

FCIA Webinar Series

Firestopping DIIIM for India

Where does it Fit?

Bill McHugh, FCIA Executive Director

Bill @ FCIA. org

10 February 2022



Firestop Contractors International Association

FCIA – Firestop Contractors International Association



- **Fire Exits??**
- **Housekeeping....Phones, Hands off Keyboard!**
- **Thanks to FCIA Members**
 - Firestop Contractors
 - Manufacturers, Consultants
 - Firestop Distributors, Reps, Friends
- **FREE PDF MOP/ Word Doc Spec - Specifiers @**
Architect/Engineering firms, Independent Specifiers, AHJ's with
Municipality Jurisdictions, More

FCIA – Firestop Contractors International Association

- **FREE Life Safety Digest**
- **UL/ULC, FM 4991 Contractor Programs,
IAS AC 291 Inspection Agency
Accreditation Program, Individual Knowledge**
- **ASTM Inspection Standards**
- **Tools @ FCIA.org** for Specifiers, AHJ's, Building Owners,
Firestop Contractors & Inspection Agencies
- **Watch FCIA.org for Webinar Announcements!**



FCIA Actions - 2022

- Conferences - HYBRID
- Webinars & Symposiums
- Worldwide Code Development & Standards Discussions
- Committee Action
- International Discussions
- ***NEW Education for Careers in Firestopping!!***
- ***FCIA's Firestop Certificate of Achievement – Check it out!***



Affinity Firestop Photo



GARDER HORS DE PORTEE DE
hygiénique. En cas de contact acci
l'aide de diluant de peinture sur les
minérale ou végétale pour libérer les
KEEP OUT OF REACH OF CHILDREN
case of accidental contact with
floors. Use ice, water, and soap to
surfaces. Évitez de laisser les animaux de

Affinity Firestop Photo



Affinity Firestop Photo





Affinity Firestop Photo



Affinity Firestop Photo



Affinity Firestop Photo



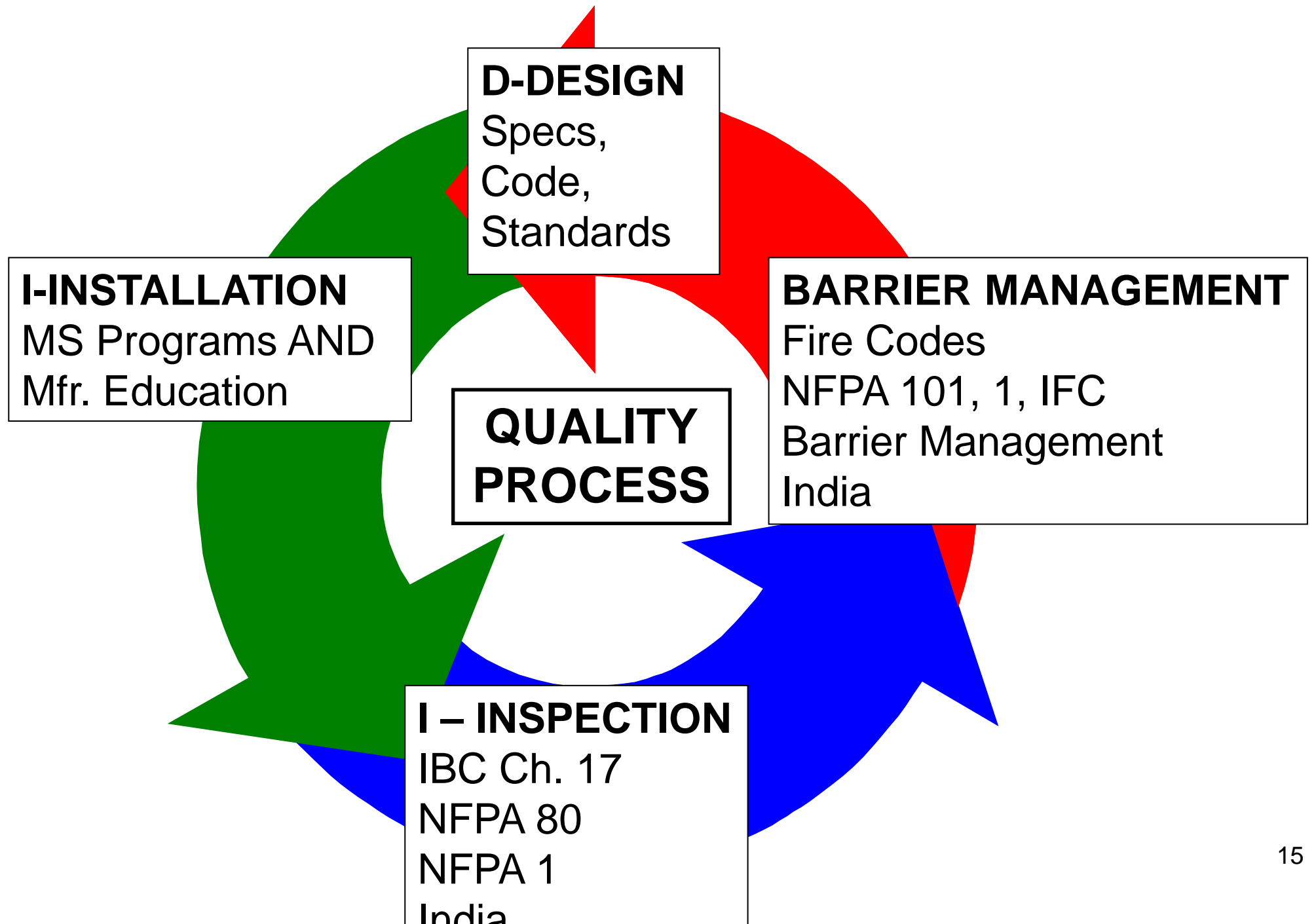
Affinity Firestop Photo



Affinity Firestop Photo



Affinity Firestop Photo



“DIIM” – Design, Install, Inspect, Maintain

- Fire Resistance & Smoke Resistant Firestopping
 - Properly *Designed* Building Codes
 - FCIA - 07-84-00 – Specification – *CCS, RSW*
 - *Tested and Listed Systems* –
 - ASTM E814, UL 1479, ASTM E1966, UL 2079, E2307, E2837, E3037
 - *India, ISO 10295-1 Part 1; Penetration Seals; 10295-2 Linear Joint (gap) Seals'*
 - **ASTM Movement, (M), UL Smoke (L), UL 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* – Annual Visual Inspection – FCIA Members

Barrier Continuity SYSTEMS

- **Products Become Systems – Test Standards**
 - **Fire & Smoke Barriers – Fire Separations**
 - ASTM E119, UL 263 – **ISO 834 –XX**
 - **Firestopping –**
 - UL 1479, ASTM E814, UL 2079, E1966, E2307, E2837, E3037...**ISO 10295**
 - **Swinging/Rolling Fire Doors –** UL 10B & UL 10C, NFPA 252, **ISO 3008-1**
 - **Fire Rated Glazing –** UL 9, NFPA 257, UL 263, ASTM E119 -
 - **Fire/Smoke Dampers –** UL 555, UL 555S, UL 555C, **ISO 21925-1**
- **SYSTEM Testing = Suitability Statement**



