

DIIM & Firestopping

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Outline

- FCIA – DIIM – Firestopping
 - Who is FCIA?
 - Total Fire Protection
 - Design - Specs, Codes, Testing, Products
 - Installation – FM, UL/ULC Programs
 - Inspection – ASTM Inspection Stds. IAS AC 291, Inspector Qualifications
 - Maintenance – Fire Codes
 - Firestopping for Safety – A Quality Protocol
 - DIIM

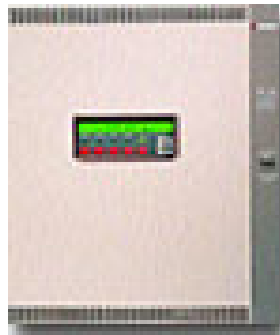
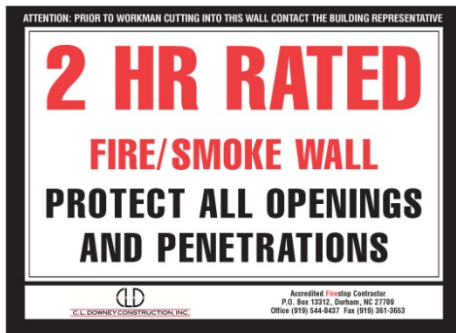
FCIA – Firestop Contractors International Association

- FCIA Members
 - Firestop Contractors
 - Firestop Manufacturers
 - Firestop Consultants
 - Firestop Distributors, Reps, Friends
- FREE MOP/Spec - Specifiers @ AE, Independent
- FREE Life Safety Digest
- 3rd Party Contractor/Inspection Company Accreditation Programs
- Chair, ASTM Inspection Standards
- Tools for Specifiers



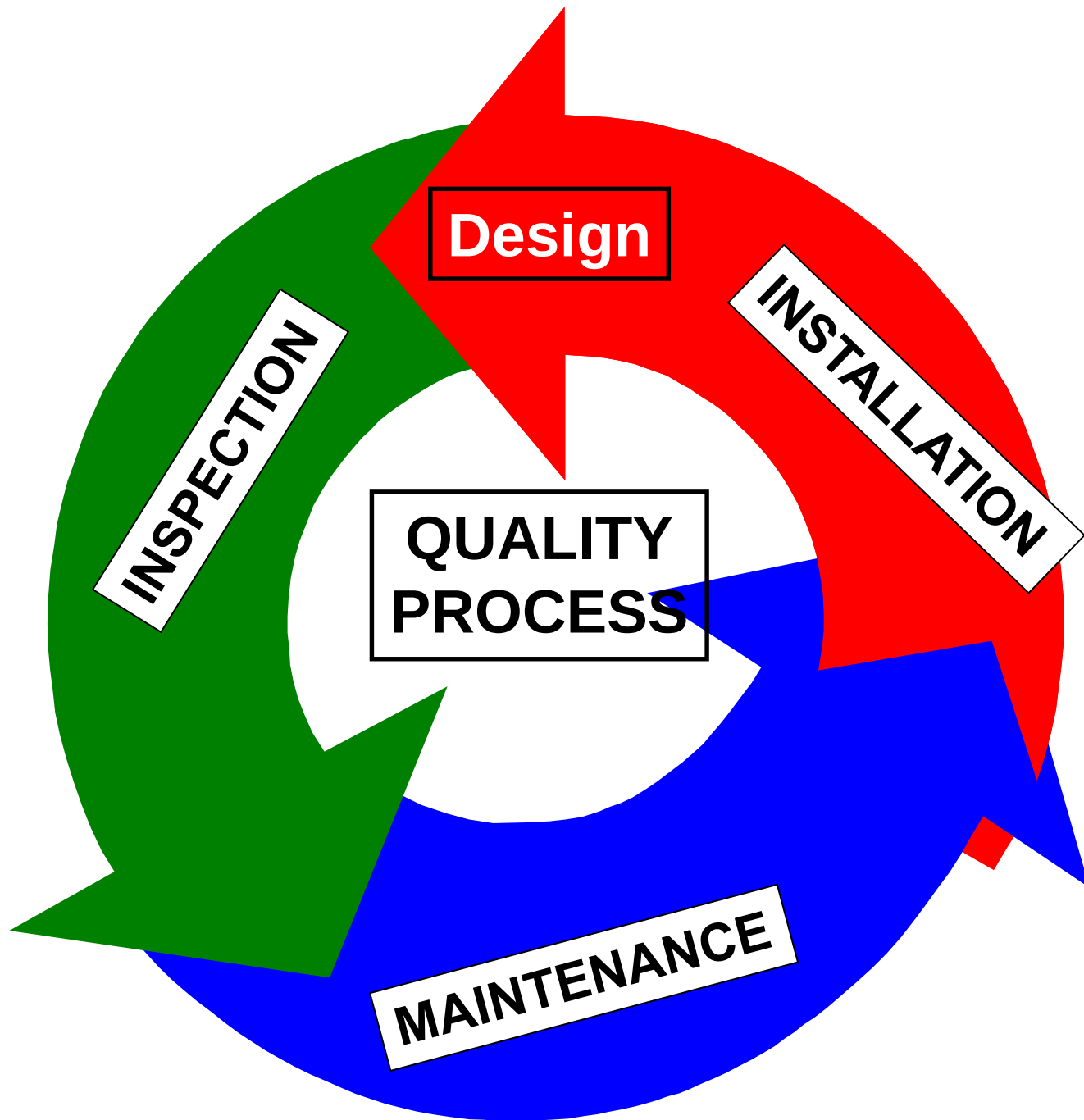
“TOTAL FIRE PROTECTION”

- 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



Firestopping for Safety“DIIM”

- Properly **Designed** and Specified Firestopping FCIA
- 07-84-00 - Specification
- **Tested and Listed Systems** - ASTM E 814 / UL
1479 – ASTM E 1966/UL 2079, FM 4990, ULC-S-
115, ASTM E2837, E2307, E3037, more
- Professional **Installation** – FCIA Member,
FM 4991 Approved, UL/ULC Qualified Contractors
- Properly **Inspected** - ASTM E 2174 / 2393 Protocol
by IAS AC 291 Accredited Inspection Agencies
- **Maintained & Managed** - Annually - FCIA
Members – NFPA 1, 101, International Fire Code



Building & Fire Code Requirements

- NFPA 5000 – 101- Chapter 8
- National Building Code – Canada
- UAE Fire and Life Safety Code – Chapter
- International Codes –
 - New and Existing Buildings International Building Code – Chapter 7
 - International Fire Code – Chapter 7
- ***Minimum requirements - Construction & Maintenance***

Building & Fire Code Requirements

- Codes Define Fire Resistance
 - **Fire Resistance** – Time, in minutes or hours that materials or assemblies have withstood a fire exposure as determined by tests, methods based on tests, or this code
 - IBC, IFC Chapter 7
 - NFPA 101, 5000 - Ch 8.
 - NFPA 1 – Chapter 12
 - **ICC adds... “Systems” – *FCIA Submitted, Approved at ICC***

Building & Fire Code Requirements

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

Building & Fire Code Requirements

- *Archaic Assemblies*
 - *Clay Tile Block*
 - *Gypsum Block*
 - *Plaster*
 - *Clay Tile/Concrete*
 - *Unidentified Assemblies*

Building & Fire Code Requirements

- **Archaic Assemblies**
 - **ICC International Existing Building Code**
 - **NFPA Archaic Construction Book**
 - **Fire-Resistance Directories**
- **EJ/EFRRRA's Required**

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

Building & Fire Code Requirements

How's Fire-Resistance Maintained? – Continuity

- **Walls / Horizontal Assemblies**
- Firestop Products Become Firestop Systems
 - Penetrations
 - Joints – Head /Bottom of Wall – Perimeter Joints
- Fire & Smoke Damper Duct Systems
- Fire Doors and Hardware Systems
 - Rolling & Swinging
- Fire Rated Glazing

Building & Fire Code Requirements

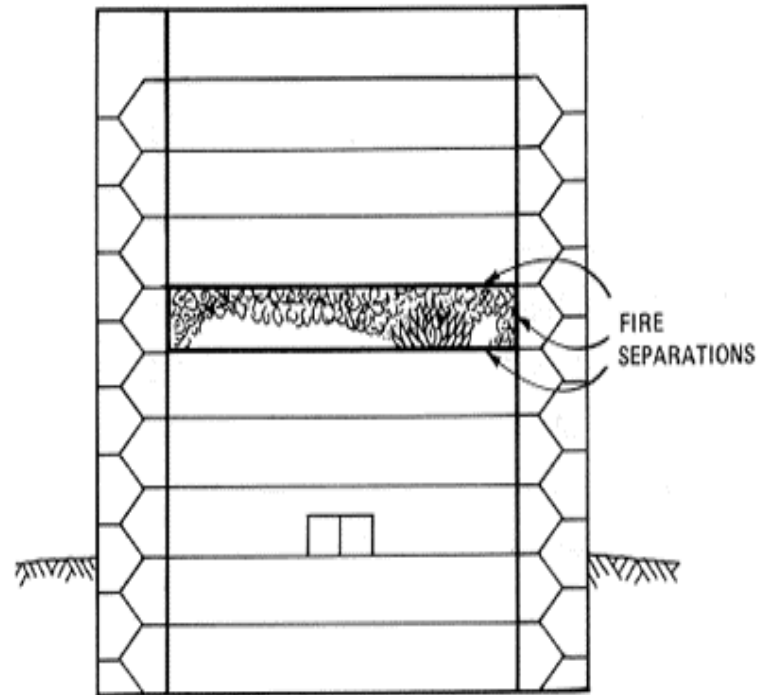
- *Are Physical Properties Specified by Codes?*
- *Chemical, Biological, Radiation, Explosion, etc.*
 - Standards?
 - R - Nuclear Power Plant Standards
 - E – Blast Strength? Check with manufacturer – 2psf
 - C – Which Chemicals? Check with manufacturer
 - B – Which Agents? Check with manufacturer
 - G – Germ – Check w/manufacturer & industrial hygienist
 - How to Regulate for Unexpected Events?
 - Due Diligence - Review Required by code?

Fire Resistance Continuity

It's Everywhere!

- Effective Compartmentation

- Education
- Office
- Mercantile
- Multi Family Residential
- Industrial – Insurance influences
- Institutional – Healthcare



Buildings are Safe Because.... Fire Resistance, ETC.

- ***Total Fire Protection Stats -
North America High Rise***
 - ***11,025 Tall Buildings - 20 + stories***
 - ***70% in NY, SF, LA, CHI, HI, Toronto...***
- = *Compartmentation Primary Defence***
- ***Chicago, NY, Toronto – Older stock of buildings***
 - ***SF, LA, HON – Earthquakes***

» *Source, Emporis.com*



Buildings are Safe Because....

- *Total Fire Protection*
- *Compartmentation*
- *Sprinklers, Alarms,*
- *Egress Strategies*
- *NIST Reports...*



Continuity – Barriers, Walls & Horizontal Assemblies

- Fire Walls and Floors –

- *Assemblies Consist of*

- Concrete
 - Concrete Block
 - Plaster
 - Gypsum Block
 - Gypsum Board / ‘Drywall’
 - Floor/Ceiling Assemblies

“Tested & Listed Wall/Floor Systems”



Charging Language - General

701.1 Scope. The provisions of this chapter shall govern the materials, systems and assemblies used for *structural fire resistance* and fire-resistance-rated construction *separation of adjacent spaces* to safeguard against the spread of fire and smoke within a building and the spread of fire to or from buildings. [IBC 2018 701.1]

Fire-Resistance Ratings & Tests

703.2 Fire-resistance ratings. The *fire-resistance rating* of building elements, components or assemblies shall be determined in accordance with the test procedures set forth in **ASTM E119 or UL 263** or in accordance with Section 703.3. The *fire-resistance rating* of penetrations and *fire-resistant joint systems* shall be determined in accordance Sections 714 and 715, respectively. [IBC 2018 703.2]

Methods for Determining Fire-Resistance

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

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

[IBC 2018 703.3]

Restrained Classifications

703.2.3 Restrained classification. Fire-resistance-rated assemblies tested under ASTM E119 or UL 263 shall not be considered to be restrained unless evidence satisfactory to the *building official* is furnished by the *registered design professional* showing that the construction qualifies for a restrained classification in accordance with ASTM E119 or UL 263.

Restrained construction shall be identified on the *construction documents*. [IBC 2018 703.2.3]

Automatic Sprinklers

703.4 Automatic sprinklers. Under the prescriptive fire resistance requirements of this code, **the fire-resistance rating** of a building element, component or assembly shall be established **without the use of automatic sprinklers or any other fire suppression system being incorporated as part of the assembly** tested in accordance with the fire exposure, procedures and acceptance criteria specified in ASTM E119 or UL 263. However, this section shall not prohibit or limit the duties and powers of the *building official* allowed by Sections 104.10 and 104.11.

[IBC 2018 703.4]

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:

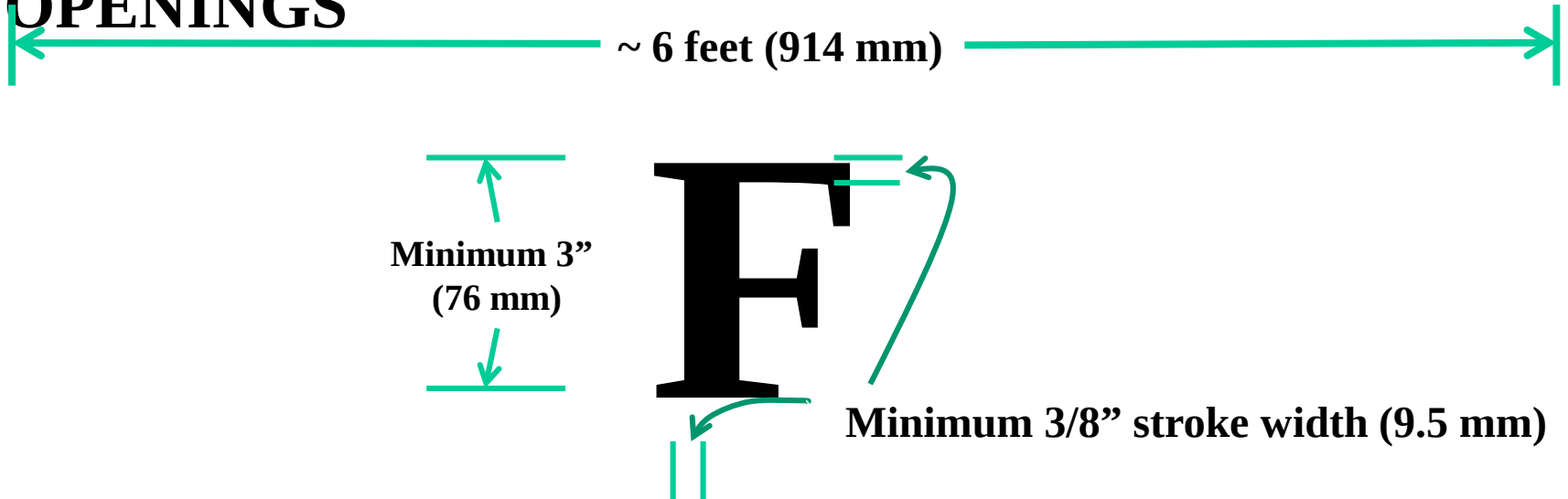
1. Be located in accessible concealed floor, floor-ceiling or *attic spaces*;
2. Be located within 15 feet (4572 mm) of the end of each wall and at intervals not exceeding 30 feet (9144 mm) measured horizontally along the wall or partition; and
3. Include lettering **not less than 3 inches (76 mm) in 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**

