Firestopping DIIM v2

Bill McHugh, FCIA Executive Director Rich Walke, Consultant to the FCIA INFO@FCIA.org



FCIA – Firestop Contractors International Association



- Fire Exits??
- Housekeeping....
- Thanks to FCIA Members
 - Firestop Contractors
 - Manufacturers, Consultants
 - Firestop Distributors, Reps, Friends

Welcome, Thanks, From FCIA.....

FREE PDF MOP for Code Officials, Governmental ICC Members & Architects, Engineers, Specifiers with Design Firms or Independent Practice

Info@FCIA.org

RESOURCES www.FCIA.org



FCIA – Firestop Contractors International Association

- FREE Life Safety Digest
- UL/ULC, FM 4991 Contractor Programs
- IAS AC 291 Inspection Agency Accreditation Program



- Firestop Certificate & Individual Knowledge
- ASTM Inspection Standards
- Tools @ FCIA.org for Specifiers, AHJ's, Building Owners, Firestop Contractors & Inspection Agencies
- Watch FCIA.org for Webinar Announcements!

FCIA Actions –2023



- Conferences
 - FCIA ME @
 - •Doha Feb. 5
 - Dubai Feb. 15
 - •Riyadh Feb. 18
 - FCIA ECA @ New Orleans, USA May 10-13
 - FCIA CAN @ Ottawa, Ontario Sept. 24-26
 - FCIA FIC @ ABQ, NM Oct. 23-27
- Webinars & Symposiums
- Code Development & Standards Discussions
- Committee Action
- International Discussions
- NEW Education for Careers in Firestopping!!
 - FCIA's Firestop Certificate of Achievement & Education Program

FCIA Actions – 2021 & 2022



NEW Education for Careers in Firestopping!!

 FCIA's Firestop Certificate of Achievement & Education Program

- 30 Hours Education & Exams
 - Members Unlimited Subscription
 - Non-Members Visit FCIA.org

Firestopping DIIM

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Firestopping & Compartmentation for Safety

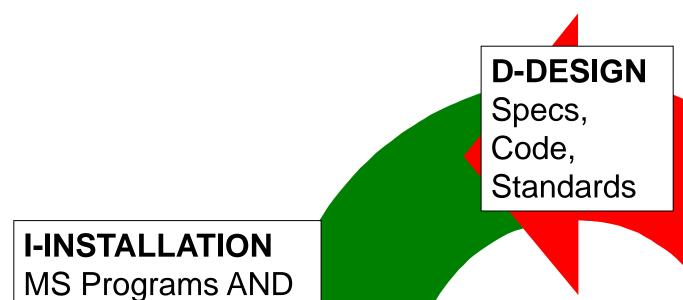
- Total Fire Protection Stats... North America
- Approx. 11,000 20 story + Buildings, 70% inNY, SF, LA, CHI, HI, Toronto...
- Compartmentation & Structural Fire-Resistance ...
 - Older buildings
 - Earthquakes
 - Source, Emporis.com

Firestopping & Compartmentation for Safety

- World Trade Center 7 Recommendation C,
- (NIST NCSTAR 1A, report for Towers I & II
- 'the need for redundancy in fire protection systems that are critical to life structural integrity';
 - Fireproofing, Compartmentation and Firestopping,
 - And the active sprinkler system each provide redundancy for maintaining structural integrity in a building fire, should one of the systems fail to perform it's intended function.
- "the ability of the structure and local floor systems to withstand a maximum credible fire scenario, without collapse, recognizing that sprinklers could be compromised, not operational, or non existent."

Outline

- FCIA DIIM Firestopping
 - Design Specs, Codes, Testing, Products
 - Installation
 - •FM 4991, UL/ULC Qualified Firestop Contractor Programs
 - Inspection
 - •ASTM E2174 / E2393 Inspection Standards
 - •IAS AC 291, Inspector Qualifications
 - Maintain Protection Fire Codes; Barrier Management
 - Firestopping for Safety
 - •Repairs??



Mfr. Education

QUALITY

PROCESS

BARRIER MANAGEMENT Fire Codes NFPA 101, 1, IFC

Barrier Management

I – INSPECTION

IBC Ch. 17 NFPA 80 NFPA 1

"DIIM" - Design, Install, Inspect, Maintain

- Fire Resistance & Smoke Resistant Firestopping
 - Properly Designed Building Codes
 - •FCIA 07-84-00 Specification **CCS**
 - Tested and Listed Systems –
 - •ASTM E814, UL 1479, ASTM E1966, UL 2079, E2307, E2837, E3037
 - Movement, (M) Smoke (L), Water (W)
 - Professional *Installation*
 - •FCIA Member, ULC Qualified Contractors, FM 4991 Approved
 - Properly Inspected
 - •ASTM E2174 / E2393, by IAS AC 291 Agencies, ULC, IFC, FM Exams
 - Protection Maintained Annually by FCIA Members

Barrier Continuity SYSTEMS

- Products Become Systems Test Standards
 - Fire & Smoke Barriers Fire Separations
 - •ASTM E119, UL 263
 - Firestopping
 - •UL 1479, ASTM E814, UL 2079, E1966, E2307, E2837, E3037...test methods..."
 - Swinging/Rolling Fire Doors UL 10B & UL 10C....NFPA 252
 - Fire Rated Glazing UL 9, NFPA 257, UL 263, ASTM E119
 - Fire/Smoke Dampers UL 555, UL 555S, UL 555C
- SYSTEM Testing = Suitability Statement

Building & Fire Code Requirements

- Fire-Resistance-Rated Assembly/Compartments
 - Exterior Walls
 - Fire Walls (IN-Fire Wall or Fire Separating Wall)
 - Fire Compartment
 - Fire Barrier (IN-Fire Resisting Barrier)
 - Fire Partitions (Not in NFPA)
 - Fire Separations (CAN)
 - Smoke Barriers
 - Smoke Partitions (Not in NFPA)
 - Archaic Assemblies

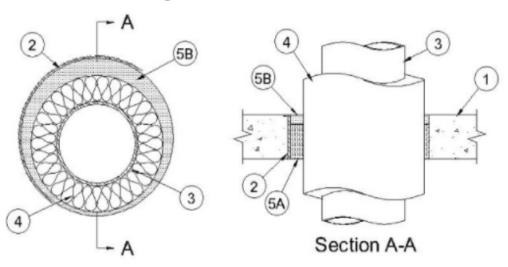
Black Bold = IBC

Systems & Materials ... Structural & Effective Compartmentation





F Ratings — 1 and 2 Hr (See Item 3)
T Ratings — 0, 3/4 and 1 Hr (See Item 4)



1. Floor or Wall Assembly — Min 2-1/2 in. (64 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600 - 2400 kg/m³) concrete floors or min 3 in. (76 mm) thick reinforced lightweight or normal weight concrete walls. Wall may also be constructed of any UL Classified Concrete Blocks*. Max diam of opening 9 in. (229 mm).

See Concrete Blocks (CAZT) category in the Fire Resistance Directory for names of manufacturers.

- 2. Steel Sleeve (Optional) Nom 9 in. (229 mm) diam (or smaller) Schedule 10 (or heavier) steel sleeve cast or grouted into floor or wall assembly. Steel sleeve may be installed flush or may project max 2 in. (51mm) beyond the floor or wall surfaces. As an alternate, nom 9 in. (229 mm) diam (or smaller) sleeve fabricated from nom 0.019 in. (0.48 mm) thick galv steel cast or grouted into floor or wall assembly flush with floor or wall surfaces.
- 3. Through Penetrants One metallic pipe to be installed concentrically or eccentrically within opening. Penetrant to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes may be used:
 - A. Steel Pipe Nom 4 in. (102 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.
 - B. Iron Pipe Nom 4 in. (102 mm) diam (or smaller) cast or ductile iron pipe.
 - C. Copper Tubing Nom 2 in. (51 mm) diam (or smaller) Type L (or heavier) copper tubing.
 - D. Copper Pipe Nom 2 in. (51 mm) diam (or smaller) Regular (or heavier) copper pipe.

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

4. Pipe Covering* — Nom 1-1/2 in. (38 mm) thick (or less) hollow cylindrical heavy density glass fiber units jacketed on the outside with an all service jacket. Longitudinal joints sealed with metal fasteners or factory-applied self-sealing lap tape. Transverse joints secured with metal fasteners or with butt tape supplied with product. Annular space between the pipe covering and periphery of opening or sleeve shall be min 1/2 in. to max 1 in. (13 mm to 25 mm).

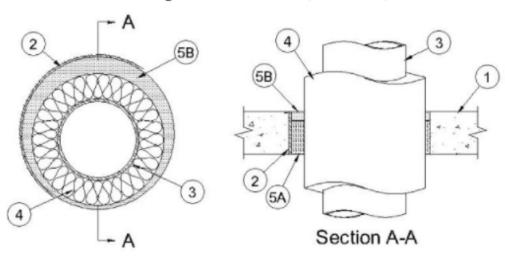
See **Pipe and Equipment Covering - Materials -** (BRGU) category in the Building Materials Directory for names of manufacturers. Any pipe covering material meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a smoke Developed Index of 50 or less may be used.

T Rating is 3/4 Hr for nom 1-1/2 in. (38 mm) thick pipe covering for penetrants A and B. T Rating is 1 Hr for nom 1-1/2 in. (38 mm) thick pipe covering for Penetrants C and D. T Rating is 0 Hr for all Penetrants when pipe coverings less than nom 1-1/2 in. (38 mm) thick.



