

Fire Resistance in Existing Buildings

- Design
- Installation
- **Inspection**
- Maintenance & Management

Today's Program

- Total Fire Protection
- Design - Specs, Codes, Testing, Products
- Installation – FM, UL/ULC Programs
- Inspection – ASTM Inspection Standards
IAS AC 291, Inspector Qualifications
- Maintain Protection – Fire Codes

“TOTAL FIRE PROTECTION”

- Effective Compartmentation
 - Fire Barriers, Fire Walls/Floors, Smoke Barriers
 - Firestopping, Fire Dampers, Swinging and Rolling Fire Doors, Fire Rated Glazing
- Detection & Alarm Systems
- Sprinkler Suppression Systems
- Education & Egress—
 - Building Owners & Managers, Building Occupants and Firefighters

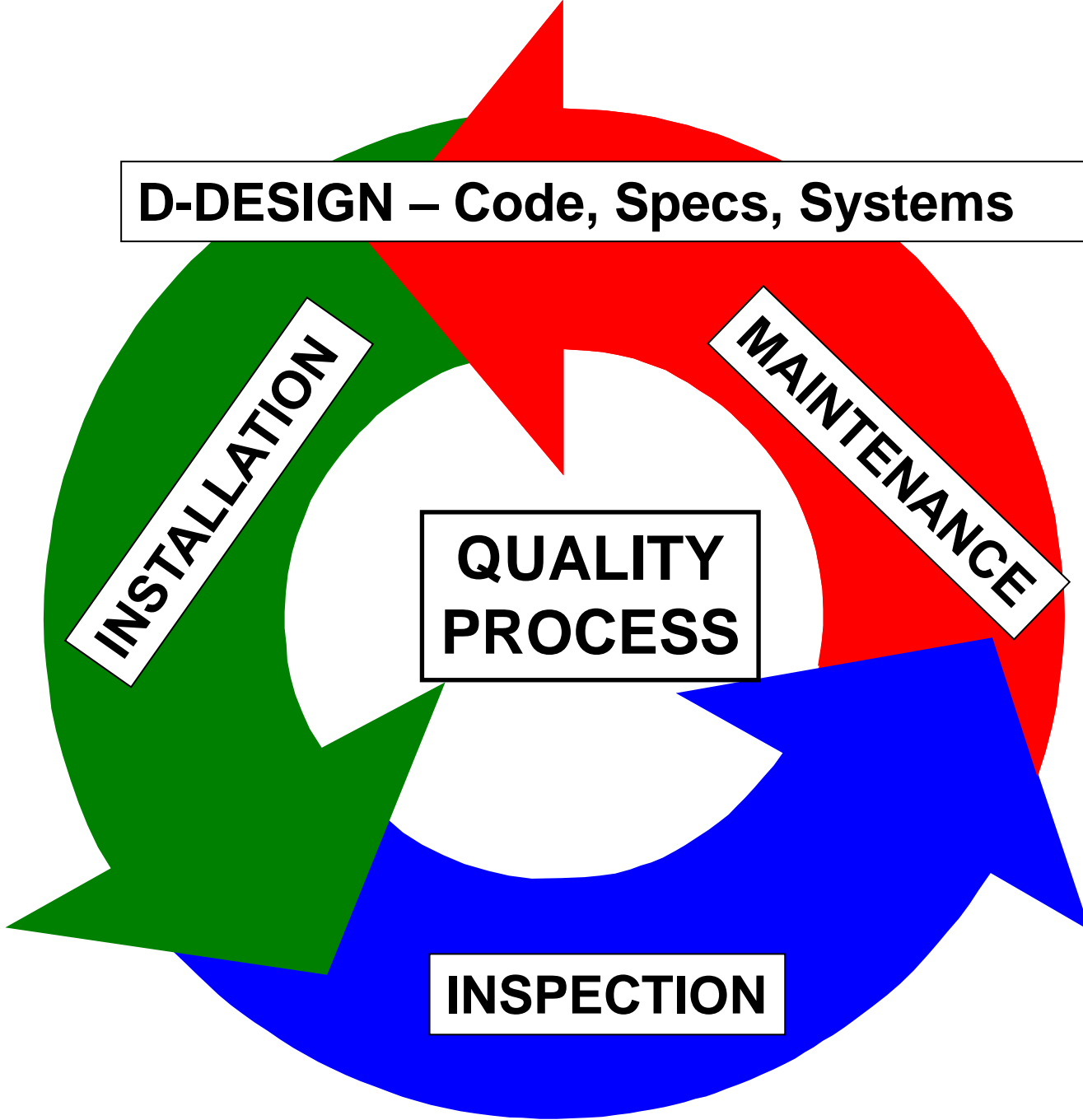
D-DESIGN – Code, Specs, Systems

INSTALLATION

MAINTENANCE

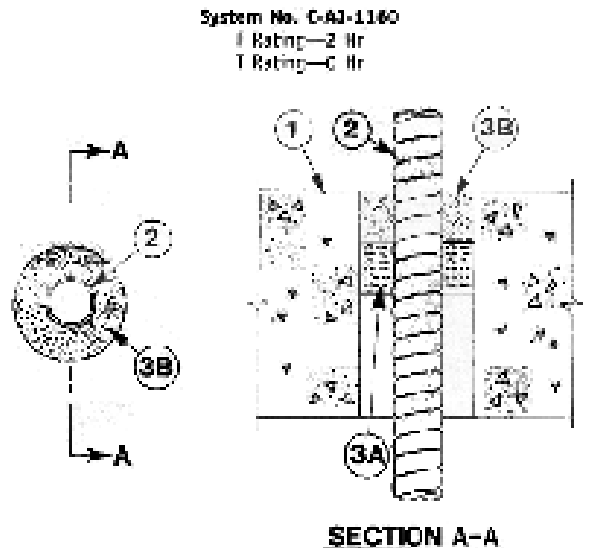
**QUALITY
PROCESS**

INSPECTION



Firestopping for Continuity

I – Classified Systems



- Floor or Wall Assembly**—Min. 4-1/2 in. thick lightweight or normal weight (100 to 150 pcf) concrete. Will may also be constructed of any UL Classified Concrete Block*. Min. of clear air through opening in floor or wall assembly to be 1/8 in. to 1-1/2 in. larger than diam of flexible metal conduit (Item 2) installed in through opening. Max diam of opening is 6 in. See Concrete Block (LAC) category in the Fire Resistance Directory for names of manufacturers.
- Through Penetrating Product**—Max. 4 in. diam (or smaller) diam. or max. 3/8 in. diam (or smaller) aluminum Flexible Metal Conduits. Also one flexible metal conduit to be installed near center of circular through opening in floor or wall assembly. Flexible metal conduit to be rigidly supported on both sides of floor or wall assembly.
 Alliance Cable Corp.
- Packing Material**—Nom. 1 in. thickness of organic (plumtree silica) fiber Markel 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.
- FIL, Void or Cavity Material**—Caulk—Applied to fill the annular space around the flexible metal conduit. In floors, a min. 1 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 250MS

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



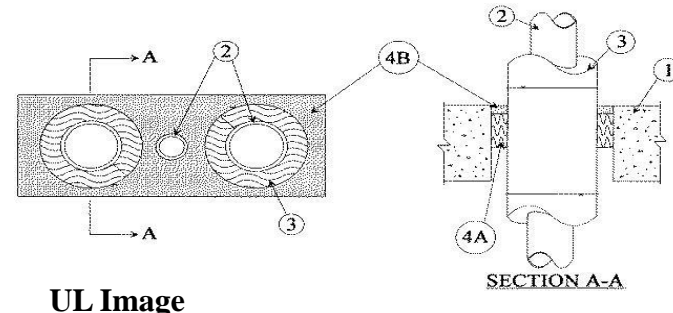
Pro-Firestop Image

Firestopping for Continuity

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



SFS Image



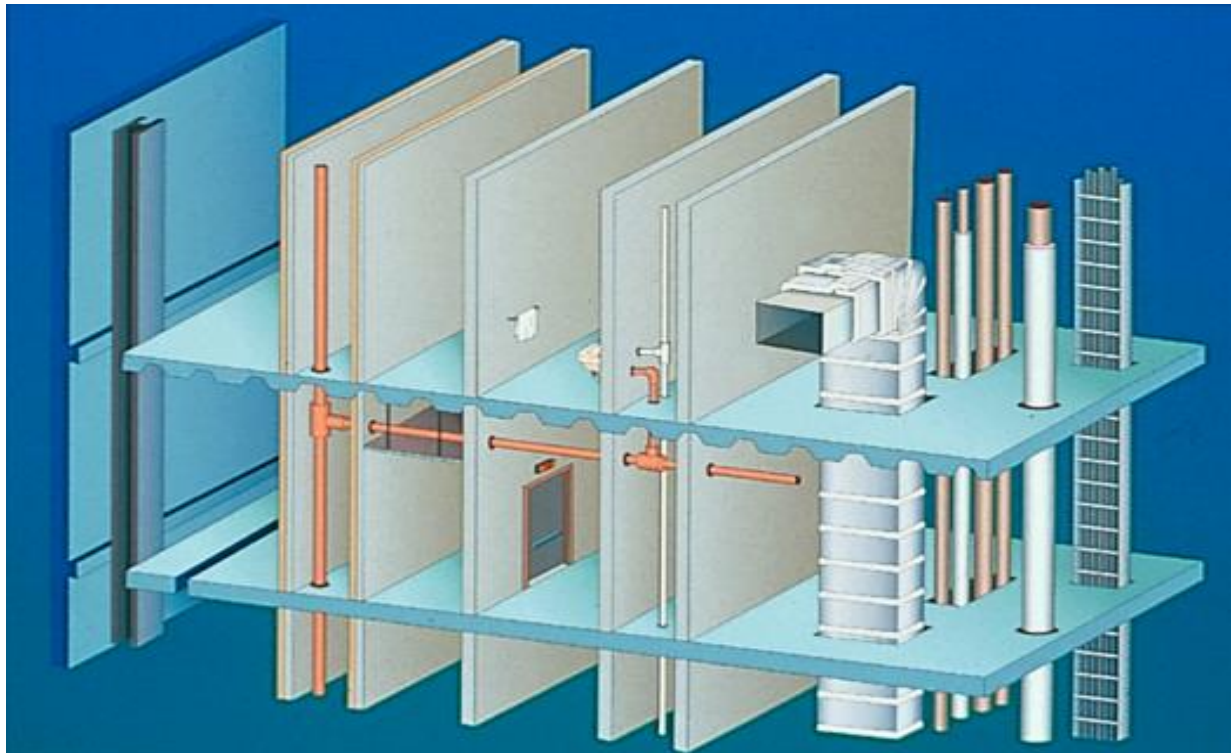
UL Image

I- Installation

SYSTEMS SELECTION

SYSTEMS ANALYSIS

Who's Responsible, How to Choose???