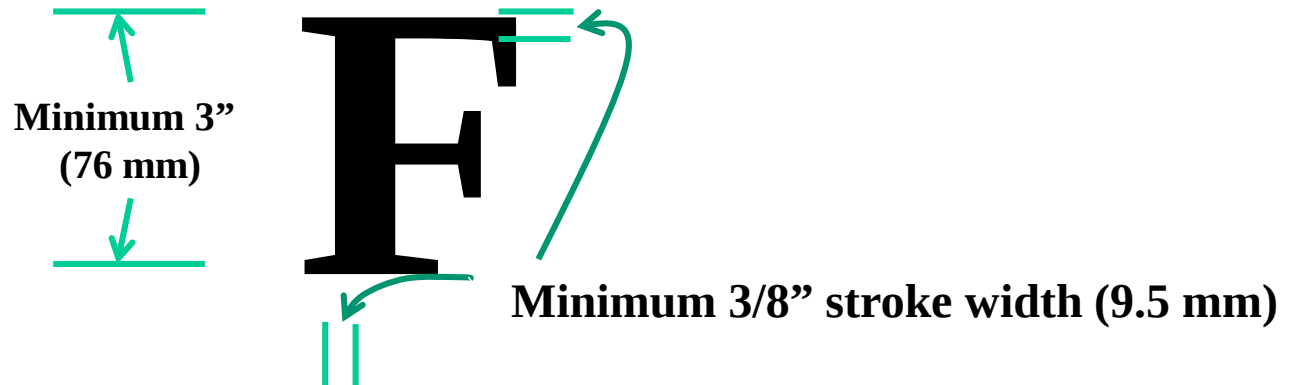


Heckler Slide

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

EXAMPLE 1



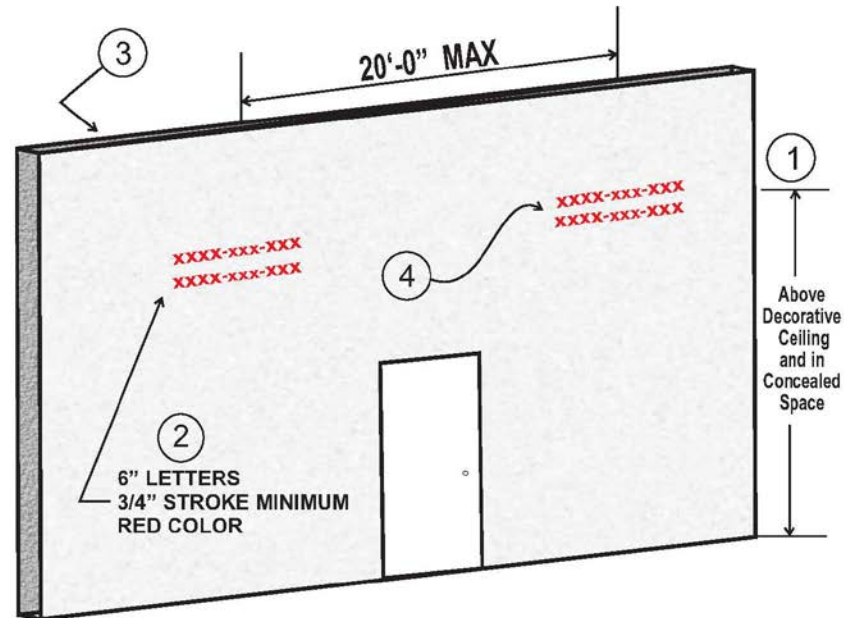
EXAMPLE 2



WALL IDENTIFICATION NOTES:

1. ALL WALLS THAT ARE RATED FOR FIRE RESISTANCE OR SMOKE BARRIERS SHALL BE MARKED AT THE HIGHEST POINT OF THE WALL IN ACCORDANCE WITH CITY OF ROCKVILLE BUILDING CODE AMENDMENTS SECTION 701.2
2. LETTERS SHALL BE 6 INCHES TALL, RED STENCIL PAINT LETTERS WITH A MINIMUM 3/4" STROKE WIDTH. MAGIC MARKER OR PENCIL WRITING WILL **NOT** SUFFICE.
3. LABEL BOTH SIDES OF WALL.

FILE NAME: Fire Rated Wall Identification.CDR
CALL FIRE MARSHAL'S OFFICE FOR
QUESTIONS OR ASSISTANCE
240-314-8240



4. IDENTIFICATION SHALL USE THE DEFINED TERMINOLOGY ACCORDING TO THE IBC SUCH AS:

- 1 HOUR FIRE PARTITION
- 2 HOUR FIRE BARRIER
- 3 HOUR FIRE WALL
- SMOKE PARTITION
- SMOKE BARRIER

IN ADDITION, "PROTECT ALL OPENINGS" MUST BE STENCILED. IF UNFAMILIAR WITH IBC TERMINOLOGY OR THE INTENDED LEVEL OF DESIGN PROTECTION, CHECK WITH THE DESIGN PROFESSIONAL OF RECORD.



**CITY OF ROCKVILLE
FIRE MARSHAL'S OFFICE**

FIRE RATED WALL IDENTIFICATION

K.HECKLER

DETAIL 8.12

OCT 2010

How are Fire-Resistance Ratings Determined?

704.1 Requirements. The *fire-resistance ratings* of structural members and assemblies shall **comply with this section and** the requirements for the type of construction as specified in **Table 601**. The *fire-resistance ratings* shall be not less than the ratings required for the fire-resistance-rated assemblies supported by the structural members. [IBC 2018 704.1]

Fire-Resistance – Barriers – Terminology and Requirements

- Exterior Walls
- Fire Walls
- Fire Barriers
- Fire Partitions (not in NFPA)
- Smoke Barriers
- Smoke Partitions
- Horizontal Assemblies

Fire-Resistance – Structural & Barriers

- Tested and Listed Assemblies
 - ASTM E119/UL 263
 - Resist Fire, Heat, Smoke/Hot Gasses
 - Structural Integrity during Fire Test
 - Hose Stream Test Survival
 - (Barriers & Walls Only)

Fire-Resistance - Barriers

- Fire Resistance Rating
- Continuity
- Openings & Penetrations
- Types of Materials
- Structural Robustness
- Supporting Construction
- Assembled
 - Listing
 - Manufacturers installation instructions

Fire-Resistance – Fire Barriers

- Fire area separations
- Mixed Occupancy Separations
- Incidental use areas
- Hazardous area separations
- Exit enclosures
- Shaft enclosures
- Horizontal exits
- Corridor Walls (NFPA only) **Koffel Slide**

Fire-Resistance – Smoke Barriers

- Occupancy Groups
 - Institutional 2
 - Institutional 3
 - Areas of Refuge
 - Hospitals & Prisons, Underground Buildings
 - Can be specified ‘Above Code’.

Fire-Resistance – Smoke Barriers

- Minimum 1 hour fire-resistance
- Continuous, floor/ceiling to deck...
- Supporting construction = rating, ex..
- Smoke Resistant ‘Features’

Fire-Resistance – Smoke Partitions

- Corridor Walls - Institutional 2 – IBC Only
- Sprinkler protected hazardous areas, NFPA
 - ‘0’ hour fire-resistance
 - Not always continuous...
 - Tight to underside of ceiling membrane in ceiling membrane designed to limit the passage of smoke
 - Ceiling Tiles differ – NFPA/IBC
- No Supporting construction rating

706 - Fire-Walls

- Hourly Fire-Resistance-Rated
- Structural Independence
- One Side of building collapses,
Other Side of Fire Wall – No
Collapse
- Continuous - Foundation through
floor/ceilings, roof to 3' above roof...

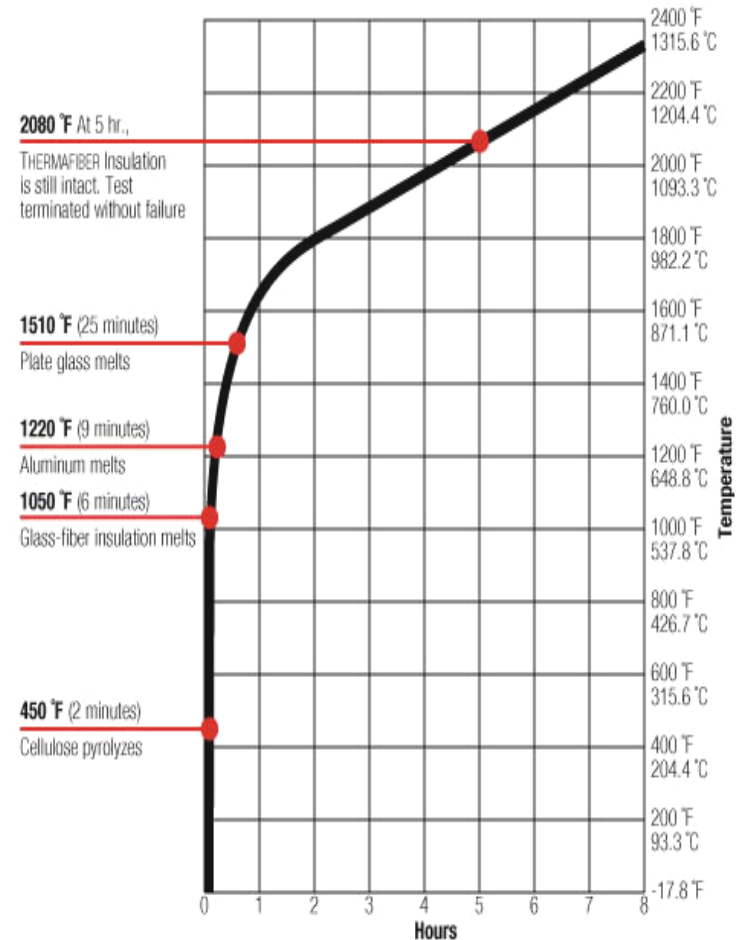
705 - Fire-Resistance – Exterior Walls

- Hourly Fire-Resistance-Rated
 - Table 601, 602, separation distances...
 - $>10'$ – resist from inside only
 - $\leq 10'$ – resist on both sides
- Continuous
 - Foundation through floor/ceilings, roof to 3' above roof...exception.

IBC – Chapter 7

703.2 Fire-resistance ratings. The *fire-resistance rating* of building elements, components or assemblies shall be determined in accordance with the test procedures set forth in **ASTM E119 or UL 263** or in accordance with Section 703.3. The *fire-resistance rating* of penetrations and *fire-resistant joint systems* shall be determined in accordance Sections 714 and 715, respectively.

[IBC 2018 703.2]



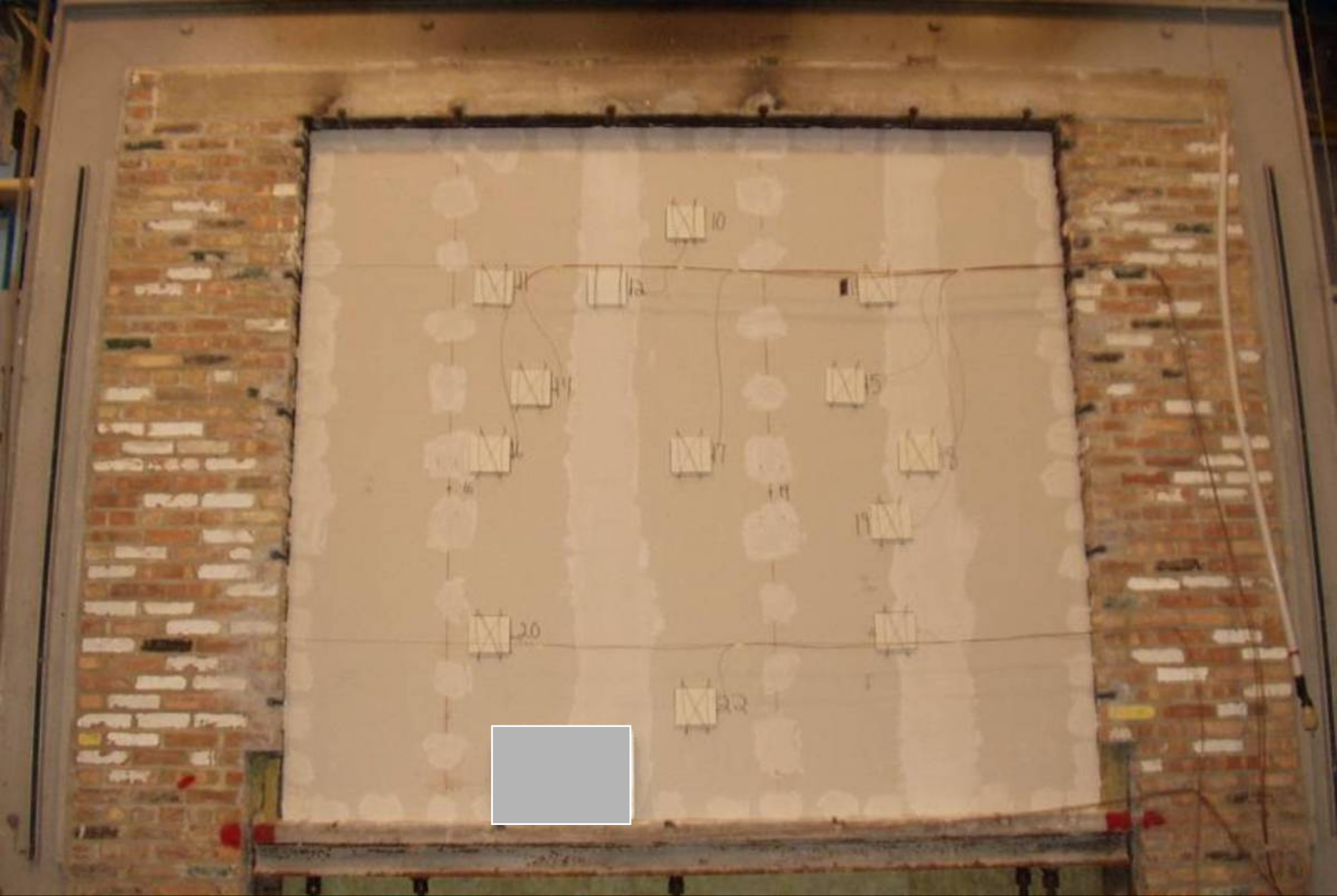
Thermafiber Image

Fire Testing

- ANSI/UL 263 or ASTM E119
 - Large Scale – Structural – Compartmentation
 - Small Scale – Penetrations
 - Hourly = Time
 - 30 minutes to 4 hours
 - Restrict Temperature Rise of **Structural Element**
 - Compartmentation / Containment



UL Slide



UL Slide



UL Slide



UL Image







UL Image



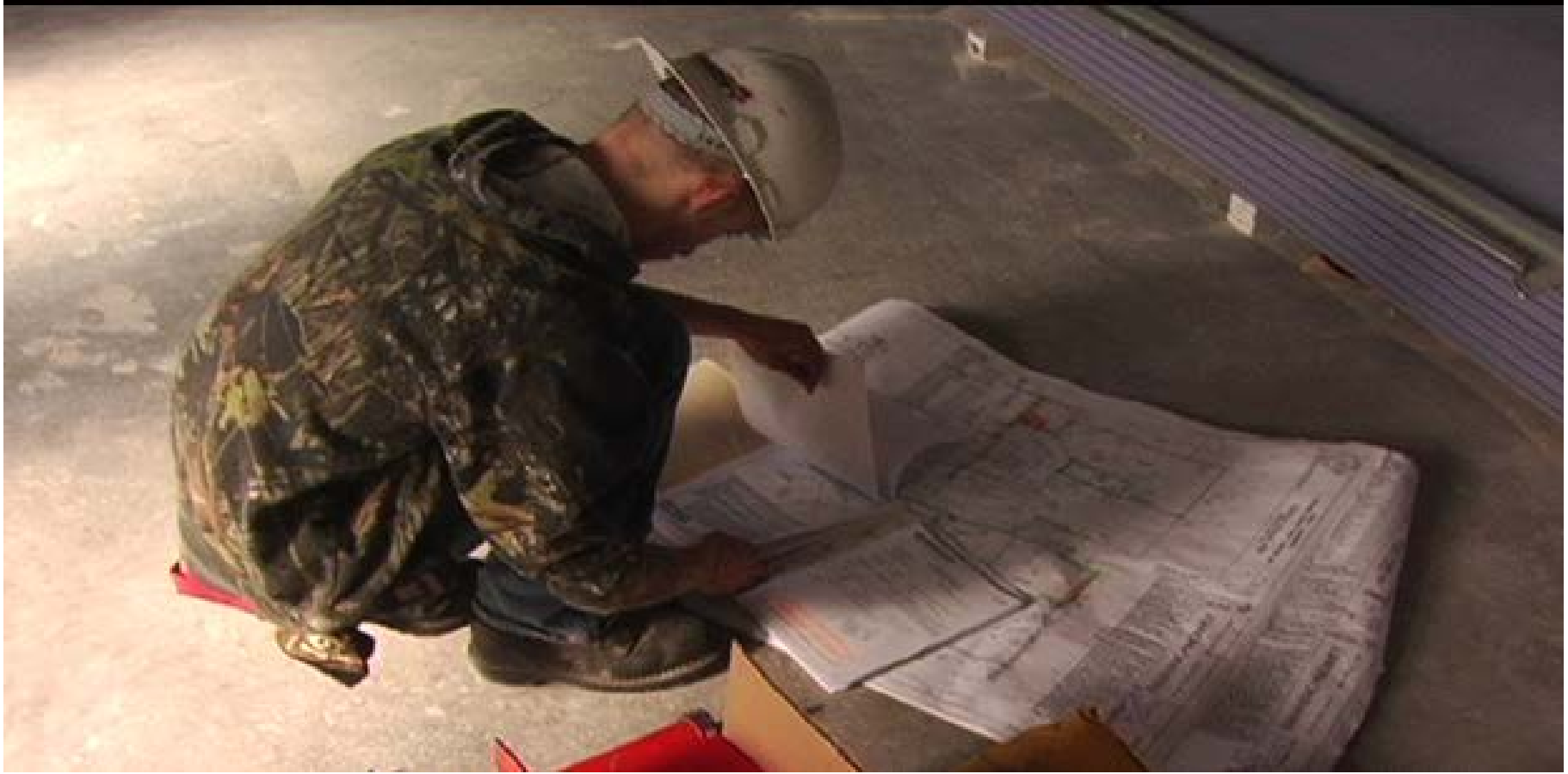
UL Image

Fire Resistance SYSTEMS

- **Products Become Systems Through....**
- **Test Standard References**
 - **Structural Elements & Assemblies**- ASTM E 119, UL 263
 - **Fire & Smoke Barriers** - ASTM E 119, UL 263
 - **Firestopping** - ASTM E 814 / UL 1479, ULC-S-115, UL 2079, E-1966, E-2307, **E-2837**, ...test method...”
 - **Fire/Smoke Dampers** - UL 555, UL 555S
 - **Swing/Rolling Fire Doors** - UL 10B, 10C
 - **Fire Rated Glazing** - UL 9, NFPA 252
- **SYSTEM Testing = Suitability statement for use of a product in a specific system/design application**