Possible UL System Nos.: C-AJ-5138, C-AJ-5209, W-J-5091, Etc. F Ratings — 1 and 2 Hr (See Item 3)
T Ratings — 0, 3/4 and 1 Hr (See Item 4)

C-AJ-5209



1. Floor or Wall Assembly — Min 2-1/2 in. (64 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600 - 2400 kg/m³) concrete floors or min 3 in. (76 mm) thick reinforced lightweight or normal weight concrete walls. Wall may also be constructed of any UL Classified Concrete Blocks*. Max diam of opening 9 in. (229 mm).

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 A. **Steel Pipe** Nom 4 in. (102 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.
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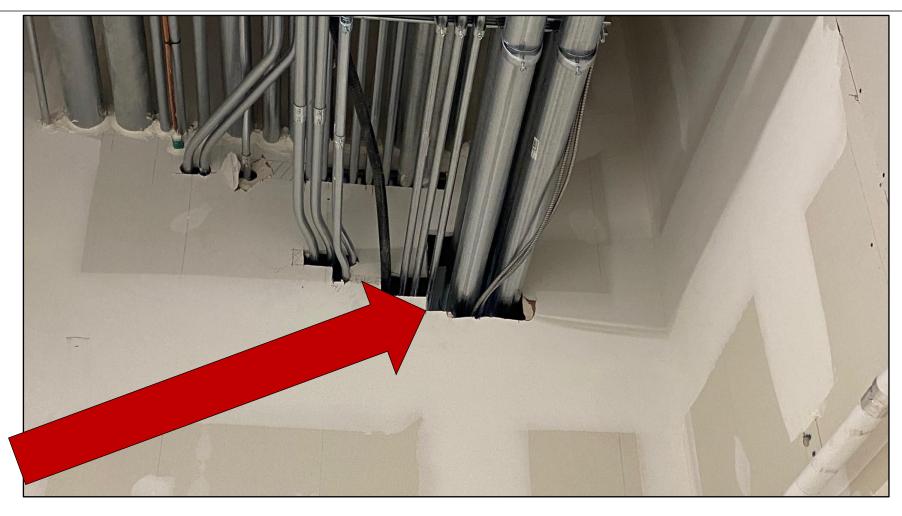
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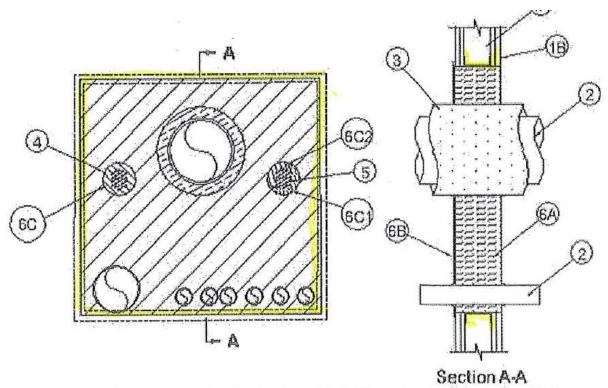


FOAM STILL???



FRAMING?





1. Wall Assembly — The 1 or 2 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. Studs — Wall framing may consist of either wood studs or channel shaped steel studs. Wood studs to consist of nom 51 by 102 mm (2 by 4 in.) lumber spaced max 406 mm (16 in.) OC. Steel studs to be min 89 mm (3-1/2 in.) wide and spaced max 610 mm (24 in.) OC. Additional framing members shall be located to completely frame the opening.

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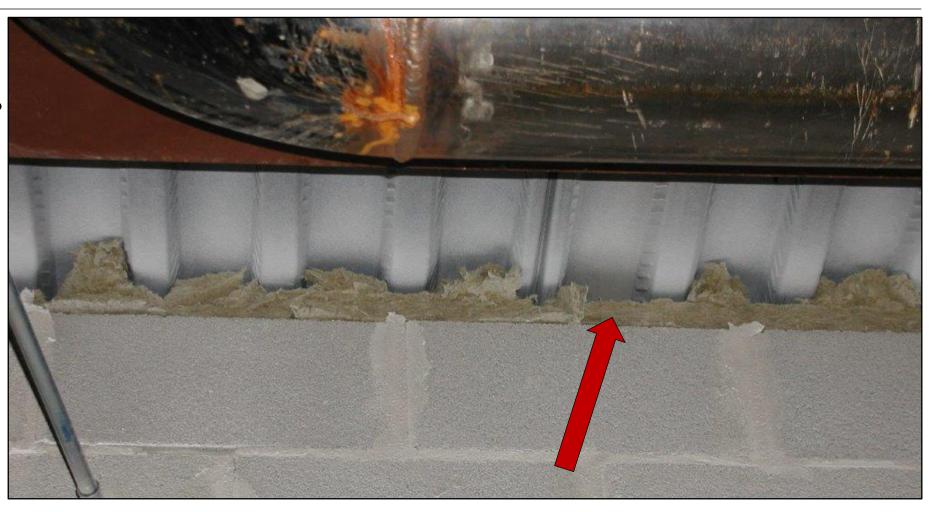
Mineral Wool with NOTHING?

Min Wool Compression?

Continuity?

SYSTEM?

1968??



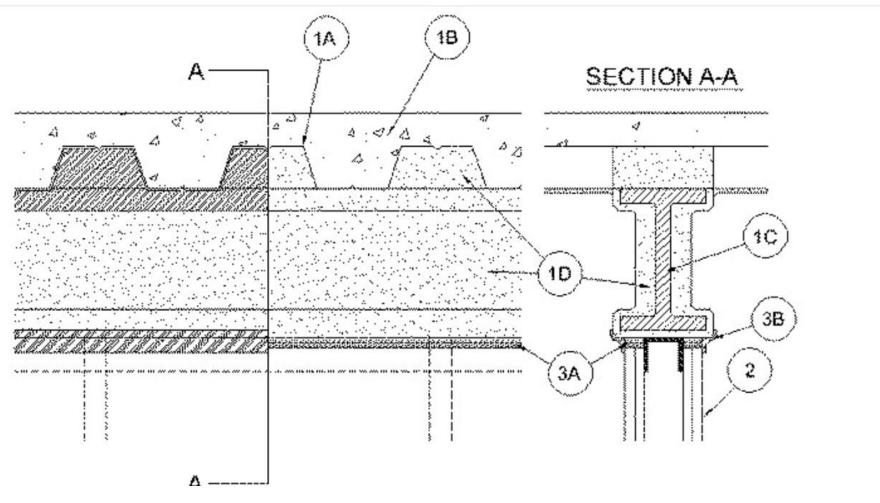
J Sharpe Image

I-Beam to Fluted Deck OVER WALL Beam is a WALL TOO!



Firestop Solutions Image

I-Beam to Fluted Deck OVER WALL HW-D-0259 -



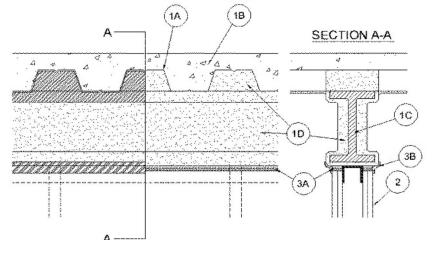
I-Beam to Fluted Deck OVER WALL HW-D-0259

- Beam Size, Shape
- INCREASED Fireproofing Thickness

• Acceptance Criteria – 250°F Ave / 325°F Individual Point on

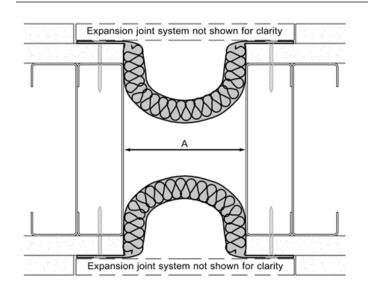
non-fire side

More later...

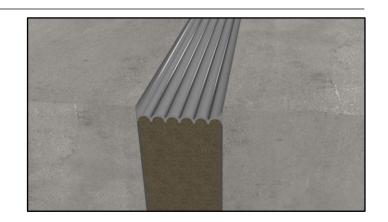


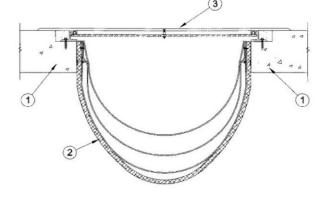
UL Solutions Image

Fire Rated Expansion Joints FF-D-4001, 1201, 1204...more











Balco, Construction Specialties, Inpro, MM Systems, UL Solutions

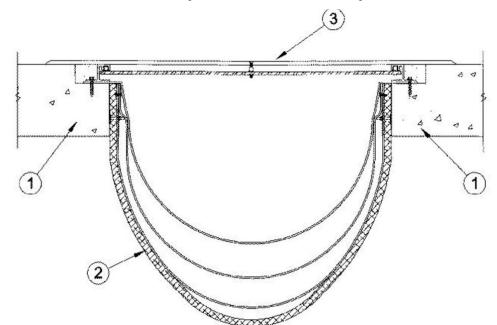
Fire Rated Expansion Joints FF-D-4001, 1201, 1204...more

System No. FF-D-4001

September 20, 2000

Assembly Rating — 2 Hr Nominal Joint Width — 25 to 36 in.

Class II and III Movement Capabilities — 50% Compression or Extension



- 1. **Floor Assembly** Reinforced lightweight or normal weight (100-150 pcf) structural concrete having a min thickness of 4-1/2 in. at stepped-edges receiving joint cover (Item 3).
- 2. **Mechanical Joint Assembly* Nom width of joint is 25 to 36 in.** Flexible multilayer mat material with galv steel mounting angles on longitudinal edges. The mechanical joint assembly shall be installed in accordance with the installation instructions accompanying the units.