ProFirestop Photo



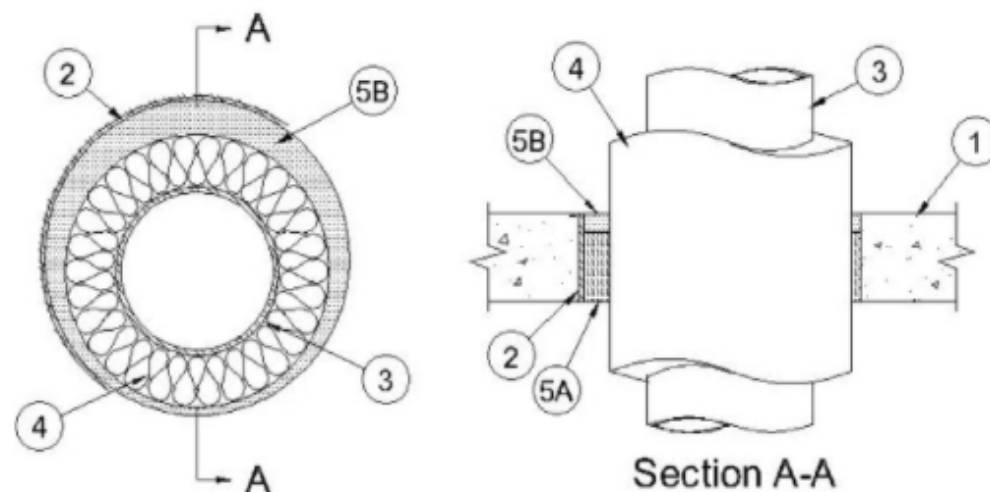
C. Zussman – Pepper
Photo



**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.

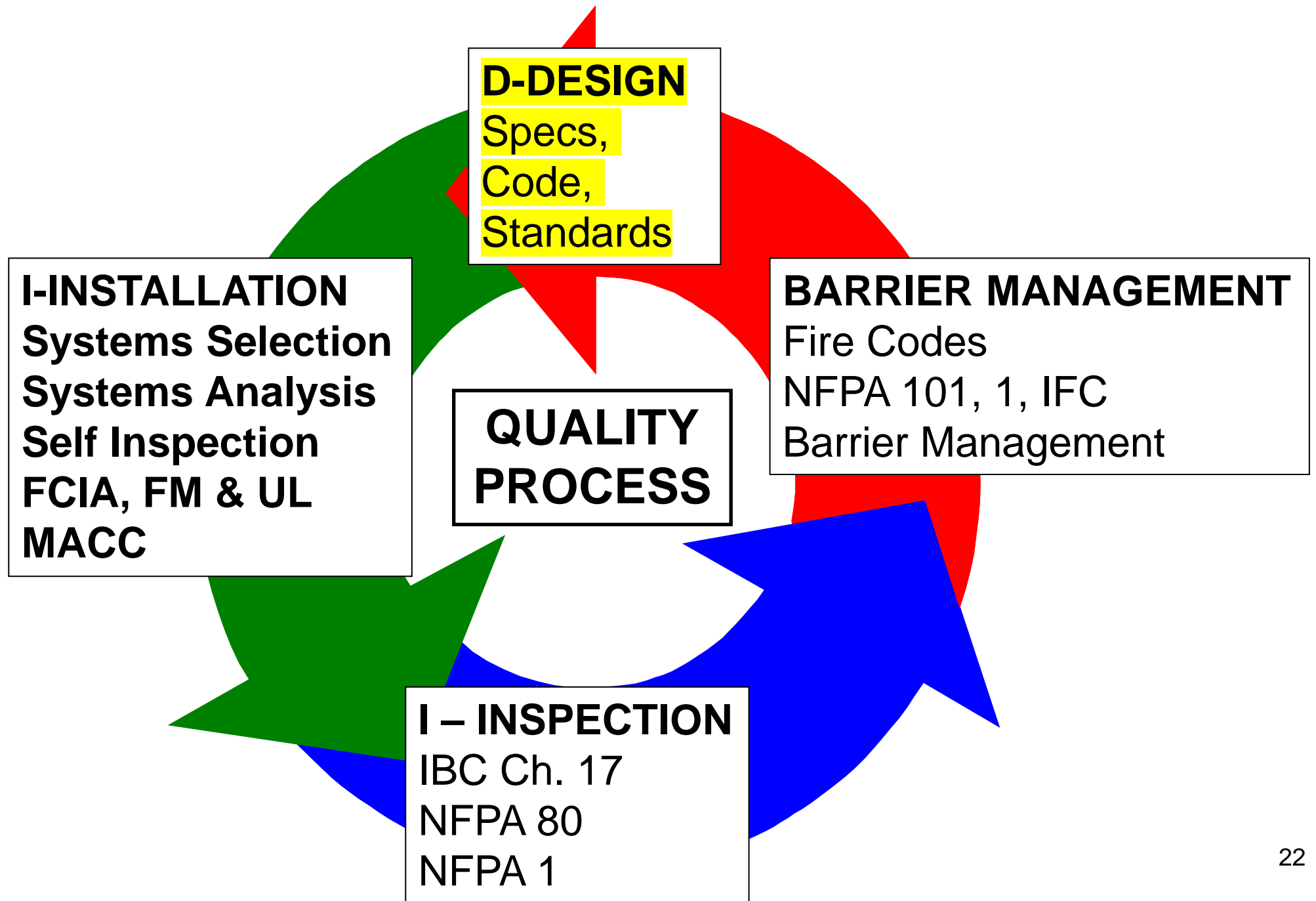
F Rating is 2 Hr for Penetrants A and B. F Rating is 1 Hr for Penetrants C and D.

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.

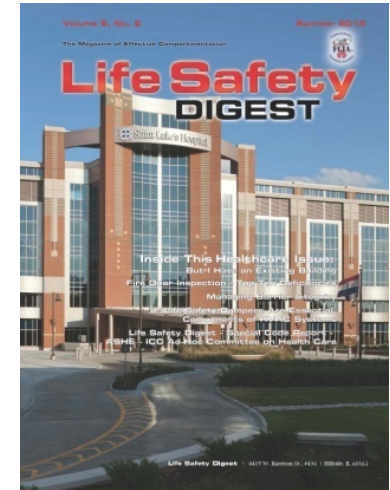




Specifications – MasterFormat – NBC Format?

New & Existing Buildings - Maintain Protection

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



Specs – Key Parts Relating to Installation

- **NEW Buildings – 07-84-00 Specs**
 - **www.FCIA.org**
- **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**

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**

Building & Fire Code Requirements

- National Building Code of India
- 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
- ***Minimum requirements - Construction & Maintaining Protection***

Building & Fire Code Requirements

- Fire-Resistance Rated Barriers – Defined Terms

- ***Fire Resistance***

- Fire Resistance - Fire resistance is a property of an element of building construction and is the measure of its ability to satisfy for a stated period, some or all of the following criteria:
 - *Load bearing capacity (Stability) (R)* - The ability of a load bearing element to withstand fire exposure without any loss of structural stability.
 - *Integrity (E)* - Resistance to penetration of flame and hot gases.
 - *Insulation (I)* - Resistance to temperature rise on the unexposed face up to a maximum of 180°C at any single point and average temperature of 140°C.

Building & Fire Code Requirements

- Fire-Resistance Rated Barriers – Defined Terms

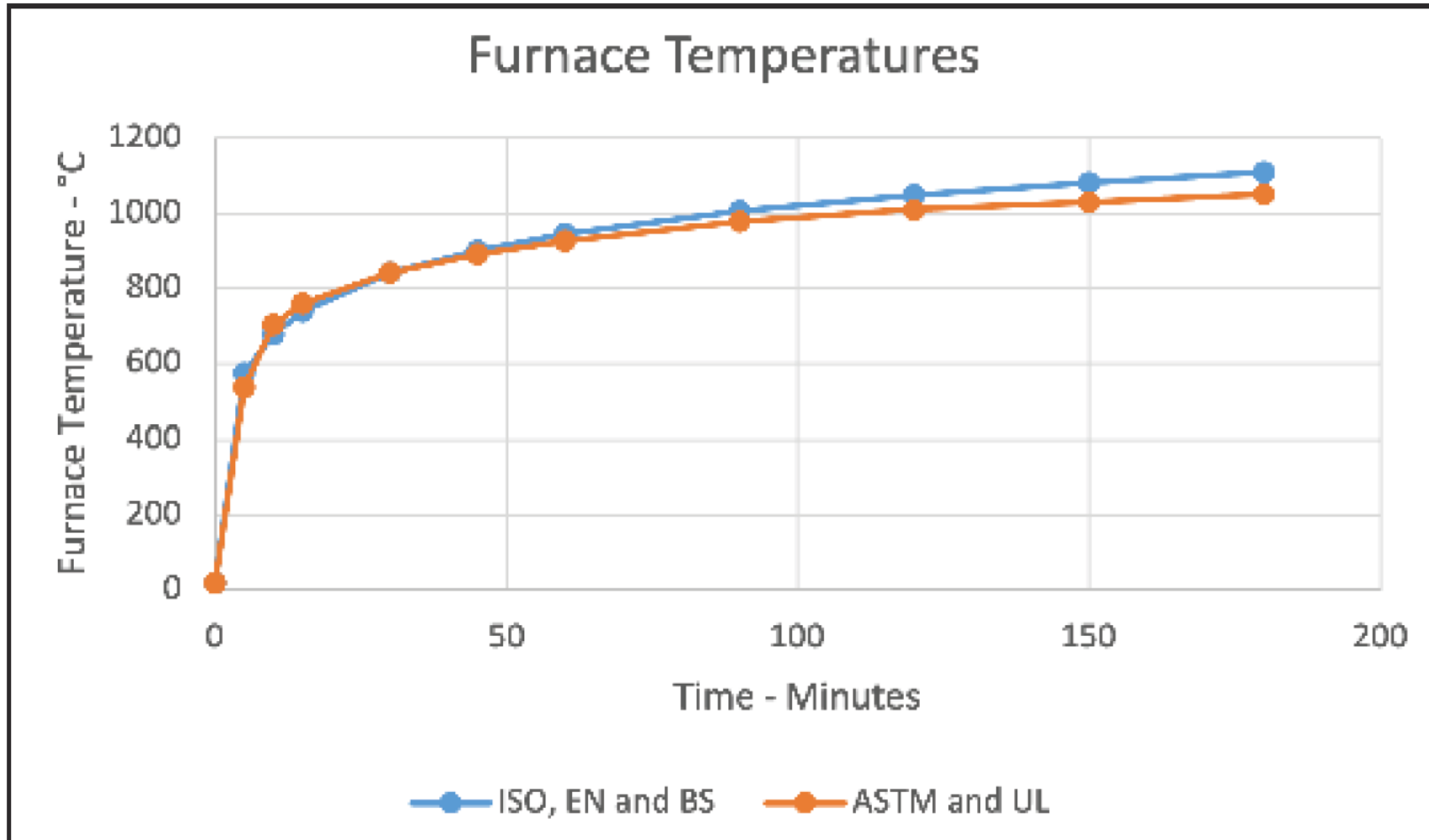
- ***Fire Resistance Rating***

Fire Resistance Rating - The time that a material or construction will withstand the standard fire exposure as determined by fire test done in accordance with the **standard methods of fire tests of materials/ structures as per the accepted standard [4(2)]**.