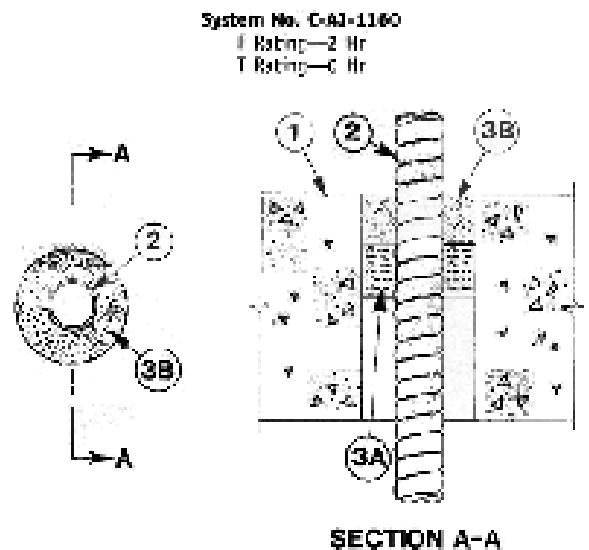
Firestopping for Continuity

I – Listed Systems



Firestopping for Continuity

I – Classified Systems



1. 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*. Blank of circular through opening in floor or wall assembly to be 1/4 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 (C-AJ) category in the Fire Resistance directory for names of manufacturers.
2. Through Penetrating Product*—Max 4 in. diam (or smaller) pipe, or max 3/4 in. diam (or smaller) aluminum Flexible Metal Conduit. No 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.
3. Packing Material—Min. 1 in. thickness of organic (plum tree sticks) fiber, Mineral or mineral wool batt insulation. Fully packed into opening as 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*—Caulk—Applied to fill the annular space around the flexible metal conduit. In floors, 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 2500

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



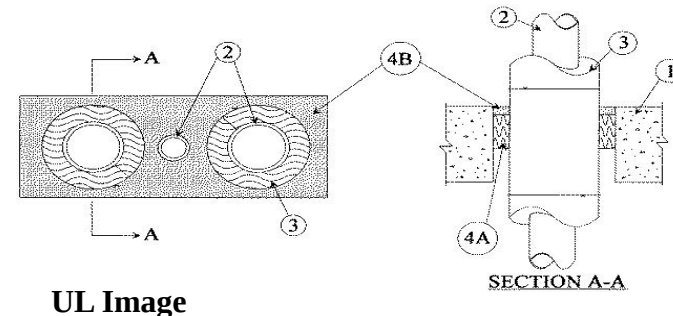
Pro-Firestop Image

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**, ULC-S-115, UL 2079, **E-2307 E-2837**, as the test method...”
 - **Testing = Suitability statement for use of a firestop product in a specific system application**



SFS Image

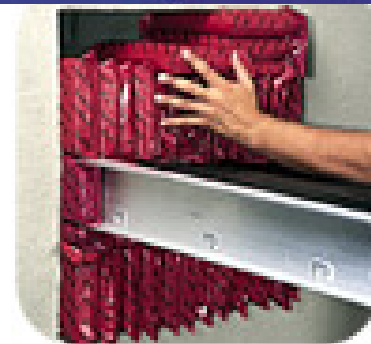


UL Image

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**



Graphics, STI, 3M, AD, HILTI, Nelson

Fire/Smoke Dampers & Firestops

- Fire/Smoke Dampers - UL 555, 555S *Systems*
 - Installed to manufacturer's written instructions
 - Listings in Mfr's Instructions (**Angles...no sealants**)
- Firestop sealants – UL 1479 – ASTM E814

**IF Firestop, Consult
Damper Manufacturer &
AHJ**

Graphics - Greenheck



Firestop Sealant IF in Manufacturers Installation Instructions.

- Combination Fire Smoke Dampers
- Multi-blade Fire Dampers
- Max. size 72" W x 96" H
- Listed Assembly
 - Greenheck Graphic

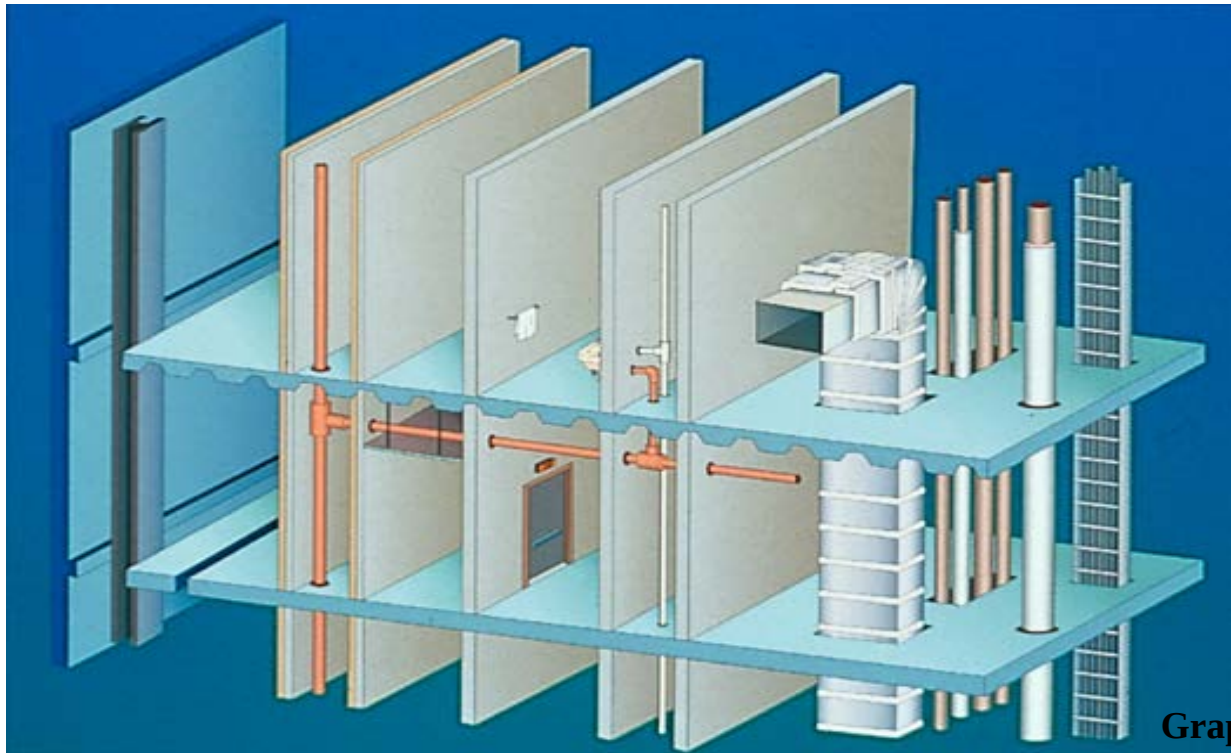


D- Design

SYSTEMS SELECTION

SYSTEMS ANALYSIS

Who's Responsible, How to Choose???



Graphics – STI

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**



Graphics – 3M



Products become Systems

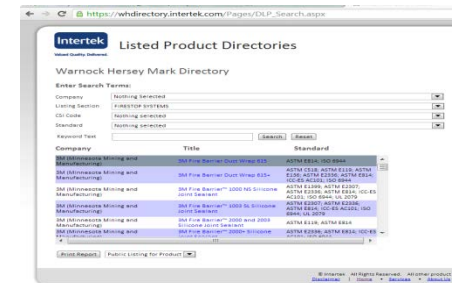
Hose Stream = Shock Test



Firestopping for Continuity Products become Systems

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

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

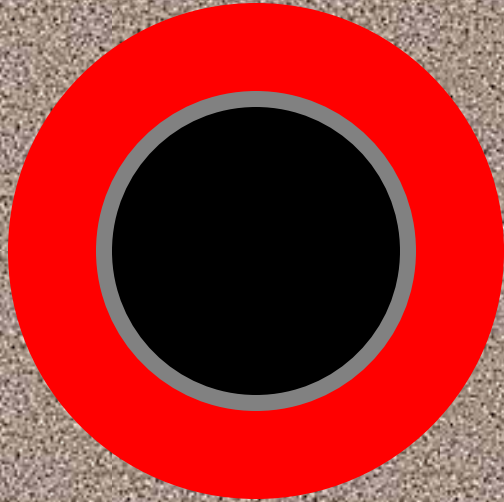


How do Contractors Select Systems & Inspection Agencies Analyze?

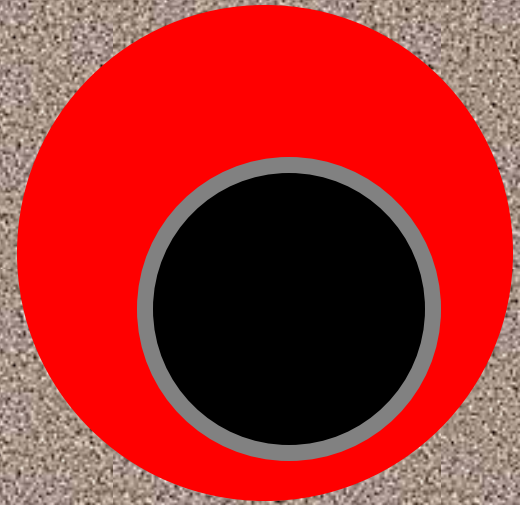
- Wall or Floor Construction Type, Rating
- Wall or Floor Thickness
- Penetrating Item, Coverings
- Size, Type, Thickness
- Annular Space Sizes
- Joint / Gap Sizes
- Backing Materials
- Fill Material(s)

= *Rated Firestop System*

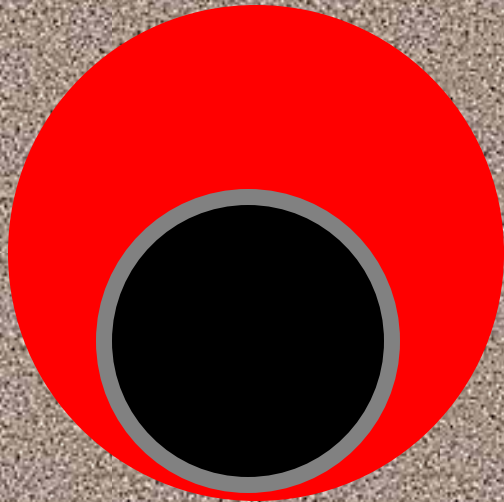




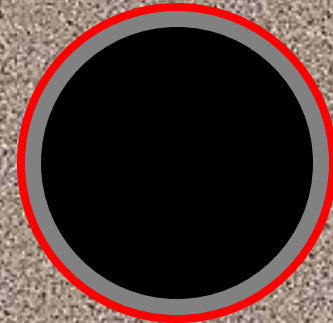
1. Centered



2. Off-Centered



3. Point Contact



**4. Continuous
Point Contact**

Engineering Judgments/EFRRRA

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

Fire Stop
Technologies,
Inc.



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*.

IFC EJ Guidelines - Engineering Judgments for firestop systems should:

- 1. Not be used in lieu of tested systems when available;**
- 2. Be issued only by a firestop manufacturer's qualified technical personnel or in concert with the manufacturer by a knowledgeable registered Professional Engineer, Fire Protection Engineer, or an independent testing agency that provides listing services for firestop systems;**
- 3. Be based upon interpolation of previously tested firestop systems that are either sufficiently similar in nature or clearly bracket the conditions upon which the judgment is to be given.**
Additional knowledge and technical interpretations based upon accepted engineering principles, fire science and fire testing guidelines (e.g. ASTM E 2032 – Standard Guide for Extension of Data from Fire Endurance Tests, ULC Subject C263E – Criteria for Use in Extension of Data from Fire Endurance Tests, or ASTM E2750 – Standard Guide for Extensions of Data for Penetration Seals) may also be used as further support data;

IFC EJ Guidelines

Engineering Judgments for firestop systems should:

- 4. Be based upon full knowledge of the elements of the construction to be protected, the understanding of the probable behavior of that construction and the recommended firestop system protecting it were they to be subjected to the appropriate Firestop Standard Fire Test method for the rating indicated on the Engineering Judgment;**
- 5. Be limited only to specific conditions and configurations upon which the engineering judgment was rendered and should be based upon reasonable performance expectations for the recommended firestop system under those conditions;**
- 6. Be accepted only for a single, specific job and project location and should not be transferred to any other job or project location without thorough and appropriate review of all aspects of the next job or location's circumstances.**

IFC EJ Guidelines - Basic Presentation Requirements

Proper EJ's should:

- 1. Be presented in appropriately descriptive written form with or without detail drawings where appropriate;**
- 2. Clearly indicate that the recommended firestop system is an EJ;**
- 3. Include clear directions for the installation of the recommended firestop system;**
- 4. Include dates of issue and authorization signature as well as the issuer's name, address and telephone number;**
- 5. Reference tested system(s) upon which design (EJ) is based on;**
- 6. Identify the job name, project location and firm EJ is issued to along with the non-standard conditions and rating supported by the EJ;**

IFC EJ Presentation Guidelines – What's Seen?

- 7. Have proper justification (i.e. UL, Intertek or other independent laboratory system(s) and or opinions);**
- 8. Provide complete descriptions of critical elements for the firestop configuration. These should include, but not be limited to the following:**

a. Basic, Common

- Type(s) of assembly used or being penetrated;**
- Rating supported by the EJ.**

b. Through Penetrations

- Penetrating item(s) (type, size, etc.);**
- Annular space requirements, (minimum, maximum, actual, nominal, etc.)**
- Opening size;**
- Firestop product(s) to be used, type and amount (thickness if applicable);**
- Accessory items(s) (i.e. anchors, backing material, etc.)**

c. Joints

- Joint Width (installed width, nominal)**
- Movement Capability;**
- Movement Class (thermal wind sway, seismic);**
- Accessory item(s) (i.e. insulation type, thickness and compression, etc.)**

IFC EJ Presentation Guidelines – What's Seen?

d•Duct Enclosure Systems – SEE www.Firestop.org

e• Firestop System – annular space dimensions, floor/wall construction, design number, components, installed thickness.

f. Perimeter Fire Barrier Systems –

- Type(s) of assembly used or being penetrated;**
- Hourly Rating required**
- Closest Listed System upon which the EJ is based**
- Joint Width**
- Static or Dynamic**
- Safing Insulation Types), thickness and compression, etc.**
- Five Basic Principles**
 - 1. Mechanical Attachment of the Spandrel Insulation**
 - 2. Protection of the Mullions**
 - 3. Compression Fitting and Orientation of the Safing Insulation**
 - 4. Installation of a Reinforcement Member(s), stiffener, at the safe-off area behind the spandrel insulation.**
 - 5. Firestop Coating, type, thickness,**

IFC EJ Presentation Guidelines – What's Seen?

f• Continuity Head-of-Wall Joints

- Joint Width, (installed width, nominal)*
- Movement Capability*
- Movement Class – (thermal, wind sway, seismic)*
- Accessory Item(s) (i.e. insulation type, thickness, compression, etc.)*

IFC recommends that these guidelines be considered when evaluating whether any firestop system engineering judgment meets minimal requirements. Questions concerning the EJ request should be addressed to the initiator of the judgment.

INSTALL FIRESTOP SYSTEM

Firestop Sealant, MW installation to Tested and Listed System Limits = Firestop System



Pack

1



Apply Sealant

2



Tool/Smooth

3

Walls - BOTH SIDES

Properly Tooled/Smoothed Firestop Sealants



Sleeved Pipes



Fire/Smoke Dampers & Firestops

- Dampers are UL 555, 555S Listed *Systems*
 - Installed to manufacturer's written instructions (Systems
 - Angles...no sealants)
- Firestop sealants – UL 1479 –
 - Improper hole sizing or poor installation...

**Consult the Damper
Manufacturer & the
Authority Having
Jurisdiction**

Graphics - Greenheck



Fire/Smoke Dampers Firestop Installation

- Combination Fire Smoke Dampers
- Multi-blade Fire Dampers
- Underfloor applications
- Max. size 72" W x 96" H
- SYSTEM...AHJ

- Greenheck Graphic



Installing an Incorrect System May Void the Fire / Smoke Damper Manufacturer's Warranty



Barriers With Combustible Penetrants

- Plastic Pipe
- Plastic-Jacketed cables
- Certain pipe insulation



Firestop Joint Systems Definition

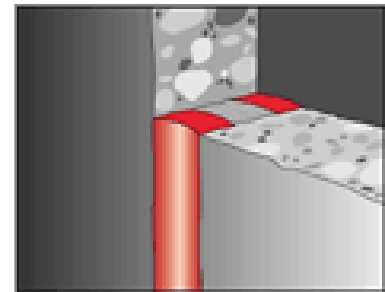
- UL 2079, ASTM E 1966, ULC-S-115
 - “A joint system is a **specific construction** consisting of adjacent **wall and floor assemblies**, **and** the materials designed to prevent the spread of fire through a linear opening between the wall and / or floor assemblies”
 - Definition
 - Joint?
 - Breach?
 - Opening?



