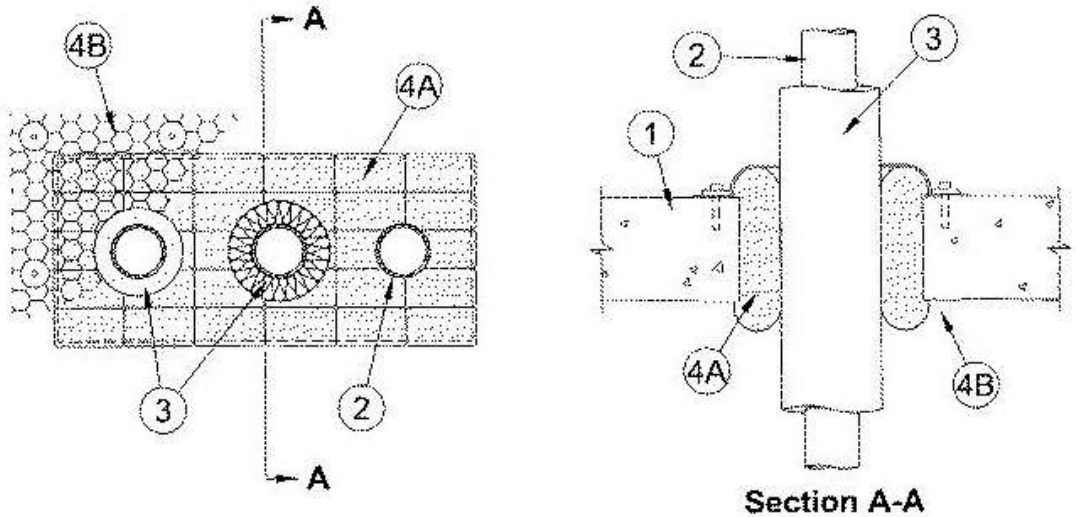
The pipe coverings may be installed on one or more of the through penetrants. The annular space between the insulated pipes or tubing and the periphery of the opening shall be a min of 2 in. to a max of 4 in. The annular space between the insulated through penetrant and the uninsulated pipes or tubing (Item 2) shall be a nom 2 in.

System No. C-AJ-8052

January 02, 2001

F Rating — 2 Hr

T Rating — 0 Hr



Section A-A

4. **Firestop System —** The firestop system shall consist of the following:

A. **Fill, Void or Cavity Materials* — Pillows —** Max 9 in. long by 6 in. wide by 3 in. thick plastic covered intumescent pillows. In floors, pillows to be installed lengthwise into the opening and positioned to extend a maximum of 2-1/2 in. below the bottom plane of the floor. In walls, pillows to be installed lengthwise through the opening and positioned to extend equally in both directions from the approximate center line of the wall. Pillows tightly packed into opening to fill the annular space between through penetrants and between through penetrants and the periphery of opening.

SPECIFIED TECHNOLOGIES INC — SpecSeal Firestop Pillows

B. **Wire Lath —** Nom 2 in. diamond shaped wire lath fabricated from min No. 20 AWG galv steel wire. Wire lath cut to fit the contour of the opening with a min 2 in. lap beyond the periphery of the opening to keep the pillows in place. Wire lath secured to top surface of floor or both surfaces of wall assembly with 1/4 in. diam by 1-1/4 in. long concrete screws in conjunction with 1/4 in by 1-1/4 in. diam steel fender washers, spaced 6 in. OC. The joints within the wire lath shall overlap a min of 2 in. and be secured together by means of No. 20 AWG steel wire spaced 6 in. OC.

*Bearing the UL Classification Marking

+ Bearing the UL Recognized Mark

FCIA Recommended Professional Practice Identification Systems

“Labelling”

-On-

Wall/Horizontal Assy. Penetrating Item Hanging

3 Firestop Installation Methods

- **Each Trade**
  - “He/She who makes the hole, fills hole”
- **Multiple Contracts**
  - Firestop Contractors, Trades
- **Single Source Firestop Contractor**
  - ***FM 4991 Approved Contractor***
  - ***UL Qualified Firestop Contractor***

Why Contractor Qualifications?

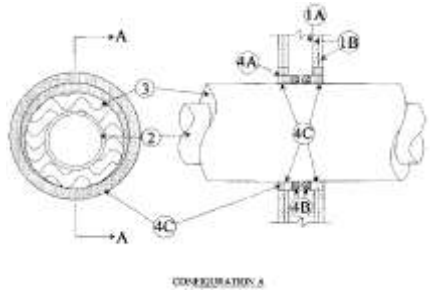
- **Firestopping Ratings - F, T, L, W, M**
- **Zero Tolerances?**
  - Annular Space Sizes, Gap Sizes
- **Product Properties**
  - Movement
  - Compatibility
  - Storage, Application, Curing Temps
- **SYSTEMS DOCUMENTATION**
- **INVENTORY OF FIRESTOP INSTALLATIONS**