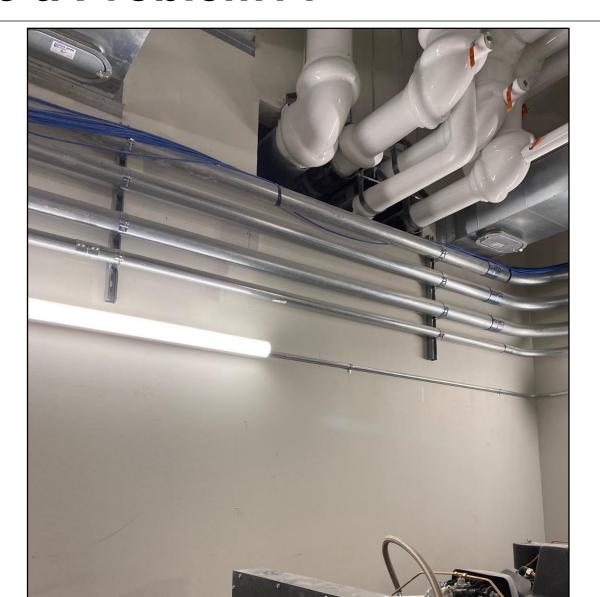
CONSTRUCTION SPECIALTIES INC — FB97-25F-++ through FB97-36F-++ (++=max width of joint opening)

3. **Joint Cover** — Min 0.030 in. thick joint cover formed of aluminum, bronze, stainless steel or galv steel. Joint covers anchored to floor slabs on each side of joint opening, continuous over entire length of joint, in accordance with the manufacturer's installation instructions.

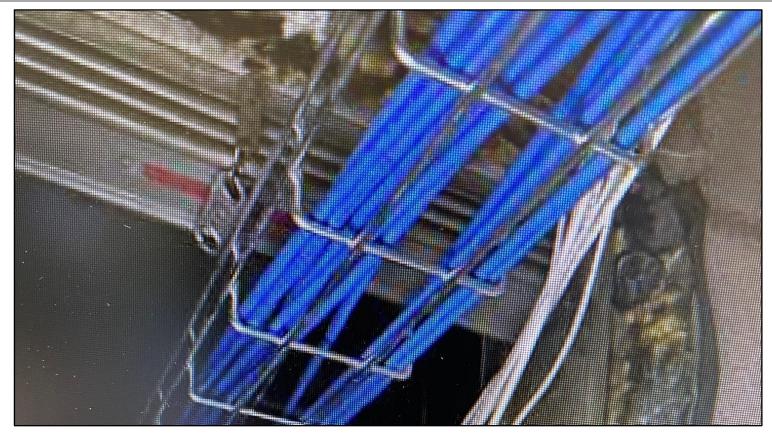
As an alternate, where the linear joint opening is enclosed within a chase wall and is non load bearing, a cover consisting of a creased sheet of min 2 mil stainless steel foil secured with 1 in. wide continuous galv steel washer strips along each side of the joint opening may be used.



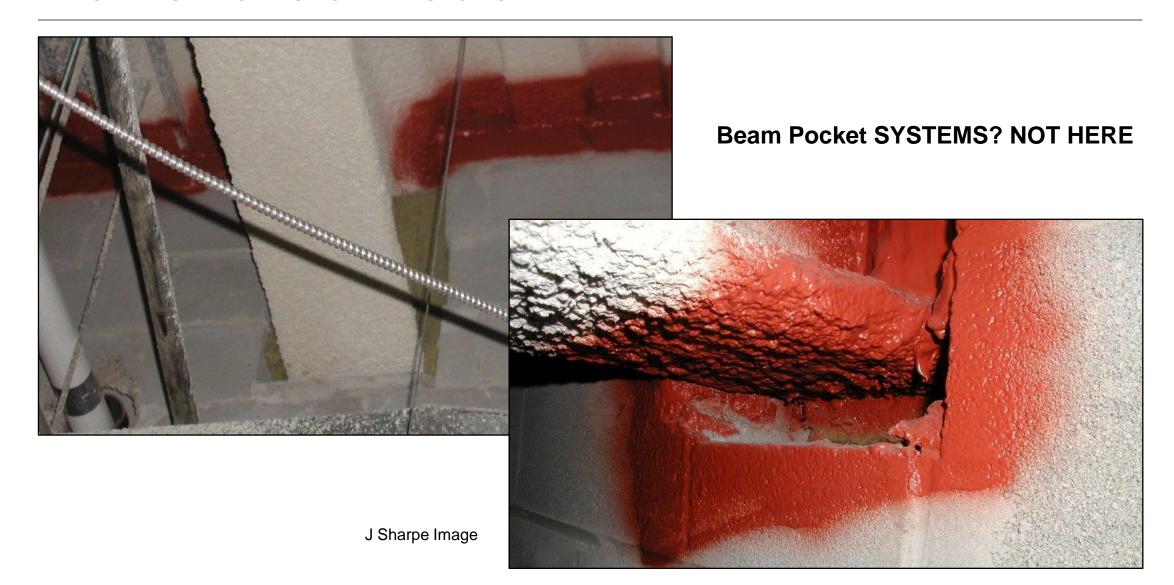


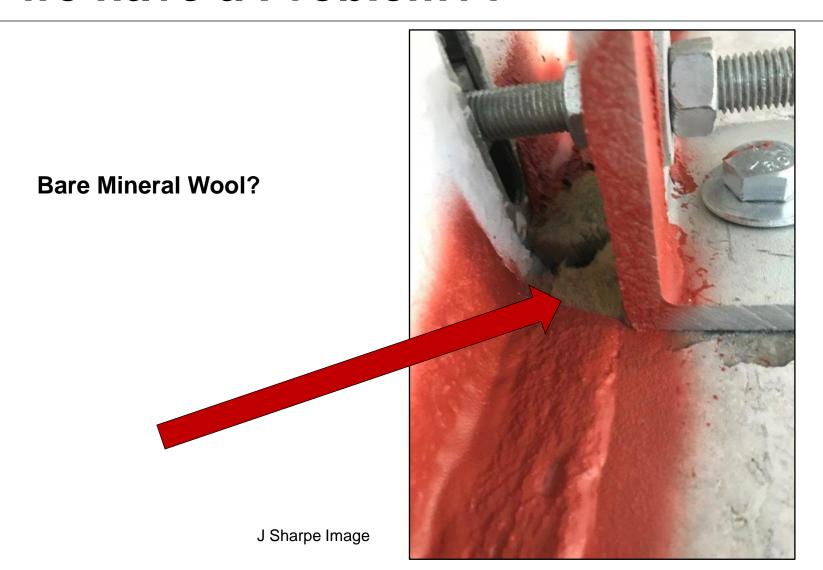


Cable Tray through a FIRE DAMPER?



J Sharpe Image



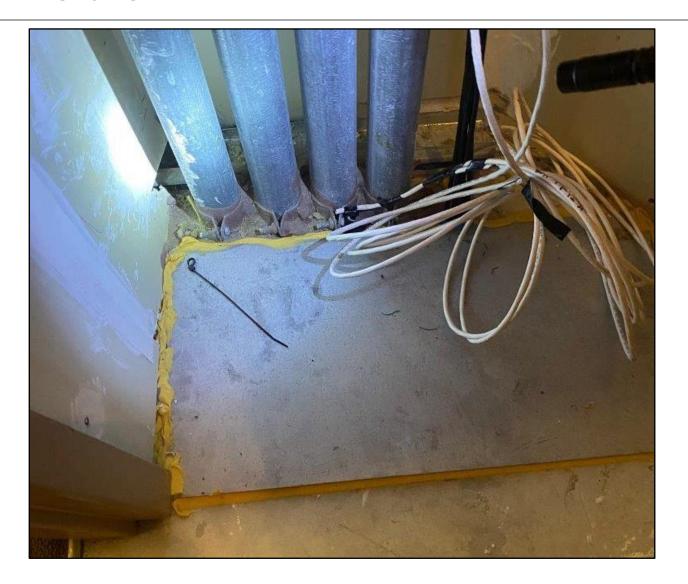


Where's the studs behind?

Sealant not TOOLED

Sealant under Anchors?

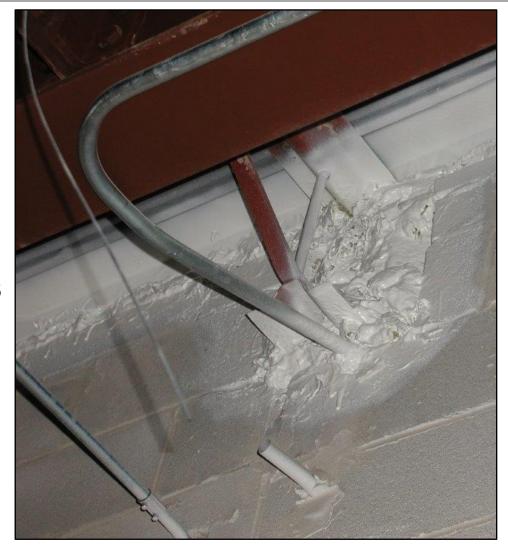
SYSTEM??