Firestopping for Continuity

Products become **SYSTEMS**

- After Installation...
- **‘Field Erected Construction...Tested to...’**
 - Standards - ASTM E814/UL 1479–UL 2079, ASTM E 1966, ASTM E 2307, ULC S-115, FM 4990
 - **F Rating - Flame**
 - T Rating – Temperature
 - H Rating – Hose
 - **L Rating – Smoke**
 - **W Rating – Water**



Firestopping for Continuity

Products become **SYSTEMS**

- After Installation...
- **‘Field Erected Construction...Tested to...’**
 - Movement
 - Exposure
 - Water
 - Salt
 - Chemicals
 - Temperature
 - “Expectations”
 - Life Span

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**



Products become Systems

Hose Stream = Shock Test

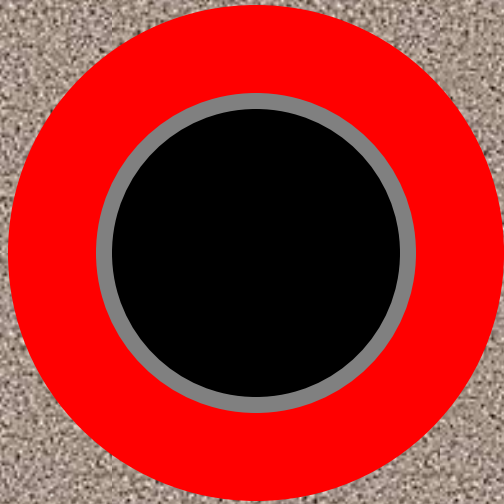


How do Contractors Select **Systems** & Inspection Agencies Analyze?

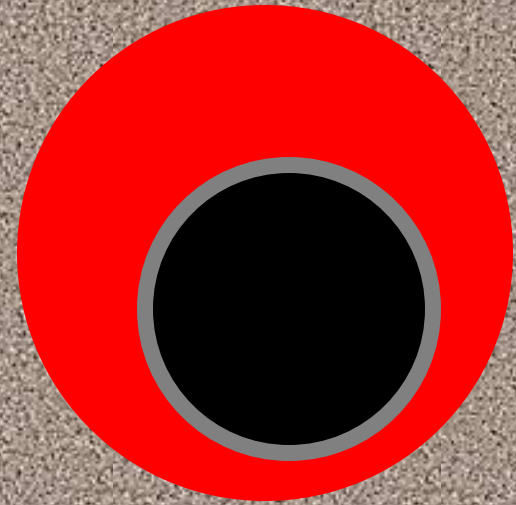
- Wall or Floor Construction Type, Rating
- Wall or Floor Thickness
- Penetrating Item, Coverings
- Size, Type, Thickness
- Annular Space Sizes
- Joint / Gap Sizes
- Backing Materials
- Fill Material(s)

= Rated Firestop System

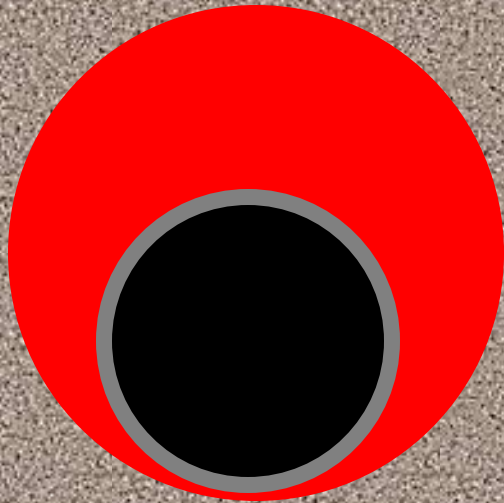




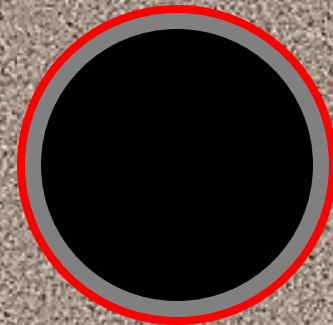
1. Centered



2. Off-Centered



3. Point Contact



4. Continuous Point Contact

Engineering Judgments/EFRRA

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



Engineering Judgments/EFRRA

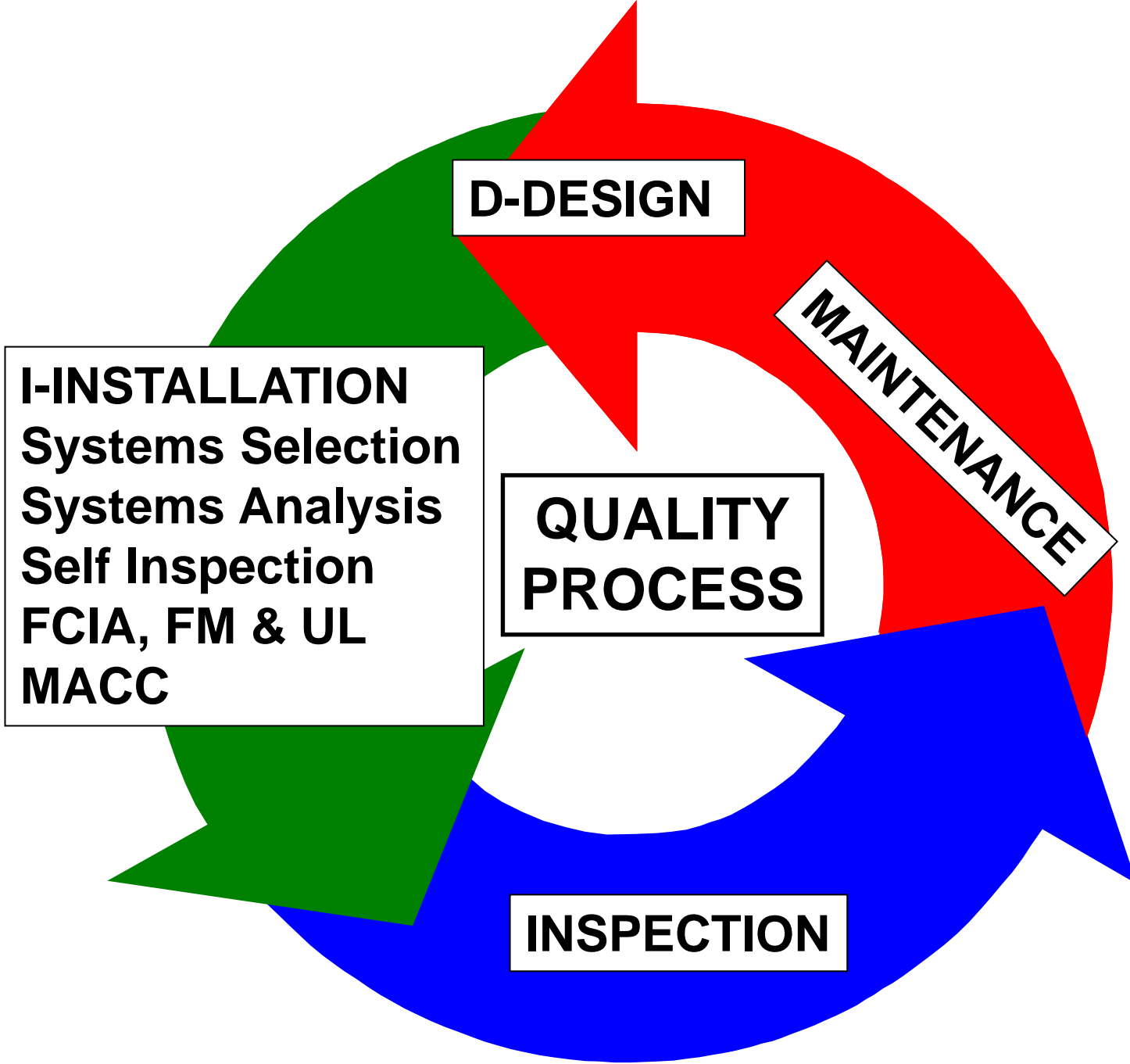
- **First Action in Process**
 - Find another system – Same Manufacturer
 - Find another system – Different Manufacturer
 - If no system exists in either case....
- **Second Action –**
 - *Engineering Judgment* – “EJ”
 - *Equivalent Fire Resistance Rated Assembly* – “EFRRA”
- *Based on engineering, IFC Protocol*
- *Inspection Agency?*

IFC Guidelines for Evaluating Engineering Judgment Guidelines

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

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

FCIA’s NOTE: Manufacturer needs to state the EJ / EFRRRA will pass a fire test if subjected...



Installation – Who?

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

Conclusion –

Without Single Firestop Installation Contractor...

fire & life safety risks



Adler Photo

Firestopping for Continuity Products become Systems

- Firestop Systems Directories –
 - UL
 - Intertek
 - FM Approvals

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



A screenshot of the UL Product iQ website. The header is red with "UL Product iQ™" on the left and "SEARCH MY SEARCHES M" on the right. Below the header, there is a navigation bar with "Dashboard / Search / THROUGH-PENETRATION FIRESTOP SYSTEMS | UL Product iQ". The main content area displays "XHEZ.C-AJ-8038 - THROUGH-PENETRATION FIRESTOP SYSTEMS". At the bottom, there are three buttons: "DETAILS", "RESOURCES", and "TAGS".

A screenshot of the Intertek website showing a search results page for "Warnock Hersey Mark Directory". The page has a search bar with "Enter Search Terms:" and several dropdown menus for "Listing Section", "CSI Code", and "Standard". Below the search bar, there is a table with columns for "Company", "Title", and "Standard". The table lists various products and their corresponding standards. At the bottom of the page, there is a footer with "© Intertek. All Rights Reserved. 4010767 product" and "Disclaimer | Home | Details | About Us".

Firestop Contractor Qualifications

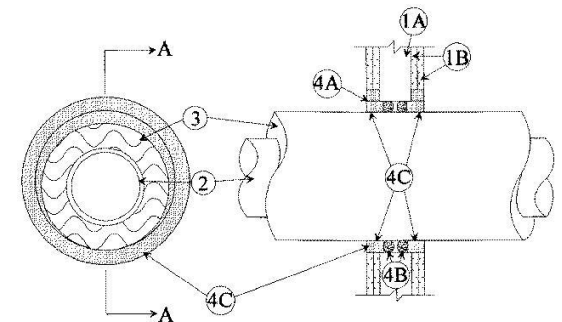
FM & UL/ULC – 4 Components

1. Office Facility Quality Management System Audit
2. Field – Jobsite Audit
3. Employ a person
 - UL/FM Firestop Exam @ 80% or better
 - DRI if employed by Approved/Qualified Firm,
 - *Designated Responsible Individual (DRI)*
4. Annual Audit



1. FM, UL/ULC Company Audit of Management System (MS)

- Employee Training & Education
- Systems Selection
- Communicate systems to Field
- Material Controls
- Systems installation “protocol”
- Labeling
- Record keeping - Variance Procedures
- Non-Conformances
- Documentation
- Project closeout



2. *Company MS Jobsite Audit* by **UL/ULC, FM or**

- Verification of firestop systems Processes
- Verify Management System Works
- Verify Company “communication”
 - Office to field, field to office
- “Culture of Quality...”

