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NFPA 241 Trends in Wood Frame Firestopping Special Inspection Intro

OSHA Round Table

June 12, 2018

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Trends in Safeguarding Wood Framed Projects from Risk of Fire

Minimum Code Compliance is no Longer Cutting It

- Zero detection until FD F/A test
- Zero suppression until C of O
- One dry manual standpipe
- Stockpiling of combustibles
- Stair installation when subs are coordinated
- Dumpsters near buildings with non-FRT trash chutes
- Phased occupancy

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Features for Consideration

- Passive barriers complete with rated doors installed
- Lumber pre/post treated with fire resistant material
- Wireless detection and monitoring
- Onsite security with training and education
- Infrared scanning after hotwork
- Active suppression during construction with central station monitoring

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Active Suppression Case Study - Alternative

- Utilize CPVC sprinkler piping.
- Complete permanent fire water room/connection and temp heat.
- Prioritize sprinkler install as early as possible
- Install a dry valve and pressurize the system (after hours only)
  - Use of permanent piping
  - Drain/fill with air daily
  - Night is automatic; Day requires FPPM opening main valve
- Monitor system with permitted fire alarm to central station
  - Ring FD on any water flow alarm; FPPM on low air supervisory
- Impair zones only when ceiling work could result in mechanical failure

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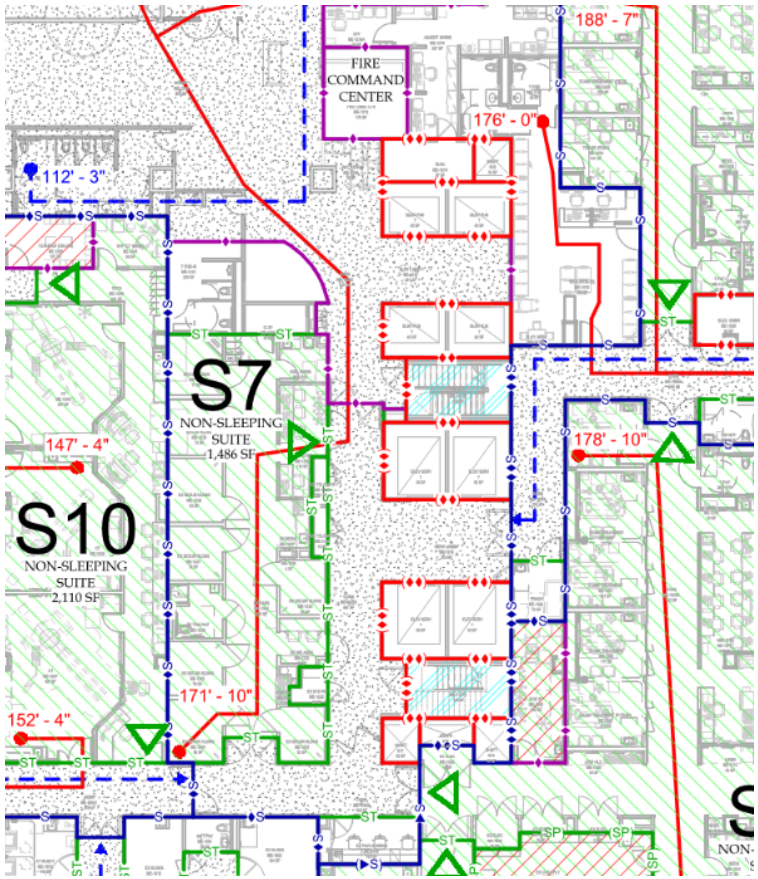
Firestopping special inspections

Introduction

- New inspection process to enhance enforcement
- No code change on what is required to be installed for firestopping
- All based on ensuring **LISTED ASSEMBLIES** are installed, Not just firestopping products

Firestopping Fundamentals



- Prescribed by the building and fire codes to maintain the integrity of the wall, floor, ceiling, or joint assemblies.
- Unprotected openings void ratings!