Firestopping for Safety

- Firestop Joint Systems Definition – UL 2079
 - Min. Positive Pressure – .01 Water, 12” below assy.
 - Movement Cycling
 - Class I – min. 500 cycles, min. 1 cycle / minute
 - Class II- min. 500 cycles, min. 10 cycles / minute
 - Class III-min 100 cycles, min. 30 cycles / minute
 - Fire Tested at Maximum Joint Width
 - No Load Bearing Characteristics, unless noted
 - Assembly, L or W Ratings

HILTI Graphic





Fire Stop
Technologies,
Inc.



Fire Stop
Technologies,
Inc.

Firestopping - Products Become *SYSTEMS*

*What's that on the
deck?*

Firestop Applications

Floor to Wall



**Fire Stop
Technologies,
Inc.**



Head of Wall

Graphics – Firestop Solutions

Joints and Seams

Head of Wall



Joints and Seams

I-Beam to Fluted Deck



Penetrations in Head of Wall



Unacceptable



Results of Improperly Installed Mineral Wool



Firestop Perimeter Fire Containment Systems

- Firestop Perimeter Systems

Definition – ASTM E 2307

- “A Perimeter Fire Containment System is a **specific field erected construction** consisting of a floor with a fire resistance rating, and an exterior curtainwall with no hourly resistance rating, and the fill material installed between the floor and the curtain wall to prevent the vertical spread of fire in a building.”



Tamweel Towers, Dubai
Perimeter Fire Protection
Gulf News: A discarded cigarette ???



NFPA 285 & ASTM E 2307?



Intertek Image



Thomas Bell-Wright International Consultants

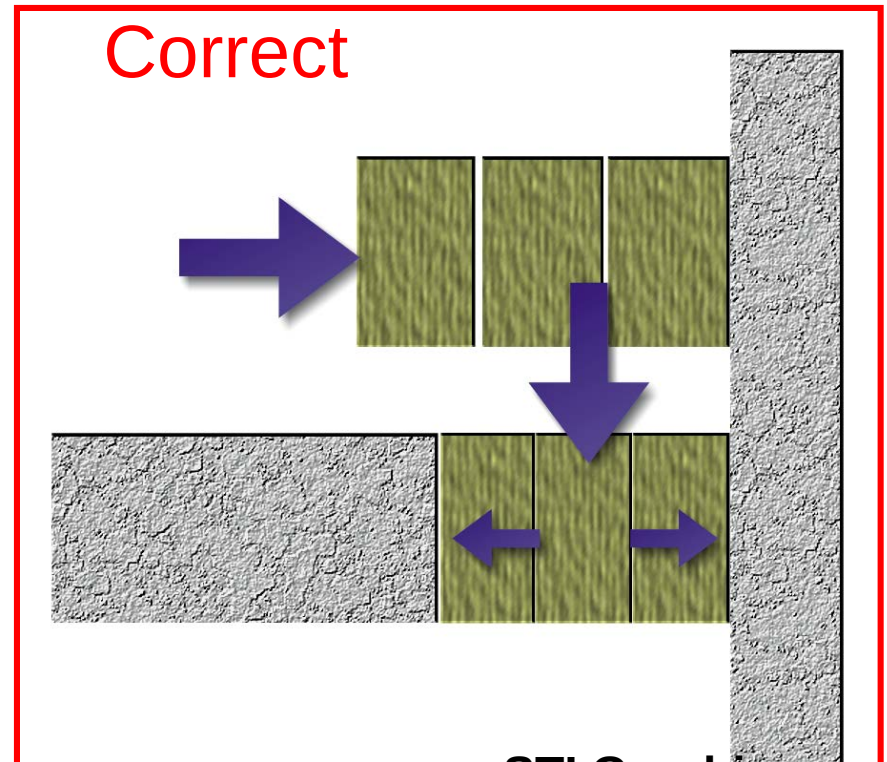
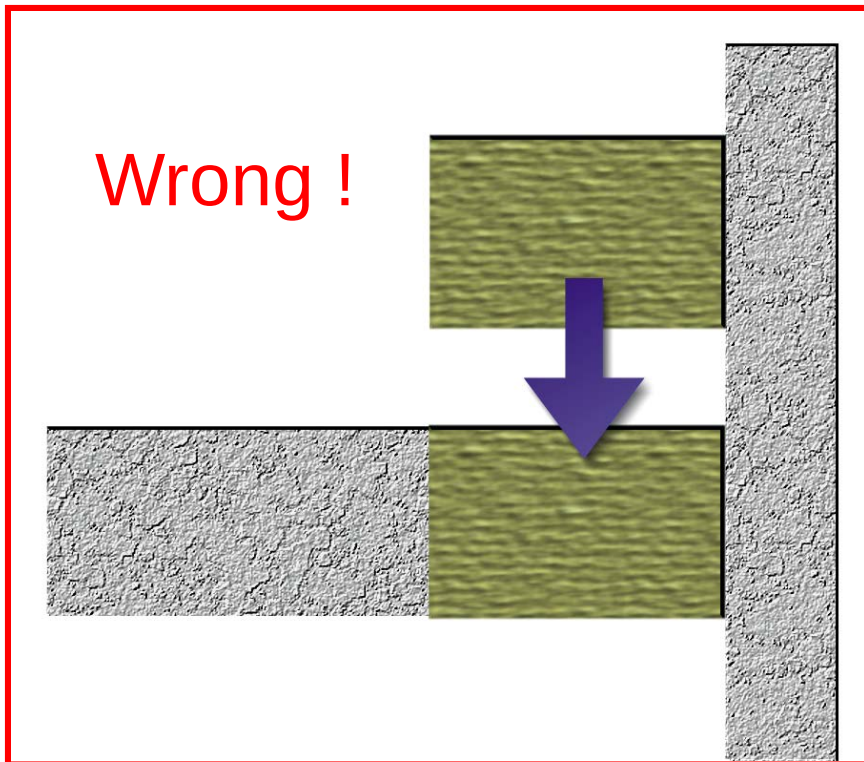
Firestop Perimeter Fire Containment Systems



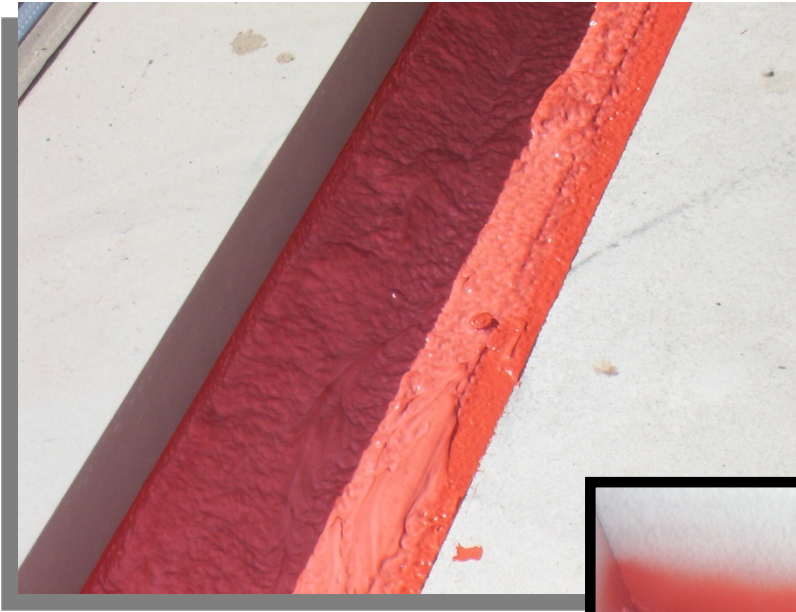
Graphic – Intertek

Proper Installation of Mineral Wool

- Compressed mineral wool must be inserted perpendicular to the joint to allow for movement between the slab and wall.



Firestop Installed at Perimeter of Floors at Curtainwall

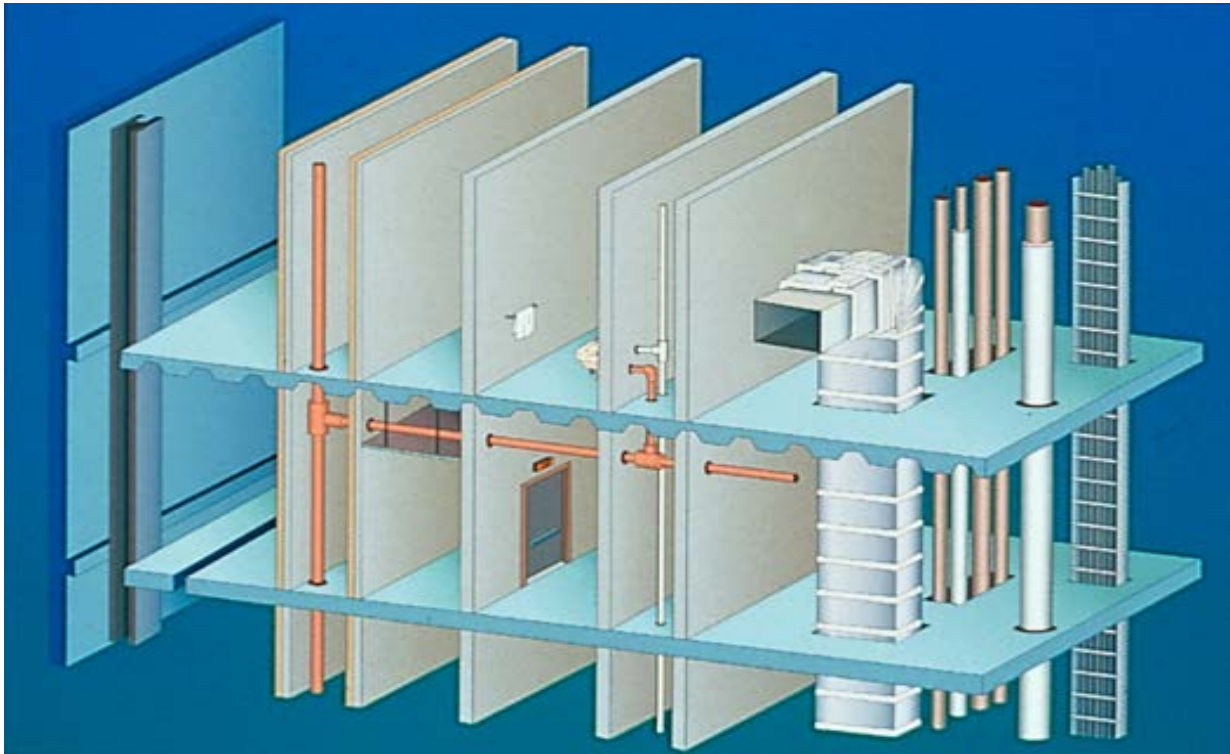


Firestop Products Become Systems when Installed to SYSTEM



I- Installation

Who's Responsible, How to Choose???



Graphics – STI

Installation – Who?

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

Conclusion –

Without Single Firestopping Trade....

fire & life safety risks



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*

Why Contractor Qualifications?

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

Firestop Contractor Qualifications

1. Bought at Hardware Store, etc.

- Contractor or Individual?

2. Manufacturer Trained Individuals

- 1 hour program
- ½ day program
- 2 day education

3. UL/ULCC Qualified, FM 4991 Approved Companies

- 3rd Party Verified **Company** Management System
- **Individuals** Pass 3rd Party Exam
- **Individual** Knowledge – FCIA MOP
- All Manufacturers Products Covered
- ***Company gets Approved or Qualified, not Individual***

Firestop Contractor Qualifications

- **Association Member**
- Insurance – Classification?
 - Specialty Firestop Contractor?
 - Plumber, other trade??
- Workforce – Educated as Firestop/Containment Workers
- Bonding Capability
- Project References & Experience
- **Management System reviewed by....**
 - **FM 4991, UL or ULC ?**

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

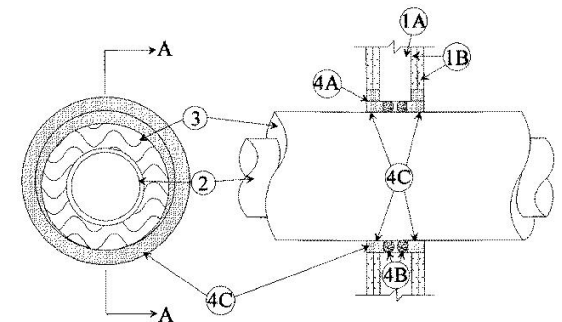


1. Office Audit of Company Management System Manual

- Controlled Management Processes
- Project Successful Proven Contractor
- Education, Training, Accountability

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 ULC, FM or UL**

- 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**

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

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: 4413 W. Harrison Street, Suite 540
Hitachi, 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. This 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 Working Contractor, or any other party for any loss, which may result in future, insurance settlements, non-compliance or requirements, cancellations of this certificate, or withdrawal by the Qualified Working Contractor from the Qualified Firestop Contractor Program.

Any modification to any firestop system of the structure will affect the complete firestop system and may require protection offered by the system indicators. Any changes will invalidate this certificate earlier than the expiration date. It is the building owner's responsibility for an annual visual inspection of the integrity of the firestop system and under certain conditions 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.

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Unauthorized reproduction or modification to 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, 2019
Address: 333 Pfingsten Rd. Expires: December 31, 2019
Telephone: 480.790.6985 Email Address: Robert.Sandval@UL.com

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

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



Underwriters
Laboratories
Qualified Firestop
Contractor Program

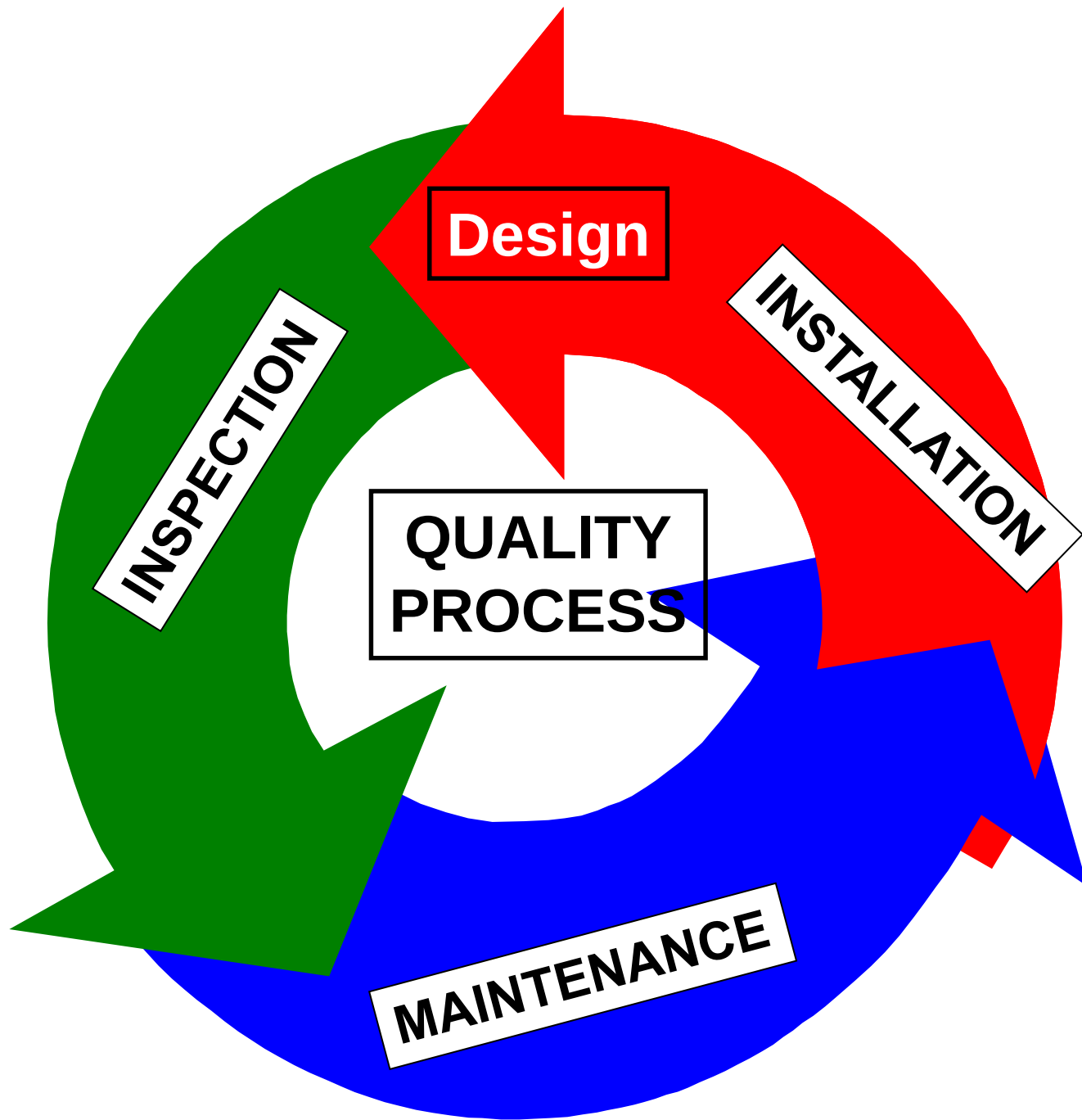
Underwriters Laboratories reserves the right to void this certificate at any point. This certificate does not indicate compliance with any UL product certification program.