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

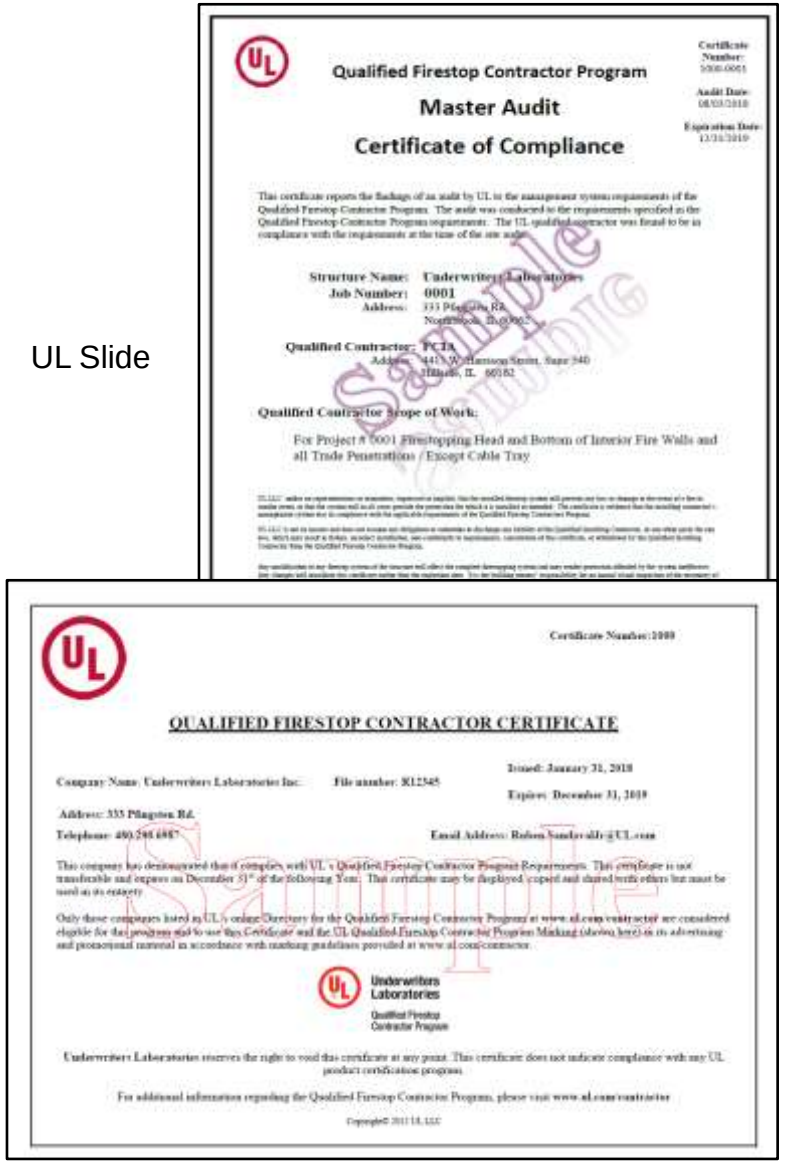
Master Audit Certificate of Compliance Program

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




FCIA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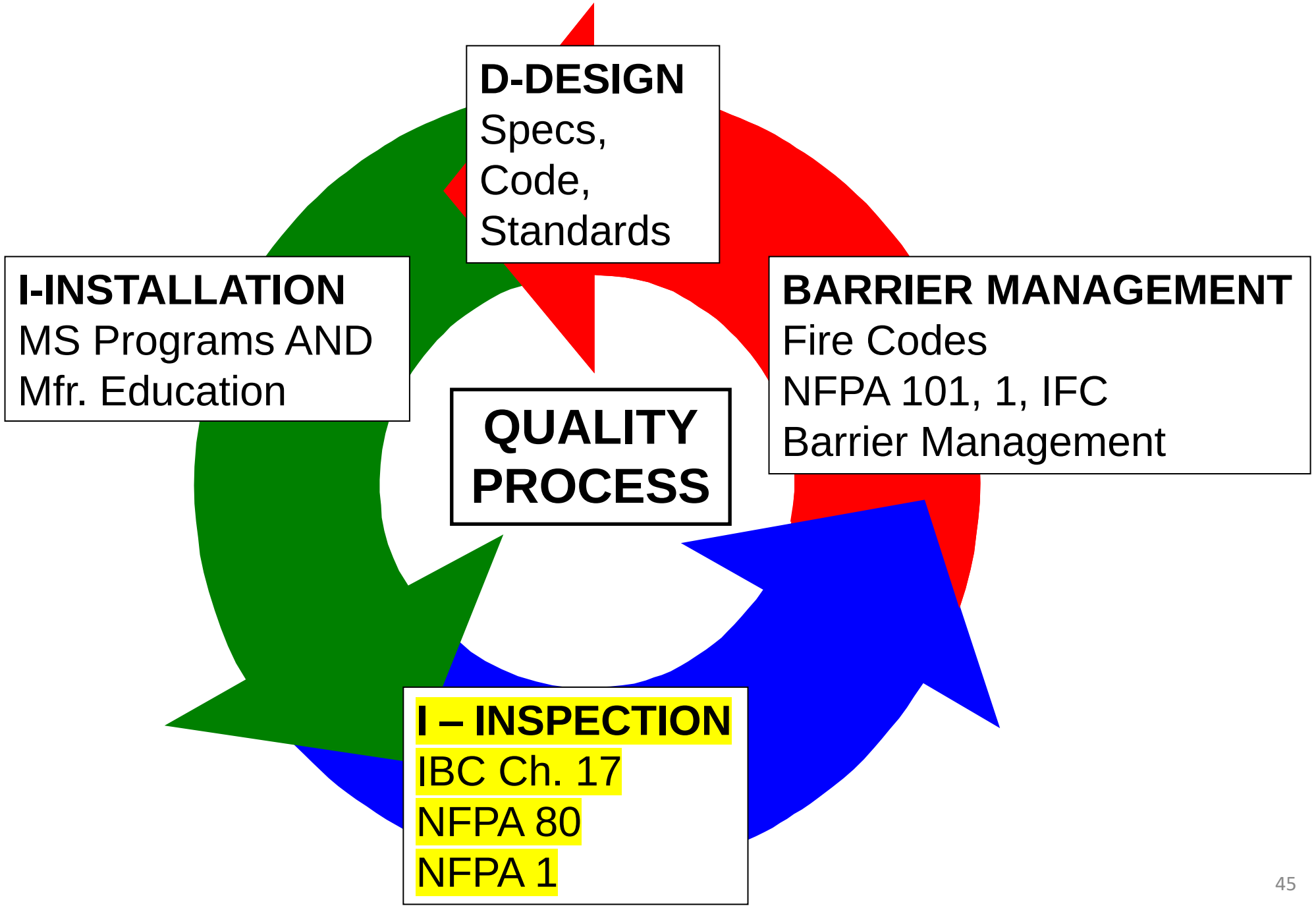
FCIA