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New Requirements for Special Inspections of firestopping

- Process for destructive inspections or witnessing of installation of firestop assemblies in certain important buildings
- Where is it required? (IBC 1705.17)
  - High Rise
  - Risk Category III and IV per 1604.5

Buildings Subject to the Requirement

- High Rise
- Risk Categories III and IV
  - Assembly occupancies with occupant load greater than 300
  - College buildings with occupant load greater than 500
  - Hospitals, prisons, police stations, fire & rescue
  - Public power generating stations
  - Any building with occupant load greater than 5,000
  - Chemical Use- Highly toxic, toxic or explosive materials over exempt amounts

New vs. Existing

- Applies to new construction and work in existing buildings
- IEBC requires work in existing buildings to meet new construction requirements
- If new penetrations or joints are installed that are subject to the requirements of the building code for listed assemblies, then special inspections are required.
- These requirements to the newly installed firestop systems only
  - Building officials could require retroactive upgrades of existing non-conforming conditions through general hazardous condition language in Ch.1 of the building code

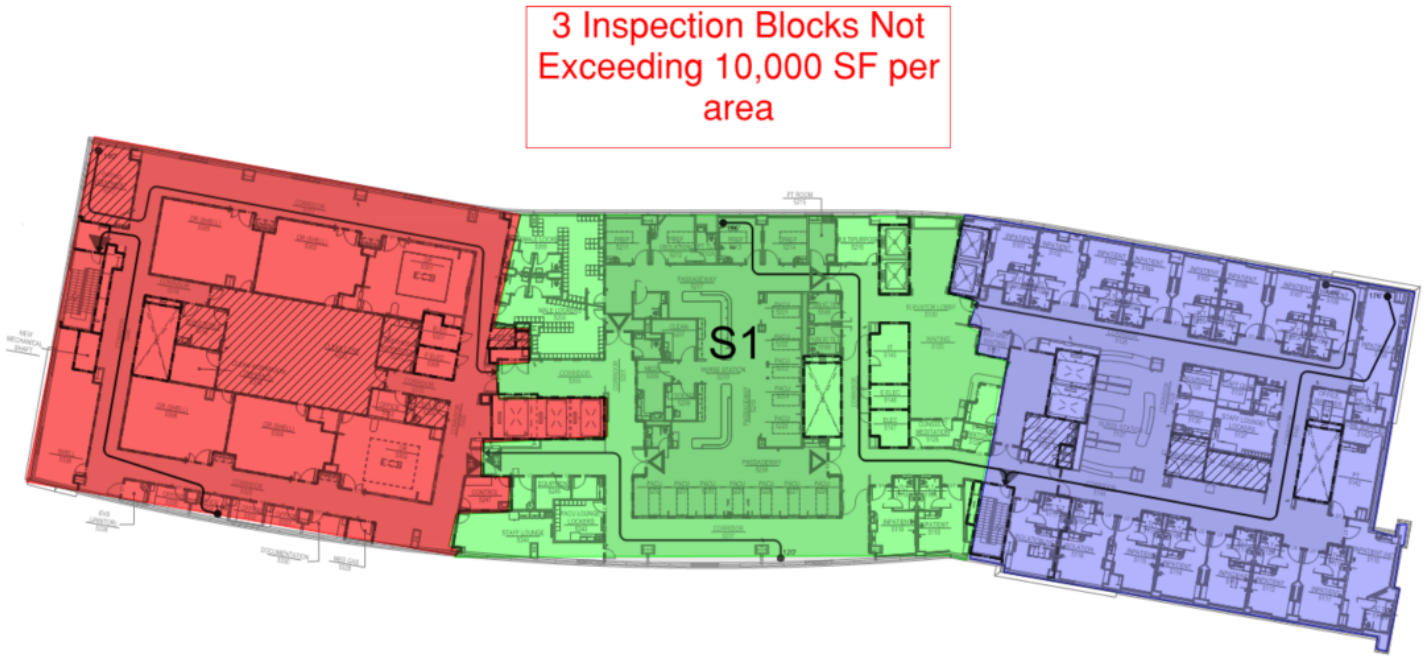
Firestopping Special Inspections

- How are they performed?
  - In accordance with ASTM E 2174 and ASTM E 2393
  - Inspector to witness 10% of each type of firestop system or perform 2% destructive test of each type of fire stop system per floor or for each area of a floor that is larger than 10,000 ft^2
  - Inspector is to be provided with all approved assemblies prior to performing inspections
  - Purpose is to confirm the details of the installed assemblies with their listing
  - Standards contain minimum requirements for documentation