Mineral Wool

- Flat
- Compressed
- Spray Even

SYSTEM STATES COMPRESSION





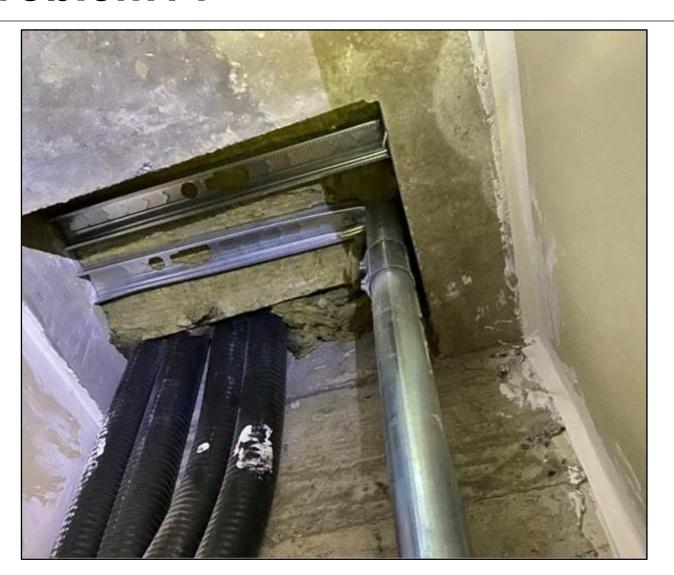
Firestop Spray?

Show me the SYSTEM!

Show me the LISTING!



Studs to support??

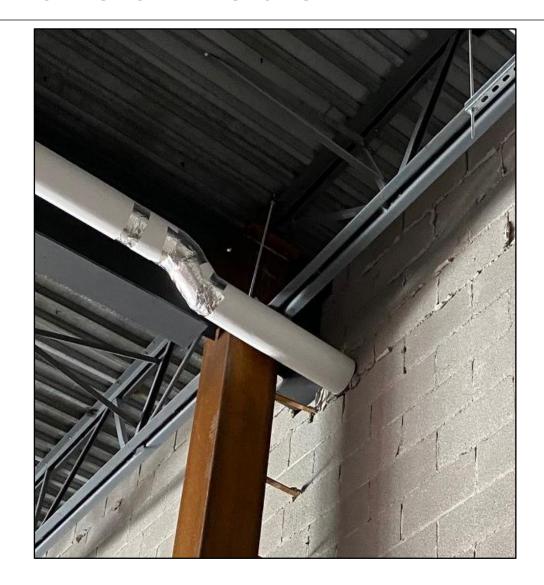


Fiberglas
Insulation
HIDING
Penetration

Plastic Pipes = COLLARS

Insulated Metal

SEALANT
ONLY MOST
CASES





Transitions

Metal Pipe Plastic Pipe

UNSAFE





Transitions

Metal Pipe Plastic Pipe

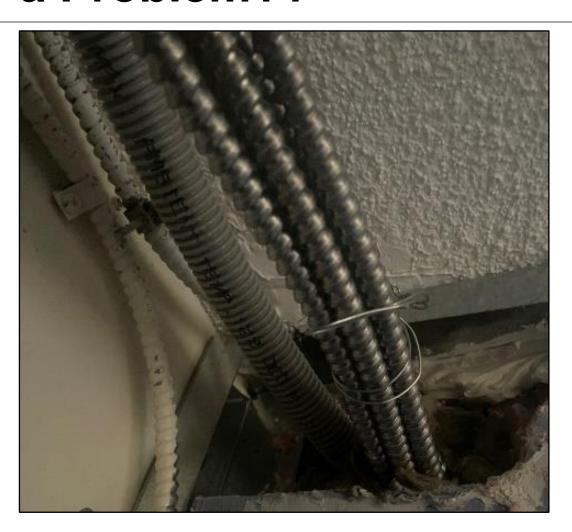
UNSAFE

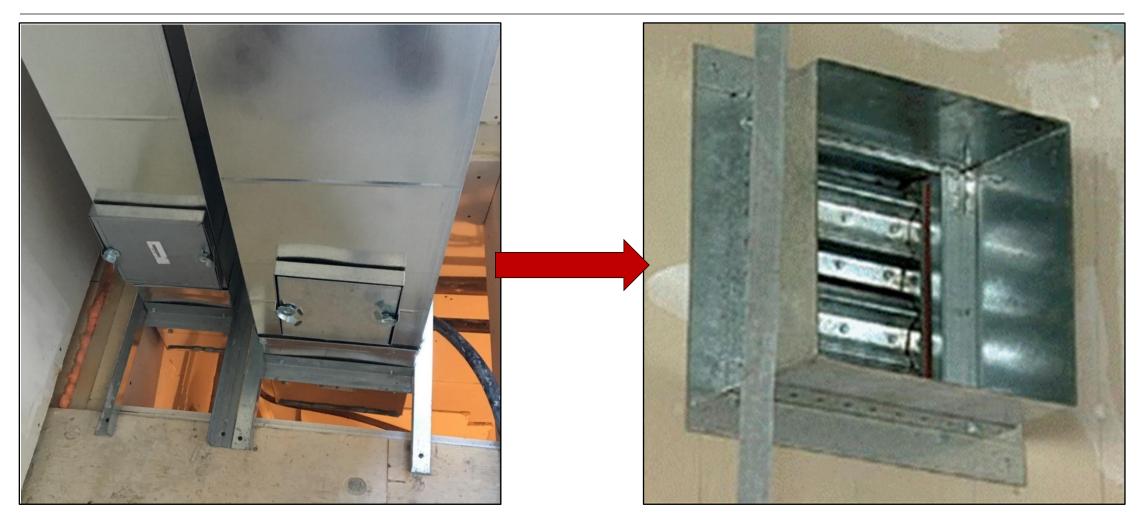






Nothing...





Fire Damper Annular Space?

Annular Space Control

System
LIMITS
ANNULAR
SPACE



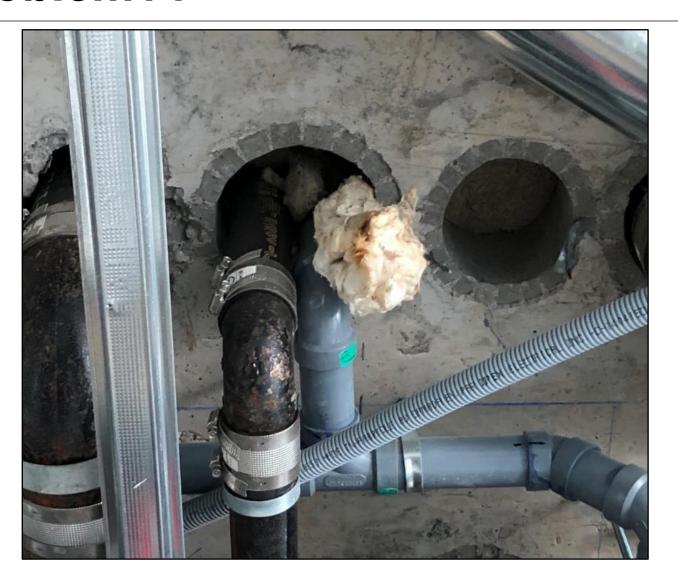
Annular Space Control?



What's this?



What SYSTEM is THIS?





Lots of Gypsum Wallboard Compound & NO FIRESTOP SYSTEM



Surface Patches?

Red STUFF?



CROSS LAMINATED TIMBER (CLT)

&

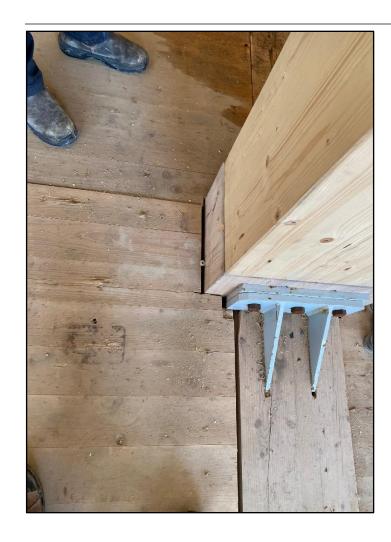
Firestopping



Any Tested and Listed Systems For Structural CLT for Penetrations/Joints?

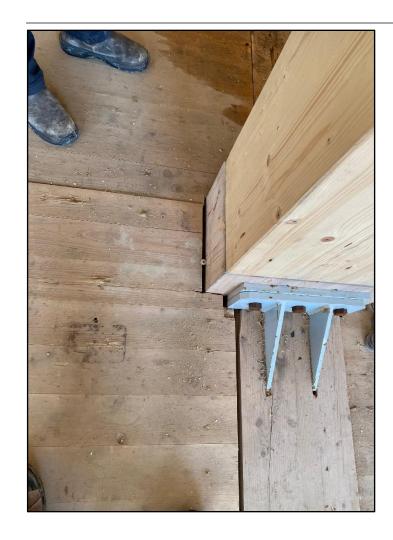
















D-DESIGN Specs, Code, Standards

I-INSTALLATION
Systems Selection
Systems Analysis
Self Inspection
FCIA, FM & UL
MACC

QUALITY PROCESS

BARRIER MANAGEMENT

Fire Codes NFPA 101, 1, IFC Barrier Management

I – INSPECTION

IBC Ch. 17 NFPA 80 NFPA 1



Building & Fire Code Requirements

- International Codes
 - New and Existing Buildings International Building Code Chapter 7
 - International Fire Code Chapter 7
- NFPA 5000 101 Chapter 8
- National Building Code of Canada
- UAE Fire and Life Safety Code
- National Building Code of India
- Other Worldwide Codes....
- Minimum requirements Construction & Maintaining Protection

Building & Fire Code Requirements

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

Existing Buildings

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

Smoke Barriers & Firestopping

- Smoke Barriers differ from Smoke Partitions?
 - Smoke Barrier
 - IBC Hourly Rated, Quantified Firestop "L" Rating
 - < 5 cfm/sf (IBC 2006)
 - < 50 cfm, 100 sf of Wall Area (IBC 2009)
 - NFPA ... 'restricting the passage of smoke'...
 - Hourly Rated, Quantified Firestop L Rating Chapter 8
 - NO quantified "L" Rating ... Healthcare Chapter
 - Continuous, Barrier to Barrier, ... through concealed spaces
 - Not always fire-resistance-rated
 - Smoke Partition
 - IBC Continuous barrier, not fire rated…'retard'
 - NFPA Continuous membrane that is designed to form a barrier to limit the transfer of smoke....