D-DESIGN
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MS Programs AND
Mfr. Education
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Fire Codes
NFPA 101, 1, IFC
Barrier Management
QUALITY
PROCESS
I – INSPECTION
IBC Ch. 17
NFPA 80
NFPA 1

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

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***

INTERNATIONAL ACCREDITATION SERVICE®

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 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/EFRRA's

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

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Firestop Inspection Process ASTM E2174 – ASTM E2393

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

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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**

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Firestop Inspection Process ASTM E2174 – ASTM E2393

- Destructive Reviews (Testing)
  - Performed Post-Construction
  - **E2174** - Minimum 2%, no less than 1, each **type** per 930 m^2 (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**

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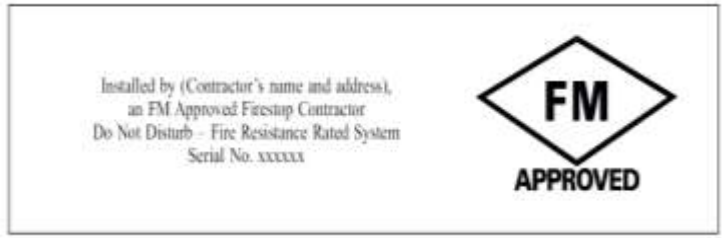
Firestop Special Inspection
ASTM E2174 – ASTM E2393

- 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

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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

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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

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Firestop Inspection Process ASTM E2174 – ASTM E2393

- **Equipment –**
  - Tapes
  - Tablets w/Systems
  - Borescope to explore areas that are concealed or partially
  - NOT MICROMETERS

Firestop Evaluation & Repairs

- **Installation Evaluations basis…**
  - Manufacturers Installation instructions
  - Acceptable methods to review installed systems
  - Listed SYSTEM requirements for installations
  - ***IFC Document on Sealant Thickness Measurement, Shrinkage***

Firestop Repairs

- Instruction requirements by manufacturer
- Listed systems
- Patch/Infilling
  - Adhesion to Old Sealant
  - **F, T, L, M, W Ratings**
  - ***As recommended by MFR***

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Firestop Inspection Forms & Variance Notices

- **Minimum one FS system for each type;**
- ***(By Type of System, By Contractor)***
- ASTM E2174 and ASTM E2393 require reports to be submitted to AA one day after review
- **IBC requires IMMEDIATE NOTICE**
- Numbered – Controlled
- Required – During/post construction methods

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

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Firestop Repairs

- Repairs & Patching
  - Manufacturer Repair Instructions
    - Tested & Listed System Design
    - Adhesion
    - Movement
    - Air Leakage
    - Water Resistance Ratings
  - ***As recommended by MFR***