Determining Quantity to be Inspected

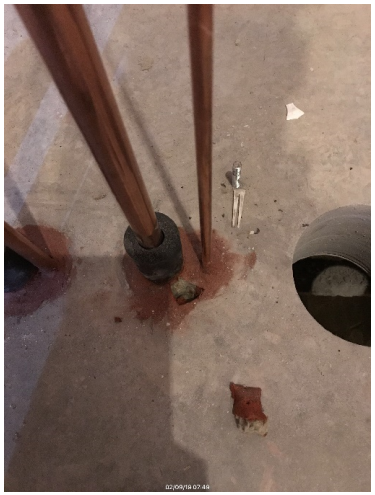
- Randomly witness 10% of each type of firestop installation
- Destructive Inspection:
  - 2% of each type per floor but not less than one
  - Floors larger than 10K SF are broken in to inspection areas not exceeding 10K SF with 2% applied within each area

Inspection Areas (< 10K SF)



What is a Type?

- Determined by AA
- Typically a function of penetrant type, firestop material, and penetrated substrate
- Installing contractor should also be considered



Determining Quantity to be Inspected

- Through wall penetrations where each trade is installing their own firestopping:
  - Plumbing- metal pipes, PVC pipes with collars, insulated pipes, multiple pipes
  - Electrical- EMT, MC, Low Voltage, Cable tray, Sleeves, Multiples
  - HVAC Ducts- Dampered vs. non dampered; insulated and non insulated
  - HVAC Piping- copper, insulated metal, multiples
  - Sprinkler- Black iron piping
  - Drywall contractor
    - Structural penetrations
  - Would need over 100 to cut 2 locations of each type
  - If a single installer, could reduce numbers as multiple trades fall in a single category

Determining Quantity to be Inspected

- Joints per ASTM 2393
  - Minimum of one sampling per type of joint system per 500 lineal feet
  - Typical types:
    - Head of wall (perpendicular to flutes, Parrallel to flutes, terminate at beam)
    - Bottom of wall
    - Slab edge
    - Drywall to columns or beams
    - Dissimilar materials

Failures

- Additional inspection for each failed location. If failure rate reaches 10%, inspection is cancelled and installer is required to review their work before requesting additional inspection
- Example:
  - 30 conduit penetrations with intumescent firestopping in given inspection area.
  - 2% requires 1 destructive test
  - If failed, cut up to 2 more before inspection is stopped (3/30=10%).

Firestopping Special Inspections

- Who can serve as Special Inspector?
  - Approved Agency-
    - *"An established and recognized agency that is regularly engaged in conducting tests or furnishing inspection services, where such agency has been approved by the building official."*
  - ASTM Standards Provide Additional Guidance:
    - 2 Year experience in construction field inspections
    - Education, credentials, and experience this is acceptable to the authorizing authority
    - Conflicts of Interest:
      - Third party inspector is required to be independent of the manufacturer, contractor, installer, and supplier of the firestopping products
      - Cannot be in competition with the manufacturer, contractor, installer, or supplier

Special Inspector Credentials

- At the discretion of the Building Official to approve
- Available certifications that are likely to be required:
  - International Firestop Council (IFC) Third Party Inspector
  - Intertek's IQP firestop inspectors program (partnered with IFC)
- Point of caution on claiming experience in field experience alone


CERTIFICATE OF ACHIEVEMENT

IFC

INTERNATIONAL FIRESTOP COUNCIL

THE Source of Firestop Expertise®

presents this certificate to

In recognition of successfully passing the examination covering the "IFC recommended knowledge base for 3rd party firestop inspectors"

To meet the full scope of the IFC recommended knowledge base, the candidate must obtain four 2-hour (minimum) sessions of hands-on product training from four different product manufacturers, as documented in the spaces below.