»

Adler Photo



3. **DRI** – Company Appoints DRI if

- **Pass Rigorous Firestop Examination**
 - FCIA Firestop Manual of Practice
 - Firestop Systems Selection & Protocol
 - Management System Knowledge
- Keep CEU's
- Retested every 3 years if not enough CEU's
- One DRI per Approved Contractor Location



4. Annual Audit

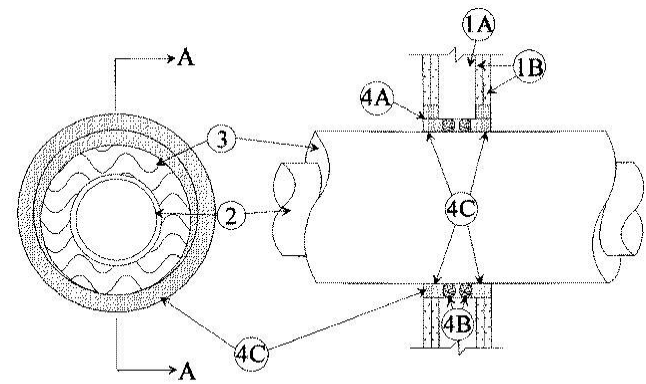
FM 4991 UL / ULC

Contractor Company Personnel

- Continued satisfactory performance
 - Quality Manual Implementation
- Documented - Archived record keeping
- Employee Training Documentation
- Jobsite Visit
- DRI CEU Verification
- **Find @ www.fcia.org**

FM 4991, UL/ULC Company Audit of **Management System** (MS)

- Employee Training & Education
- Systems Selection
- Communicate systems to Field
- Material Controls
- Systems installation “protocol”
- Labeling
- Record keeping - Variance Procedures
- Non-Conformances
- Documentation
- Project closeout



CONFIGURATION A

Why Contractor Qualifications?

- **Built right the first time...Start a Trend...**
- **SYSTEMS Selection, Analysis, As-Built Inventory**
 - Applied Fireproofing – Listings, Manufacturers Instructions
 - F, T, L, W Rated **Firestop** Systems
 - Tolerances - Annular Space Sizes
 - Angles @ **Dampers**
 - **Door** Gap Sizes - Undercuts - Framing
 - Door Frame Anchors - Spacing
 - Door Closers - Activation Sensors
 - Door Hardware
 - **Damper** Breakaway Connections
 - **Wall fastener** Patterns, Stud Spacing
 - Horizontal Assembly Construction



Greenheck Photo

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



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

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

This certificate reports the findings of an audit by UL to the management system requirements of the Qualified Firestop Contractor Program. The audit was conducted to the requirements specified in the Qualified Firestop Contractor Program requirements. The UL qualified contractor was found to be in compliance with the requirements at the time of the site audit.

Structure Name: Underwriters Laboratories
Job Number: 0001
Address: 333 Pfingsten Rd.
Northbrook, IL 60062

Qualified Contractor: FCTA
Address: 4415 W. Harrison Street, Suite 540
Hitland, IL 60162

Qualified Contractor Scope of Work:
For Project # 0001 Firestopping Head and Bottom of Interior Fire Walls and all Trade Penetrations / Except Cable Tray

UL LLC makes no representations or warranties, expressed or implied, that the installed Firestop system will prevent any loss or damage in the event of a fire or similar event, or that the system will in all cases provide the protection for which it is installed or intended. The certificate is evidence that the working contractor's management system was in compliance with the applicable requirements of the Qualified Firestop Contractor Program.
UL LLC is not an insurer and does not assume any obligation or undertake to discharge any liability of the Qualified Issuing Contractor, or any other party for any loss, which may result in future, insurance settlements, non-compliance in requirements, qualifications of fire certificate, or withdrawal by the Qualified Issuing Contractor from the Qualified Firestop Contractor Program.
Any modification to any Firestop system of the structure will affect the complete Firestop system and may render protection afforded by the system ineffective. Any changes will involve the certificate holder and the responsible party. It is the building owner's responsibility for an annual visual inspection of the inventory of fire-resistance-rated and smoke-resistance assemblies as required by the International Fire Code or other adopted codes. Please contact your local UL Qualified Firestop Contractor or visit www.ul.com/firestopcontractor for a complete list of qualified contractors.

UL and the UL Logo are Trademarks of UL LLC © 2018
Unauthorized reproduction or modification of this certificate constitutes fraud.
This certificate is for reference use only.
To verify Site Audit Certificate or Audit Requirements, please refer to website:
www.ul.com/firestopcontractor

 Certificate Number: 1000

QUALIFIED FIRESTOP CONTRACTOR CERTIFICATE

Company Name: Underwriters Laboratories Inc. File number: R12345 Issued: January 31, 2018
Expires: December 31, 2019

Address: 333 Pfingsten Rd.
Telephone: 480.290.6987
Email Address: Raben.Sandvaljr@UL.com

This company has demonstrated that it complies with UL's Qualified Firestop Contractor Program Requirements. This certificate is not transferable and expires on December 31st of the following Year. This certificate may be displayed, copied and shared with others but must be used in its entirety.

Only those companies listed in UL's online Directory for the Qualified Firestop Contractor Program at www.ul.com/contractor are considered eligible for that program and to use this Certificate and the UL Qualified Firestop Contractor Program Marking (shown here) in its advertising and promotional material in accordance with marking guidelines provided at www.ul.com/contractor.

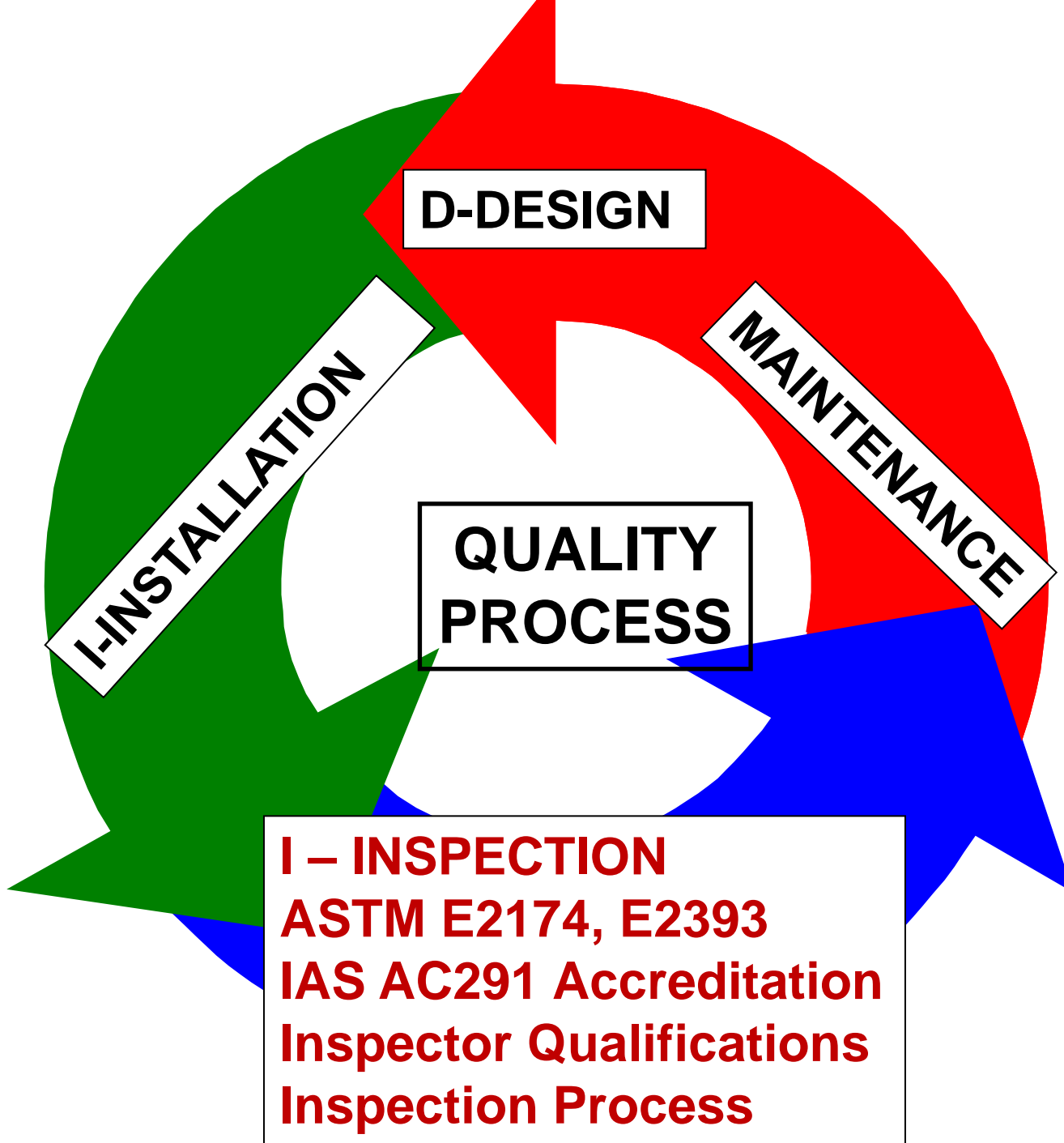
 Underwriters Laboratories
Qualified Firestop Contractor Program