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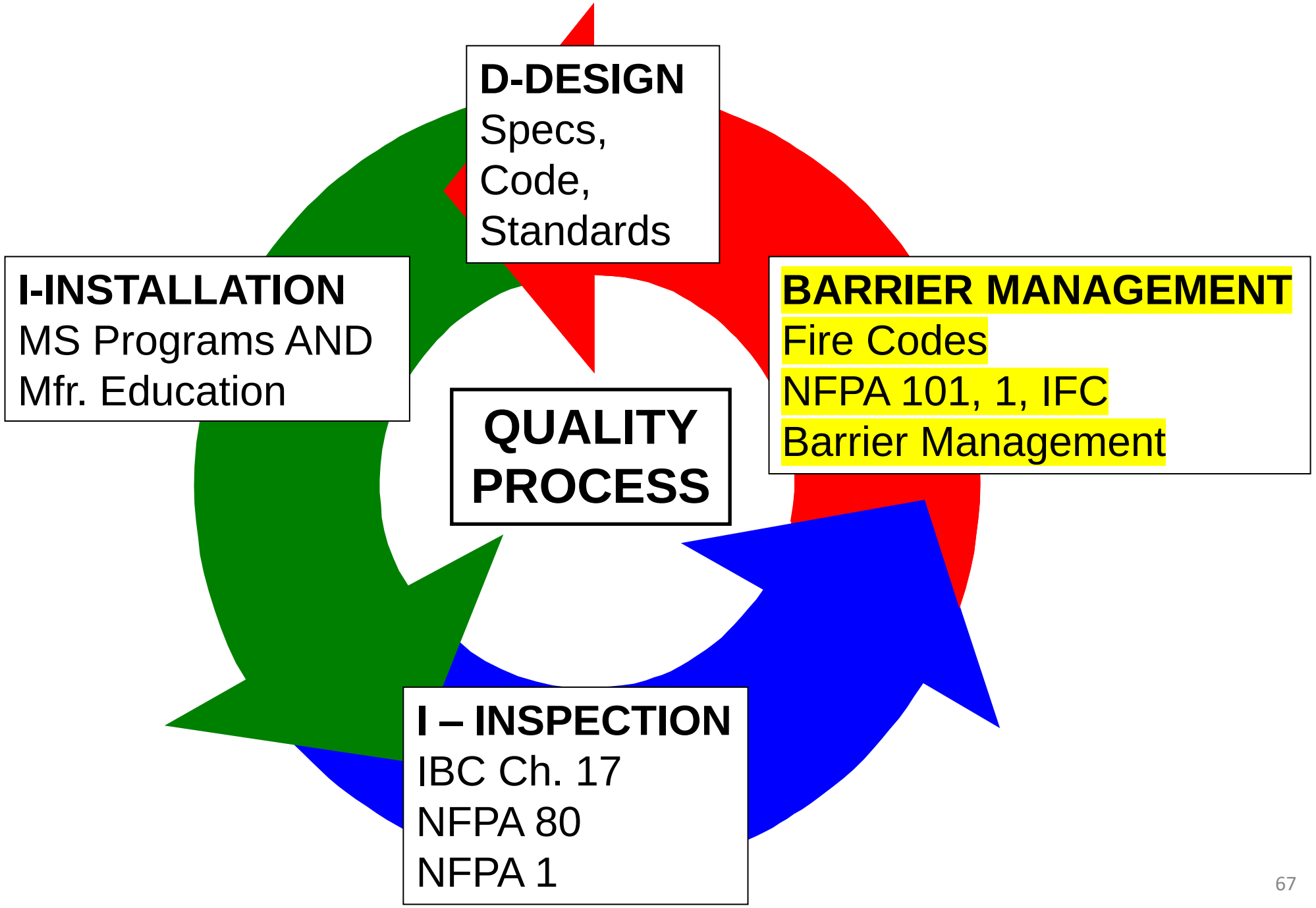
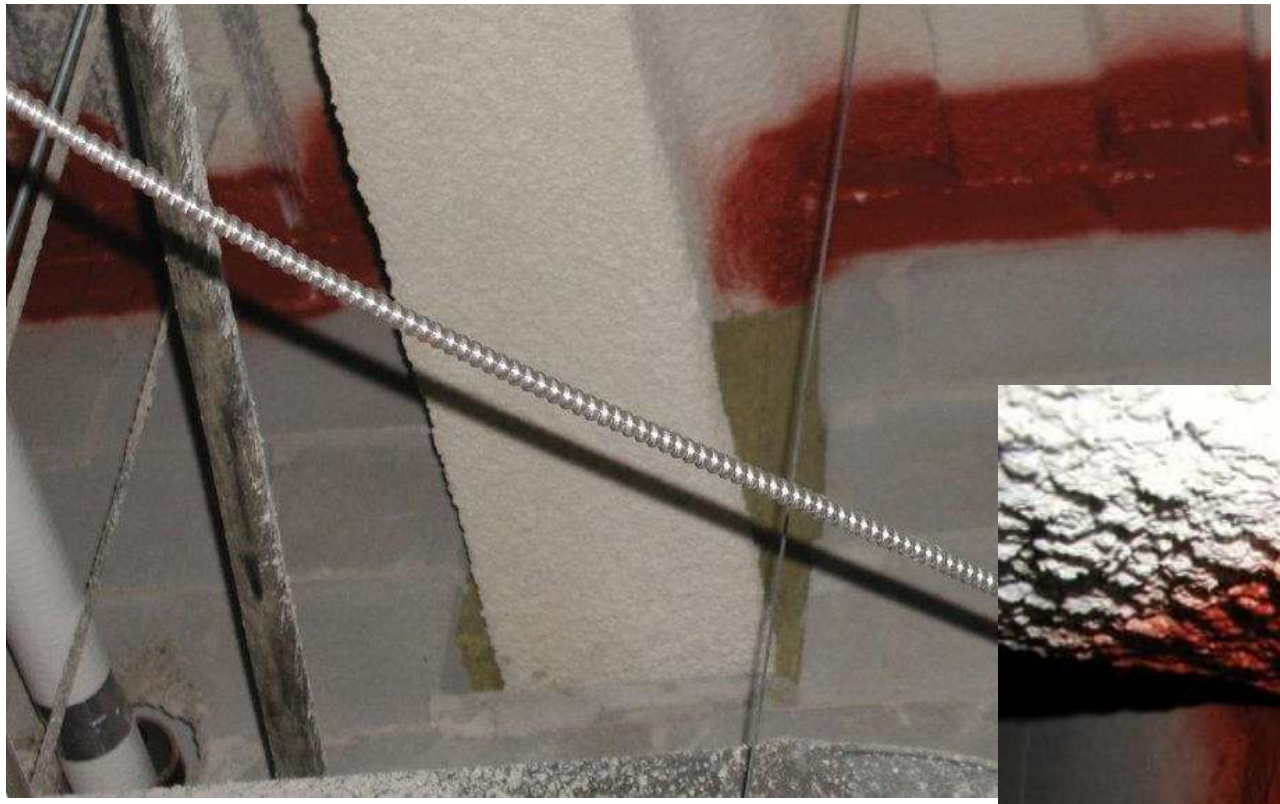