NOTES

1. The requirement of rating of various building elements as given in this Part shall be applicable in accordance with the provisions given in the accepted standard [4(2)].
2. The fire resistance rating shall be specified in terms of minutes.
3. Fire resistance rating for non-structural material/assembly shall bear a label of compliance to such rating as per the approval of competent authority based on testing and evaluation. The label shall be permanently affixed to the material/assembly and may carry other relevant details such as name and type of the product, and manufacturer's details.

Building & Fire Code Requirements



**Figure 1 - Comparison of furnace temperatures, the time/temperature curve
Berhinig Image**

Building & Fire Code Requirements

- Fire Compartments
 - *Exterior Walls*
 - *Fire Walls (IN-Fire Wall or Fire Separating Wall)*
 - *Fire Compartment*
 - *Fire Barrier (IN-Fire Resisting Barrier)*
 - *Fire Partitions (Not in NFPA)*
 - *Smoke Barriers*
 - *Smoke Partitions*
 - *Archaic Assemblies*

Building & Fire Code Requirements

- Fire-Resistance Rated Barriers – Defined Terms
 - ***Fire Compartment***
 - A space within a building that is enclosed by fire barrier or fire resistant walls on all sides, including the top and bottom.

Building & Fire Code Requirements

- Fire-Resistance Rated Barriers – Defined Terms
 - ***Fire Barrier (Fire Resisting Barrier)***
 - Fire Barrier (or Fire Resisting Barrier) – A fire barrier is a vertically or horizontally aligned member such as a wall or a fire curtain, or a floor. These may be with discontinuities created by openings with a specified fire resistance rating, where such members are designed and constructed with a **specified fire resistance rating to limit the spread of fire that also restricts the movement of smoke.**

Building & Fire Code Requirements

- Fire-Resistance Rated Barriers – Defined Terms
 - ***Fire Wall or Fire Separating Wall*** –
 - A fire resistance rated wall having fire protected openings, which **restricts the spread of fire and extends continuously** from the foundation to the roof (and through the roof at least 1 m above the roof in case of combustible roof), with **sufficient structural stability under fire conditions to allow collapse of construction on one side or either side without collapse of the wall.**

Building & Fire Code Requirements

- Fire-Resistance Rated Barriers – Defined Terms

- ***Smoke Barriers***

- A continuous membrane, or a membrane, where such membrane is designed and constructed to **restrict** the movement of smoke.

- ***Smoke Compartment***

- A space within a building enclosed by smoke barriers on all sides.

Existing Buildings

- **Archaic Assemblies**
 - Clay Tile Block
 - Gypsum Block
 - Plaster
 - Clay Tile/Concrete
 - Unidentified Assemblies
- **Tested ... Calculated ... Prescriptive**
- **Ratings Identified in NBC India**

Smoke Barriers & Firestopping

- Smoke Barriers differ from Smoke Partitions?
 - **Smoke Barrier IBC, NFPA & INDIA are Different....**
 - **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 – NOT IN INDIA**
 - **IBC** – Continuous barrier, not fire rated... ‘retard’
 - **NFPA** – Continuous membrane that is designed to form a barrier to *limit the transfer of smoke*....

“DIIM” – Design, Install, Inspect, Maintain

- Fire Resistance & Smoke Resistant Firestopping
- **Fire Stop – NBC India 2016 –**
- ***Vol. 1 , 2.3.2 Fire Stop - A fire resistant material, or construction, **having a fire resistance rating** of not less than the fire separating elements, installed in concealed spaces or between structural elements of a building to prevent the **spread/propagation of fire and smoke through walls, ceilings and the like as per the laid down criteria.*****

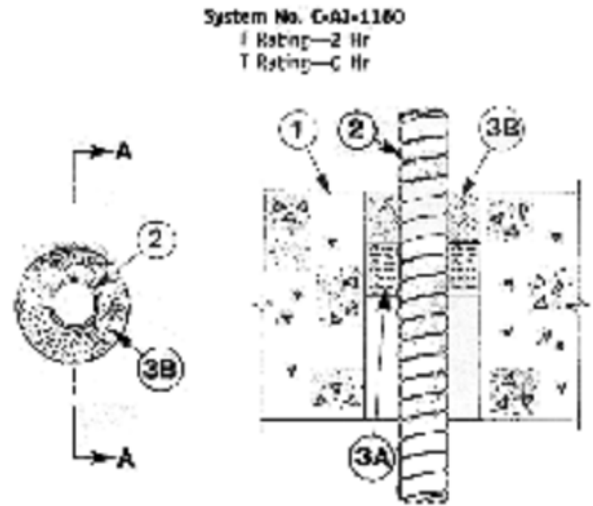
Continuity

Effective Compartmentation Features



Firestopping for Continuity

I – Classified Systems

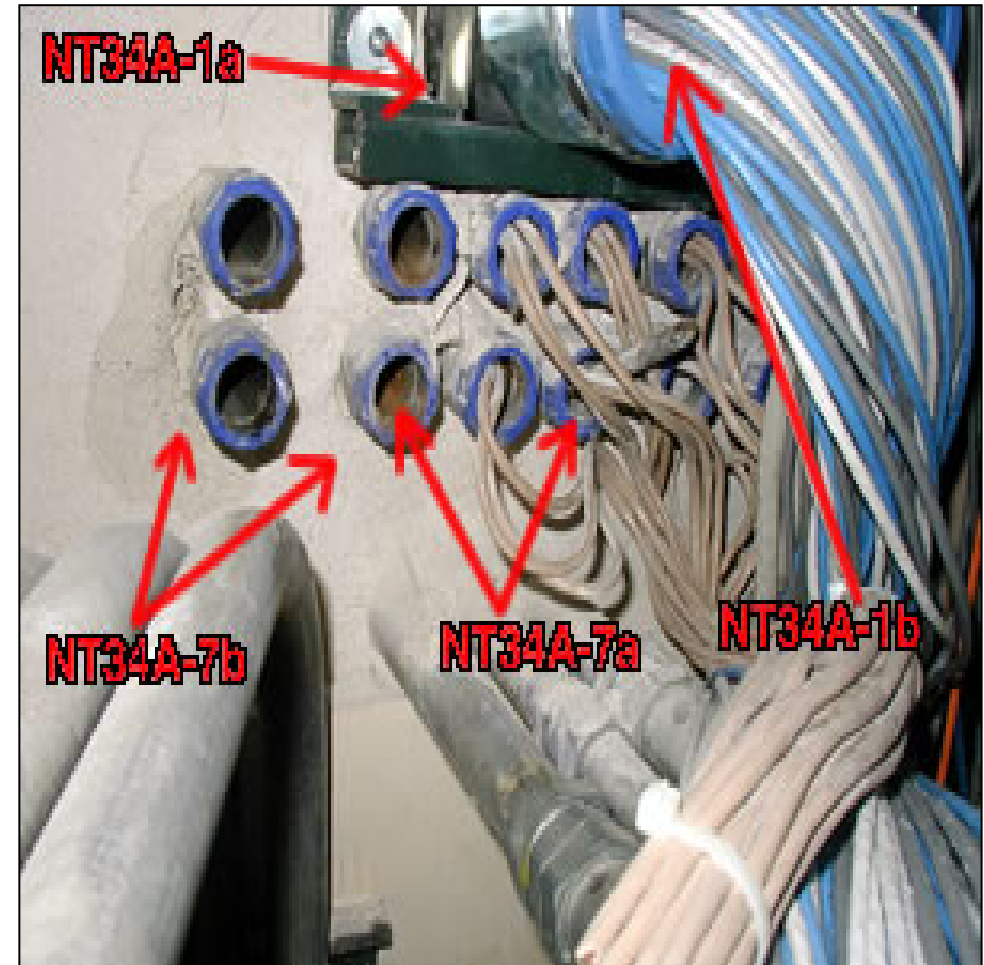


SECTION A-A

1. Floor or Wall Assembly—Min. 4-1/2 in. thick lightweight or normal weight (1100 to 150 pcf) concrete. Wall may also be constructed of any A Classified Concrete Block*. Size of circular through opening in floor or wall assembly to be 1 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 (A-21) category in the Fire Resistance Directory for names of manufacturers.
2. Through Penetrating Product*—Max 4 in. diam (or smaller) steel or max 3/4 in. diam (or smaller) aluminum flexible metal conduit. Max one flexible metal conduit to be installed rear center or circular through opening in floor or wall assembly. Flexible metal conduit to be rigidly supported on both sides of floor or wall assembly.
3. Packing Material—Min 1 in. thickness of ceramic (plastic) fiber blanket or mineral wool batt insulation. Insulation to be installed in a permanent form. Packing material to be recessed min. 1 in. from top surface of floor or from both surfaces of wall.
4. Fill, Void or Cavity Material*—Grout—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 27506