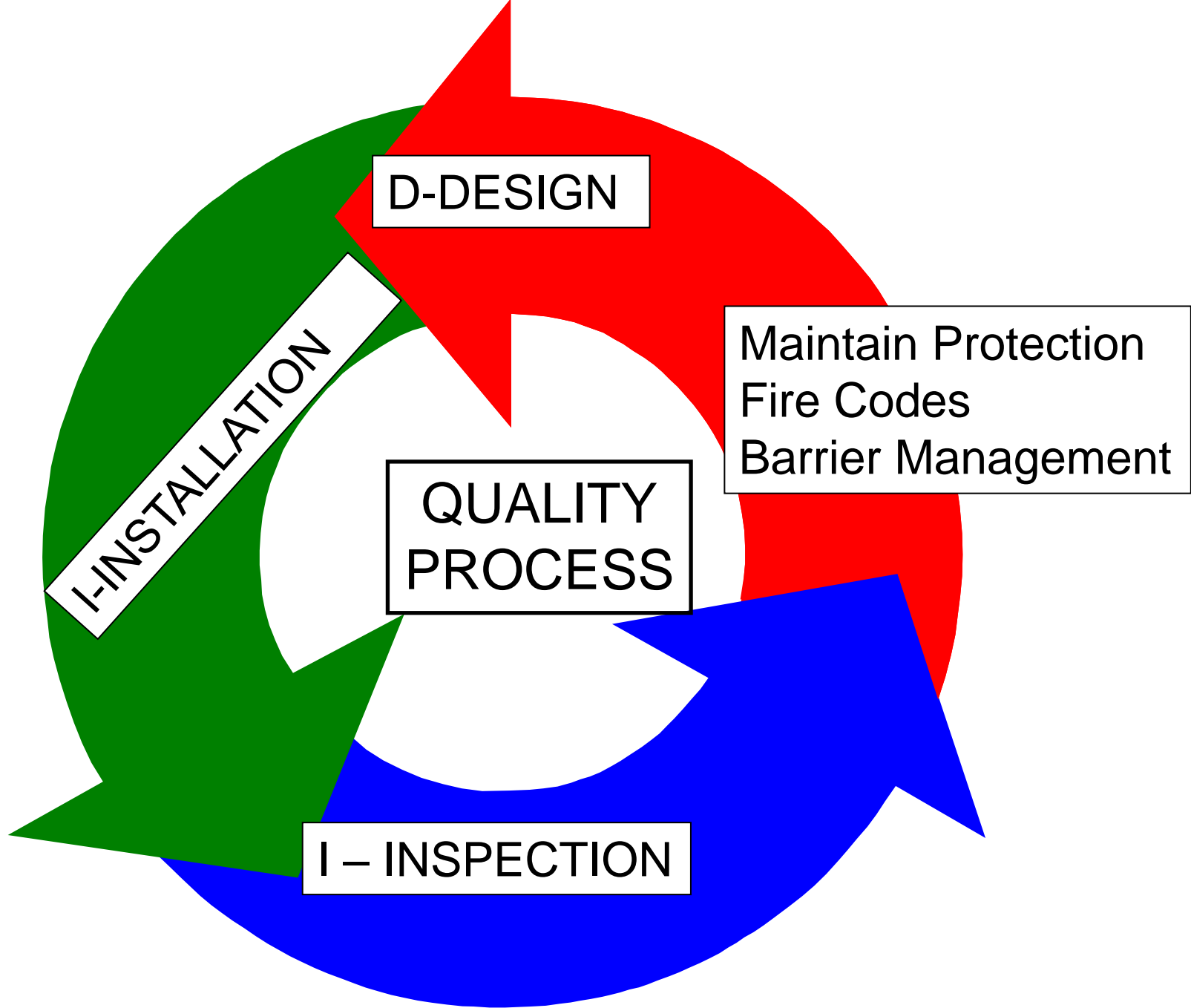
Underwriters Laboratories reserves the right to void this certificate at any point. This certificate does not indicate compliance with any UL product certification program.

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

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UL Slide





I – Inspection – Options

- **Contractor Self Inspection**
 - Verify Management System validity
 - Not 2%, 10%
 - Required for FM & UL, ULC Contractors
- **Manufacturer Inspection**
 - Does not exist ...
- **ASTM E 2174 & ASTM E 2393 –**
 - Independent 3rd Party
 - Destructive, Non Destructive
 - Specified Frequency

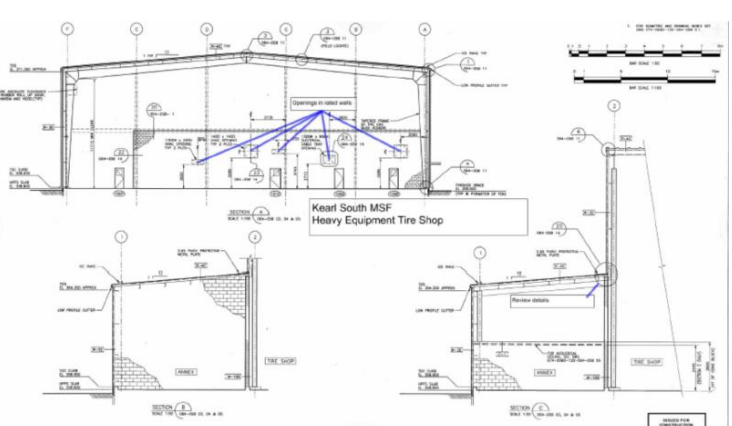
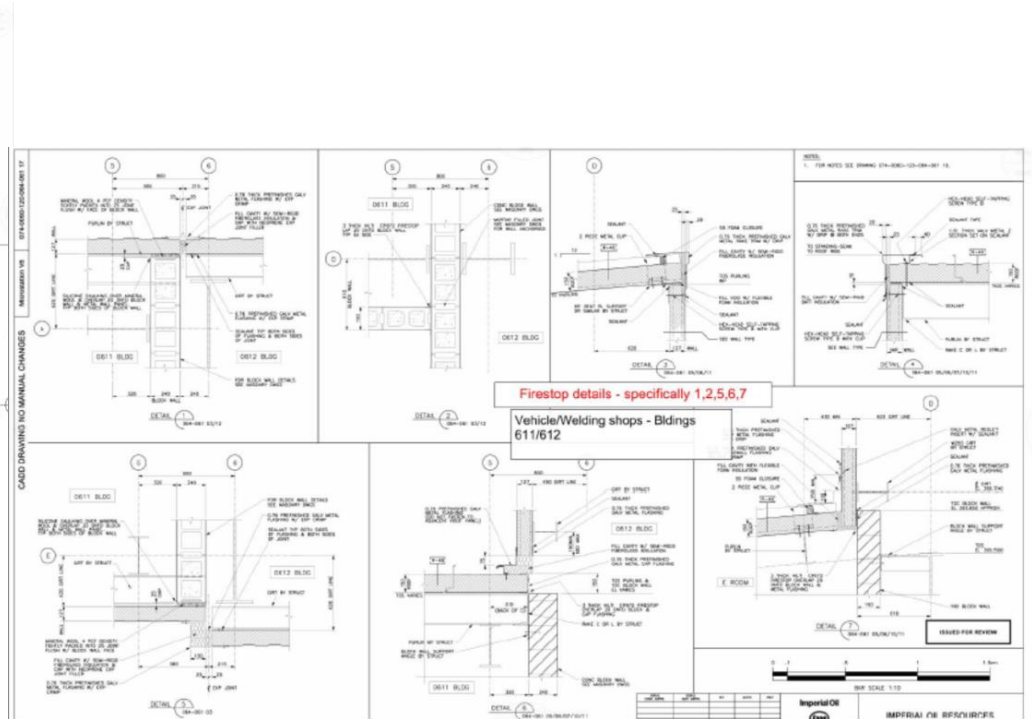
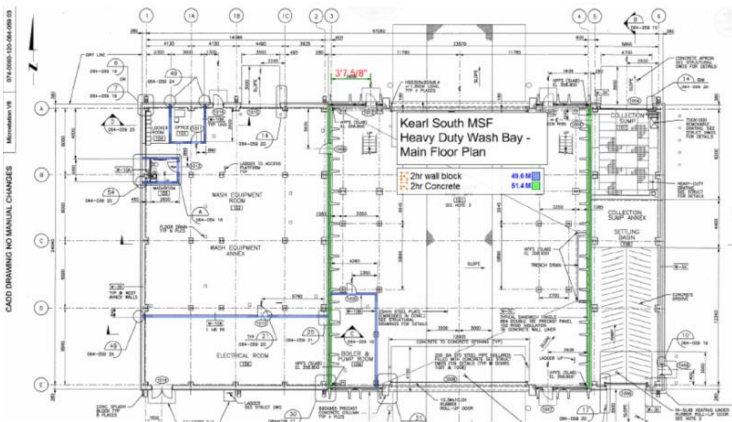
Inspection in Codes

ASTM E 2174 - ASTM E 2393

- FCIA ICC CODE PROPOSALS - 2001, 2006, 2007, 2009
- **FCIA Success @ 2012 International Building Code**
 - CH 17 – Special Inspections
 - Buildings 75' & higher above Fire Department Access
 - Occupancy Type III, IV, Chapter 16 Table 1604.5
 - Not all Jurisdictions Adopt...
- NFPA 101 / 5000 - Chapter 8 – FCIA ADDED to Annex
- NFPA 1 Refers to 'Quality Assurance Program' (FM/UL & Inspection)
- **Master Specifications – 2012 – “It’s in the IBC Code”**



Inspection – Regulations



National Fire Protection Association - NFPA 1-2018

- **12.2* Construction.**
- 12.2.2 Fire safety construction features for **new and existing occupancies** shall comply with **this Code and the referenced edition of NFPA 101.**
- **12.3 Fire-Resistive Materials and Construction.**
- 12.3.1 The design and construction of fire walls and fire barrier walls that are required to **separate buildings or subdivide a building to prevent the spread of fire** shall comply with Section 12.3 and NFPA 221.

National Fire Protection Association - NFPA 1-2018

- **12.3.2* Quality Assurance for Penetrations and Joints.** In **new buildings** three stories or greater in height, **a quality assurance program for the installation of devices and systems installed to protect penetration and joints shall be prepared and monitored by the RDP** responsible for design. Inspections of firestop systems and fire-resistive joint systems shall be in accordance with 12.3.2.1 and 12.3.2.2.

National Fire Protection Association - NFPA 1-2018

- **12.3.2.1 ... Penetrations ... shall be inspected in accordance with ASTM E 2174**
- **12.3.2.2. ... Joint Systems ... shall be inspected in accordance with ASTM E 2393**
- **FCIA Proposal...**
- **More about this later....**

I – Inspection – Code Requirements

[A] 110.3 Required inspections. The *building official*, upon notification, shall make the inspections set forth in Sections 110.3.1 through 110.3.10.

[A] 110.3.6 Fire- and smoke-resistant penetrations. Protection of joints and penetrations in fire-resistance rated assemblies, *smoke barriers* and smoke partitions shall not be concealed from view until inspected and *approved*.

I – Inspection – Code Requirements

- **1705.1.1 Special cases.** Special inspections shall be required for proposed work that is, in the opinion of the building official, unusual in its nature, such as, but not limited to, the following **examples:**

I – Inspection – Code Requirements

- Examples:
 - Construction materials and systems that are alternatives to materials and systems prescribed by this code. [EJ's]
 - Unusual design applications of materials described in this code. [EJ's]
 - Materials and systems required to be installed in accordance with additional manufacturer's instructions that prescribe requirements not contained in this code or in standards referenced by this code.