D-DESIGN
Specs,
Code,
Standards
I-INSTALLATION
MS Programs AND
Mfr. Education
BARRIER MANAGEMENT
Fire Codes
NFPA 101, 1, IFC
Barrier Management
QUALITY
PROCESS
I – INSPECTION
IBC Ch. 17
NFPA 80
NFPA 1

Existing Buildings? Did you know…

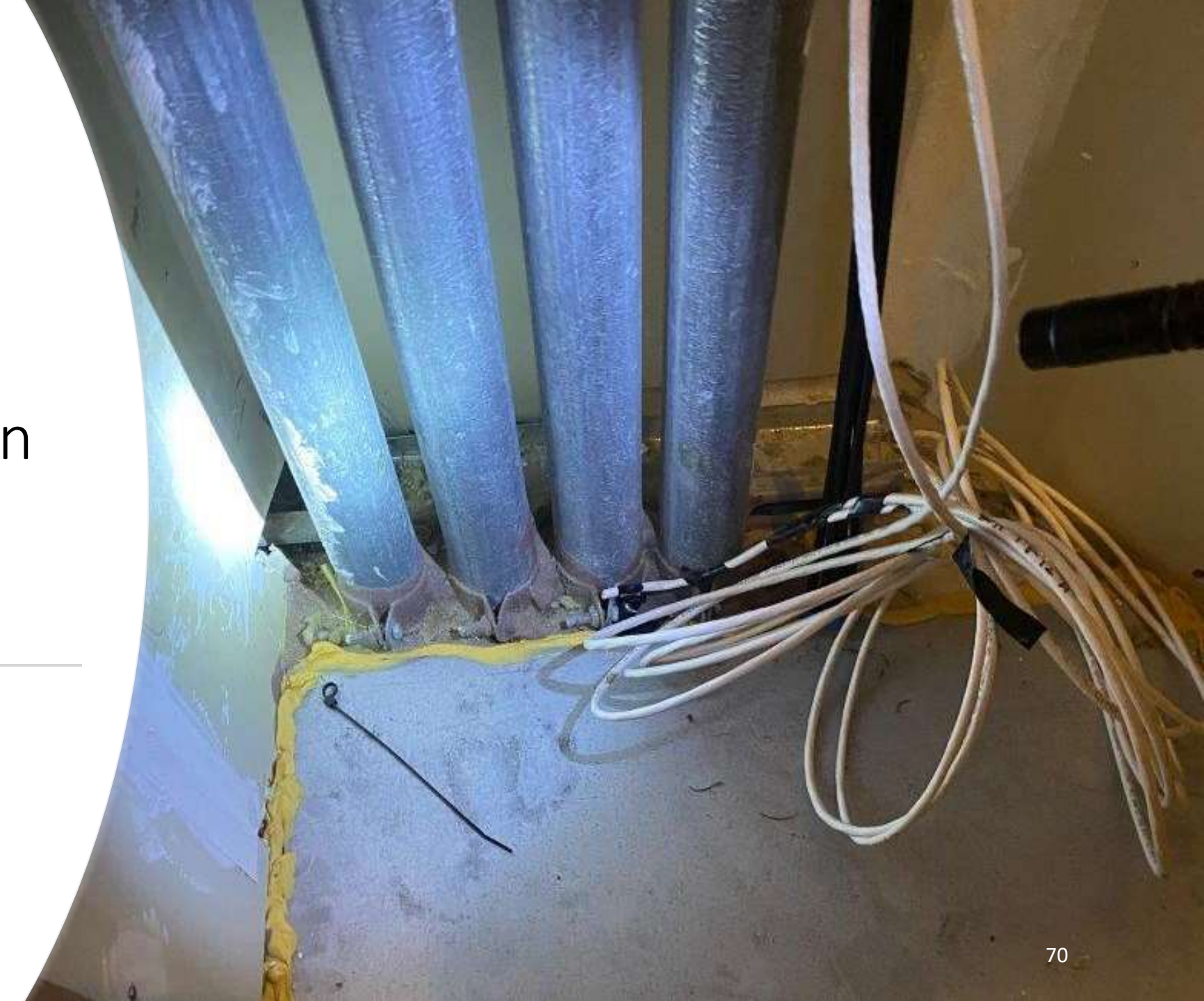
- **Fire, existing building codes have existed for decades**