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 ... Survey, maybe
- **ASTM E 2174 & ASTM E 2393 –**
 - Independent 3rd Party
 - Destructive, Non Destructive
 - Specified Frequency



Affinity Firestop Photo



GARDER HORS DE PORTEE DE
hygienique. 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 adhesi
floors. Use ice, vegetable or mineral oil
SOUCI HUMAINITAIRE: les animaux p

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Affinity Firestop Photo





Affinity Firestop Photo



Affinity Firestop Photo

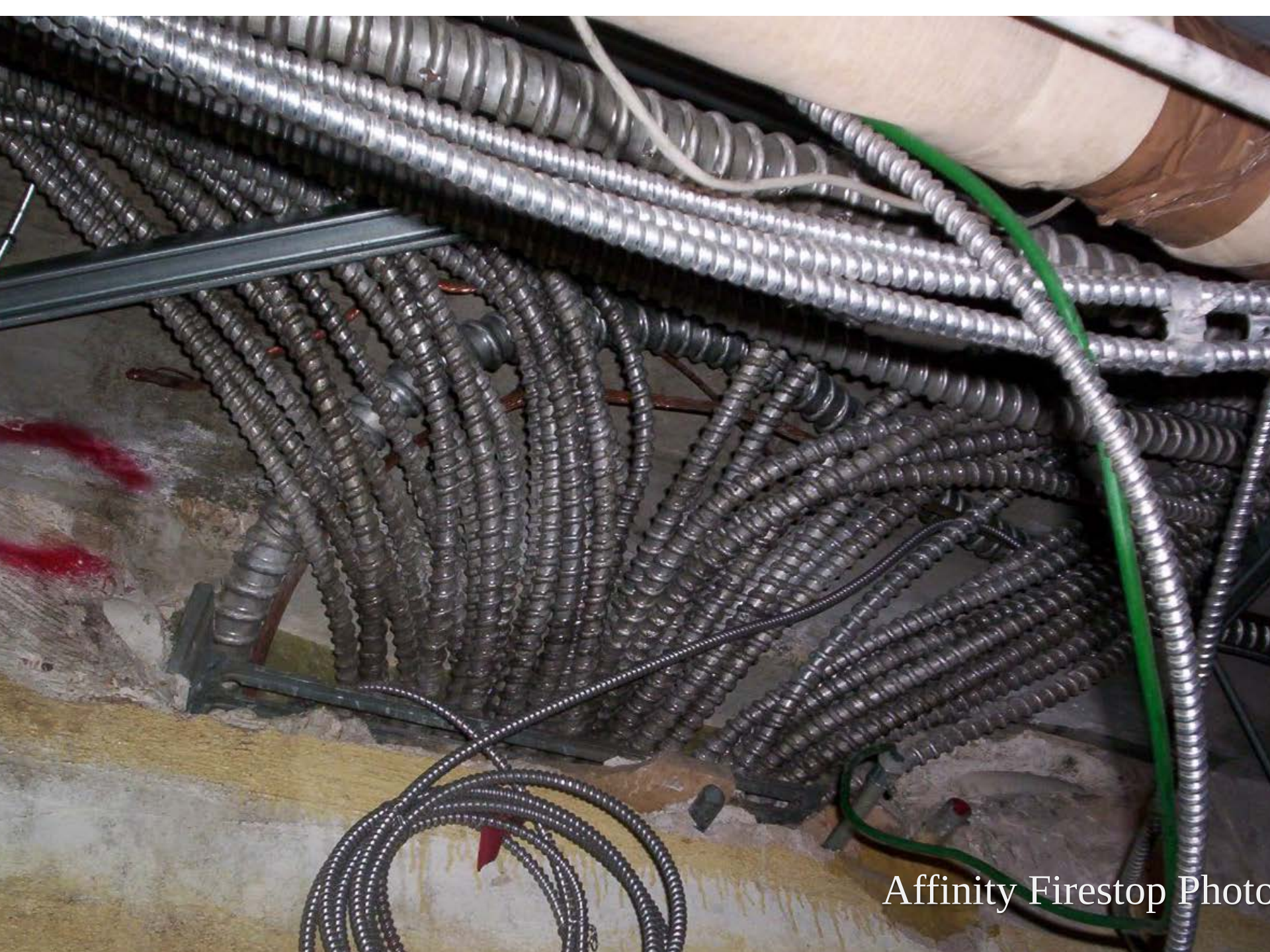


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2 POR PAQUETE

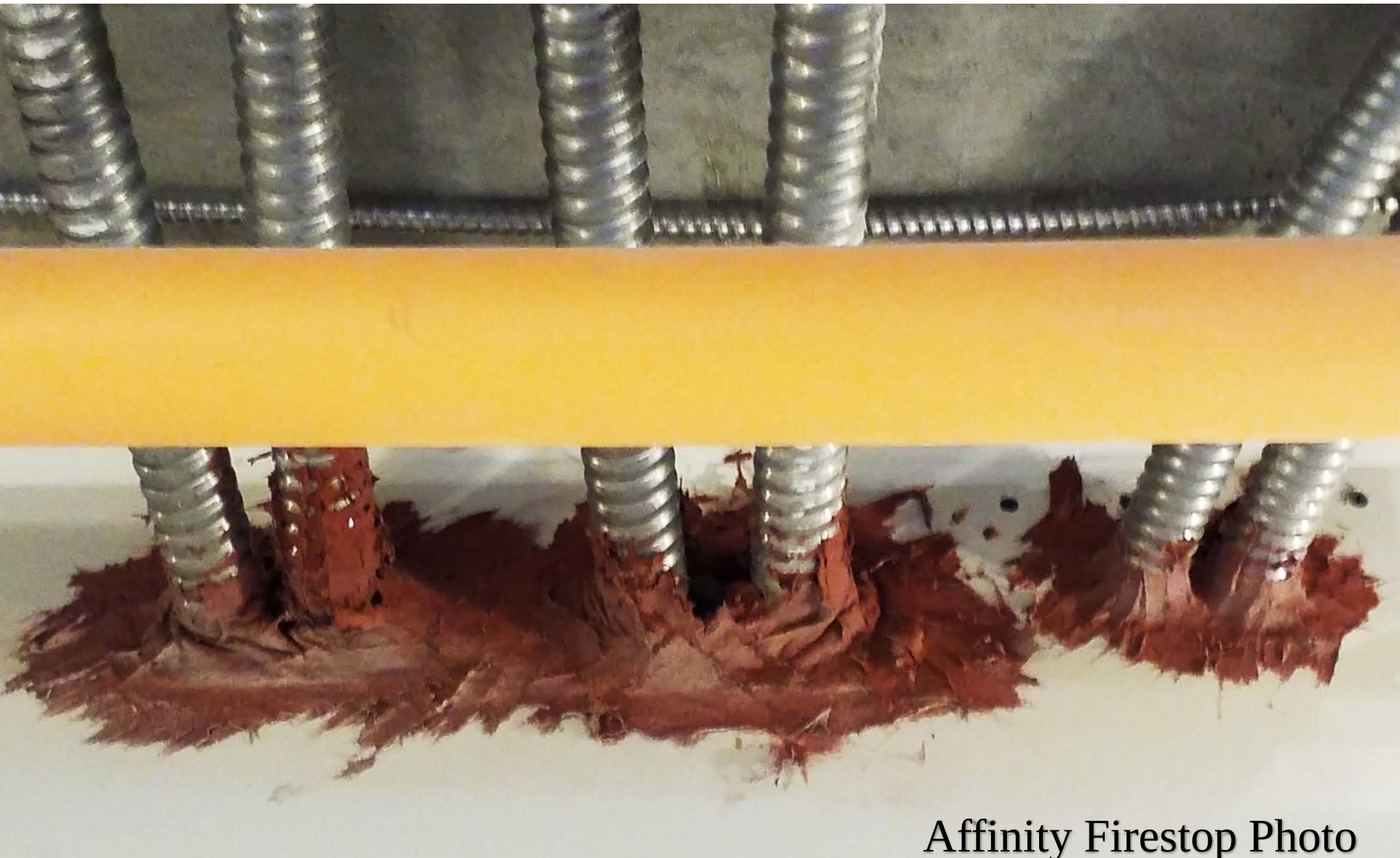
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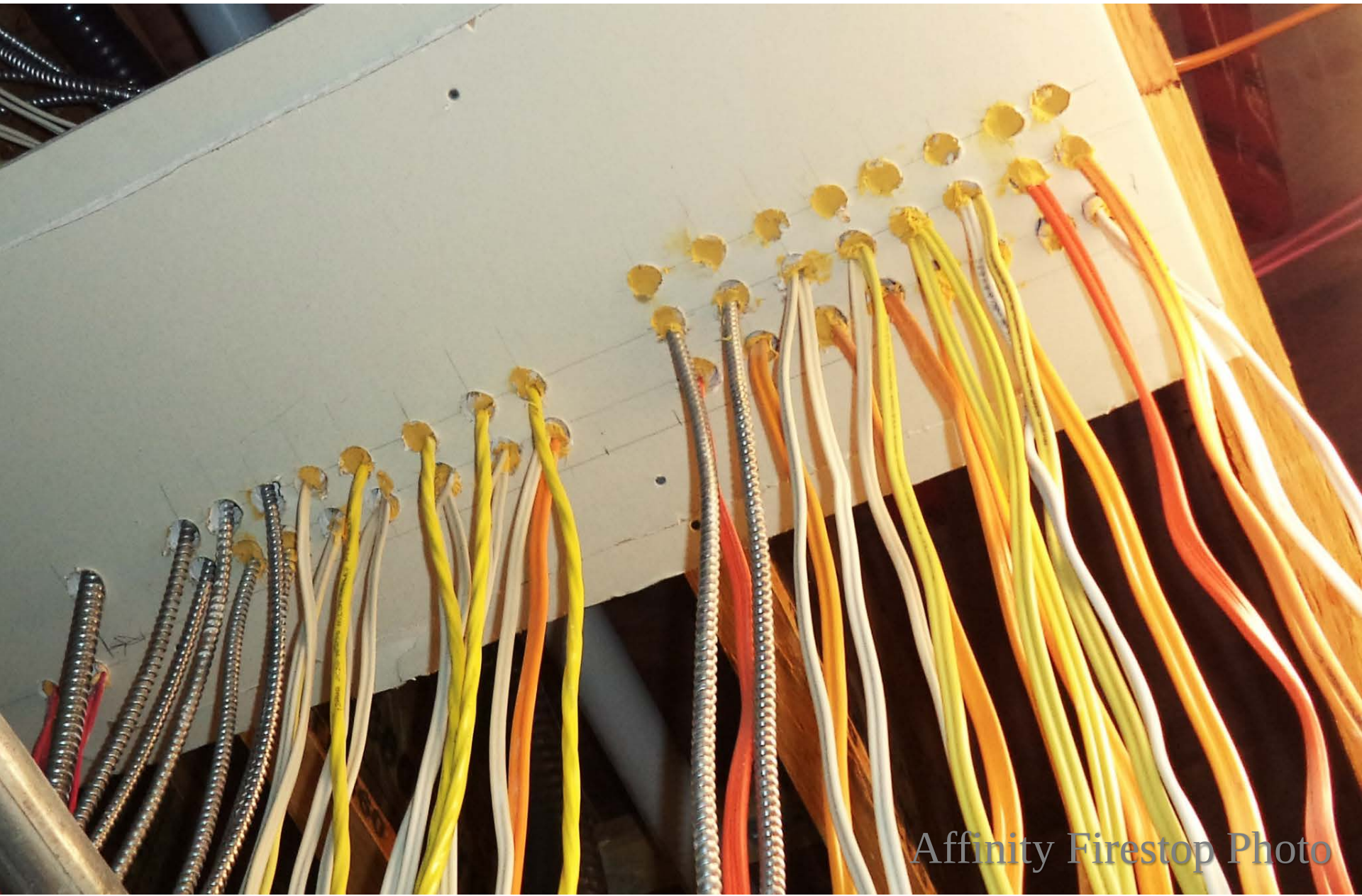
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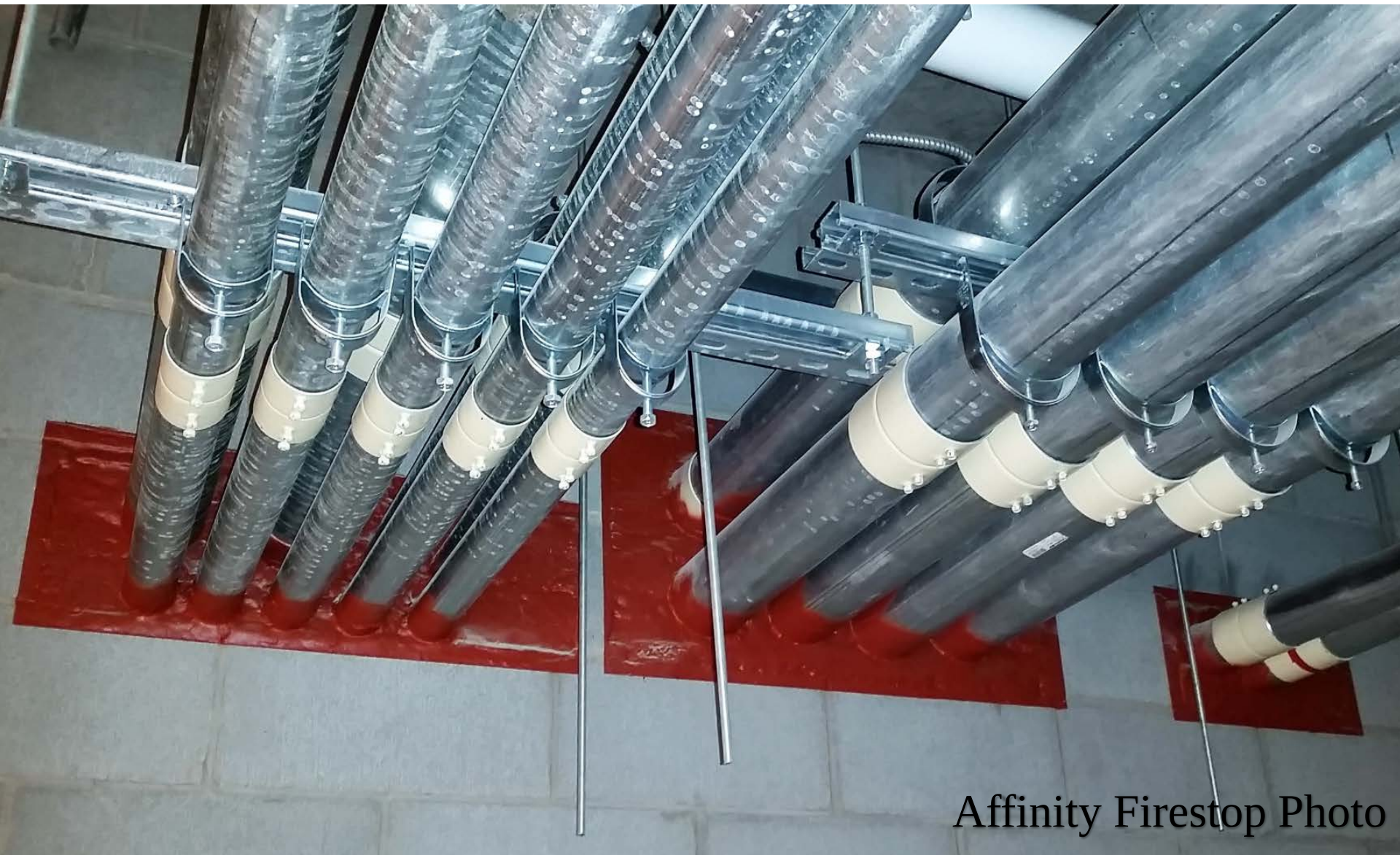
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Firestop Inspection Standards

- ASTM E 2174/ ASTM E 2393 Standard Practice



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 – Scope

- **ASTM E 2174 & ASTM E 2393 –**
 - Firestopping – Mandatory for Certain Buildings
- Other Scopes—possibilities for SIA's
 - Walls, Horizontal Assemblies
 - Fire Dampers
 - Fire Rated Glazing
 - Fire Doors

I – Inspection – Agencies AHJ Approved

[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 – Inspector AHJ Approved

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 – IBC's Ch. 17–FCIA Proponent

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 – 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.**

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 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 explosives*

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*

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.*

Agency & Individual Qualifications

ASTM E 2174 - ASTM E 2393

- Inspector Firm & Inspectors
 - **‘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 statements of ...**

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

Inspection Agency Qualifications

- **Inspection Agency Company Qualification**
- **IAS AC 291 – Accreditation Criteria**
- **Includes Individual Competencies too...**