*Bearing the UL Classification Marking
*Bearing the UL Listing Mark



Firestopping for Continuity

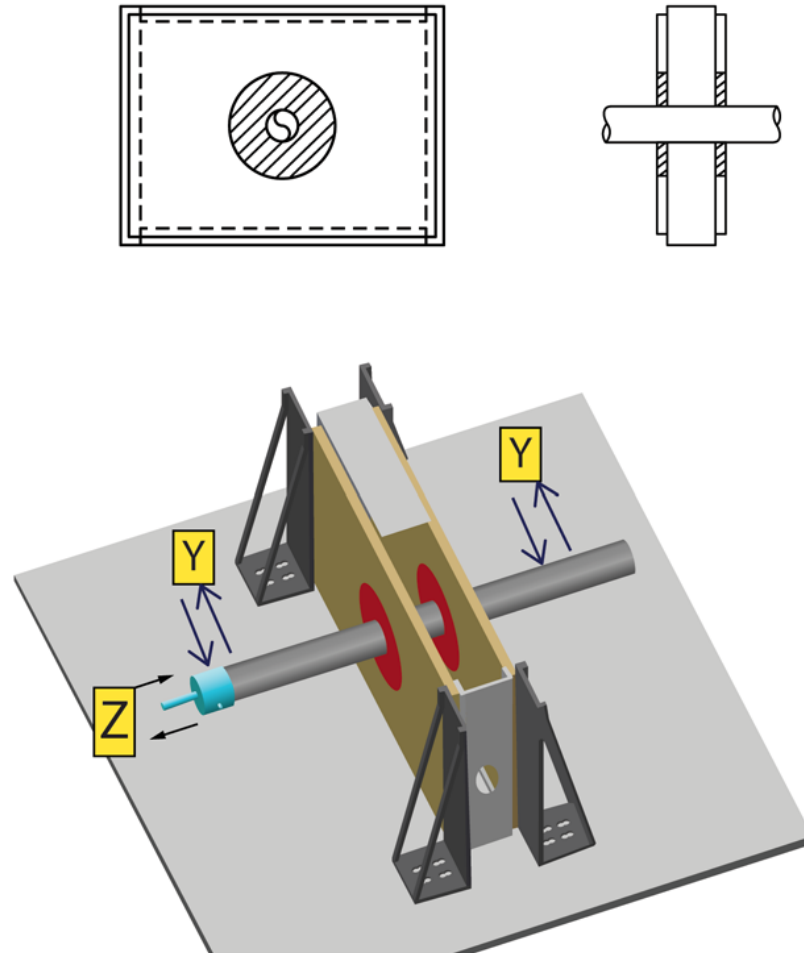
Products become **SYSTEMS** Based on Testing

- **‘Field Erected Construction...Tested to...’**
 - Standards –UL 1479, ASTM E814, UL 2079, ASTM E1966, ASTM E2837, ASTM E2307, FM 4990 – [ISO Standards]
 - F Rating – Flame
 - T Rating – Temperature (180C)
 - L Rating – Smoke, Ambient; 204C
 - W Rating – Water; .91m head/72hr
 - M Rating – Movement, ASTM E3037
 - **H Hose Stream Test**

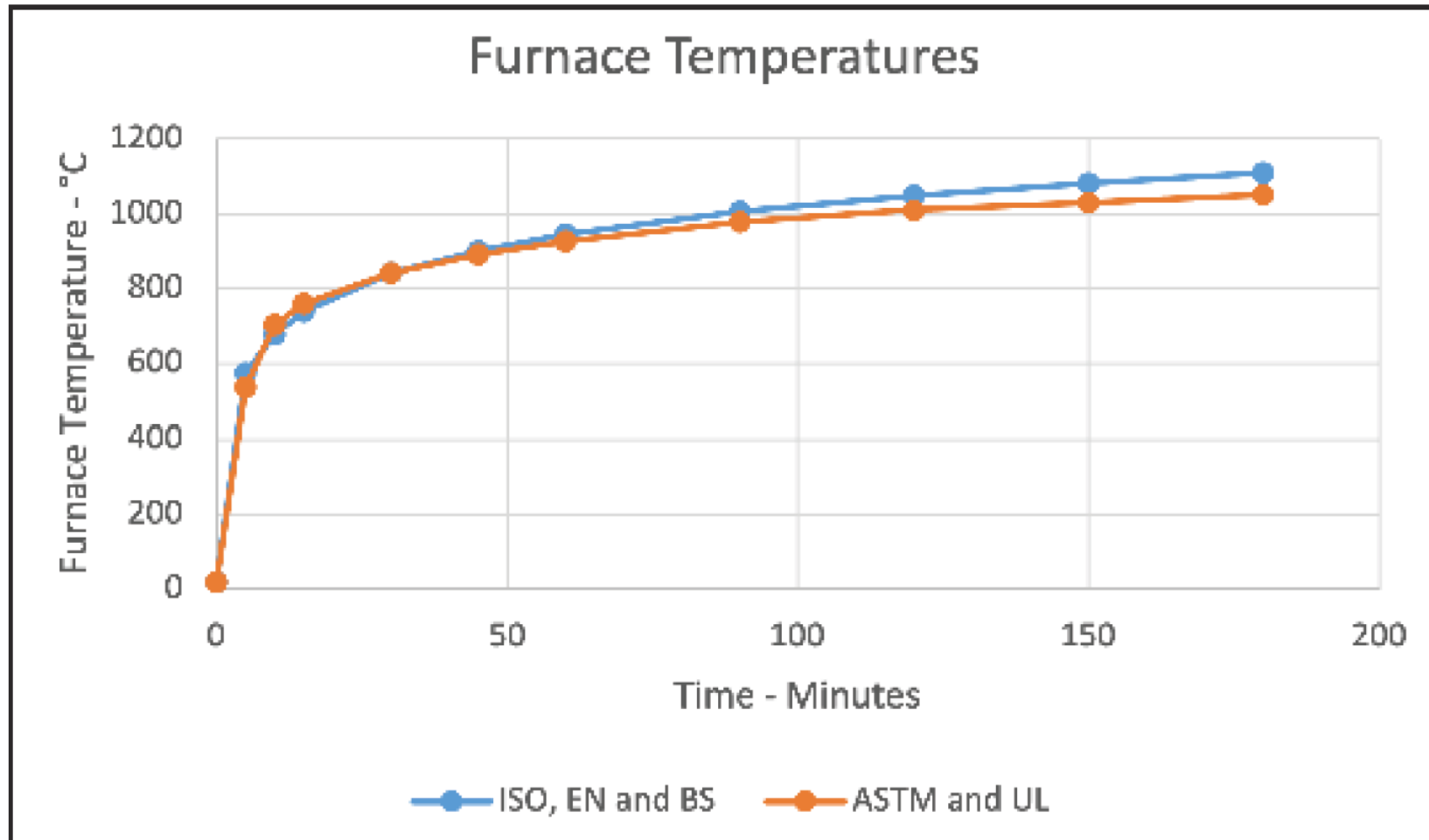


3M Photo

M Rating (Optional – ASTM Image)