- Fire Codes dictate maintaining protection of structural fire-protection and fire-resistance-rated compartmentation

Firestopping & Compartmentation
Do we have a Problem??



Firestopping & Compartmentation Do we have a Problem??



Firestopping & Compartmentation
Do we have a Problem??

Firestopping & Compartmentation
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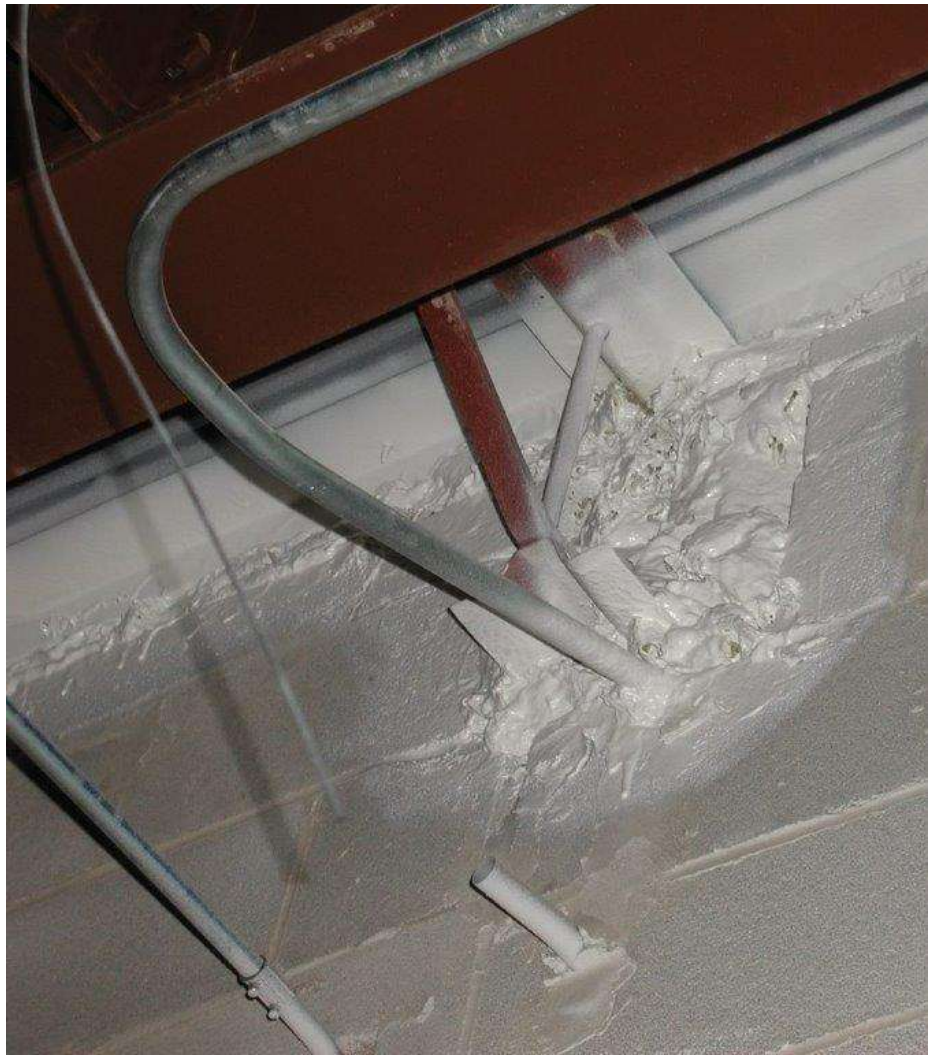


Firestopping & Compartmentation
Do we have a Problem??

Firestopping & Compartmentation
Do we have a Problem??

Firestopping & Compartmentation
Do we have a Problem??

Firestopping & Compartmentation
Do we have a Problem??