IAS AC 291 – Inspector Requirements

- Inspector 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

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
 - UL Firestop Exam
 - IFC Exam

Firestop Inspection Process

- Inspection Agency & Inspector
 - Independent
 - Hired after systems submitted, etc.
 - Hired by building Owner and manager or representative
 - Scope of work directed by AA
 - AHJ approval

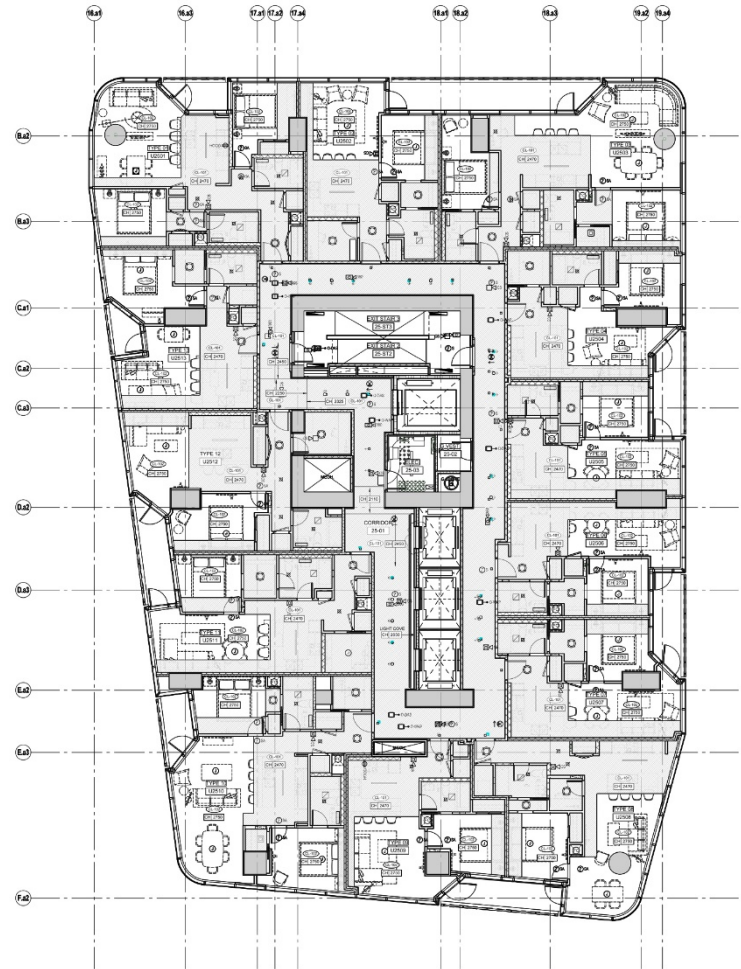


Affinity Firestop
Photo

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

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

FIRESTOP CONTRACTOR (204) 555-0101		
WARNING This is an approved Firestop System and shall NOT be disturbed except by Authorized Personnel.		
Wall/Penetration No.: SE-2393-1	Fire Rating Required: 1.5 F	
Floor Level: 1ST	Room No.: 201	
Installer's Name: JOHN SMITH	Product: FS-200	
Installation Date: APRIL 1, 2013	System Design No.: E.A./322A	
Re-permited by: Company	Installer	Date



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

Firestop Inspection Process

ASTM E 2174 - ASTM E 2393

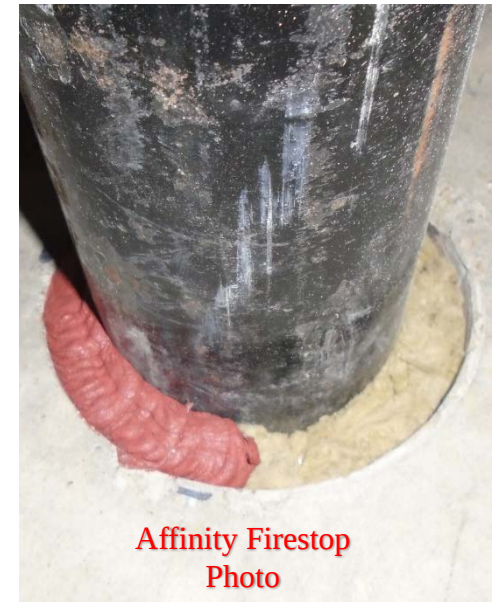
- Inspection Schedule
 - Notifies Inspector
 - Inspections within 2 days
 - Inspector verifies installation
 - Is in accordance with Documents
 - Meets Manufacturers Installation Instructions



Firestop Inspection Process

ASTM E 2174 - ASTM E 2393

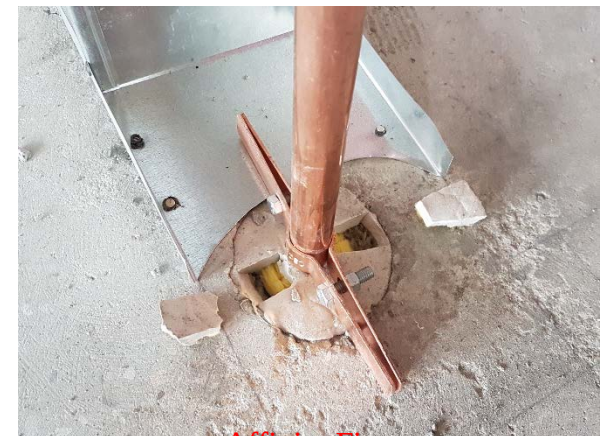
- Observation Reviews
 - Performed during construction
 - Witnessed randomly of the installed systems on each floor
 - 2174 - 10%, each **type** of Service Penetration Firestop System
 - Type = By System, By Scope of Work
 - 2393 - 5% of Total Lineal Feet for each type of Fire Resistance Rated Joint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

Inspection Methods

ASTM E 2174 - ASTM E 2393

- Variances....
 - ASTM E 2174 & ASTM E 2393
 - One Day Notice after discovery to Contractor
 - International Building Code 1704.2.4
 - ‘Brought to IMMEDIATE attention of contractor’
 - ‘If not corrected, Building Official AND RDP... notified prior to completion of that phase’



Adler Photo

Inspection Methods

ASTM E 2174 - ASTM E 2393

- 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 reinspects
- Document all Deficiencies

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



Affinity Firestop
Photo

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 Evaluation & Repairs

- Evaluations of Manufacturers Installation Instructions
 - Manufacturers instructions evaluating installed systems
 - Acceptable methods to review installed systems
 - Listed SYSTEM requirements for installations
 - ***IFC Document on Sealant Thickness Measurement***



Firestop Repairs

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



Affinity Firestop
Photo

Firestop Inspection Forms

Variance Notices

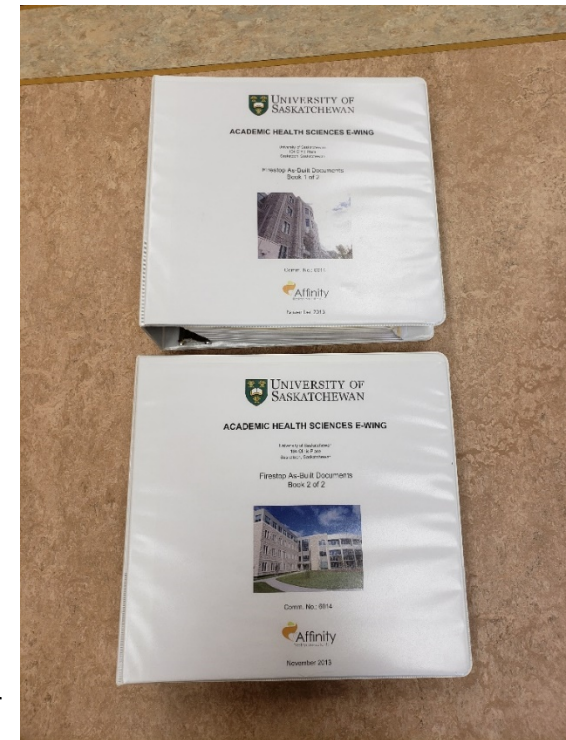
- Minimum one FS system for each type; ***(Type By Contractor)***
- Submit reports one day after review to AA; ASTM E 2174 and ASTM E 2393 vs.
- **IBC requires IMMEDIATE NOTICE**
- Numbered – Controlled
- Required – During/post construction methods



Firestop Inspection Final Report

ASTM E 2174 - ASTM E 2393

- Project name and location
- Project team contact info
- Firestops reviewed (inspected)
 - Type and quantity
 - Verification method
 - Percentage of total deficiencies
- All documents submitted to AA



Affinity Firestop
Photo

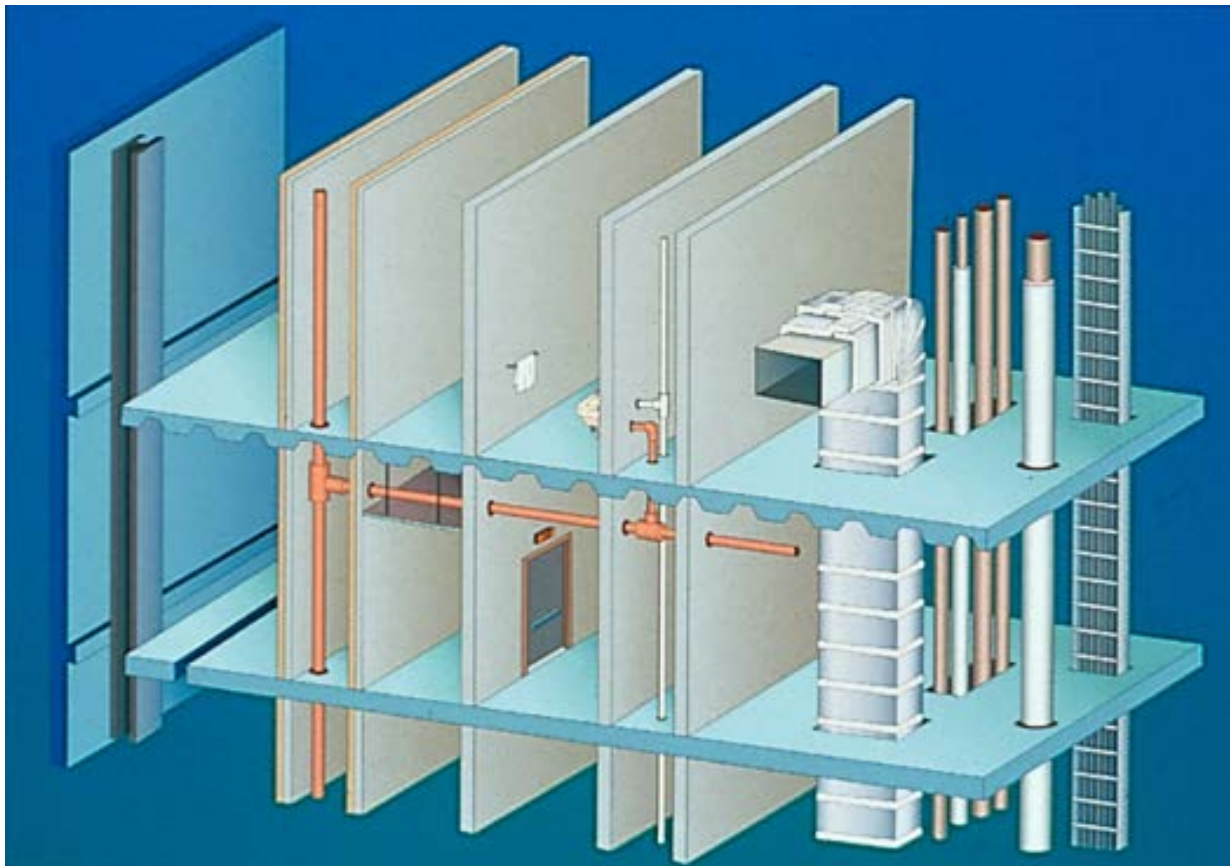
Special Inspection

ASTM E 2174 - ASTM E 2393

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

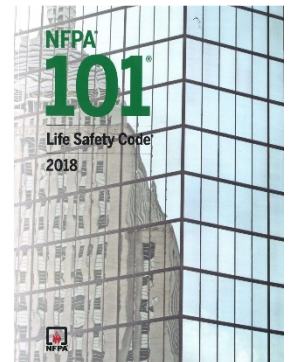
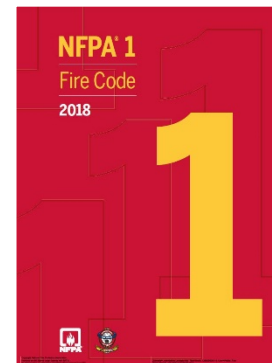
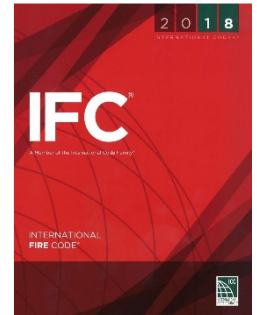


M – Maintenance (& Management)



Fire Codes Require Maintenance

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



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

- 12.3.3* 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.

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.

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.

National Fire Protection Association - NFPA 101-2012

- **SECTION 4.5.8 Maintenance, Inspection, and Testing.**
- **4.5.8.1** **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. [101:4.6.12.1]

National Fire Protection Association - NFPA 101-2012

- **4.5.8.2** No existing life safety feature shall be removed or reduced where such feature is a requirement for new construction. [101:4.6.12.2]
- **4.5.8.3*** Existing life safety features **obvious to the public**, if not required by the Code, shall be either maintained or removed. [101:4.6.12.3]
- **4.5.8.4** 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. [101:4.6.12.4]
- **4.5.8.5** 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. [101:4.6.12.5]

International Fire Code Maintenance



SECTION 703 FIRE-RESISTANCE-RATED CONSTRUCTION

703.1 Maintenance. The required fire resistance rating of fire-resistance rated construction (including walls, fire stops, shaft enclosures, partitions, smoke barriers, floors, fire resistive coatings and sprayed fire resistant materials applied to structural members and fire resistive joint systems) shall be maintained. Such elements shall be visually inspected by the owner annually and properly repaired, restored or replaced when damaged, altered, breached or penetrated.

Openings made therein for the passage of pipes, electrical conduit, wires, ducts, air transfer openings, and holes made for any reason shall be protected with approved methods capable of resisting the passage of smoke and fire.

2015 International Fire Code Maintenance

SECTION 703

FIRE-RESISTANCE-RATED CONSTRUCTION

703.1 Maintenance. The required *fire-resistance rating* of fire-resistance-rated construction, including, but not limited to, walls, firestops, shaft enclosures, partitions, *smoke barriers*, floors, fire-resistive coatings and sprayed fire-resistant materials applied to structural members and fire-resistant joint systems, shall be maintained. Such elements **shall be visually inspected by the owner annually and properly repaired, restored or replaced where damaged, altered, breached or penetrated. Records** of inspections and repairs shall be maintained..



2015 International Fire Code Maintenance

SECTION 703

FIRE-RESISTANCE-RATED CONSTRUCTION

703.1 Maintenance. (continued) 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. Openings made therein for the passage of pipes, electrical conduit, wires, ducts, air transfer openings and holes made for any reason **shall be protected with *approved* methods** capable of resisting the passage of smoke and fire. Openings through fire-resistance-rated assemblies shall be protected by self- or automatic-closing doors of *approved* construction meeting the fire protection requirements for the assembly.



2015 International Fire Code Maintenance

SECTION 703

FIRE-RESISTANCE-RATED CONSTRUCTION

703.1 Maintenance. (continued) 703.1.1 Fireblocking and draftstopping.

Required *Fireblocking* and draftstopping in combustible concealed spaces shall be maintained to provide continuity and integrity of the construction.

703.1.2 Smoke barriers and smoke partitions. Required *smoke barriers* and smoke partitions shall be maintained to prevent the passage of smoke.

Openings protected with *approved* smoke barrier doors or smoke dampers shall be maintained in accordance with NFPA 105.

703.1.3 Fire walls, fire barriers and fire partitions.

Required *fire walls*, *fire barriers* and *fire partitions* shall be maintained to prevent the passage of fire. Openings protected with *approved* doors or fire dampers shall be maintained in accordance with NFPA 80.



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

- **701.6, Continued...PC2**
- **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.*

2018 International Fire Code

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

2018 International Fire Code Documentation Required

- **703.1 ... Continued.**

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 instruction.