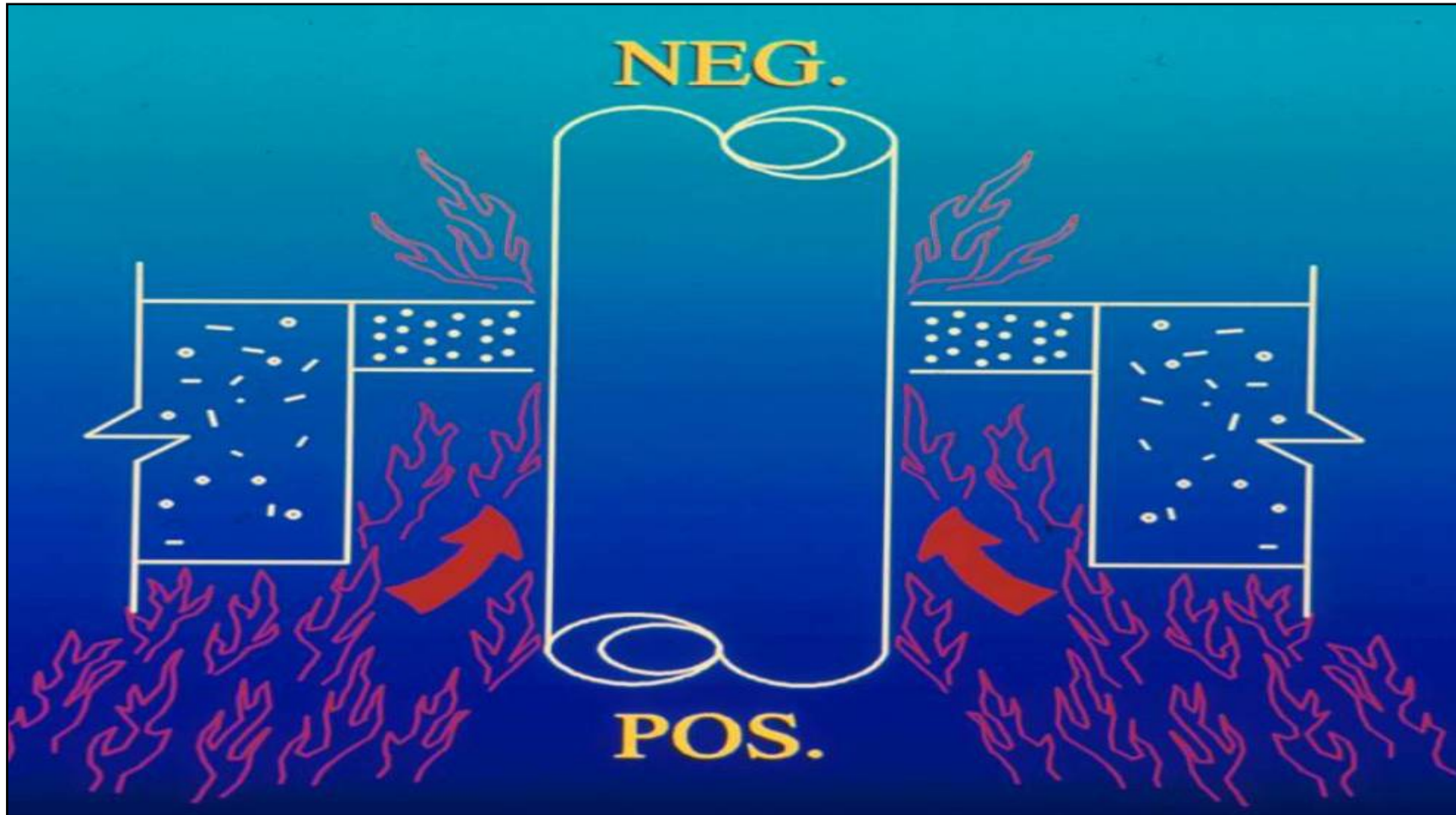


Time-Temperature Curve – ASTM/UL & ISO;



**Figure 1 - Comparison of furnace temperatures, the time/temperature curve
Berhning Image**

Positive Furnace Pressure





Post-Test View – Under Assembly

Hose Stream Test



UL Photo

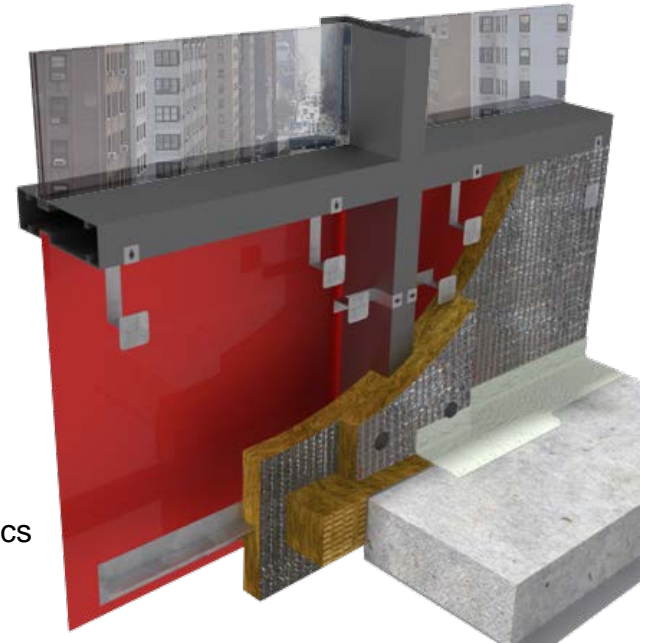
Building & Fire

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?

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**

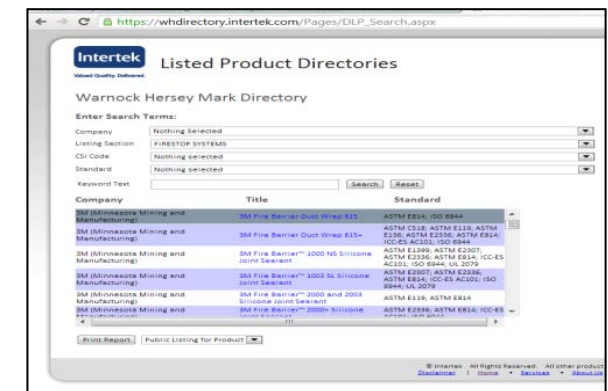


OCF/Thermafiber Graphics

Barrier Continuity Products become SYSTEMS

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

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



Engineering Judgments/EFRRRA

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



J. Sharp – ProFirestop Photo



C. Zussman – Pepper Photo

Engineering Judgments/EFRRA

- Variances to Systems at Site? – Now What...
 - **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***

Engineering Judgments/EFRRA

International Firestop Council – Manufacturers – www.firestop.org

IFC Guidelines for Evaluating Engineering Judgment Guidelines

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

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

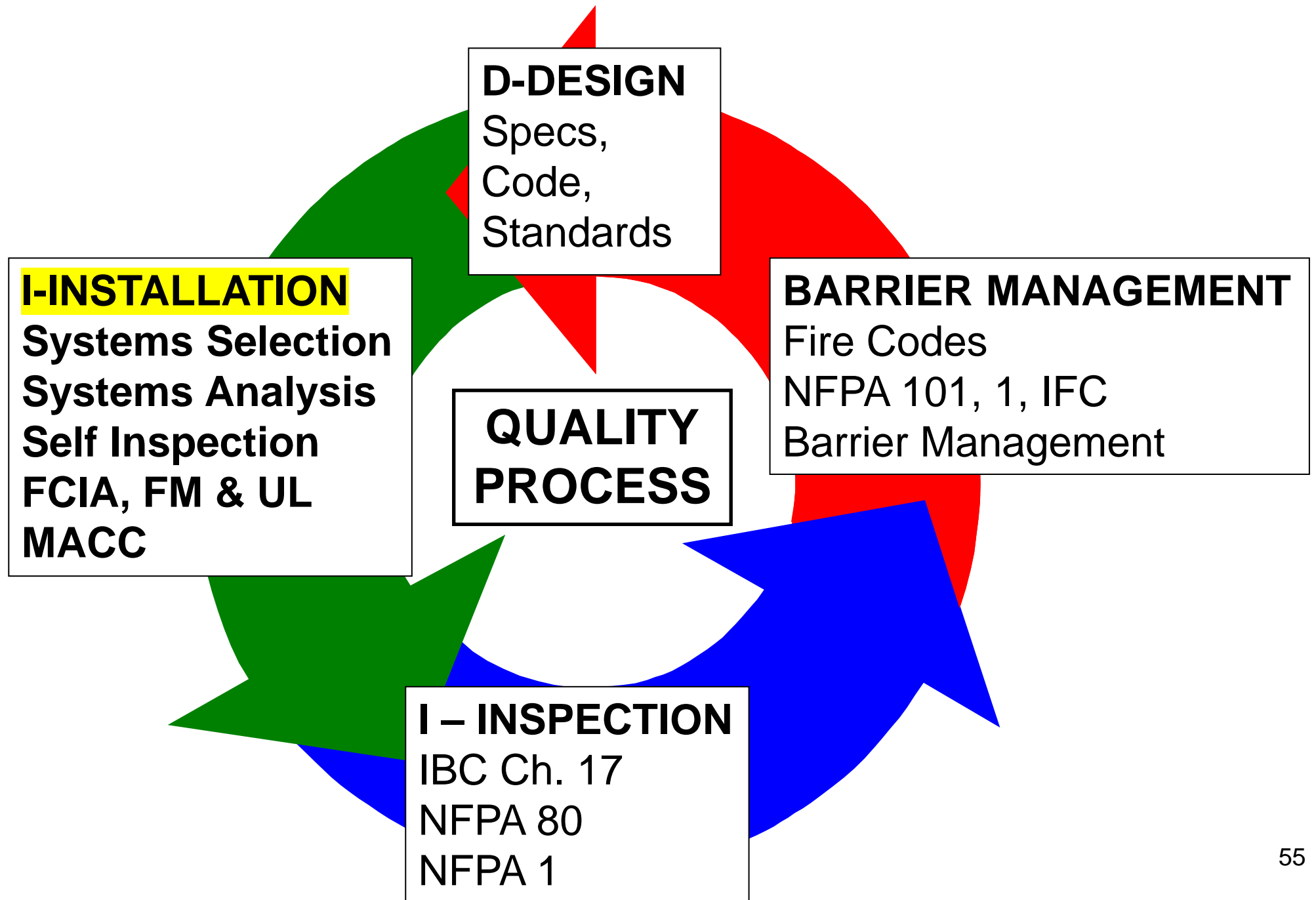
Engineering Judgments/EFRRA

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

FIRESTOP SYSTEM INSTALLATION

Firestop Sealant & MW installed to Tested and Listed
System Limits = **Firestop System**