Fire Resistance Barrier SYSTEMS

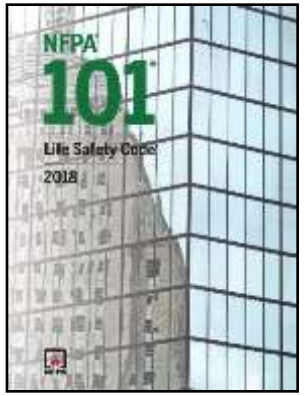
- **Products Become Systems Through….**
- **Test Standard References**
  - **Structural Elements & Assemblies** – ASTM E119, UL 263
  - **Fire & Smoke Barriers** – ASTM E119, UL 263
  - **Firestopping** – ASTM E814 / UL 1479, ULC-S115**,** UL 2079, ASTM E1966, E2307, E2837, E3037, **…**test method…"
  - **Fire/Smoke Dampers** – UL 555, UL 555S, UL 555C
  - **Swinging/Rolling Fire Doors** – UL 10B, 10C, NFPA 257
  - **Fire Rated Glazing** – UL 9, NFPA 252
- **SYSTEM Testing = Suitability statement for use of a product in a specific *system*/design application**

Facility Budget Line Items…

- Fire-Sprinklers, Pumps, etc…**YES**
- Fire-Detection & Alarms…**YES**
- Fire Separations / Barriers? **WHAT?**
  - Fire-Resistance Rated Walls/Floors
  - Penetrations & Joints
  - Fire Doors
  - Fire/Smoke Dampers
  - Fire-Rated Glazing
- In-House Staff?
- Barrier Services Contractor?

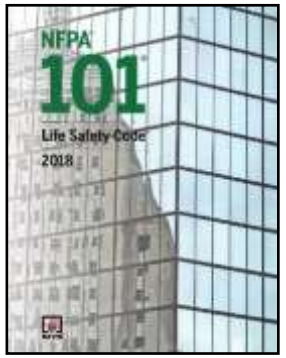
Fire Codes Require Maintenance

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



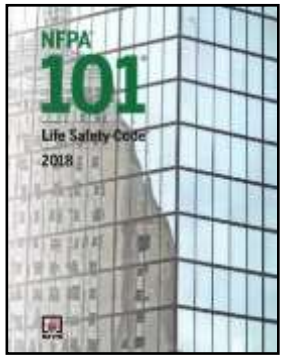
National Fire Protection Association
NFPA 101 – 2018

- **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 101 – 2018

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



National Fire Protection Association NFPA 1 – 2018

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

FCIA Added Emphasis

National Fire Protection Association NFPA 1 – 2018

- **12.3.3.2** Where required, **fire-rated gypsum wallboard** walls or ceilings that are damaged to the extent that through openings exist, the damaged gypsum wallboard shall be **replaced or returned to the required level of fire-resistance using a listed repair system or using materials and methods equivalent to the original construction**.

- **12.3.3.3** Where readily accessible, required fire-resistance-rated assemblies in high-rise buildings shall be visually inspected for integrity at least once every 3 years.

FCIA Added Emphasis

National Fire Protection Association NFPA 1 – 2018

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

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

- **701.2 Fire-resistance-rated construction.** The *fire-resistance rating* of the following *fire-resistance-rated* construction shall be maintained:
  1. Structural members
  2. *Exterior walls*
  3. *Fire walls, fire barriers, fire partitions*
  4. *Horizontal assemblies*
  5. Shaft enclosures

2018 International Fire Code Maintenance

SECTION 701
GENERAL

- **701.3 Smoke barriers.** The *fire-resistance rating* and smoke-resistant characteristics of smoke barriers shall be maintained.
- **701.4 Smoke partitions.** The smoke-resistant characteristics of smoke partitions shall be maintained.

2018 International Fire Code Maintenance

SECTION 701
GENERAL

- **701.5 Maintaining protection.** Materials, systems and devices used to repair or protect breaches and openings in fire-resistance-rated construction and construction installed to resist the passage of smoke shall be maintained in accordance with Sections 703 through 707.

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

2018 International Fire Code Maintenance

SECTION 703
PENETRATIONS

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

FCIA Added Emphasis

2018 International Fire Code Maintenance

SECTION 703
PENETRATIONS

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

- **FCIA Initiative…"Where the system design number is known"…**

FCIA Added Emphasis

2018 International Fire Code Maintenance

SECTION 704
JOINTS AND VOIDS

- **704.1 Maintaining protection.** Where required when the building was originally constructed, materials and systems used to protect joints and voids in the following locations shall be maintained. The materials and systems shall be securely attached to or bonded to the adjacent construction, without openings visible through the construction.

FCIA Added Emphasis

2018 International Fire Code Maintenance

SECTION 704
JOINTS AND VOIDS

- **704.1 Maintaining protection cont.**
  - Subparagraphs 1 through 7 detail the types of joints and voids required to be maintained. This list corresponds to joints and voids which are required to be protected by the 2018 IBC.
- Unprotected joints and voids do not need to be protected where such joints and voids were not required to be protected when the building was originally constructed.

FCIA Added Emphasis

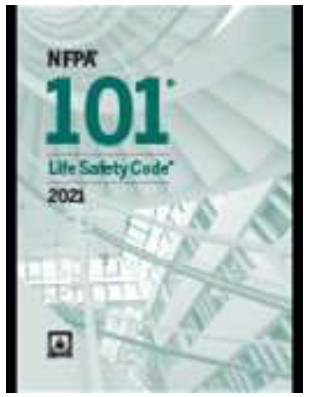
Existing Buildings? Educate

- **NFPA 1, NFPA 101, IFC – Decades in place.**

- **New IFC "maintaining protection" requirements**
  - Inventory of fire-resistance-rated assemblies?