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

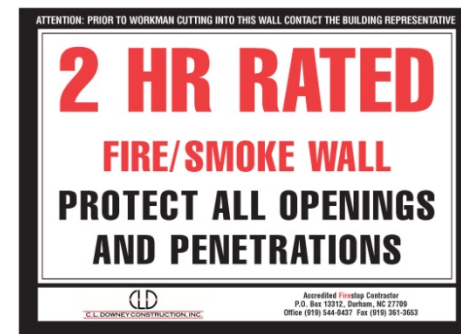
National Fire Code of Canada

- ***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



Firestop Maintenance

- **Maintenance**
 - Code Required
 - How??
- **How to keep Track – Barrier Management Initiative**
 - Paper
 - Software
 - Labeling



M–Barrier Management Systems

- **Why Manage Barriers & Structural Elements?**
 - **International Fire Code**
 - **International Property Maintenance Code**
 - **NFPA 101**
 - **NFPA 1**
- **It makes Fire and Life Safety Sense**

M–Barrier Management Systems

Policy Topics

- **Advise Clients – Create a Budget to Meet Code Requirements**
- **Inventory – What Info?**
- **Implement Fire Resistance Management**
 - In House (Rules)
 - Outside Contractor (Rules)
- **Monitor Process**

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 – 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 – ASTM E 3038**

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 13 Completion and Correction List**
 - **01 78 19 Maintenance Contracts**
 - **On Labels.... Call for Annual Survey**
 - **01 78 23 Operation and Maintenance Data**
 - **01 78 23.13 Operation Data**
 - **01 78 23.16 Maintenance Data**
 - **01 78 23.19 Preventative Maintenance Instructions**

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

Built Right = Maintain Right WHEN SPECIFIED

- **Why Specifications Division 01-78-00?**
 - **Fire Resistance Inventory REQUIRED** -
 - F-113-16 – 2018 International Fire Code
 - Section 703.1 becomes 701.1
 - Fire Rated Walls & Floors
 - **Firestop Systems**
 - Fire & Smoke Dampers
 - Fire Rated Rolling & Swinging Doors
 - Fire Rated Glazing

M–Barrier Management Systems

- **Why Manage Barriers?**
- **International Fire Code**
- **International Property Maintenance Code**

M–Barrier Management Systems

ICC's IPMC

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.

International Existing Building Code

M–Barrier Management Systems Policies

- **Barrier Management Policy**
 - **Inventory**
 - **Monitor**
 - **Permits**
 - **Management**
 - **Request Budget to Meet Code Requirements**
 - **Implement Maintenance**
 - **In House (Rules)**
 - **Outside Contractor (Rules)**

M–Barrier Management Systems Policies

- **Barrier Management Policy**
 - **Inventory - Items to Survey**
 - **Fire-Resistance-Rated Walls and Floors**
 - **Breaches for Penetrations, Joints, Doors, etc.**
 - **Wall not completed at new construction?**
 - **Wall removed above ceiling?**

M–Barrier Management Systems Policies

- “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.***
- **[IFC 2015, 703.1]**

M–Barrier Management Systems Starts with CONSTRUCTION

- **Fire-Resistance-Rated Walls & Floors**
 - Walls - U, V 400, 900 Designs
 - Floors – P Designs
 - Calculated Fire Resistance
 - Code Defined Fire Resistance - 720
 - Firestop Systems
 - Fire & Smoke Dampers
 - Fire Rated Rolling & Swinging Doors
 - Fire Rated Glazing

M–Barrier Management Systems Operations

- **Items to Survey**
- **Fire-Rated Doors – Annually – NFPA 80**
 - Close and Latch
 - Holes
 - Attach at Frame
 - Undercut & Astragals
 - Labels Legible
 - Labels recertified, requirements of 3rd party certification agency

M–Barrier Management Systems Operations

- **Firestop Systems – Not Concealed Only**
- **Through & Membrane Penetrations**
 - **Joints**
 - **Wall to Wall**
 - **Floor to Floor**
 - **Head – Bottom of Wall**
 - **Continuity Head of Wall**
 - **Perimeter Fire Containment**

M–Barrier Management Systems Operations

- **Firestop Systems – SYSTEMS**
 - Visibly Comply with System
 - Visibly ‘sealed’
 - Without openings
 - Firestop Materials & Systems
 - Securely Attached

M–Barrier Management Systems

Items to Survey

Fire & Smoke, Ceiling, Radiation Dampers

- **NFPA 80 –**
- **Initial Installation**
- **At 1 year, each 4 years,**
- **6 years *Hospitals Only***
 - **Fire Dampers**
 - **Smoke Dampers**
 - **Combination Fire/Smoke Dampers**
 - **Ceiling Dampers**

M–Barrier Management Systems

Items to Survey

- **Fire Rated Glazing**
 - Verify it's still fire rated
 - Glazing / Frame Attachment
 - Frame attached to wall
 - Glazing Marking as Built

M–Barrier Management Systems

Items to Survey

- **Fire Resistance Inventory Systems**
 - Paper & Files
 - Spreadsheets
 - Software

M–Barrier Management Systems Building Operational

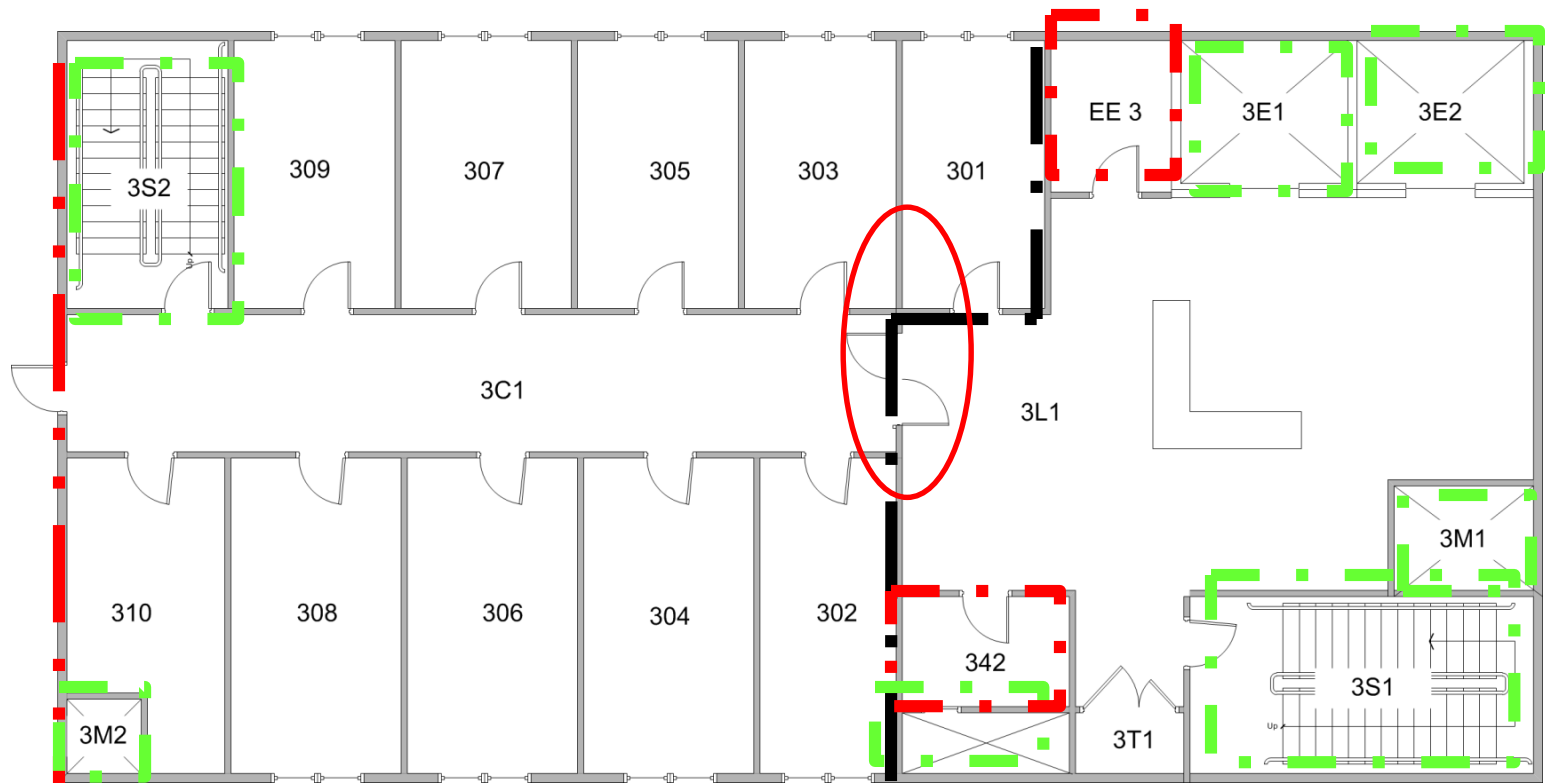
- **Barrier Management Policy**

- **Repairs**

- **As originally permitted and *approved***
 - ***As required by Fire Code, Existing Building Code***
 - **If SYSTEMS required, SYSTEMS REPAIRS**
 - **If no Systems, original materials.**
 - **Fire Official**
 - **Insurance Company**

M-Barrier Management Systems

- **Now it's your building....**



- **Gleeson Powers Graphic**

M–Barrier Management Systems

- **Barrier Management**
 - **Issues...Budget???**
 - **Other Occupancies---Big Problem**
 - **Constant issues**
 - **Control?**
 - **Staff?**
 - **Manage?**

Barrier Management HUB

- **The HUB is Facility Director!**
- **HUB Controls Actions**
 - **C-Suite Execs – Budgeted Yearly**
 - **Construction –**
 - **In House Crews**
 - **Outside Contractors**
 - **I-T Department –**
 - **In House Crews & Outside Contractors**

Barrier Hub = Facility Director?

- **Answer to...**
 - **Other AHJ's**
 - **C-Suite**
 - **Occupants, Students, Faculty, Patients**
 - **Building Official, Fire Marshal**
 - **Insurance Company**
 - **The Joint Commission**
 - **CMS Inspectors**

Barrier Management Policy Contents

- *Annual Line Item Budget*
- Rules of Engagement in Contracts
 - Internal Contracts
 - External Contracts
- Pre Construction Meetings
- Barrier Warnings - Markings
- Violation Consequences
- Ongoing Management
- Staff - Occupant Education



Barrier Management Policy Tool

- **Contracts = Rules**
 - **Internal Contracts -**
 - **In House Departments similar to Outside Contractors**
 - **External Contracts**
 - **AIA Contract**
 - **Marked Fire - Smoke Barrier Actions**
 - **Barrier Permits**
 - **Documentation Systems**
 - **Report**

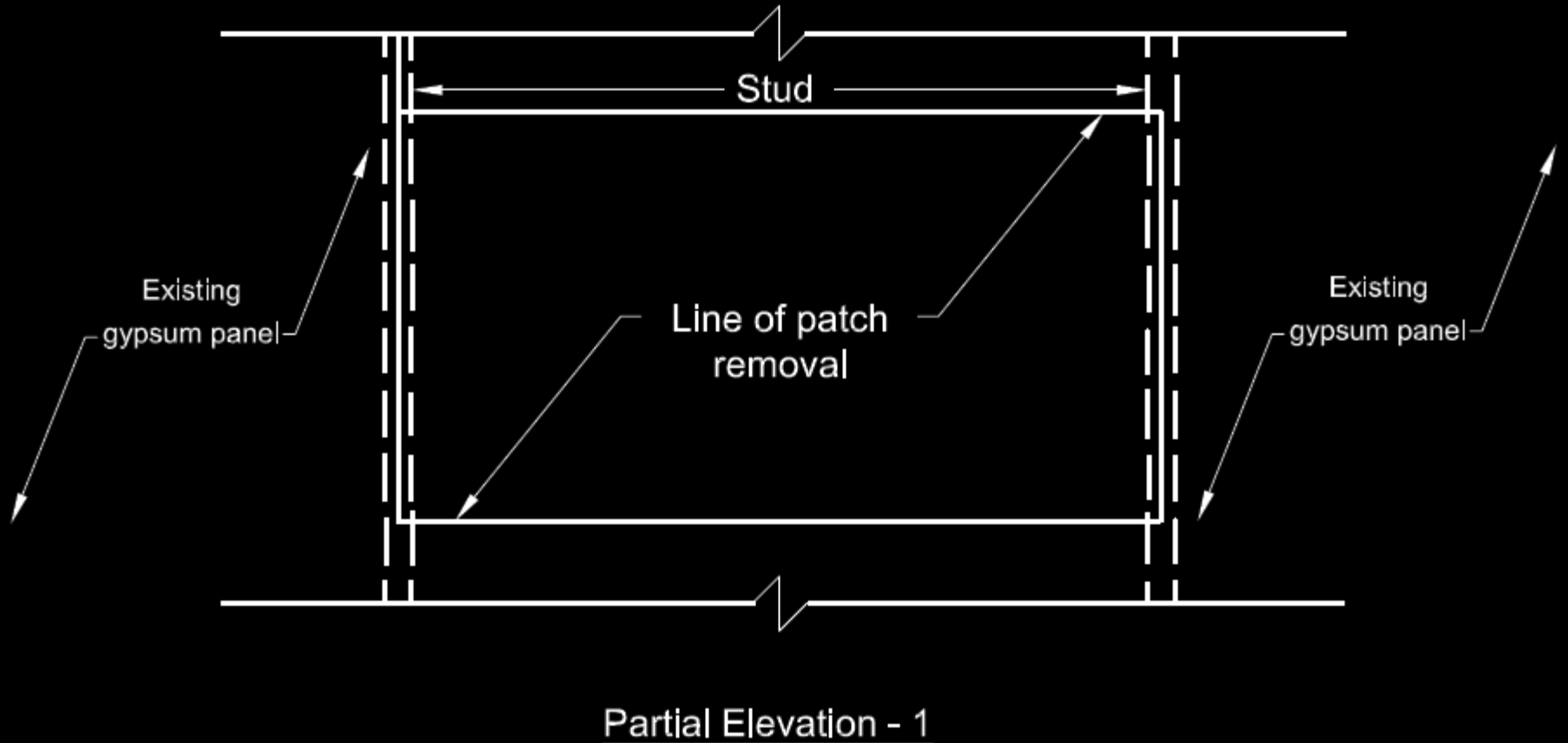
M–Barrier Management Systems

- **Barrier Inventory Elements**
 - Life Safety Drawings
 - Existing Conditions Documented
 - Ongoing Survey Records
 - Deficiency Reports
 - Systems Documentation Control, Retrieval
- **ALL FIRE PROTECTION FEATURES**

M–Barrier Management Systems

- **Barrier Repair Examples**

Gypsum Wallboard Repair Large Holes



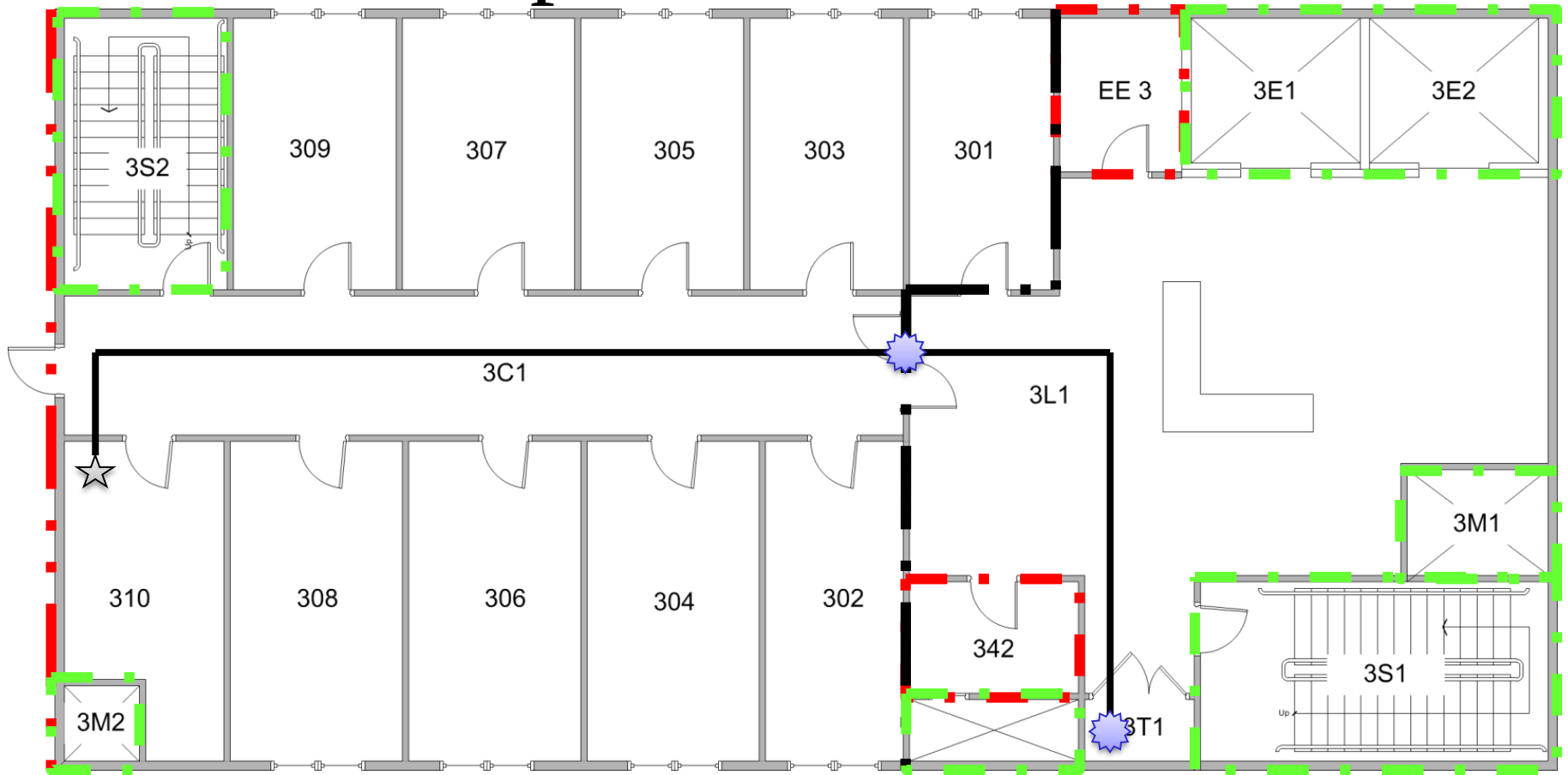
- USG Photo

M–Barrier Management Systems

- **Electronic Best Practice Elements**
 - **Action Oriented**
 - **Projects - Specifications**
 - **Ongoing Surveys – FCIA RPPS 2010-1**
 - **Action Reminders**
 - **In Process Status**
 - **Record Retrieval**