Breaches in Fire-Resistance-Rated Construction

Firestop Systems

Penetration Firestop Systems

Joint Firestop Systems

Perimeter Joint Firestop Systems

Opening Protectives

Ducts and Air Transfer Openings









Firestopping for Continuity Products become SYSTEMS Based on Testing

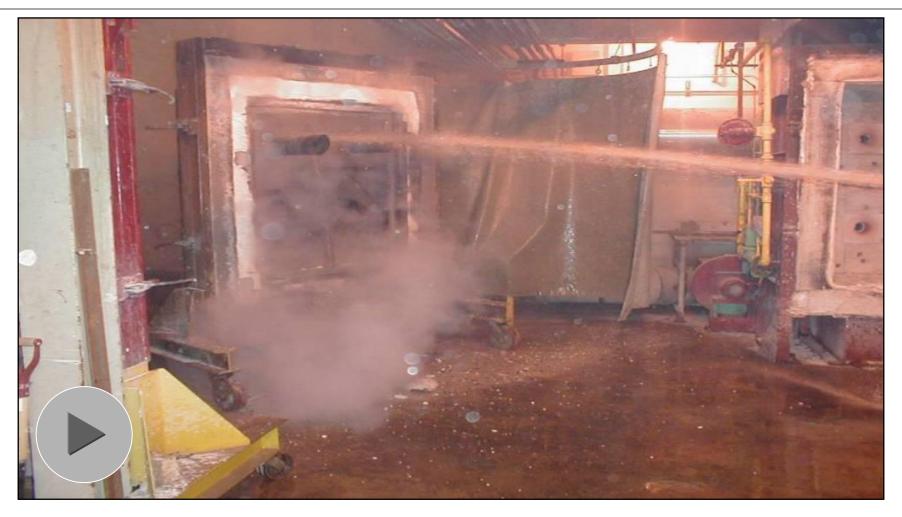
- 'Field Erected Construction...Tested to...'
 - Standards –UL 1479, ASTM E814, UL 2079, ASTM E1966, ASTM E2837, ASTM E2307, FM 4990
 - F Rating Flame
 - T Rating Temperature
 - L Rating Smoke
 - W Rating Water
 - M Rating Movement
 - H Hose Stream Test



3M Image

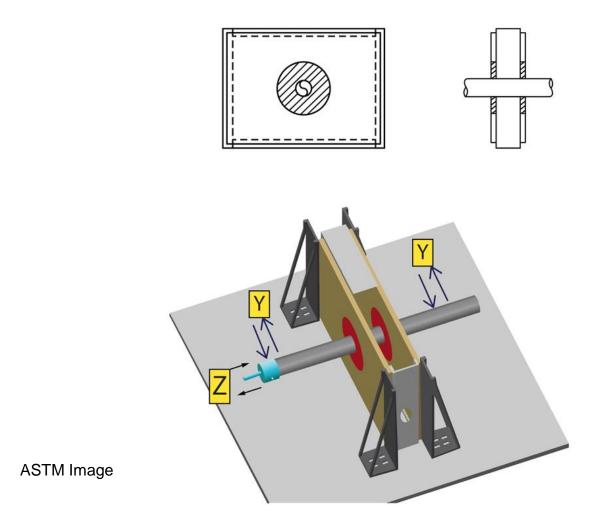
Pre-Test View – Top, Concrete Assy. **UL Solutions Image**

Hose Stream Test



UL Solutions Image

M Rating (Optional)

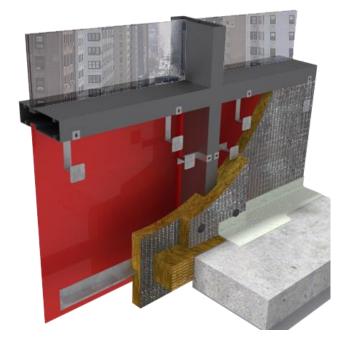


Building & Fire Worldwide Code Requirements

- Chemical, Biological, Radiation, Explosion, Germ, etc.
 - Standards?
 - •C Which Chemicals? Check with manufacturer
 - •B Which Agents? Check with manufacturer
 - •R Nuclear Power Plant Standards? Check with manufacturer
 - •E Blast Strength? Check with manufacturer
 - •G Germ Check with manufacturer & industrial hygienist
 - How to Regulate for Unexpected Events?
 - Due Diligence Review Required by code?
 - SPECIFIED ...

IBC & Curtain Walls – ASTM E2307

- Prevent Fire Spread @ Interior Safing Slot
 - Interior Flame
 - Exterior Flame Plume from Window
 - Time & Temperature
 - Tested Systems....
- Leapfrog Testing ASTM E2874



OCF/Thermafiber Graphics

Barrier Continuity Products become SYSTEMS

- Fire Rated Systems Directories
 - FM Approvals
 - Intertek
 - UL/ULC Product iQ Online Directory



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





Engineering Judgments/EFRRA

- Variances to Systems at Site?
 - First Action in Process
 - •Find another system Same Manufacturer
 - •Find another system Different Manufacturer
 - •If no system exists in either case....
 - Second Action
 - Engineering Judgment
 - "EJ"
 - Equivalent Fire Resistance Rated Assembly
 - "EFRRA"
 - Based on Engineering, IFC Protocol



J. Sharp – ProFirestop Image



C. Zussman – Pepper Image

Engineering Judgments/EFRRA

International Firestop Council – Manufacturers – www.firestop.org

IFC Recommended Guidelines for Evaluating Firestop Systems in Engineering Judgments

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

ADD THIS TO EJ's.... "Manufacturer attests this EJ will pass applicable firestop fire test with hose stream test if subjected..."

D-DESIGN

Specs, Code, Standards

I-INSTALLATION

Systems Selection Systems Analysis Self Inspection FCIA, FM & UL MACC

QUALITY PROCESS

BARRIER MANAGEMENT

Fire Codes NFPA 101, 1, IFC Barrier Management

I - INSPECTION

IBC Ch. 17 NFPA 80 NFPA 1

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

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





STI Graphic

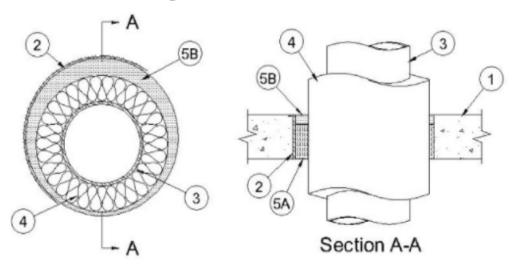
Systems & Materials....







Possible UL System Nos.: C-AJ-5138, C-AJ-5209, W-J-5091, Etc. F Ratings — 1 and 2 Hr (See Item 3)
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F Rating is 2 Hr for Penetrants A and B. F Rating is 1 Hr for Penetrants C and D.

4. Pipe Covering* — Nom 1-1/2 in. (38 mm) thick (or less) hollow cylindrical heavy density glass fiber units jacketed on the outside with an all service jacket. Longitudinal joints sealed with metal fasteners or factory-applied self-sealing lap tape. Transverse joints secured with metal fasteners or with butt tape supplied with product. Annular space between the pipe covering and periphery of opening or sleeve shall be min 1/2 in. to max 1 in. (13 mm to 25 mm).

See **Pipe and Equipment Covering - Materials -** (BRGU) category in the Building Materials Directory for names of manufacturers. Any pipe covering material meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a smoke Developed Index of 50 or less may be used.

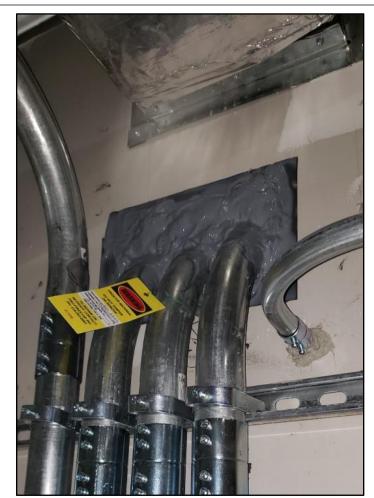
T Rating is 3/4 Hr for nom 1-1/2 in. (38 mm) thick pipe covering for penetrants A and B. T Rating is 1 Hr for nom 1-1/2 in. (38 mm) thick pipe covering for Penetrants C and D. T Rating is 0 Hr for all Penetrants when pipe coverings less than nom 1-1/2 in. (38 mm) thick.