- **What's inventory?**
  - Life Safety Drawings with Fire-Resistance Ratings
  - Tested and Listed Systems Designs
  - Manufacturers Instructions/Product Data Sheets

- **What's risk** –
  - Fire and Smoke Spread means life, property, continuity of operations losses



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

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

2018 International Fire Code Fire-Resistance Inventory Explained

- **Life Safety Drawings**
- Designs, Systems and Assemblies – **Listings**
- **Manufacturers Installation and Maintenance Instructions**
- How?
  - Paper & Files
  - Spreadsheets
  - Software

M–Barrier Management Systems

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

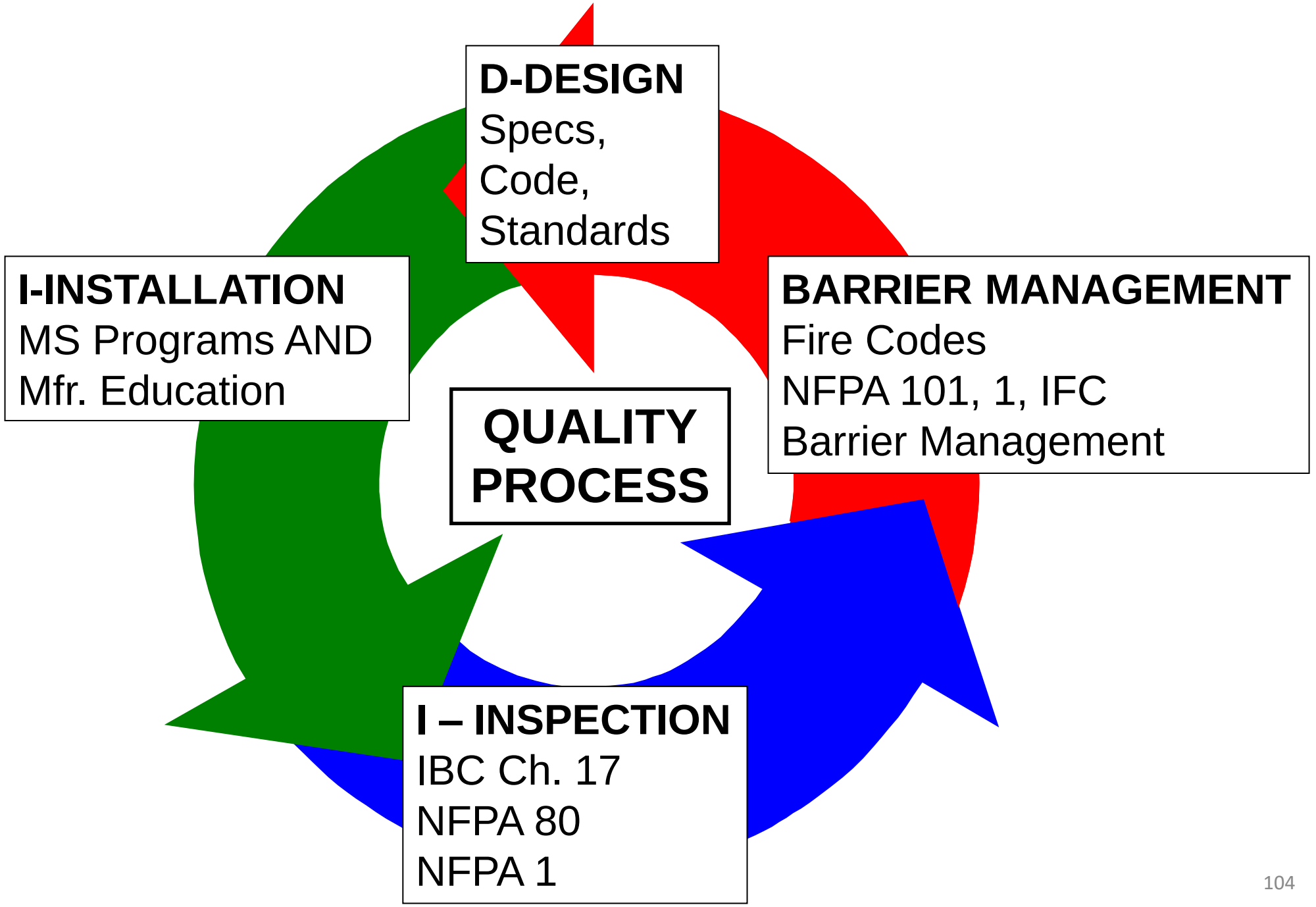
Firestop (& Other Fire-Resistance Repairs)

- Repairs
  - Instruction requirements by manufacturer
  - TESTED AND LISTED SYSTEMS
  - Patching
    - Systems….Ratings
    - Adhesion
    - Movement
    - T, L, W Ratings
    - ***As recommended by MFR, Liisting***

Affinity Firestop Photo

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**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I – INSPECTION
IBC Ch. 17
NFPA 80
NFPA 1

Firestopping DIIM

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PERFORMANCE FIRESTOP