SAMPLE

On behalf of the International Firestop Council:

EXECUTIVE DIRECTOR, INTERNATIONAL FIRESTOP COUNCIL

Issued: June 16, 2016 (certificate valid 3 years from date of issue)

Confirmation of this certificate holder's status can be confirmed at www.firestop.org/certificate-holders

International Firestop Council, 2660 S Utica Avenue, Tulsa, OK 74114 USA +1-918-200-3757, info@firestop.org

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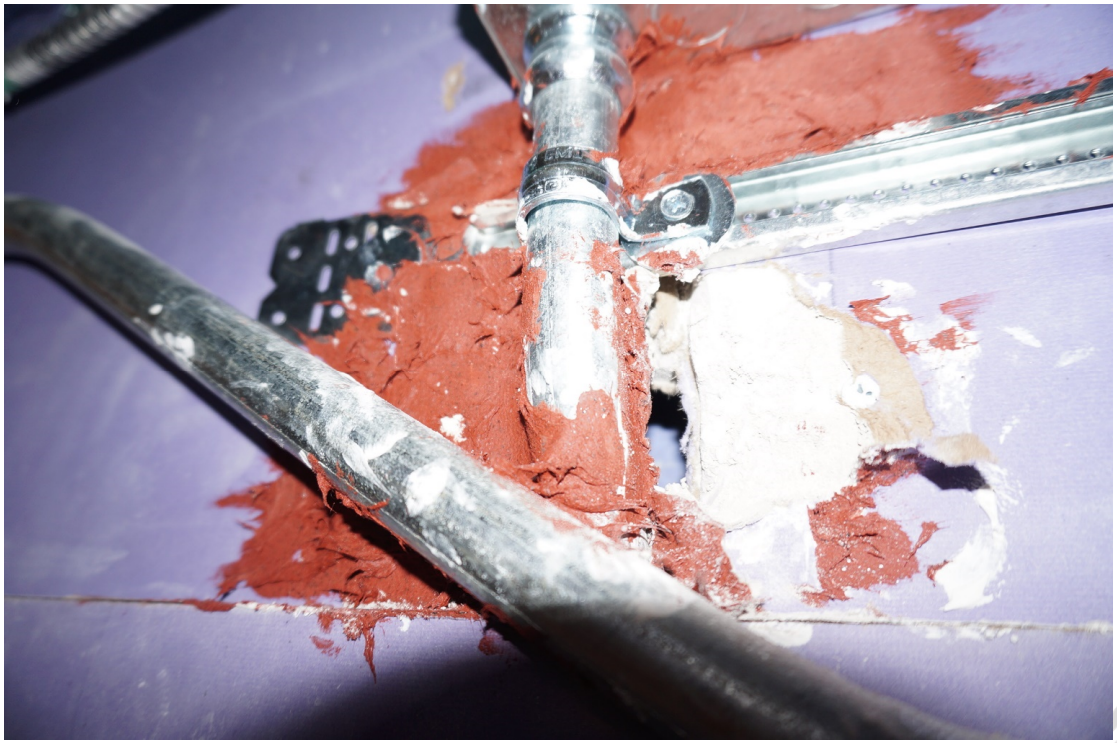
Who hires the Special Inspector?

- Based on the conflict of interest clause, special inspector is generally hired by the owner or the owner's representative
- Someone will be the authorizing agent (AA) from the owner's side
- Will play a role in the process
- Helps determine the manner in which the 2% destructive is applied

Enforced by the Building Official

- Expect to see on construction control affidavits
- Will like require affidavit from special inspector on their independence
- They are being trained on the new process and what is required
- Special inspection report due at the end
- ASTM standards require reporting to have specific information that building officials will be looking for

Why was this requirement added to the code?