FCIA Recommended
Professional Practice
Identification Systems
"Labelling"
-OnWall/Horizontal Assy.
Penetrating Item
Hanging

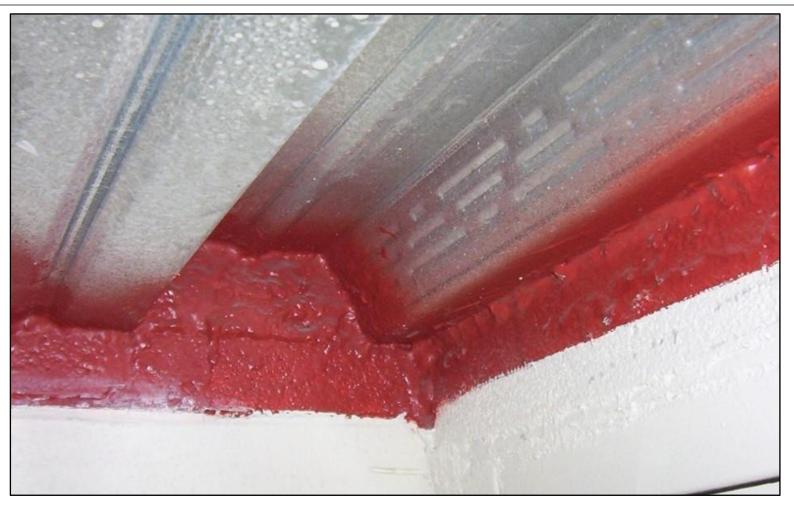








Joints and Voids Head-of-Wall – Mineral Wool & Spray



Firestop Solutions Image

Joints and Voids Head-of-Wall – Intumescent Strips

System No. HW-D-0300

October 16, 2015

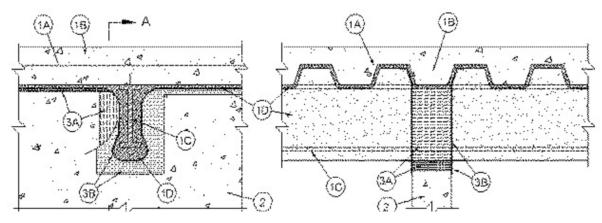
Assembly Ratings — 2 and 3 Hr (See Item 3A)

Nominal Joint Width — 1 and 2 In. (See Item 3)

Class II Movement Capabilities — 25% Compression or Extension

L Rating At Ambient - Less Than 1 CFM/Lin Ft

L Rating At 400 F - Less Than 1 CFM/Lin Ft



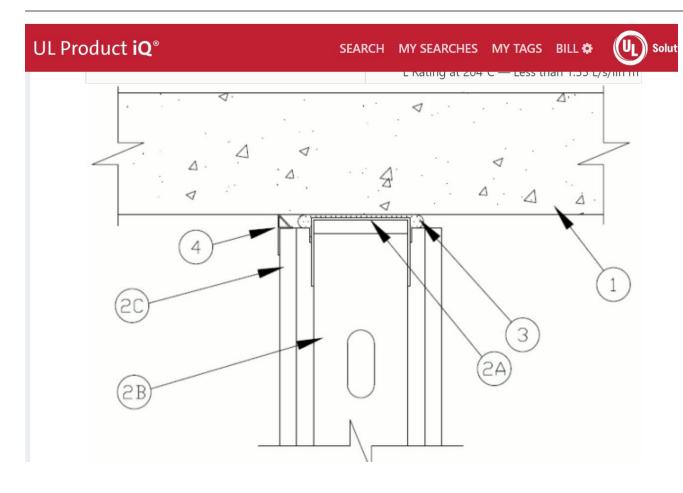
UL Solutions Image / Text HW-D0300 - Rectorseal

- 1A. **Roof Assembly (Not Shown)** As an alternate to the floor assembly, a fire-rated fluted steel deck roof assembly may be used. The roof assembly shall be constructed of the materials and in the manner described in the individual P700 and P900 Series Roof-Ceiling Design in the UL Fire Resistance Directory. The hourly rating of the roof assembly shall be equal to or greater than the hourly rating of the wall assembly. The roof assembly shall include the following construction details:
 - A. **Steel Roof Deck** Max 2 in. (51 mm) deep galv steel fluted roof deck.
 - B. **Roof Insulation** For P900 Series Designs, min 2-1/4 in. (57 mm) thick poured insulating concrete, as measured from the top plane of the roof deck. For P700 Series Designs, as specified in the individual P700 Series Design.
 - C. **Spray-Applied Fire Resistive Materials*** Prior to the installation of the Forming Material and Fill, Void or Cavity Material (Items 3A and 3B, respectively), the steel roof deck shall be sprayed with the thickness of material specified in the individual P700 Series Design. For P900 Series Designs, structural steel supports only to be sprayed in accordance with the specifications in the individual P900 Series Design.

ISOLATEK INTERNATIONAL — Type 300 GCP APPLIED TECHNOLOGIES INC — Type MK-6/HY, MK-6/HY ES, MK-6S and RG

The hourly fire rating of the roof assembly shall be equal to or greater than the hourly rating of the wall assembly.

Joints and Voids Head-of-Wall – Intumescent Strips



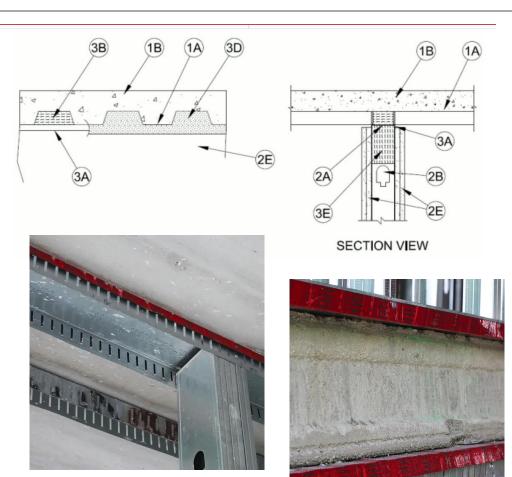
UL Solutions Image

3. Fill, Void or Cavity Material* — Top Track Seal — When max separation between the bottom of floor and top of wall is 1/2 in. (13 mm), the joint system is designed to accommodate a max 50 percent compression or extension from its installed width. When max separation between the bottom of floor and top of wall is 3/4 in. (19 mm), the joint system is designed to accommodate a max 66% compression only from its installed width.

Factory supplied foam seal sized for width of and installed over the ceiling runner (Item 2A) prior to attachment to underside of concrete floor in accordance with the installation instructions. Butt joints in CFS-TTS shall be compressed min 1/2 in. (13 mm).

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CFS-TTS 212, CFS-TTS 358, CFS-TTS 600, CFS-TTS R or CFS-TTS-OS

Joints and Voids Head-of-Wall – Intumescent Strips



3. **Joint System** — Max separation between bottom plane of the floor or roof and top of gypsum board is 1 in. (25 mm). The joint system is designed to accommodate a max 100 percent compression or extension from its installed width. The joint system consists of the following:

A. **Fill, Void or Cavity Material*** — Factory-supplied intumescent gasket installed and nominally centered over the ceiling runner (Item 2A, 2A1, 2A2, 2A3) prior to attachment to underside of floor or roof assembly. Gypsum wallboard layers to be installed on both sides of the wall maintaining a minimum 1/8 in. (3 mm) overlap over the intumescent gasket at time of installation.

SPECIFIED TECHNOLOGIES INC — Speed Flex Track Top Gasket

C. **Forming Material*** — As an option to Item 3B, preformed mineral wool plugs, formed to the shape of the fluted floor units, friction fit to completely fill the flutes above ceiling runner. The forming material shall be recessed from each surface of wall ceiling runner to accommodate the required thickness of fill material (Item 3D).

THERMAFIBER INC — TopStop mineral wool deck plugs Type SAF batts

D. **Fill, Void or Cavity Material*** — **Sealant** — Min 1/4 in. (6 mm) thickness of fill material installed on each side of the wall in the flutes of the steel floor or roof deck and between the top of the fill, void or cavity material (Item 3A) and the bottom of the steel floor or roof deck, flush with each surface of wall framing.

SPECIFIED TECHNOLOGIES INC — SpecSeal ES Sealant

Fire/Smoke Dampers & Firestops

- Dampers UL 555, 555S
 - Listings Systems
 - Installed to manufacturer's written instructions
 - Systems Angles…no sealants required
- Firestop sealants UL 1479, ASTM E814
 - Improper hole sizing or poor installation...

Consult the Damper Manufacturer & the Authority Having Jurisdiction



Greenheck Image

Review of UL Firestop and Joint Systems on UL Product iQ

- Review:
- U410
- C-AJ-1155
- C-AJ-3314
- C-AJ-4036
- C-AJ-8001
- W-L-1137
- W-L-2030

W-L-2154

W-L-5001

BW-S-0002

FF-D-1001

HW-D-0221

CW-D-1046

Barrier Continuity I – Installation – Listed Systems



Firestopping for Continuity – Firestop Products

- Sealants
 - Silicone, Acryic/Latex, Intumescent
- Wrap Strips & Collars
 - "Thick, Thin, Wide, Less Wide"
- Putties
- Pre Fabricated MCT Devices
- Fire Pillows
- Mortar
- Composite Sheets
- Bricks / Plugs
- Spray Products
- Tapes
- Cavity Barriers, Strips



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 Firestop Contractors

Spec Contractor Qualifications

- FM 4991 Standard for the Approval of Firestop Contractors
- UL Qualified Firestop Contractors
- Other Industries???
- FM 4991 / UL-ULC CONTRACTORS UNDERSTAND MANAGEMENT SYSTEM FOR FIRESTOP SYSTEMS, INVENTORY - DOCUMENTATION







FM 4991 & UL/ULC QFC

- FM, UL/ULC Firestop Exam @ 80% min.
- Management System (MS) Written
- MS Procedures implemented
- MS Audit @.....
 - Contractor Office Records & Documents
 - Jobsite Observation, possible destructive

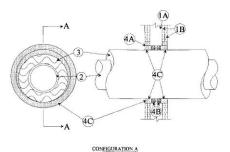






Management System & Audit – UL, FM 4991

- Facility Tour
- Review MS Manual
- Construction Document Requirements and Review
 - Systems Selection & Analysis
- Procurement
- Storage, Handling, Preservation and Delivery
- Labeling
- Installation, Application and Field Quality Assurance Procedures
 - Systems Installation, Self Inspection/Survey



Management System & Audit – UL, FM 4991

- Inspection, Testing and Calibration
 - Tape Measures
- Control of Nonconforming Product
- Training and Qualification of Staff
 - DRI's, Workforce
- Corrective/Preventive Action
- Quality System Monitoring and Improvement
- Documentation and Record Keeping
 - 7 years

FM 4991 & UL/ULC QFC

• UL QUALIFIED or FM 4991 APPROVED

- DRI Appointed by Contractor, CEU's
- Listed @
 - www.FCIA.org
 - www.UL.com
 - ApprovalGuide.com





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.