Inspection in Codes

ASTM E 2174 - ASTM E 2393

- NFPA 101 / 5000 - Chapter 8 - Annex
- 2012 International Building Code
 - CH 17 – Special Inspections
 - Buildings 75' & higher above Fire Department Access
 - Occupancy Type III, IV, Chapter 16 Table 1604.5
- Abu Dhabi International Building Code

Inspection in Codes

- **Table 1604.5 – Risk III** - *Buildings and other structures that represent a substantial hazard to human life in the event of failure, include but are not limited to:*
 - *Public Assy., Occupant Load >300*
 - *Bldgs. Containing Elem., 2ndary', day care, >250*
 - *I-2, >50, no surgery, emergency; I-3*
 - *Occupancy load >5,000*
 - *Power-gen, h2o treatment, wastewater treatment, public utilities, not in IV*
 - *Buildings not in IV, with toxic or explosive*

[BCNYS 2020, Table 1604.5]



Inspection in Codes

- **Table 1604.5 – Risk IV - Buildings and other structures designated as essential facilities, including but not limited to:**
 - *Group I-2 occupancies having surgery or emergency treatment facilities.*
 - *Fire, rescue, ambulance/police stations, emergency vehicle garages.*
 - *Designated earthquake, hurricane or other emergency shelters.*
 - *Designated emergency prep, communications and operations centers and other facilities required for emergency response.*
 - *Power-generating stations and other public utility facilities required as emergency backup facilities for*

[BCNYS 2020, Table 1604.5]



Inspection in Codes

- **Table 1604.5 – Risk IV - Buildings and other structures designated as essential facilities, including but not limited to:**
 - *Buildings and other structures containing quantities of highly toxic materials that:*
 - *Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the International Fire Code, and are sufficient to pose a threat to the public if released.*
 - *Aviation control towers, air traffic control centers and emergency aircraft hangars.*
 - *Buildings and other structures having critical national defense functions.*
 - *Water storage facilities and pump structures required to maintain water pressure for fire suppression.* [BCNYS 2020, Table 1604.5]



I – Inspection – Code Requirements

Definitions

[A] **APPROVED AGENCY**. An **established and recognized agency** regularly engaged in conducting tests or furnishing inspection services, when such agency has been *approved*. [IBC 202. Definitions]

[A] **APPROVED**. Acceptable to the *building official* or authority having jurisdiction.

[IBC 202 Definitions]

I – Inspection – Code Requirements

SPECIAL INSPECTOR. A qualified person *employed or retained by an approved agency* and *approved* by the *building official* as having the competence necessary to inspect a particular type of construction requiring *special inspection*. [IBC 202. Definitions]

I – Inspection – Code Requirements

SECTION 1703 APPROVALS

1703.1 Approved agency. An *approved agency* shall provide all information as necessary for the *building official* to determine that the agency meets the applicable requirements.

I – Inspection – Code Requirements

1703.1.1 Independence. An approved agency shall be objective, competent and independent from the contractor responsible for the work being inspected. The agency shall also disclose possible conflicts of interest so that objectivity can be confirmed. **[IBC 1703.1.2]**

1703.1.2 Equipment. An approved agency shall have adequate equipment to perform required tests. The equipment shall be periodically calibrated. **[IBC 1703.1.2]**

I – Inspection – Code Requirements

1703.1.3 Personnel. An approved agency shall employ experienced personnel educated in conducting, supervising and evaluating tests and/or inspections.

[IBC 1703.1.3]

I – Inspection – Code Requirements

1704.2 Special inspections. Where application is made for construction as described in this section, **the owner or the registered design professional in responsible charge acting as the owner’s agent** shall employ one or more approved agencies to perform inspections during construction on the types of work listed under Section 1705. **These inspections are in addition to the inspections identified in Section 110. [IBC 1704.2]**

I – Inspection – Code Requirements

1704.2.1 Special inspector qualifications. The special inspector shall provide written documentation to the building official **demonstrating his or her competence** and relevant experience or training. **Experience or training shall be considered relevant** when the documented experience or training **is related in complexity to the same type of special inspection activities for projects of similar complexity and material qualities.** These qualifications are in addition to qualifications specified in other sections of this code. The **registered design professional in responsible charge** and engineers of record involved in the design of the project **are permitted to act as the approved agency and their personnel are permitted to act as the special inspector for the work designed by them, provided they qualify as special inspectors.**

I – Inspection – Code Requirements

1705.16 Fire-resistant penetrations and joints. In high-rise buildings or in buildings assigned to Risk Category III or IV in accordance with Section 1604.5, special inspections for through-penetrations, membrane penetration firestops, fire resistant joint systems, and perimeter fire barrier systems that are tested and listed in accordance with Sections 714.3.1.2, 714.4.1.2, 715.3 and 715.4 shall be in accordance with Section 1705.16.1 or 1705.16.2.

I – Inspection – Code Requirements

- **1705.1.1 Special cases.** Special inspections shall be required for proposed work that is, in the opinion of the building official, unusual in its nature, such as, but not limited to, the following **examples:**

I – Inspection – Code Requirements

- Examples:
 - Construction materials and systems that are alternatives to materials and systems prescribed by this code. [EJ's]
 - Unusual design applications of materials described in this code. [EJ's]
 - Materials and systems required to be installed in accordance with additional manufacturer's instructions that prescribe requirements not contained in this code or in standards referenced by this code.

I – Inspection – Code Requirements

HIGH-RISE BUILDING. A building with an occupied floor located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access. [IBC 202]

I – Inspection – Mandatory

1705.16.1 Penetration firestops. Inspections of penetration firestop systems that are tested and listed in accordance with Sections 714.3.1.2 and 714.4.1.2 shall be conducted by an approved inspection agency in accordance with **ASTM E 2174**.

1705.16.2 Fire-resistant joint systems. Inspection of fire resistant joint systems that are tested and listed in accordance with Sections 715.3 and 715.4 shall be conducted by an approved inspection agency in accordance with **ASTM E 2393**.

Inspection Firm & Individual Qualifications

ASTM E 2174 - ASTM E 2393

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

Firm and Individual Qualifications IAS AC 291

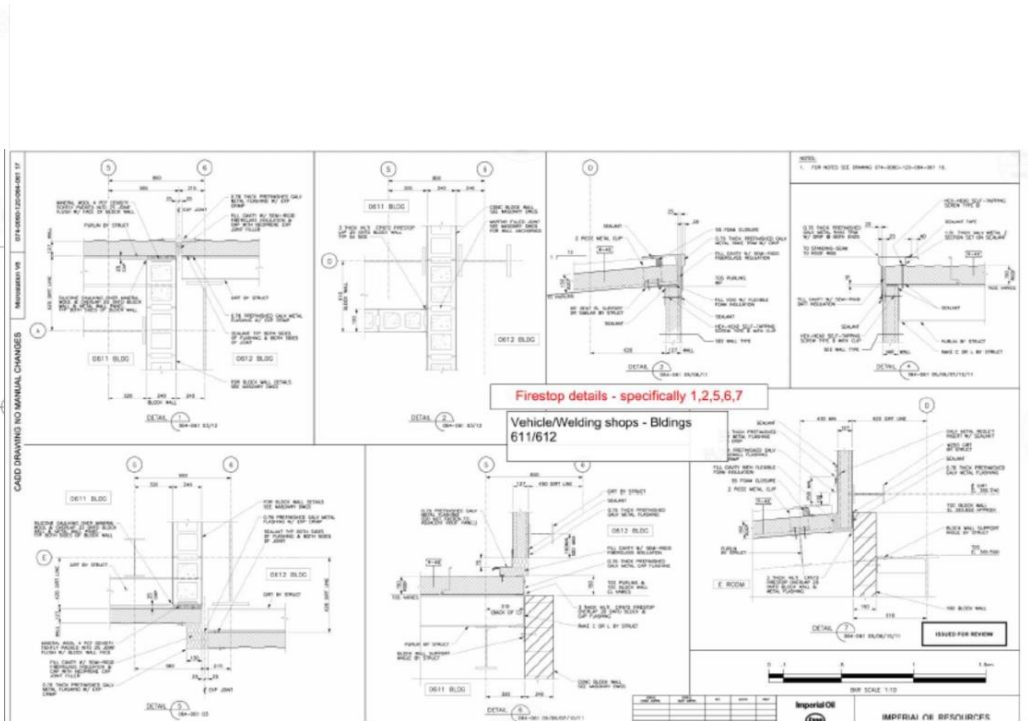
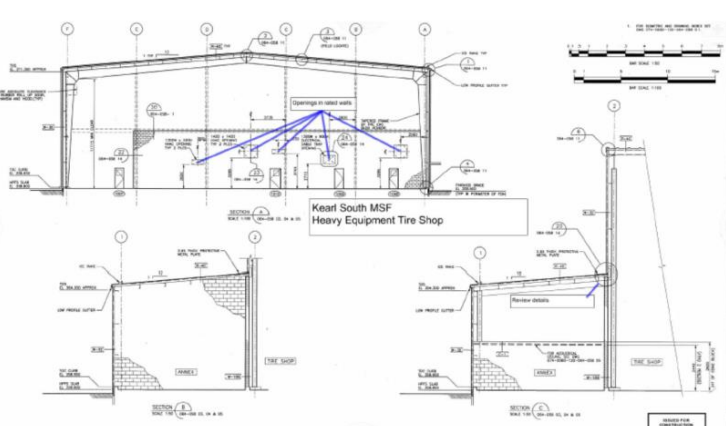
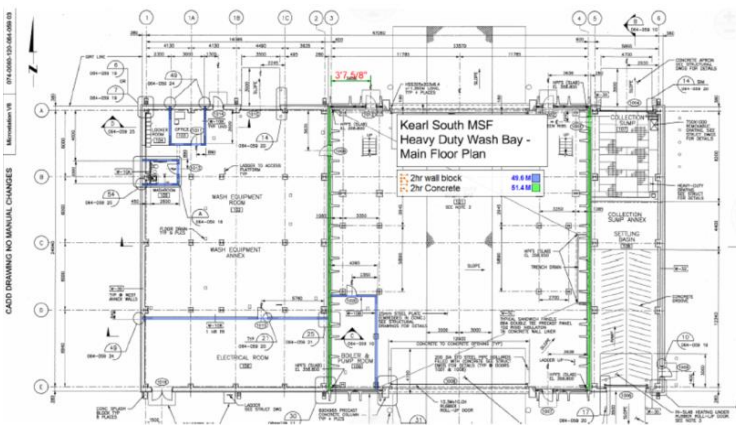
- Inspector Firm shall have at least one staff..
 - PASS UL or FM Firestop Exam
 - 1 year Quality Assurance
 - Or...*
 - PASS UL/FM Firestop Exam, *and* PE, FPE, Registered Architect, or
 - PASS UL/FM Firestop Exam, *and* Education by Certified Agency

Firestop Systems Inspection

ASTM E 2174 - ASTM E 2393

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

Inspection – What's needed?