Industry Standard on Firestop Installations

- Fill the holes with the red fire caulking.

The Firestopping Problem

- In general, the code requirements and detailed assembly listings are not being strictly adhered to. Why?
  - Knowledge and training
  - Trade Coordination
  - Enforcement
- Historically performed by each sub, usually given to an apprentice
- Firestopping being installed with non-compliant wall construction or non-compliant penetrant configurations
- Knowledge base has traditionally been to apply some red caulk on all the penetrations
- Most commonly, visual inspections to confirm red caulk installed were performed by AHJs
- Result is that the installations are in general, not close to the details of the testing that the fire ratings are based on

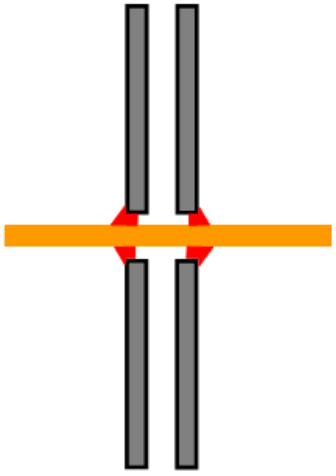
What does the code require?

- Listed assemblies
- Like any other fire tested system- must meet the detail exactly
- Through Wall, Floor or Membrane Penetrations= ASTM E814 or UL 1479
- Joints (wall to wall, wall to floor, head of wall)= ASTM E1966 or UL 2079
- Curtain Wall ASTM E2307
- Fire ratings (F ratings in all cases)
- T ratings at joints and through floors outside of wall