Certificate Number:1000

QUALIFIED FIRESTOP CONTRACTOR CERTIFICATE

nany Name: Underwriters I abayatavies Inc. File number: P122

Issued: January

Expires: December 31, 2019

Address: 333 Pfingsten Rd.

290.6987 Email Address: Ruben Sandovallr@1

This company has demonstrated that of complex with U. S Qualified Finestop Confractor 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 used in its entirety.

Only those companies listed in UL is online Directory for the Outhfield Furieston Contractor Program at wiww.il.com/contractor are considered eligible for this program and to use this Certificate and the UL Qualities Eireston Contractor Program Marking (shown here) in its advertising and promotional material in accordance with marking guidelines provided at www.ul.com/contractor.



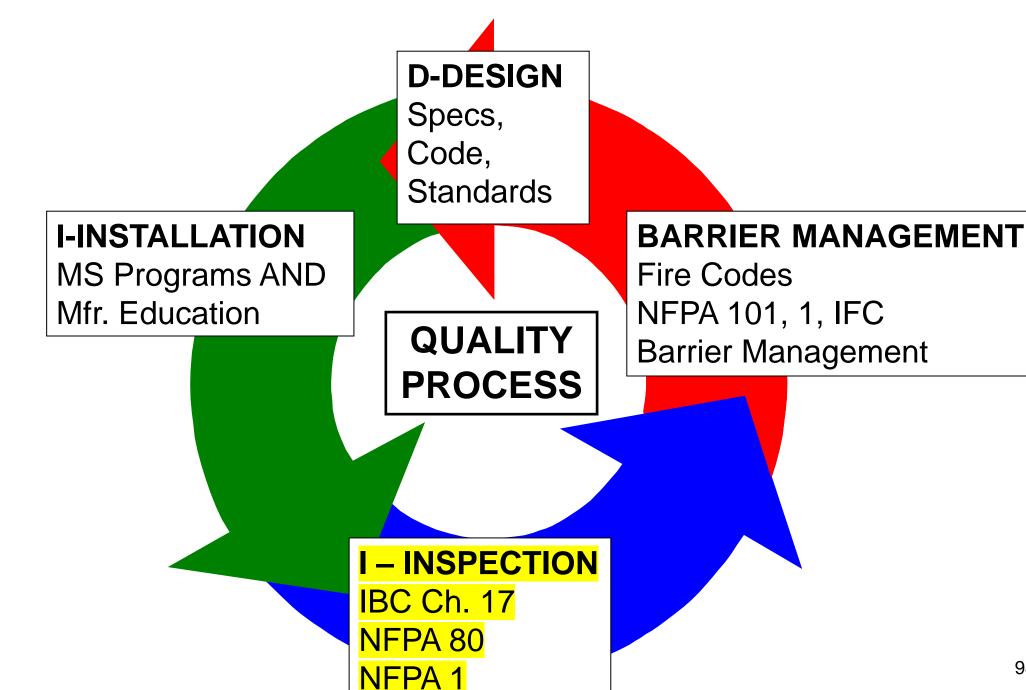
Underwriters Laboratories

Contractor Program

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

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

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Firestop & Inspection

• ASTM E2174 / ASTM E2393 – "Inspection Process"



- NFPA 1 Ch. 12
- NFPA 101 / 5000 Chapter 8 Annex
- 2012 2018 International Building Code
- IBC Ch. 17 Special Inspections
 - •Buildings 75' & higher above Fire Department Access
 - Occupancy Type III, IV, Chapter 16 Table 1604.5
 - •IBC 2021 Residential => 250 Occupants
- Abu Dhabi International Building Code

FCIA & KOFFEL 2002-2023



I – Inspection – IBC AHJ Approvals – x2

Definitions – Chapter 17, IBC

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

[A] APPROVED. Acceptable to the *building official* or authority having jurisdiction. [IBC 202 Definitions]

I – Inspection – IBC AHJ Approvals – x2

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

Firestop Systems Inspection Introduction ASTM E2174 – ASTM E2393

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

Firestop Inspection Firm & Individual Qualifications – ASTM E2174 – ASTM E2393

- Inspection Firm & Inspectors are:
 - 'Independent of, and Divested from'
 - •Installing firm, Distributor, Manufacturer, Competitor, Supplier...
 - 'Not a Competitor
 - •...of the Installer, contractor, manufacturer, or supplier
 - Other than the contractor...
 - Submit notarized independence statements

Firestop Inspection Firm & Individual Qualifications – ASTM E2174 – ASTM E2393

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



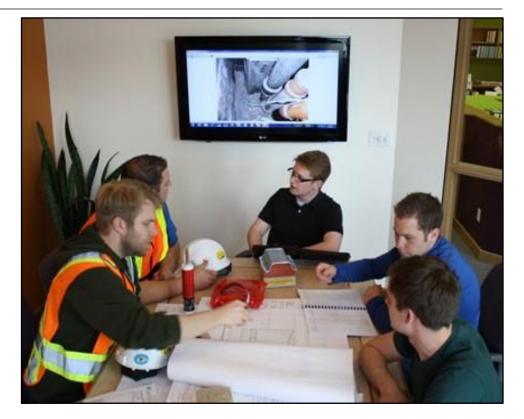
Inspection Documents

- 07-84-00 Specifications and Drawings
- Manufacturer Product Data Sheets and Installation Instructions
- Safety Data Sheets
- Listed Systems and EJ's/EFRRA's



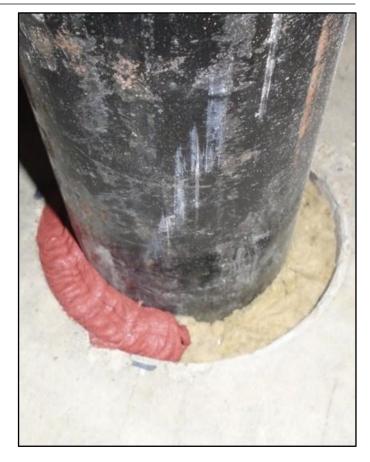
Pre-Construction Meeting

- 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 Image

- Observation Reviews
 - During construction
 - Witnessed randomly of the installed systems on each floor
 - E2174 10%, each type of Service Penetration Firestop System
 - •Type = By System, By Firestop Installation Contractor
 - E2393 5% of Total Lineal Feet for each type of Fire Resistance Rated Joint System
 - •Type = By System, By Firestop Installation Contractor



Affinity Firestop Image

- Destructive Reviews (Testing)
 - Performed Post-Construction
 - E2174 Minimum 2%, no less than 1, each type per 930 m² (10,000 SF) of floor area
 - Type = By System, By Contractor
 - E2393 Minimum 1 / 152 LM (500 LF) of Joint Area, by type, mandatory; Exception mechanical joints
 - Type = By System, By Contractor





Affinity Firestop Image

- Variances / Deviations
- ASTM E2174 & ASTM E2393
 - •FS Contractor is notified of any deficiencies within one day
- IBC 1704.2.4
 - Work is in conformance to the documents
 - •Otherwise it is **immediately** brought to the attention of the FS Contractor
 - If not corrected, AHJ and AA will be informed to take action





Affinity Firestop Image

Firestop Inspection Process ASTM E2174 – ASTM E2393

Inspectors shall

- Not supervise or direct
 FS Contractors
 - Systems Selection = Supervision
- Commence reviews at the start of FS installation
- Review installation based on manufacturers and system requirements



Affinity Firestop Image

Firestop Inspection Final Report ASTM E2174 - ASTM E2393

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



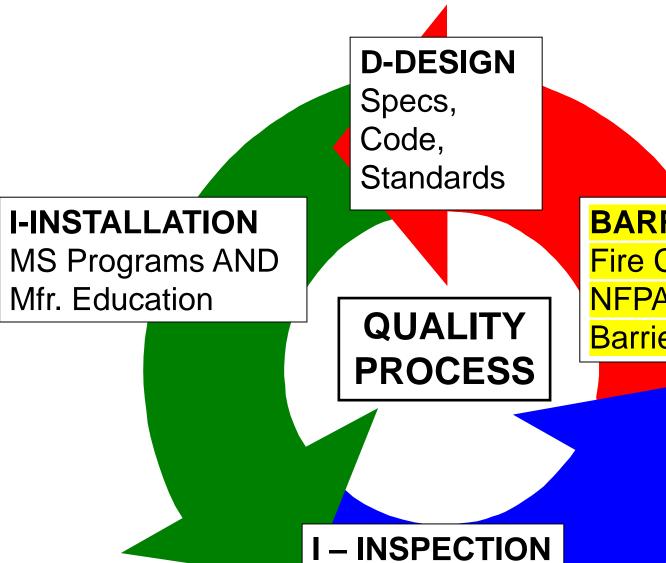
Affinity Firestop Image

Firestop Repairs

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



Affinity Firestop Image



BARRIER MANAGEMENT

Fire Codes

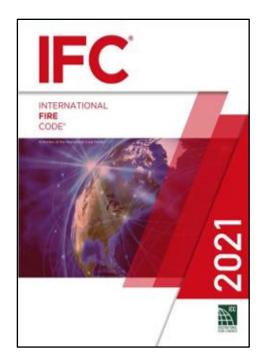
NFPA 101, 1, IFC

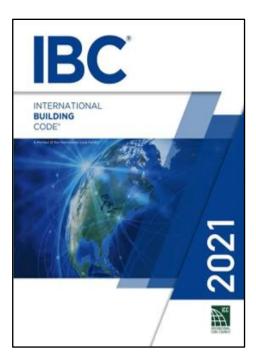
Barrier Management

IBC Ch. 17 NFPA 80 NFPA 1

Existing Buildings? Did you know...