Firestop Inspection Standards & Professional Contractor = Success

- ASTM E 2174/ ASTM E 2393 Standard Practice



I – Inspection – What’s Needed?

- **Life Safety Drawings**
 - **Architectural Plans with Fire-Resistance Rated Assemblies noted**
- **Tested and Listed System Designs**
 - **UL Product iQ, FM Approval Guide, others.**
 - **Firestop Penetrations**
 - **Fire-Resistive Joints –**
 - **HW, WW, FW, FF, CW, etc.**

I – Inspection – What's Needed?

- **Manufacturers Installation Instructions**
- **Safety Data Sheets**
- **Identification Systems!!**

I – Inspection – What's Needed?

- **Ladders, Lifts??**
- **Tools ... more later.**

Firestop Inspection Process

ASTM E 2174 - ASTM E 2393

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

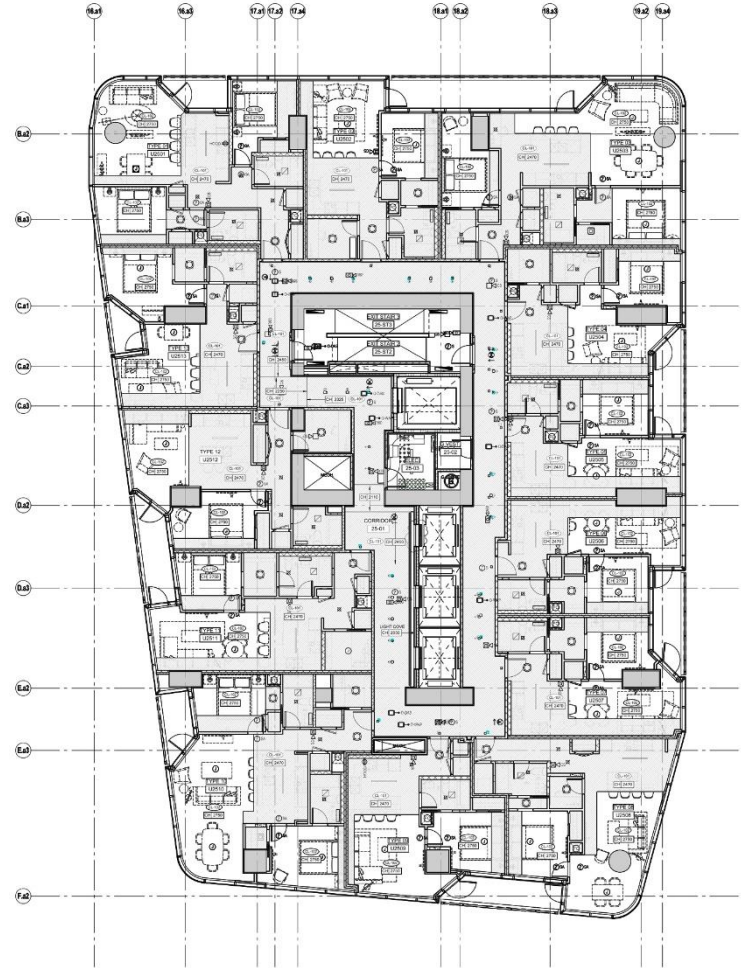
FIRESTOP CONTRACTOR (204) 555-0101		WARNING	
<small>This is an approved Firestop System and shall NOT be disturbed except by Authorized Personnel.</small>			
Wall Penetration No.: <u>SE-2393-1</u>	Fire Rating Required: <u>1.5 F</u>		
Floor Level: <u>L1/FL 200</u>	Room No.: <u>201</u>		
Installer's Name: <u>JJH/SHT</u>	Product: <u>FS-20E</u>		
Installation Date: <u>APRIL 1, 2011</u>	System Design No.: <u>E.A./322a</u>		
Responsible by:	Installer	Date	
Company			



Firestop Inspection Process

ASTM E 2174 - ASTM E 2393

- Pre-Construction Meeting
 - Review Documents
 - Identify Conflicts
 - Review Materials Systems
- **ASTM E 814 or UL 1479, FM 4990, ASTM E 1966, UL 2079, ASTM E 2307 Systems, ULC S-115**



Firestop Inspection Process

ASTM E 2174 - ASTM E 2393

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



Affinity Firestop
Photo

A GC that gets It!

Prep – Inspection/Installation



C. Zussman Pepper Photo

Firestop Inspection Process

ASTM E 2174 - ASTM E 2393

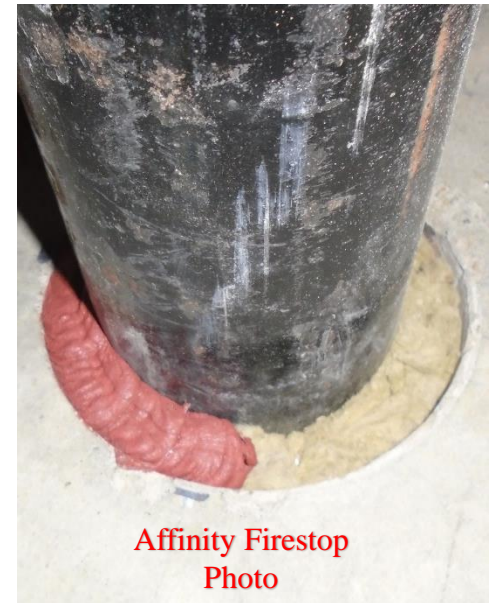
- Inspection Schedule
 - Notifies Inspector
 - Inspections within 2 days
 - Inspector verifies installation
 - Is in accordance with Documents
 - Meets Manufacturers Installation Instructions



Firestop Inspection Process

ASTM E 2174 - ASTM E 2393

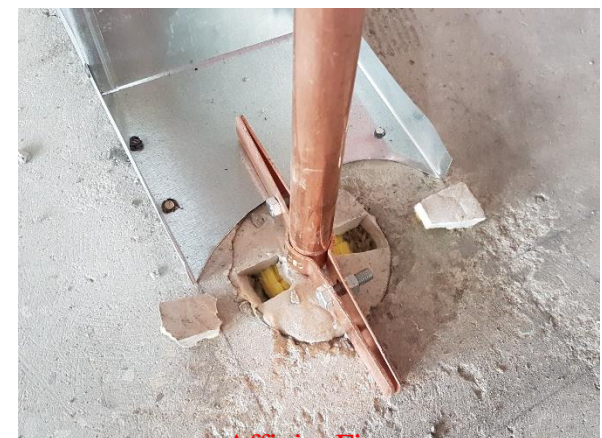
- Observation Reviews
 - Performed during construction
 - Witnessed randomly of the installed systems on each floor
 - 2174 - 10%, each **type** of Service Penetration Firestop System
 - Type = By System, By Scope of Work
 - 2393 - 5% of Total Lineal Feet for each type of Fire Resistance Rated Joint System
 - Type = By System, By Scope of Work



Firestop Inspection Process

ASTM E 2174 - ASTM E 2393

- Destructive Reviews (Testing)
 - Performed Post-Construction
 - **2174 - Minimum 2% , no less than 1, each type per 930 m² (10,000 SF) of floor area**
 - Type = By System, Scope of Work
 - **2393 - Minimum 1 / 152 LM (500 LF) of Joint Area, by type, mandatory; Exception mechanical joints**
 - Type = By System, Scope of Work



Affinity Firestop
Photos

Measure Sealant Thickness NOT MIDDLE Bond Lines – Pen./Assy.



Firestop Inspection

ASTM E 2174 - ASTM E 2393

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



Firestop Inspection Process

ASTM E 2174 - ASTM E 2393

- Inspectors shall
 - Not supervise or direct FS Contractors
 - Commence reviews at the start of FS installation
 - Review installation based on manufacturers and system requirements
 - *Selecting Systems, Coaching is Supervising...*



Affinity Firestop
Photo

Firestop Repairs

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



Affinity Firestop
Photo

Inspection Forms

ASTM E 2174 - ASTM E 2393

- One for each type of firestop
- Submit 1 day after Inspection to
Authorizing Agency
- Numbered – Controlled
- Required – During/Post Construction
Methods
- TYPE = By System, By Contractor....

Inspection Final Report

ASTM E 2174 - ASTM E 2393

- Name, address, location – project, installer, inspector
- Type and quantity of firestops inspected
- Verification method
- Percentage Deviation
- Copies of all documents sent to Authorizing Agency

cUL SYSTEM NO. C-AJ-2022
PLASTIC PIPE THROUGH CONCRETE FLOOR/WALL OR BLOCK WALL ASSEMBLY
 F-RATING = 2HR.
 FT, FH AND FTH-RATING = 0HR.
 NOTE: TESTED WITH A 50 P.S.I. PRESSURE DIFFERENTIAL

1. CONCRETE FLOOR OR WALL ASSEMBLY (2HR, FIRE-RATING):
 A. LIGHTWEIGHT OR NORMAL WEIGHT CONCRETE FLOOR OR WALL (MIN. 2-1/2" THICK).
 B. ANY UL/CUL CLASSIFIED CONCRETE BLOCK WALL.

2. PENETRATING ITEM TO BE ONE OF THE FOLLOWING:
 A. MAXIMUM 4" NOMINAL DIAMETER PVC PLASTIC PIPE (CELLULAR OR SOLID CORE),
 B. MAXIMUM 4" NOMINAL DIAMETER ABS PLASTIC PIPE (CELLULAR OR SOLID CORE),
 C. MAXIMUM 4" NOMINAL DIAMETER FRPP PLASTIC PIPE,
 D. MAXIMUM 4" NOMINAL DIAMETER CPVC PLASTIC PIPE (SDR 13.5) (CLOSED PIPING SYSTEM ONLY),
 E. MAXIMUM 3" NOMINAL DIAMETER AQUARISE CPVC PLASTIC PIPE (SDR 11) MANUFACTURED BY IPEX, INC. (CLOSED PIPING SYSTEM ONLY),
 F. MAXIMUM 4" NOMINAL DIAMETER RIGID NONMETALLIC CONDUIT (SCH 40 PVC).

3. HILTI CP 648E WRAP STRIP (NOMINAL 3/16" THICK x 1-3/4" WIDE) WRAPPED CONTINUOUSLY AROUND THE OUTER CIRCUMFERENCE OF PIPE, AS SPECIFIED IN THE TABLE BELOW, WITH ENDS BUTTED AND HELD IN PLACE WITH TAPE. WRAP STRIP TO BE INSERTED INTO ANNULAR SPACE AND POSITIONED 1/4" FROM BOTTOM SURFACE OF CONCRETE FLOOR.