Pack

1



Apply Sealant

2



Tool/Smooth

3

Walls - BOTH SIDES

Joints and Voids

Head-of-Wall



Firestop Solutions Photo

Joints and Voids

I-Beam to Fluted Deck



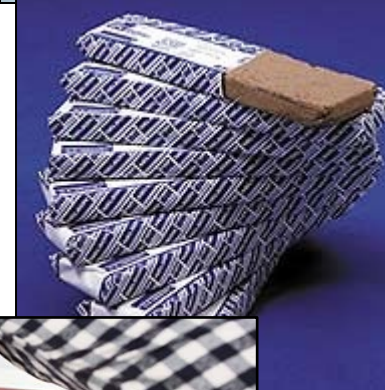
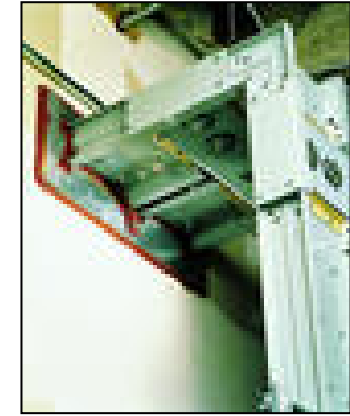
Firestop Solutions Photo

Sleeved Pipes



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



Fire/Smoke Dampers & Firestops

- Dampers – Different than Firestop Systems
 - 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



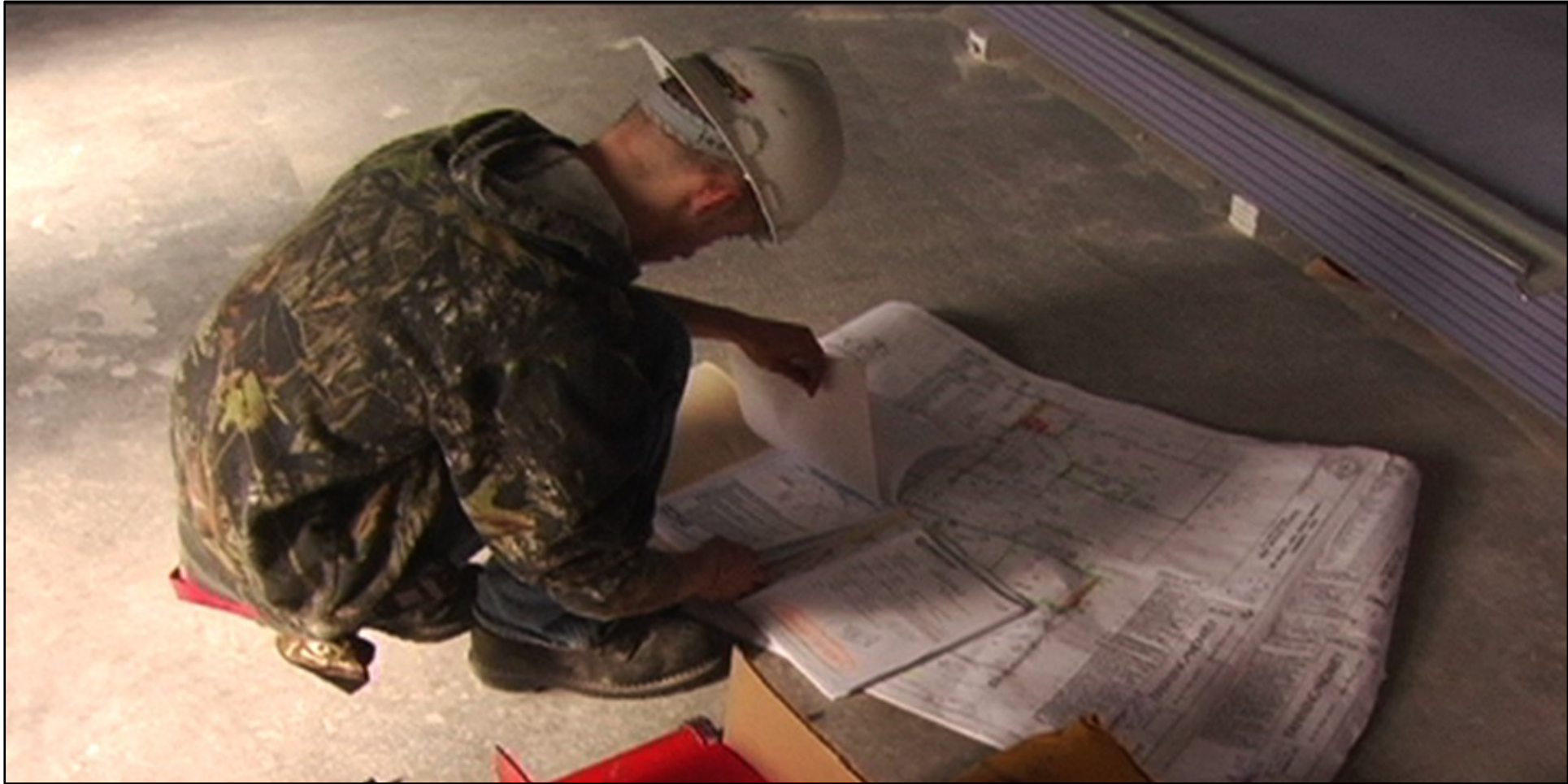
Review of UL Firestop and Joint Systems on UL Product iQ

- 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



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***



Why Contractor Qualifications?

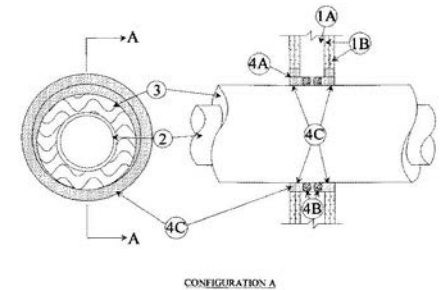
- **Built right the first time...**
- **Documentation = Inventory**
- **Fire-Resistance SYSTEMS Selection**
- **SYSTEMS Analysis & As Builts**
 - F, T, L, W, M Rated Systems
 - Tolerances - Annular Space Sizes, Angles
 - Gap Sizes - Undercuts - Framing
 - Anchors - Spacing – Hardware
 - Closers - Activation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

FM 4991 & UL/ULC QFC

- **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

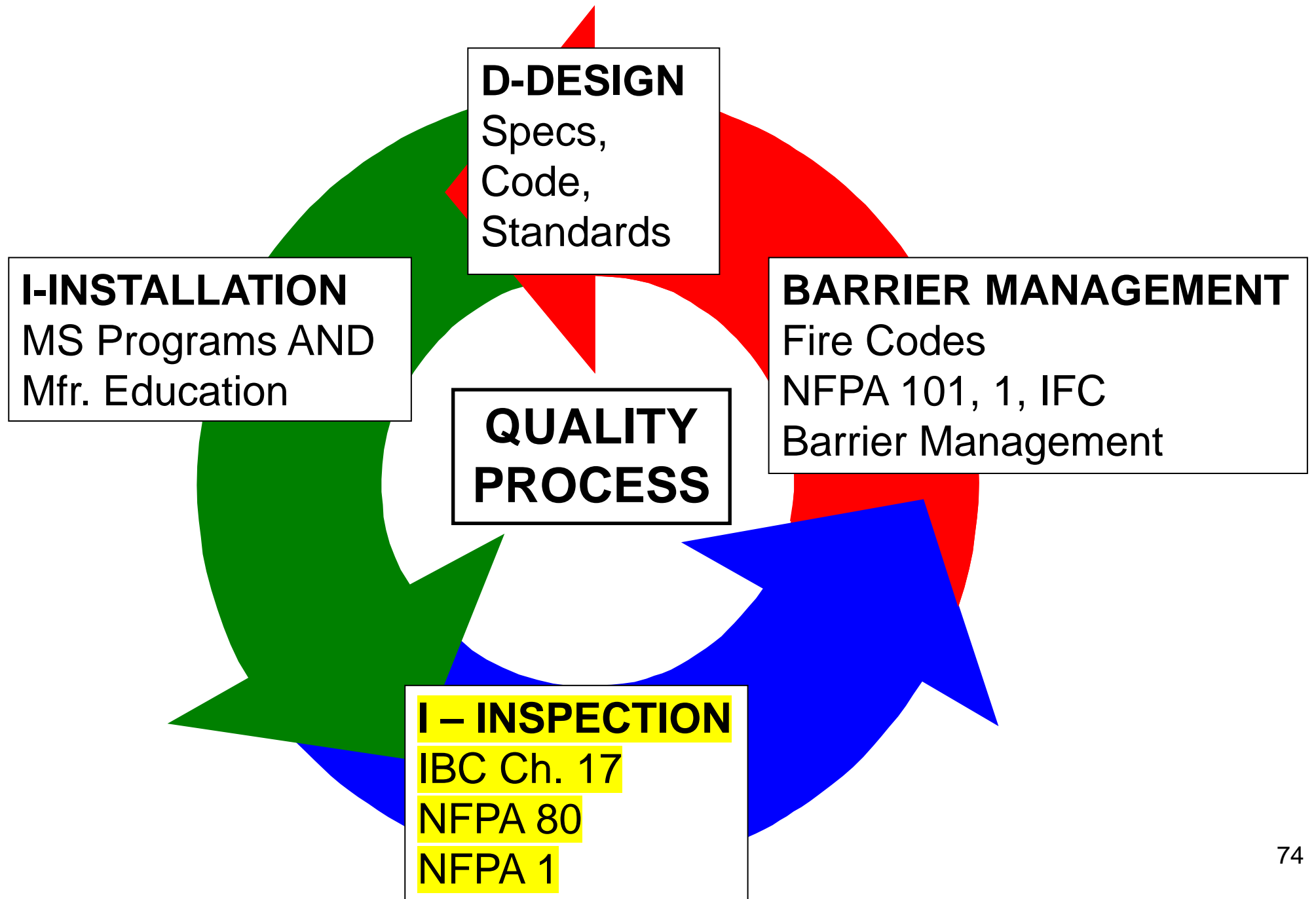
A **Jobsite Specific Management System Audit** – Our audit provides verified processes were followed to properly installed firestop systems.