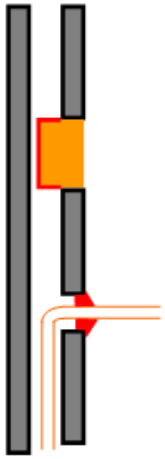
Firestopping Applications

- Through Penetrations
- Membrane Penetrations
- Joints and Perimeter Barriers

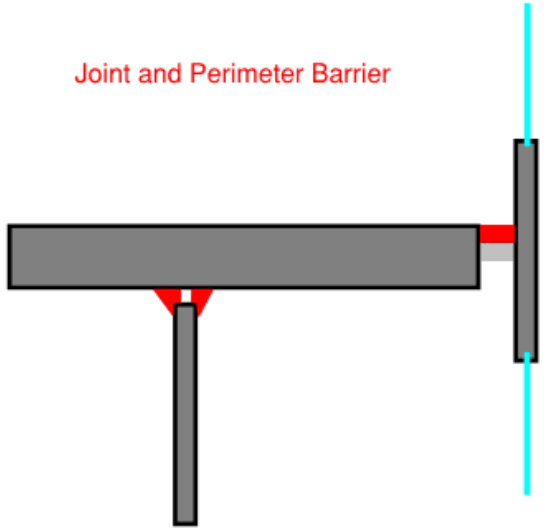
Through Wall Penetrations



Membrane Penetrations



Joint and Perimeter Barrier



Items often forgotten

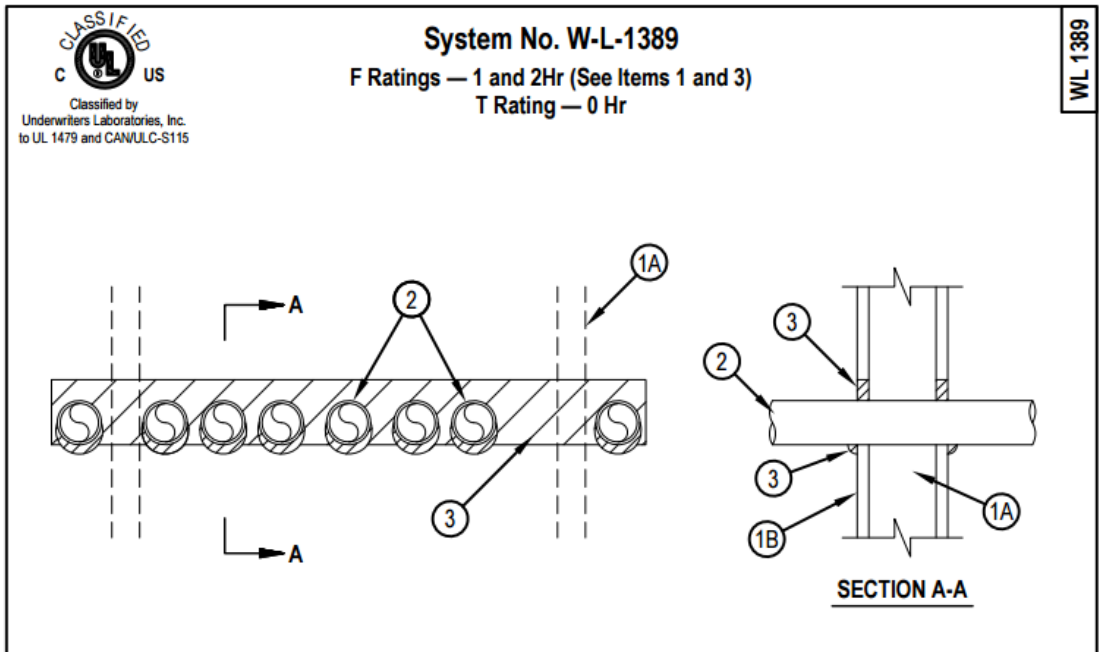
- Drains
- Bottom of wall joints
- Electrical boxes and panels

Firestopping Fundamentals

- Approved Assembly vs. Product

Firestopping Fundamentals

- Approved Assembly vs. Product



Firestopping Fundamentals

- Approved Assembly vs. Product

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 described in the individual U400 or V400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. Studs — Wall framing shall consist of min 3-5/8 in. (92 mm) wide steel studs spaced max 24 in. (610 mm) OC.
B. Gypsum Board* — Thickness, type, number of layers and fasteners, as specified in the individual U400 or V400 Series Wall and Partition Design. Max height of opening is 3-1/2 in. (89 mm). Max width of opening is 32 in. (813 mm).

Firestopping Fundamentals

- Approved Assembly vs. Product

2. Through Penetrants — Multiple pipes or conduits installed in single layer array within the firestop system. The annular space between the pipes and conduits and the edges of the opening shall be min 0 in. (0 mm, point contact) to max 1-3/8 in. (35 mm). The separation between pipes and conduits to be a min 0 in. (0 mm, point contact) to a max 1-1/4 in. (32 mm). Pipes and conduits to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes or conduits may be used:

A. Steel Pipe — Nom 2 in. (51 mm) diam (or smaller) Schedule 5 (or heavier) steel pipe.
B. Conduit — Nom 2 in. (51 mm) diam (or smaller) rigid steel conduit or steel electrical metallic tubing (EMT).