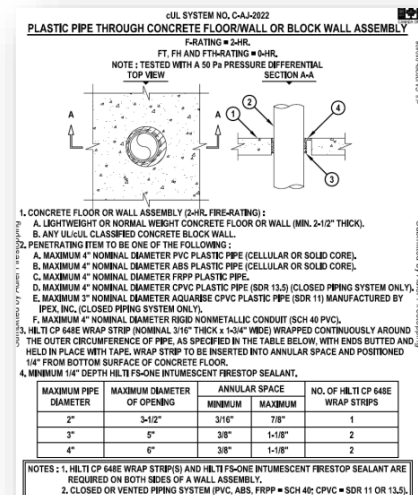
4. MINIMUM 1/4" DEPTH HILTI FS-ONE INTUMESCENT FIRESTOP SEALANT.

MAXIMUM PIPE DIAMETER	MAXIMUM DIAMETER OF OPENING	ANNULAR SPACE		NO. OF HILTI CP 648E WRAP STRIPS
		MINIMUM	MAXIMUM	
2"	3-1/2"	3/16"	7/8"	1
3"	5"	3/8"	1-1/8"	2
4"	6"	3/8"	1-1/8"	2

NOTES: 1. HILTI CP 648E WRAP STRIPS AND HILTI FS-ONE INTUMESCENT FIRESTOP SEALANT ARE REQUIRED ON BOTH SIDES OF A WALL ASSEMBLY.
 2. CLOSED OR VENTED PIPING SYSTEM (PVC, ABS, FRPP = SCH 40; CPVC = SDR 11 OR 13.5).

Firestop Contractor Provides Documentation = Inventory

- Copies of all documents sent to Authorizing Agency
- Product Data Sheets
- ‘SYSTEMS’, Fire Rated Assemblies = As Builts
- Inspection Docs
- Warranty Docs
- Maintenance Requirements
- Letters of Compliance
- FCIA Member in Good Standing Certificate



Without Inspection?



K. Heckler Photo

Really?



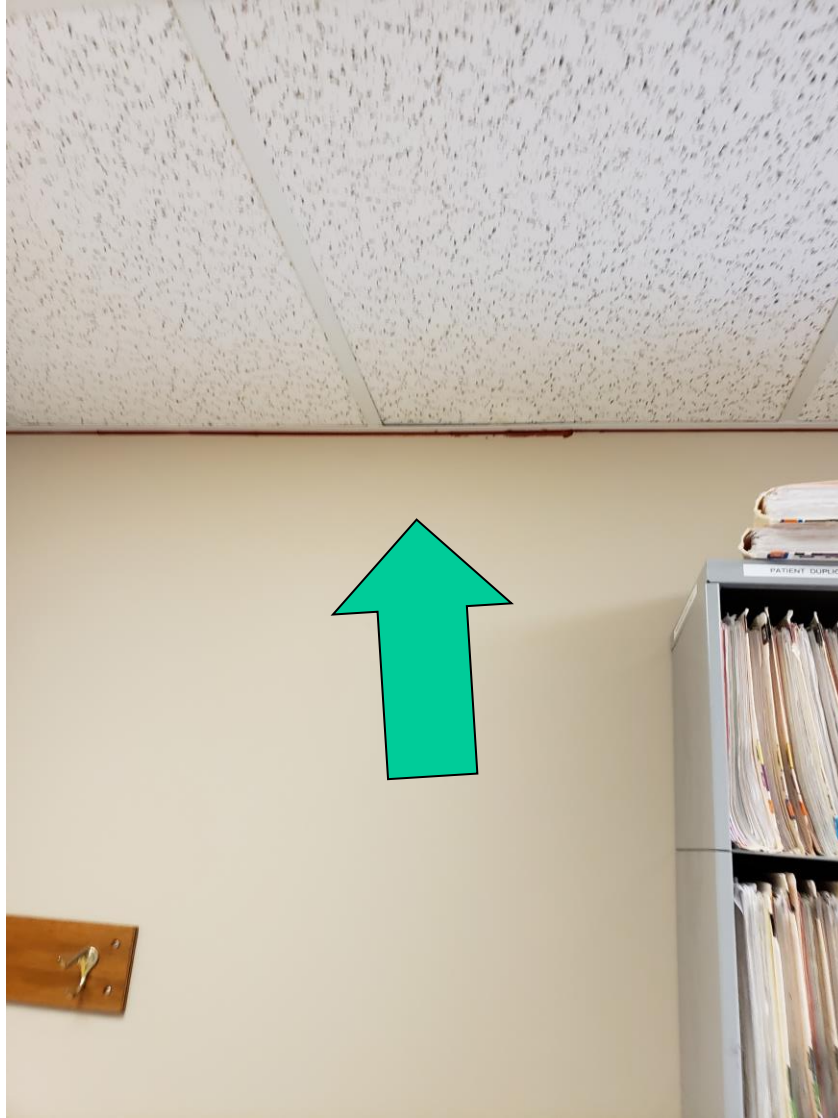
J. Sharp Photo

Protected?



D. Falconer Photo

Really?



J. Chiangi Photo

Inspection?



Affinity Firestop Photo



Affinity Firestop Photo

Inspection?



Affinity Firestop Photo

Inspection?



Affinity Firestop Photo

Firestop Repairs

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



Affinity Firestop
Photo

Building & Fire Code Requirements

- Smoke Barriers differ from Smoke Partitions?
 - **Smoke Barrier** –
 - **IBC – Hourly Rated, Quantified Firestop “L” Rating**
 - <5cfm/sf (IBC 2006)
 - < 50 cfm, 100sf 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*....

Building & Fire Code Requirements

- What Gets Used Where?
 - **Smoke Barrier** –
 - **IBC** - Firestop System With L Rating
 - **NFPA** – Firestop System with L Rating
 - **Smoke Partition**
 - **IBC** – Smoke and Sound OR Firestop System with L Rating
 - **NFPA** - Smoke and Sound OR Firestop System with L Rating

2018 International Fire Code

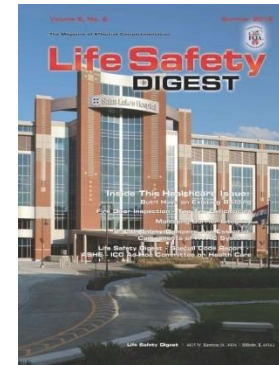
- **701.6 Owner's responsibility.** The **owner** **shall maintain an inventory of all** **required** *fire-resistance-rated and smoke resistant* construction, and the construction included in Sections 703 through 707 and such construction shall be visually inspected by the *owner annually and properly repaired, restored or replaced where damaged, altered, breached or penetrated.*

2018 International Fire Code Explained

- **What's a Fire-Resistance Inventory?**
 - **Life Safety Drawings**
 - Designs, Systems and Assemblies
 - **Listings**
 - **Manufacturers Installation and Maintenance Instructions**
 - Paper & Files
 - Spreadsheets
 - Software

M–Barrier Management Systems Starts @ NEW CONSTRUCTION

- **NEW Buildings – 07-84-00 Specs**
 - **www.FCIA.org**
- **Part I – Focus on**
 - **Systems**
 - **Not Products**
 - **Manufacturers**
- **“Single Manufacturer to the greatest extent possible” – EJ’s**



M–Barrier Management Systems Starts with CONSTRUCTION

- **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**

M–Barrier Management Systems Starts with CONSTRUCTION

- **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**

M–Barrier Management Systems Starts with CONSTRUCTION

- **NEW Buildings – 07-84-00 Specs**
- **Part III – Execution**
 - **Special Inspection**
 - **ASTM E 2174 - Penetrations**
 - **ASTM E 2393 - Joints**

Built Right = Maintain Right WHEN SPECIFIED

- **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**

International Property Maintenance Code

IPMC SECTION 703

[F] 703.1 Fire-resistance-rated assemblies. The required fire-resistance rating of fire-resistance-rated walls, fire stops, shaft enclosures, partitions and floors shall be maintained.

[F] 703.2 Opening protectives. Required opening protectives shall be maintained in an operative condition. Fire and smokestop doors shall be maintained in operable condition. Fire doors and smoke barrier doors shall not be blocked or obstructed or otherwise made inoperable.

UAE Fire and Life Safety Code of Practice

Maintenance & Management

Chapter 1, SECTION 21 Firestopping

21.15.2 The required fire resistance rating of installed firestop systems shall be ***visually inspected by the owner or owner's inspection agency 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.

21.15.3 Any new **Openings** made therein for the passage of through penetrants, **shall be protected with approved firestop system** to comply with applicable codes as per the guidelines of Civil defense.

National Fire Code of Canada

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



M–Barrier Management Systems

- **Barrier Management Starts at New Construction Specification.....**

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**

Building & Fire Code Requirements

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 - **NFPA** - Smoke and Sound OR Firestop System with L Rating

Are Fire-Resistance Rated Assemblies to be Marked? YES

703.7 Marking and identification. *Fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall* required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall:

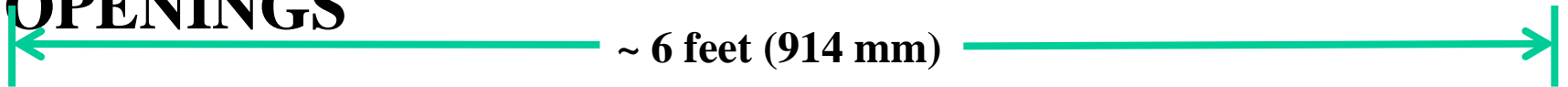
1. Be located in accessible concealed floor, floor-ceiling or *attic spaces*;
2. Be located within 15 feet (4572 mm) of the end of each wall and at intervals not exceeding 30 feet (9144 mm) measured horizontally along the wall or partition; and
3. Include lettering **not less than 3 inches (76 mm) in height with a minimum 3/8 inch (9.5 mm) stroke** in a contrasting color incorporating the suggested wording.
“FIRE AND/OR SMOKE BARRIER—PROTECT ALL OPENINGS”
or other wording.

Exception: Walls in Group R-2 occupancies that do not have a removable decorative ceiling allowing access to the concealed space.