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





Firestop & Inspection

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



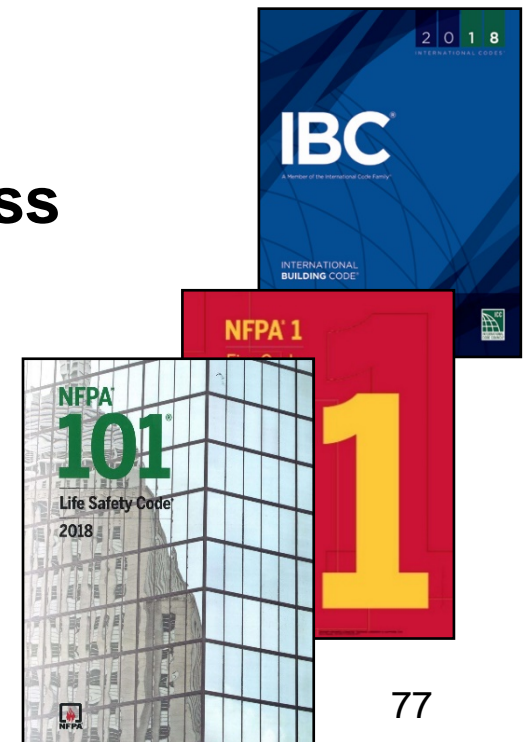
I – Inspection – Options

- **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 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



I – Inspection – IBC Code Requirements - Definitions

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 Code Requirements - Definitions

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 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

- Review Documents
- Pre-Construction Meeting
 - Conflicts, Materials, Systems
 - 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 Documents**
 - 07-84-00 Specifications and Drawings
 - Manufacturer Product Data Sheets and Installation Instructions
 - Safety Data Sheets
 - Listed Systems and EJ's/EFRRRA's

FIRESTOP CONTRACTOR (204) 555-0101		
WARNING		
This is an approved Firestop System and shall NOT be disturbed except by Authorized Personnel.		
Wall Plate Penetration No.: <u>W-2001-1</u>	Fire Rating Required: <u>1.0 F</u>	
Floor Level: <u>LEVEL 200</u>	Room No.: <u>201</u>	
Installer's Name: <u>JOHN SMITH</u>	Product: <u>FS-ONE</u>	
Installation Date: <u>APRIL 1, 2013</u>	System Design No.: <u>SAJ-1022a</u>	
Re-penetrated by:		
Company	Installer	Date
_____	_____	_____
_____	_____	_____
_____	_____	_____

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 Contractor**
 - E2393 - 5% of Total Lineal Feet for each **type** of Fire Resistance Rated Joint System
 - **Type = By System, By 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 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**

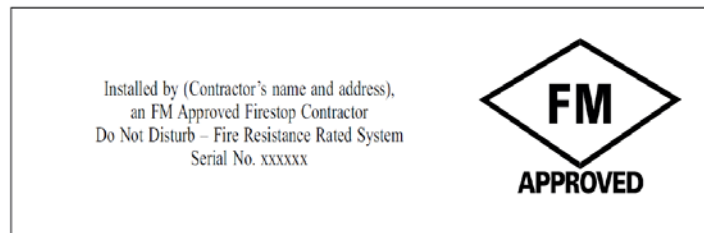


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Firestop Special Inspection

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

- 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 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

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

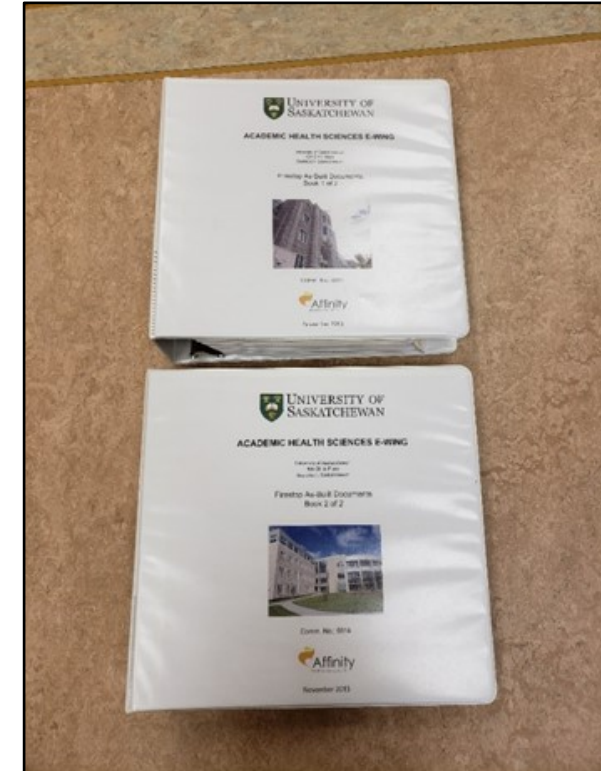


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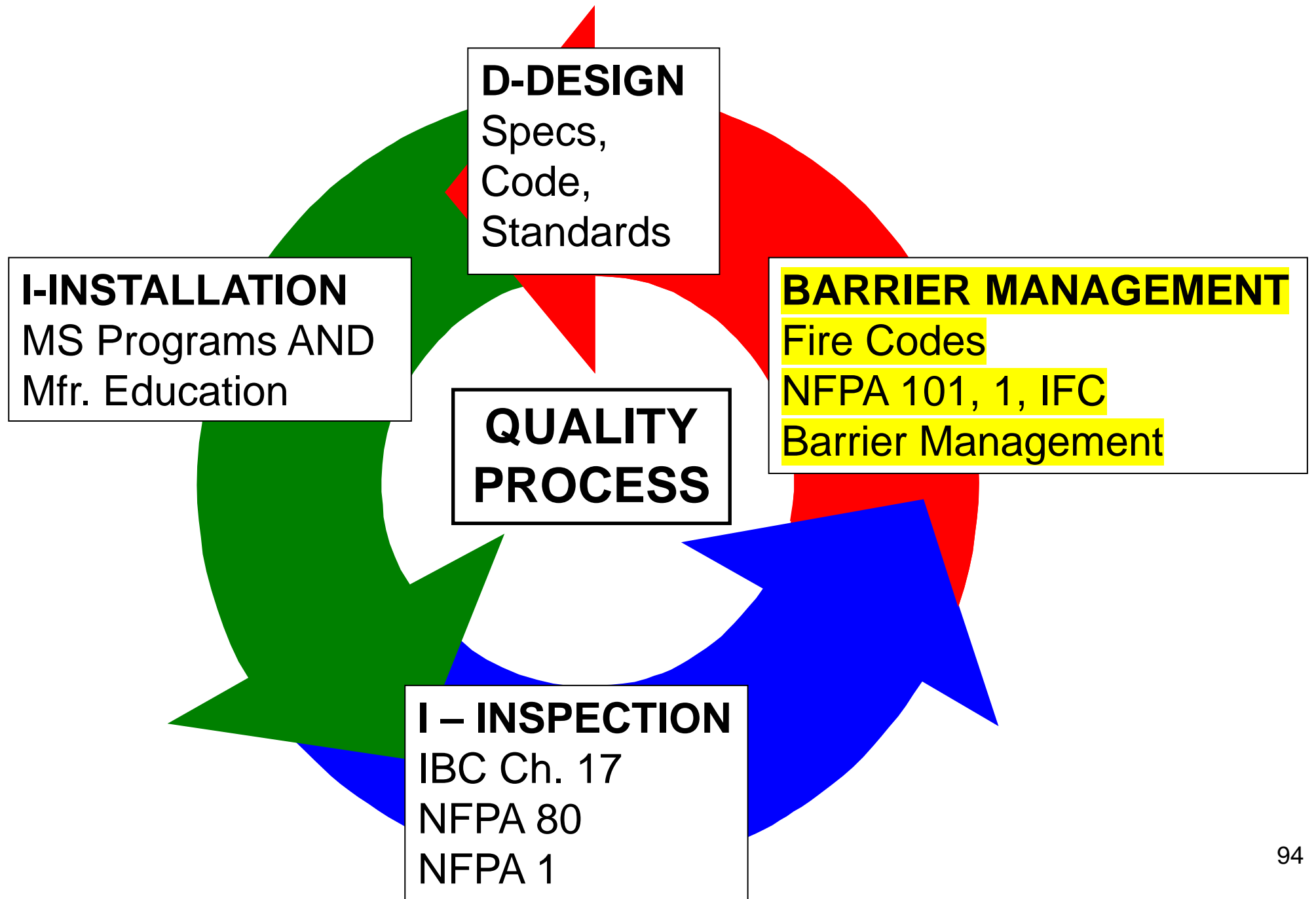
Firestop Inspection Final Report