Sample Permit – Area





Demo Hospital

Permit No.: 2011-005

Area (*): 3C1/3L1

Side 1: 3C1

Side 2: 3L1

LSR ID: LST-B1-03-007

Compliance Status: ● Non-compliant

Survey ID:

LSR Group:

Life Safety Details Surveys Photos Floor Plan Diagrams

LSR Deta...	Status	Latest Ph...	Detail Description	Life Safety T...	Life Safety Sub ...	Letters	Numbers	LSR Count	Notes
> 001	● Non-com...		Firestopping Through Wall Penetration - Firestop	Firestopping	Through Wall Pe...	WL	1000-1999	1	
002	● Compliant		Firestopping Through Wall Penetration - Firestop	Firestopping	Through Wall Pe...	WL	1000-1999	0	
003	● Compliant		Firestopping Through Wall Penetration - Firestop	Firestopping	Through Wall Pe...	WL	5000-5999	1	
004	● Compliant		Firestopping Through Wall Penetration - Firestop	Firestopping	Through Wall Pe...	WL	3000-3999	1	EZ Path

Add New Life Safety Detail Entry

Edit Selected Life Safety Detail Entry

Edit

Save

Save & Add Another

Save & Close

Delete Record

Cancel

Edit Selected Permit

Delete Selected Row

/view/Print Permi

Close Form

admin Client: Life Safety Tracker Demo

Beta v1.3.13.9

Gleeson Powers Graphic

Corrective Action Report

Building\Floor\Area:
Building 1 \ 3rd Floor \ 3C1/3L1

LSR # - Detail#:
LST-B1-03-007 - 001

Life Safety Type Firestopping

Life Safety Sub Type: Through Wall Penetration - Firestop Systems

Penetration Type: EMT or Conduit

Penetration Size: Max 1"

Annular Space: MIN: 0 to .50", MAX:

Wall Rating Type:

Date Completed: May-02-2011

Classified System:

Survey #: Survey

Survey Date:

Deficiency Description: No firestopping

Suggested CA Notes: Install UL Listed Firestopping System at penetration/joint

Survey Notes:

CA Notes:

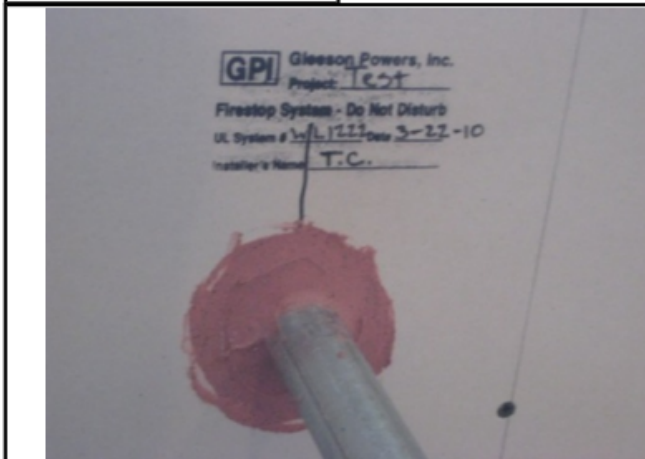
Survey Photo



Side: 37296

Photo ID: 37296

Corrective Action Photo



Side: 1: 3C1

Photo Notes:

Photo ID: 37298

Survey Photo



Side: 2: 3L1

Photo ID: 37297

Corrective Action Photo



Side: 2: 3L1

Photo Notes:

Photo ID: 37299

Barrier Management Policy

Code Guidance

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.

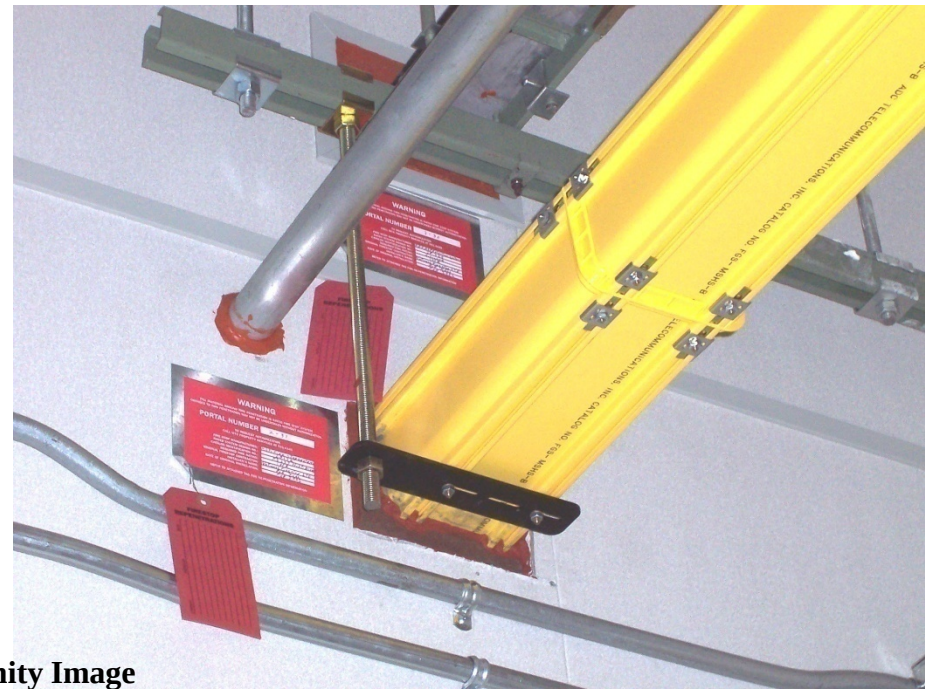


Barrier Management Policy Tool

- Barrier Warnings on ASSEMBLIES
- International Building Code – 2009++



CL Downey Image



Affinity Image

Barrier Management Policy Tool

- **Pre Construction Meetings - Education**
 - **Barrier Markings Mean...**
 - **Actions when at Barriers Required...**
 - **Permit required – Above Ceiling, Barrier Hole...**
 - **Infection Control Rules**
 - **Healthcare facility Rules**

Barrier Management Policy Tool

- **Violation Consequences**
 - **In House –**
 - 2 strikes & work reassignment to cleaning...
 - Others...
 - **Outside Contractors**
 - 2 strikes & not allowed to work above ceilings
 - Others...

Barrier Management Policy Tool

- **Find Violators....**
 - **Staff Awards**

Barrier Management Policy Tool

- **Ongoing Management**
 - **Engineering Staff Reviews**
 - **User Staff Reviews**
 - **Inside Construction**
 - **Outside Contractor**

Barrier Management Policy Tool

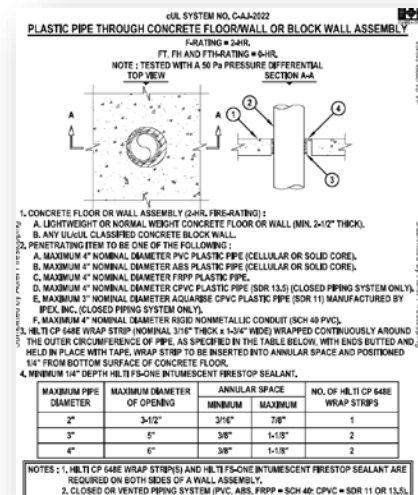
- **Education - Staff Repairs – Simple??**
 - **Fire Doors & Hardware – Simple things...**
 - **Close & Latch**
 - **Holes in Door**
 - **Ladder = ?? Permit Sticker?**
 - **Fire Rated Walls - Holes**
 - **Accidental**
 - **Workers**

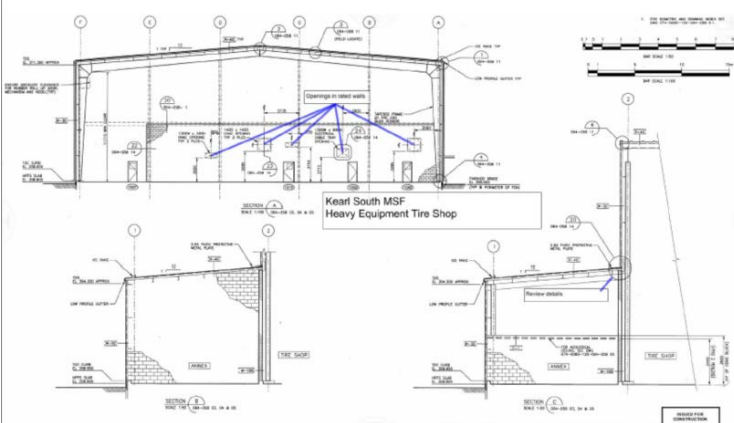
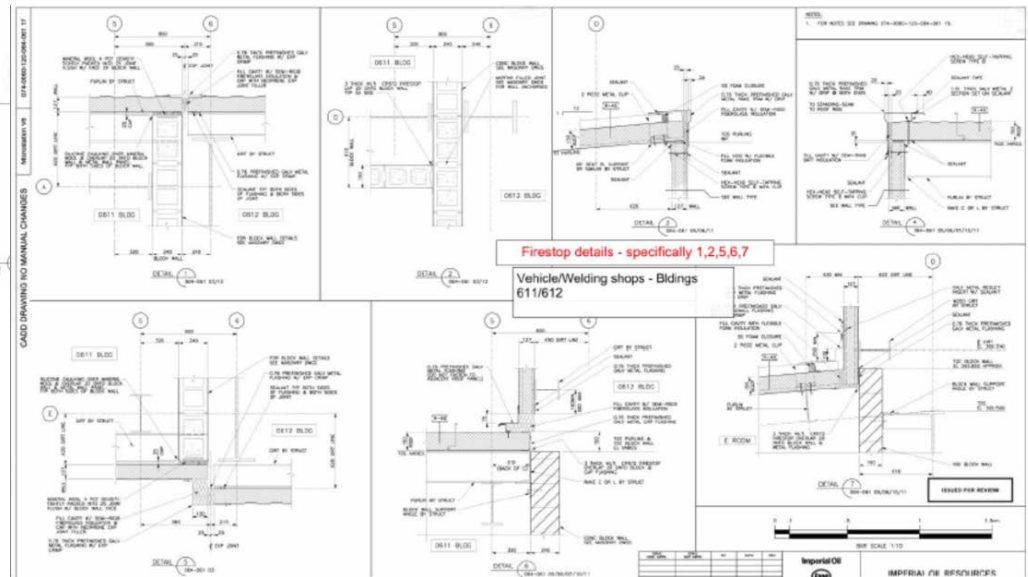
Barrier Management Policy Tool

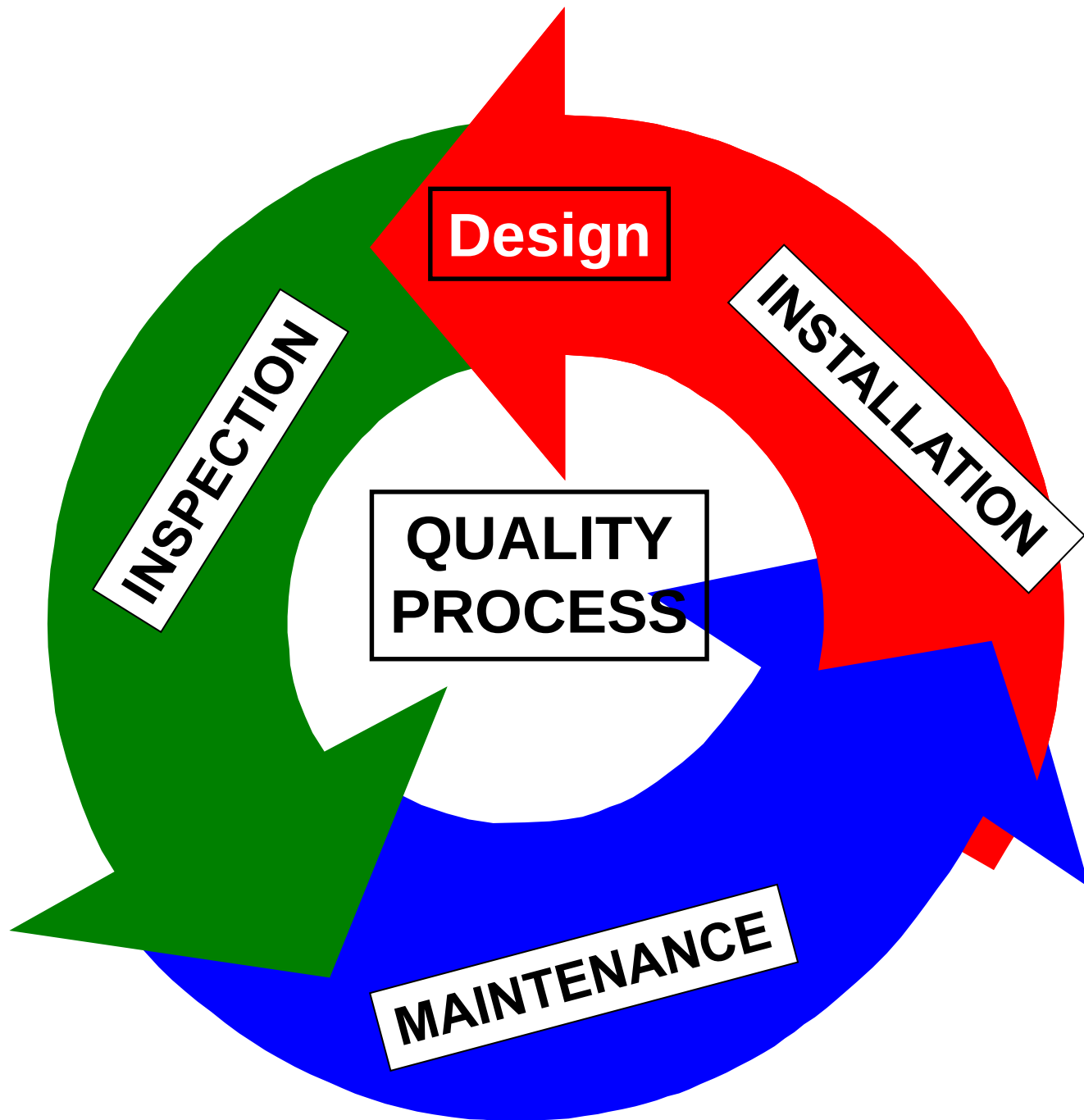
- **Budgets...**
 - **Sprinkler Maintenance**
 - **Alarms Maintenance**
 - **Security**
 - **Fire and Smoke Resistant Assemblies**
 - **Doors**
 - **Dampers**
 - **Firestops**
 - **Glazing**
 - **Walls/Floors**

Firestopping & Compartmentation for Safety

- 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



[illegible]



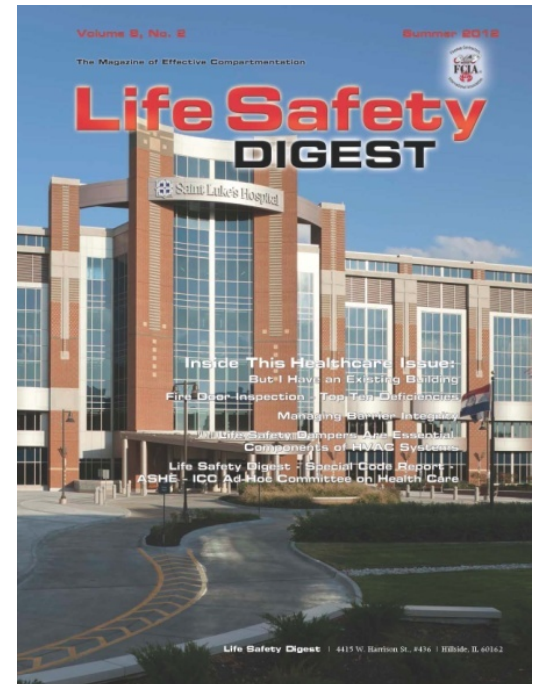
FCIA DIIM & Firestopping

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.

FCIA DIIM & Firestopping I & I - Inspection Webinar

- Free Subscription to Life Safety Digest
- Specifications @ FCIA.org,



Effective Compartmentation is a SYSTEM





Contacts

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DIIM & Firestopping

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