Firestopping Fundamentals

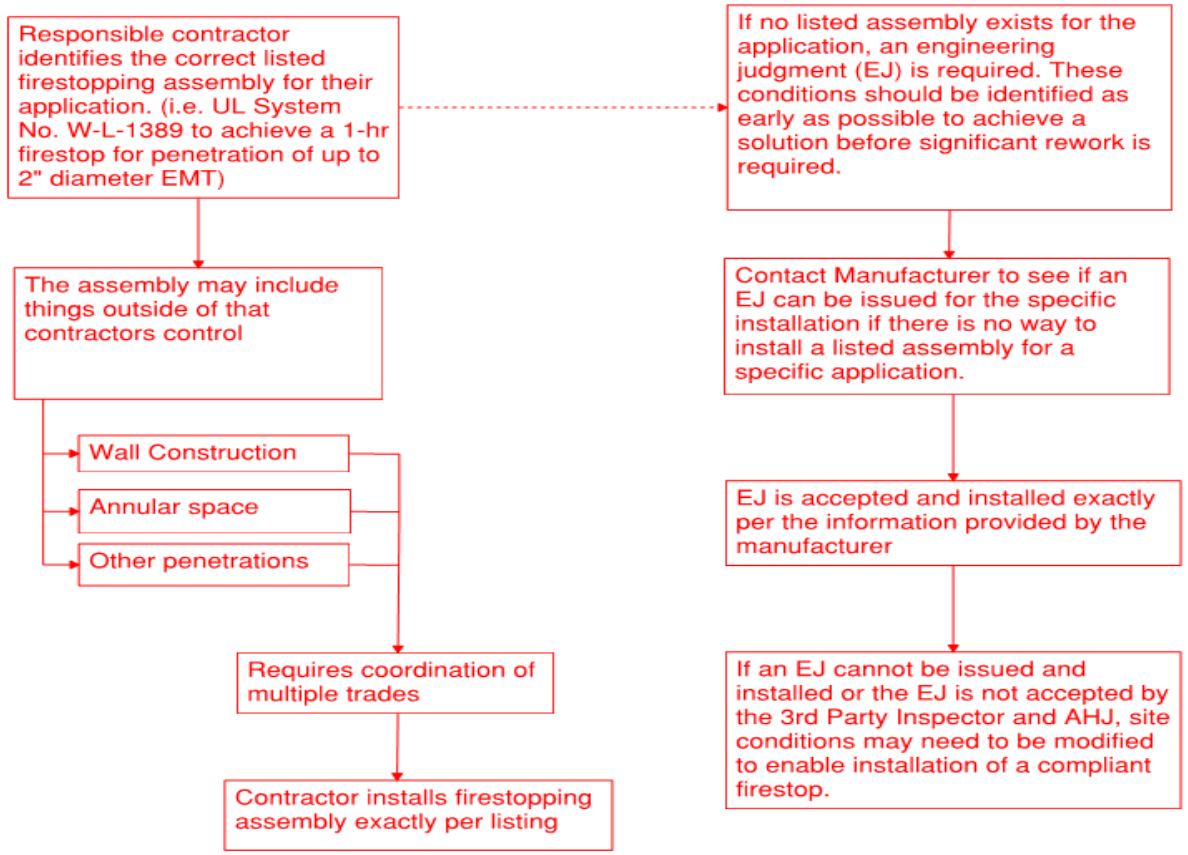
- Approved Assembly vs. Product

3. Fill Void or Cavity Materials* - Sealant — Min 5/8 in. (16 mm) thickness of fill material installed to completely fill annular space between pipes, conduits and gypsum flush with each surface of wall. Min 1/2 in. (13 mm) diam bead of fill material applied to the through penetrant/wall interface at the point contact locations on both sides of the wall. The 2 hour F Rating applies only when FS-ONE Sealant is used.
HILTI CONSTRUCTION CHEMICALS, DIV OF
HILTI INC — Hilti CP 606 Flexible Firestop Sealant or FS-ONE Sealant

Need for Listed Assemblies Biggest Shift

- Contractors and installers don't carry this time based on current industry standard
- No process in construction or MEP coordination process to represent firestopping concerns
- Multiple trades involved
- What to do in situations not covered by available listed assemblies?

Firestopping Installation Workflow



Inspection Process

- Inspection Documents:
  - Inspection documents include submittals, drawings, specs, etc…
  - Contractor to have complete submittal of all listed assemblies and EJ's utilized to the inspector **10 working days prior** to the inspection
  - Submittal is at the approval of the AHJ and AA
  - Inspector can issue written notification to the AA when they feel inadequate documentation or conflicting documentation is provided

Inspection Process

- Requesting and Inspection:
  - Up front the inspector and installer agree to an inspection schedule for:
    - Confirmation of firestopping materials
    - Start of installation
    - Anticipated completion of installation
  - Inspection process to not interfere with installation process
  - Installer to submit inspection request with at least 2 business day notice

Inspection Forms

- Due within 1 working day to the contractor
- Written and clearly describe the results of the inspection and any deficiencies
- Separate form for each type inspected specifying locations, measurements, observations, failures, installing contractors

Destructive Firestop Inspections

INSPECTION INFORMATION

Inspection Floor: 9 **Inspection Bay:** A

Inspection Location Description:

D3, ELECTRICAL CONDUIT PENETRATION LOCATION
Destructive Test 3, refer to POD 9A drawing, "20150707 - Deficiency Drawing - 9A."
Comment 9A.066.