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

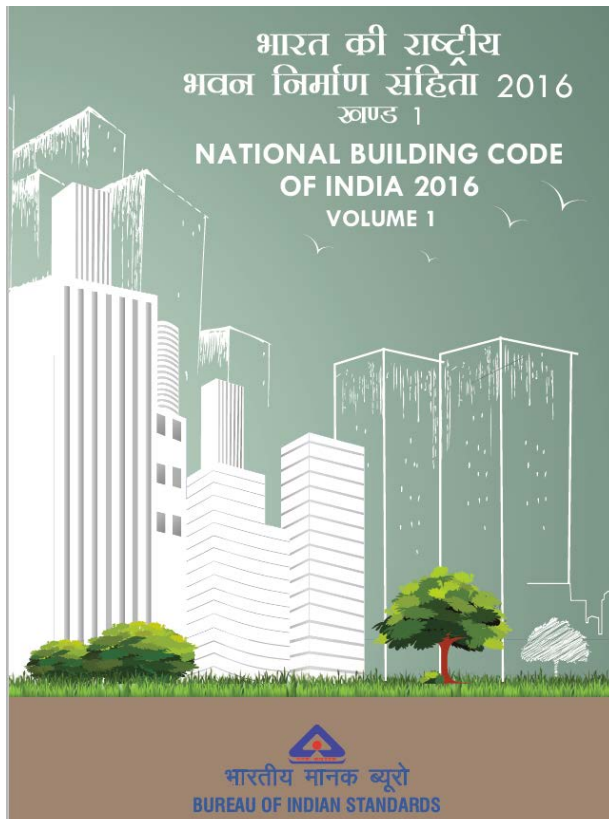


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Existing Buildings? Did you know...

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



“DIIM” – Design, Install, Inspect, Maintain

- Fire Resistance & Smoke Resistant Firestopping
 - Properly *Designed* Building Codes
 - FCIA - 07-84-00 – Specification – *CCS, RSW*
 - *Tested and Listed Systems* –
 - ASTM E814, UL 1479, ASTM E1966, UL 2079, E2307, E2837, E3037
 - *India, ISO 10295-1 Part 1; Penetration Seals; 10295-2 Linear Joint (gap) Seals'*
 - **ASTM Movement, (M), UL Smoke (L), UL 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* – Annual Visual Inspection – FCIA Members

Fire Codes Require Maintenance

- NFPA 101
- NFPA 1
- International Fire Code
- National Building Code of India
 - Maintenance Methods and Management
- Minimum Requirements Stated
- Frequency



Fire Codes Require Maintenance

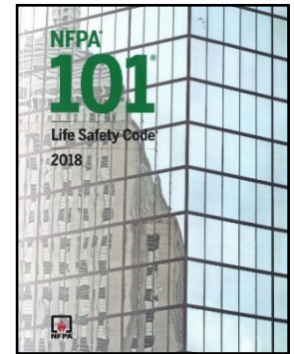
- 9 BUILDING MAINTENANCE – METHODS AND MANAGEMENT
- 9.1 General – “Any building (including its services) when built has certain objectives and during its total economic life, it has to be maintained in proper condition to meet those objectives. Maintenance is a continuous process requiring a close watch and taking immediate remedial action. It is interwoven with good quality of housekeeping. It is largely governed by the quality of original construction. The owners, engineers, constructors, occupants and the maintenance agency are all deeply involved in this process and share a responsibility....”.

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 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

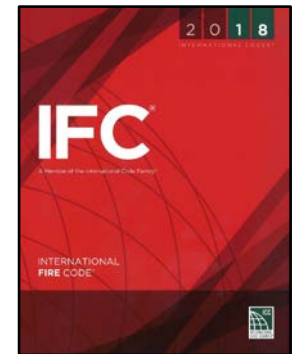


2018 International Fire Code Maintenance

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

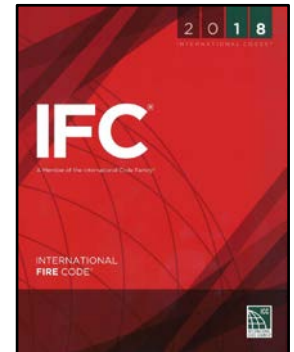


2018 International Fire Code Maintenance

SECTION 701 GENERAL

- **701.5 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

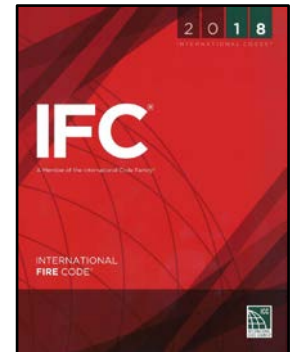


2018 International Fire Code Maintenance

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 Added Emphasis



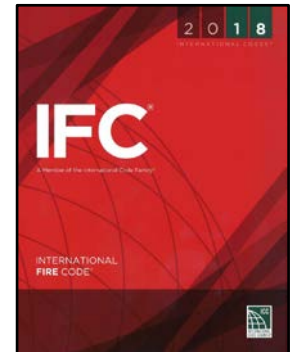
2018 International Fire Code Maintenance

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

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, Listing***

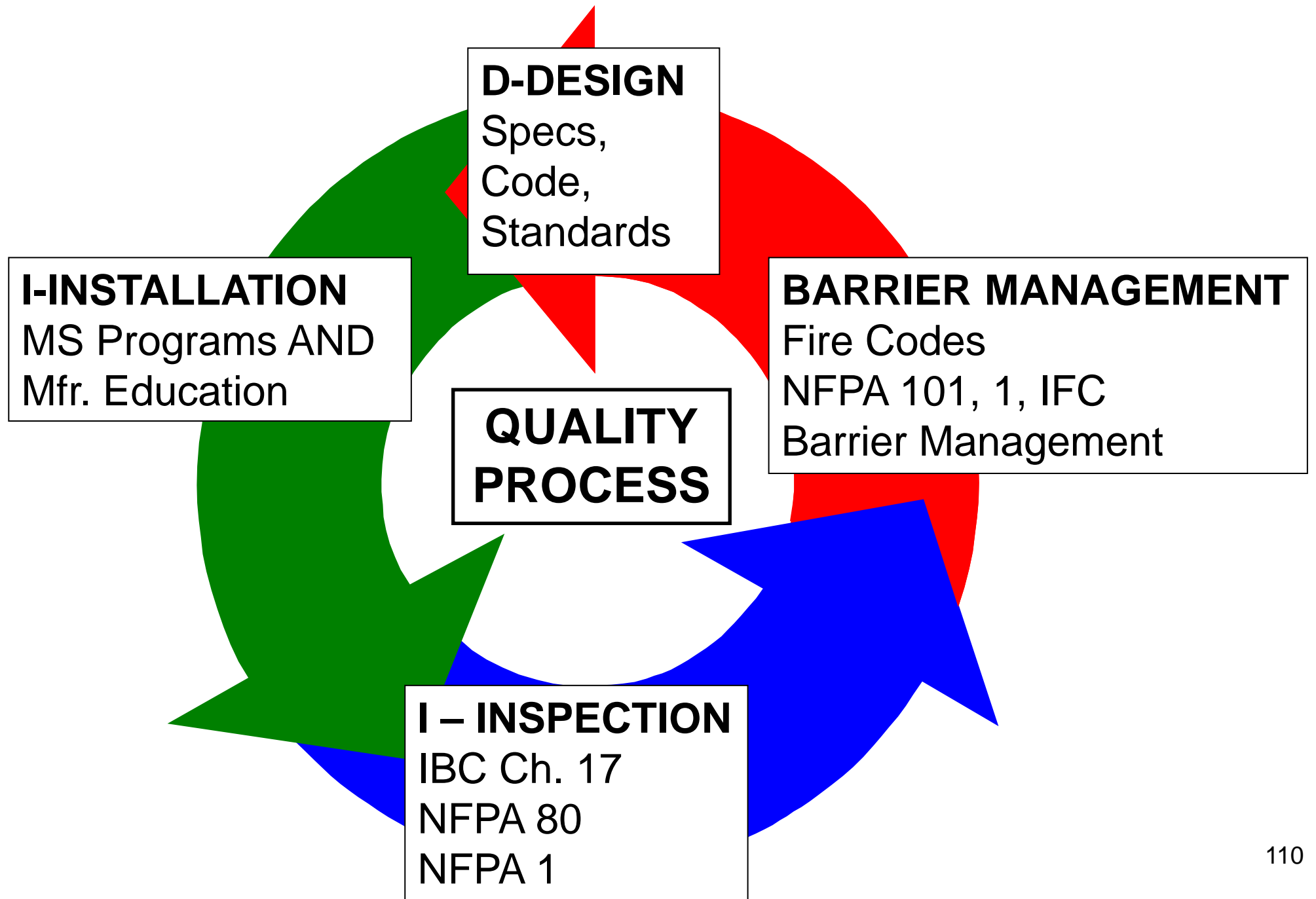


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M–Barrier Management Systems

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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FCIA Webinar Series

Firestopping DIIIM for India

Bill McHugh, FCIA Executive Director

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