Mark Walls with Code Defined Terms? NOT IBC; YES NFPA

International Building Code, Section 703.7

**FIRE AND/OR SMOKE BARRIER – PROTECT ALL
OPENINGS**



Heckler Slide

NFPA 101 - Life Safety Code, Section 8.2.2.5 (2018 edition)

**FIRE BARRIER – 1
HOUR**

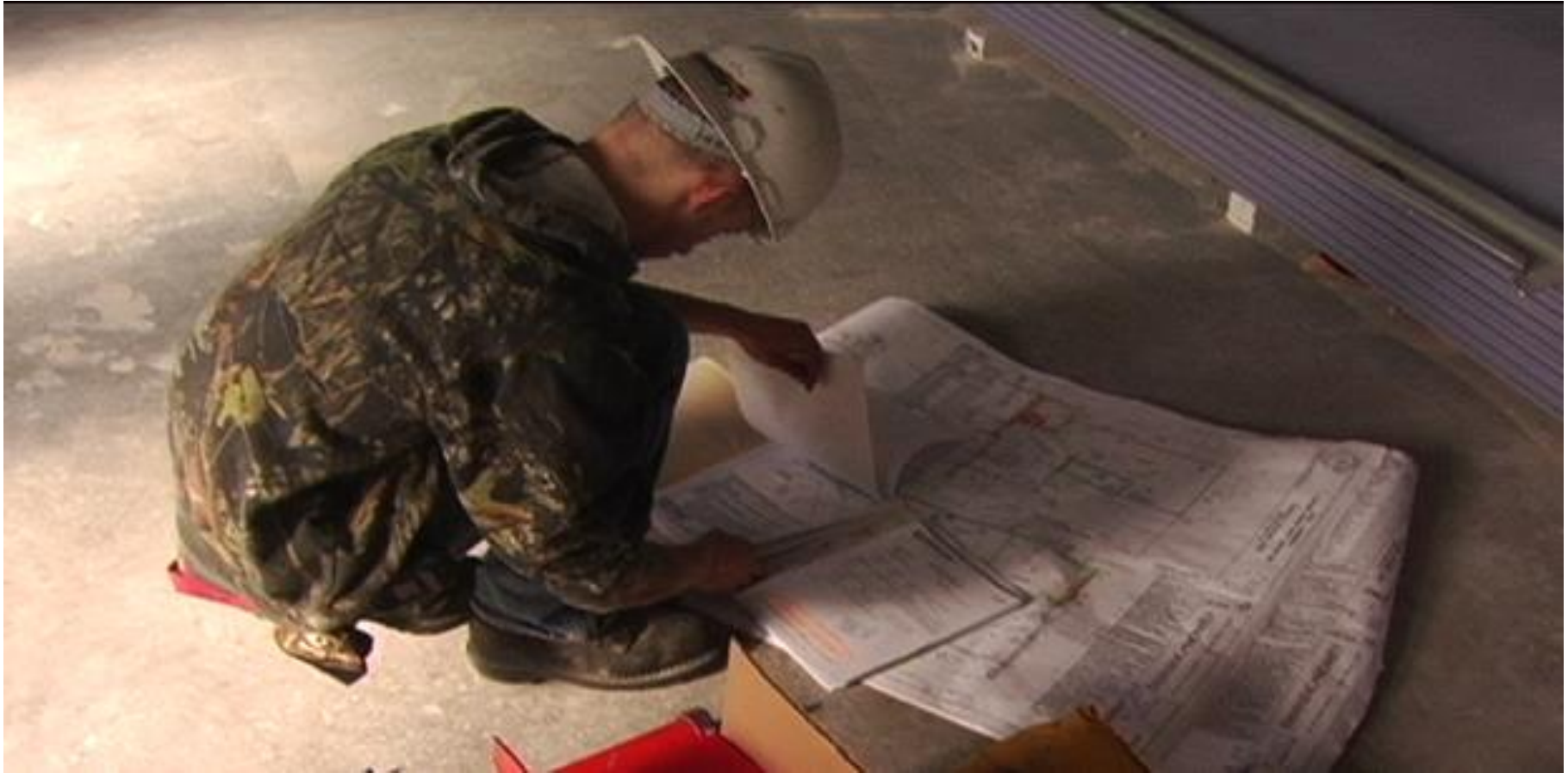
Identify the wall
type and its fire
resistance, as
applicable



Heckler Slide

Firestopping for Continuity

I – Listed Systems



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**
- **Wraps, Ductwrap**



UL-ULC/FM 4991 Contractor Company Benefits

Quantified Differentiation ...

- **Focus on the Company & Individual**
- Investment in Company Procedures
- Investment in People Education
- Investment in FCIA Manual of Practice
 - Project Successful Proven Contractor
 - Education, Training, Accountability
 - = Reduced Risk – Life, Property, Business

Why Inspection?

Firestop Installation Methods

- **Each Construction Discipline – MEP, etc.**
 - “He/She who pokes hole, fills hole”
- **Multiple Contracts**
 - Firestop Contractors, Trades
- **Single Source Firestop Contractor**
 - *FCIA Member in Good Standing*
 - *UL/ULC Qualified, or FM 4991*

Firestop Inspection Standards & Professional Contractor = Success

- ASTM E 2174/ ASTM E 2393 Standard Practice



Inspection in Codes

ASTM E 2174 - ASTM E 2393

- 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

IAS AC 291 Must be Specified

- **IAS AC 291** Quantified Qualifications
 - Helps AHJ with “Approved Agency”
 - Not in ASTM Standards, Code
- **Individual Competencies - Exams**
 - FM Firestop Exam
 - **OR**
 - UL Firestop Exam
 - **AND**
 - IFC Exam

Measure Sealant Thickness NOT MIDDLE Bond Lines – Pen./Assy.



Firestop Inspection

ASTM E 2174 - ASTM E 2393

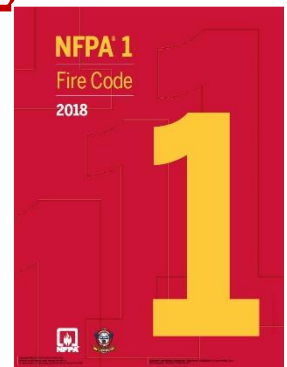
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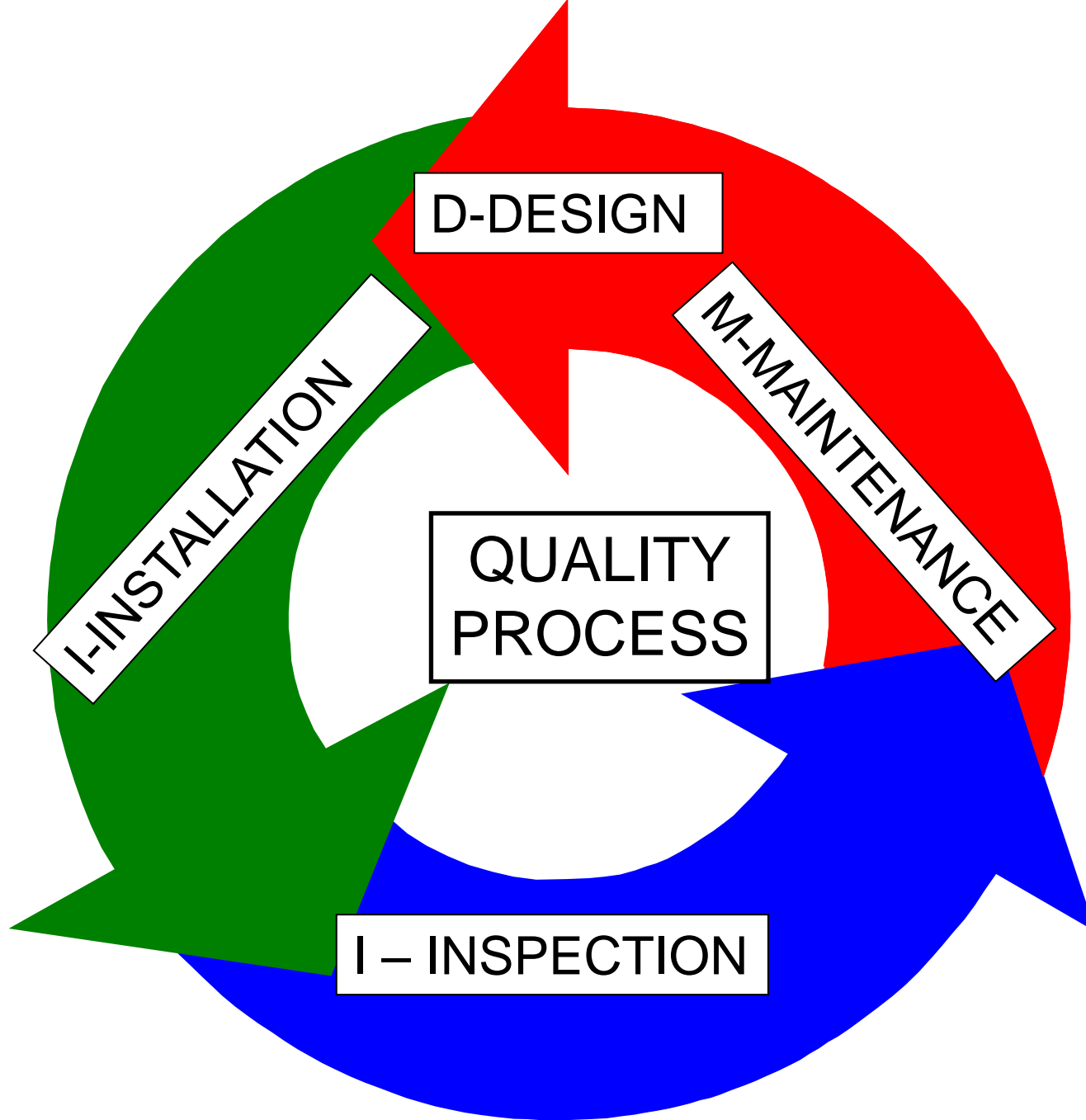


National Fire Protection Association - NFPA 1-2018

- 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 DIIM & Firestopping

Proper ***DIIM*** Means Reliable Systems...

- **Properly *Designed*** - A/E - Consultant
 - Tested and Listed Systems, FCIA Member Mfr's., Compartments per IBC, NFPA Codes, SUBMITTALS....*Specified (CCS, CDT, RSW)*
- **Properly *Installed***
 - **FCIA Member, FM 4991, or UL *Qualified Contractors***
- **Properly *Inspected***
 - ASTM E 2174 & ASTM E 2393, by IAS *Qualified Inspectors at IAS AC 291 Accredited Inspection Firms*
- **Properly *Maintained & Managed*** –
 - FCIA Member, FM 4991, or UL Qualified Contractors.

Effective Compartmentation is a SYSTEM



Fire Resistance in Existing Buildings

- Design
- Installation
- **Inspection**
- Maintenance & Management

Today's Program

- Total Fire Protection
- Design - Specs, Codes, Testing, Products
- Installation – FM, UL/ULC Programs
- **Inspection – ASTM Inspection Standards
IAS AC 291, Inspector Qualifications**
- Maintain Protection – Fire Codes

Contact

Firestop Contractors International Association

Hillside, IL – +1-708-202-1108 - office

Bill@FCIA.org

Fire Resistance in Existing Buildings

- Design
- Installation
- **Inspection**
- Maintenance & Management