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





Facility Budget Line Items...

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



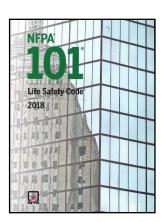


Fire Codes Require Maintenance

- NFPA 101
- NFPA 1
- International Fire Code
- UAE
- India
- Saudi Arabia
- Etc....
 - Minimum Requirements Stated
 - Frequency







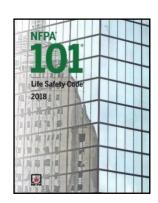
National Fire Protection Association NFPA 101 – 2018

- SECTION 4.6.12 Maintenance, Inspection, and Testing.
 - 4.6.12.1 Whenever or wherever any device, equipment, system, condition, arrangement, level of protection, fire-resistive construction, or any other feature is required for compliance with the provisions of this Code, such device, equipment, system, condition, arrangement, level of protection, fire-resistive construction, or other feature shall
 thereafter be continuously maintained ... in accordance

with applicable NFPA requirements or requirements developed as part of a performance-based design, or as directed by the AHJ.

National Fire Protection Association NFPA 101 – 2018

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



National Fire Protection Association NFPA 1 - 2018

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

NFPA 1

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-resistancerated assemblies in high-rise buildings shall be visually inspected for integrity at least once every 3 years.



National Fire Protection Association NFPA 1 – 2018

- •12.3.3.1 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.
- •12.3.3.2 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.



SECTION 701 GENERAL

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

FCIA Added Emphasis

with the IBC.

IFC

SECTION 701 GENERAL

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



SECTION 701 GENERAL

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



SECTION 701 GENERAL

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



SECTION 701 GENERAL

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

FCIA Initiative with Koffel Assoc. Inventory...

FCIA Added Emphasis

2 0 1 8

IFC

SECTION 701 GENERAL

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



SECTION 703PENETRATIONS

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



SECTION 703PENETRATIONS

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

2 0 1 8

SECTION 704 JOINTS AND VOIDS

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



SECTION 704 JOINTS AND VOIDS

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

IFC

International Property Maintenance Code

- [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.

IPMC

International Property Maintenance Code

• [F] 703.3 Maintenance. The required fire-resistance rating of fire-resistance-rated construction, including walls, firestops, shaft enclosures, partitions, smoke barriers, floors, fire-resistive coatings and sprayed fire-resistant materials applied to structural members and joint systems, shall be maintained. Such elements shall be visually inspected annually by the owner and repaired, restored or replace where damaged, altered, breached or penetrated. Records of inspections and repairs shall be maintained. [IPMC 2018, 703]

2 0 1 8

IPMC

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...



UAE Fire and Life Safety Code of Practice Maintenance & Management

- 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.

UAE Fire & Life Safety Code of Practice

3.7. Maintenance & Management

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

UAE Fire & Life Safety Code of Practice

3.7. Maintenance & Management

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

Saudi Arabia Fire Code

SECTION 107 MAINTENANCE

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

Fire Codes Require Maintenance – INDIA

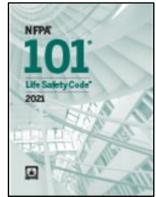
• 9 BUILDING MAINTENANCE – METHODS AND MANAGEMENT

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

Existing Buildings? Educate Clients

- NFPA 1, NFPA 101, IFC Decades in place
- New IFC "maintaining protection" requirements
 - Inventory of fire-resistance-rated assemblies?
- What's inventory?
 - Life Safety Drawings with Fire-Resistance Ratings
 - Tested and Listed Systems Designs
 - Manufacturers Instructions/Product Data Sheets
- What's risk
 - Fire and Smoke Spread means life, property, continuity of operations losses







What type of Repair is NEEDED??

- 703.2 Repair of penetrations. Where damaged, materials used to protect membrane- and through-penetrations shall be replaced or restored with materials or systems that meet or exceed the code requirements applicable at the time when the assembly was constructed, remodeled or altered. Where the system design number is known, the system shall be inspected to the listing criteria and manufacturer's installation instructions.
- 704.2 Repair of joints and voids. Where damaged, materials used to protect joints and voids shall be replaced or restored with materials or systems that meet or exceed the code requirements applicable at the time when the assembly was constructed, remodeled or altered.

M-Barrier Management Systems Building Owner's Policy Topics

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

M–Barrier Management System for Building Owners - *Inventory*

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

M-Barrier Management Systems - Survey

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

M–Barrier Management System for Building Owners - *Records*

 Keep easily retrievable fire-resistance INVENTOTY records, records of inspections and repairs for AHJ's...

- Paper
- Spreadsheets
- Custom Software

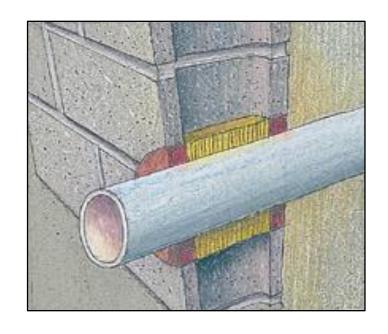
Repeat the process, for the life of the building

M-Barrier Management Systems

- Visual Building Survey/Inspection....
 - Tested and Listed Systems (Listings)
 - Manufacturers installation instructions
- Get a ladder look up, look down!

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

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



STI Graphic

Firestop (& Other Fire-Resistance Repairs)

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



Affinity Firestop Image

Great DIIM starts @ SPEC...

- NEW Buildings 07-84-00 Specs
 - www. FCIA .org & FCIA MOP
- Part I Products…but
 - Systems SUBMITTED, Firestop Installation Contractor
 - Product Properties
 - Manufacturers
- "Single Manufacturer to the greatest extent possible"

MINIMIZE EJ/EFRRA's



Specs – Key Parts Relating to Installation

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



Specs – Key Parts Relating to Inspection

- NEW Buildings 07-84-00 Specs www. FCIA .org
- Part II Qualifications Special Inspection
 - Special Inspection Agency
 - •IAS AC 291 Accredited Special Inspection Agencies
 - Special Inspector Qualifications
 - FM Firestop Exam
 - UL Firestop Exam
 - •AND
 - •IFC Exam
 - ICC Certificate of Learning Achievement
 - FCIA Certificate of Achievement Education Program

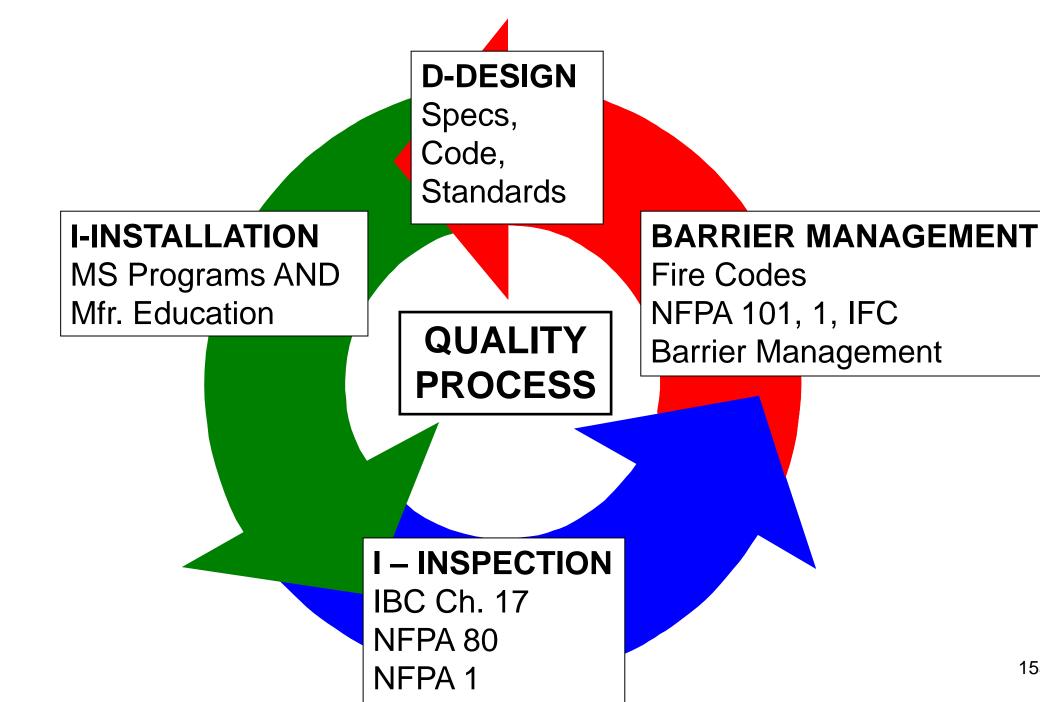


Specs – Key Parts Relating to Execution

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

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

- Reference to ALL Divisions for Closeout Submittals
 - 01 78 29 Final Site Survey
 - •01 78 33 Bonds
 - •01 78 36 Warranties
 - •01 78 39 Project Record Documents (Ref.07-84-00, etc.)
 - •01 78 43 Spare Parts
 - 01 78 46 Extra Stock Materials
 - 01 78 53 Sustainable Design Closeout Documentation



Welcome, Thanks, From FCIA.....

FREE PDF MOP for Code Officials, Governmental ICC Members & Architects, Engineers, Specifiers with Design Firms or Independent Practice

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RESOURCES www.FCIA.org



Questions??





Firestopping DIIM

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