Deficiency? ○ **Yes** ◉ **No**

If yes, explain:

NO DEFICIENCIES.

NOTES:GOOD COMPRESSION, 3/4" INTUMESCENT TOPPING, 1 1/2" BETWEEN CONDUIT AND CONCRETE, FLUSH WITH FLOOR

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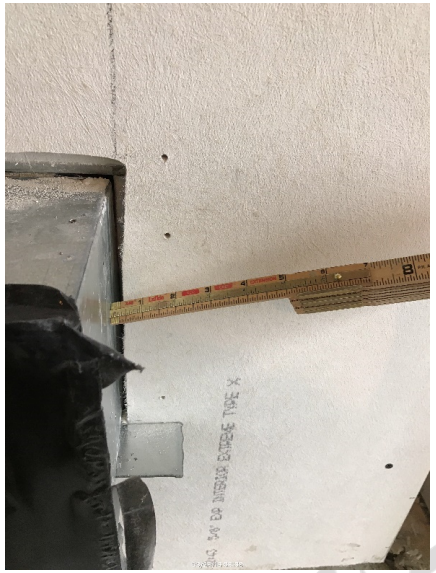
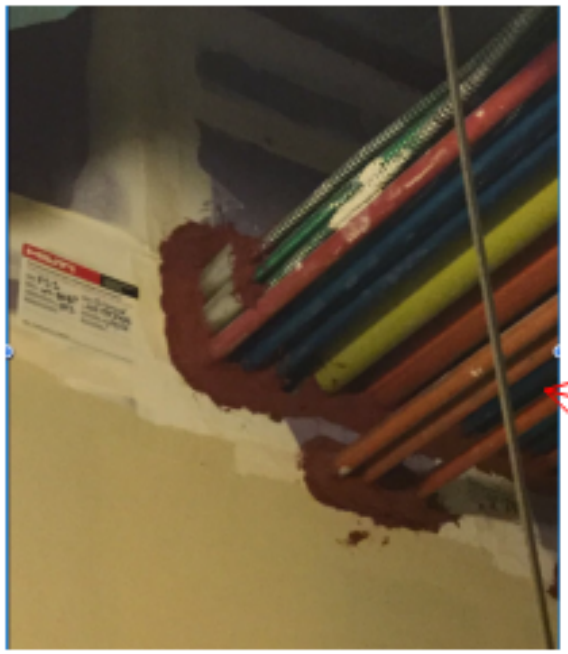
Confirming Details of Installation & Taking Measurements



Hidden behind the Surface



DESTRUCTIVE TEST; OPENING PROTECTIVE NOT CONSISTENT WITH WL 8087 LISTING AS INDICATED ON WALL LABEL (6"x26" HOLE, 5/8" THICKNESS); NO BLOCKS OR WIRE MESH AS LISTING INDICATES

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Final Report

- Cover page showing the following:
  - Project name, location, ref number
  - Name and address of inspector
  - Name and address of installer, as well as prime if different
  - Name and address of AA
  - Name and address of the AHJ
- Summary Page:
  - Types and quantity of each firestop system on the project
  - Which verification method was used
  - Quantity of each firestop system inspected and a notarized statement by inspector that the number complies with the ASTM standard minimum requirements
  - Percentages of deficiencies for each type of firestop system
  - Total number of deficiencies as a percentage of the total number of firestop systems inspected
- Copies of all information inspector sent to the AA
- All inspection reports issued during the project

Firestopping Field Inspection Final Report

October 26, 2017

Project:
Project Name
Project Number

Prepared for:
Building Department
City Hall
Boston, MA

Role	Fire Name	Address	Phone	Point of Contact
Installing Contractor				
Authority Having Jurisdiction				
Authorizing Agent				
Inspector				

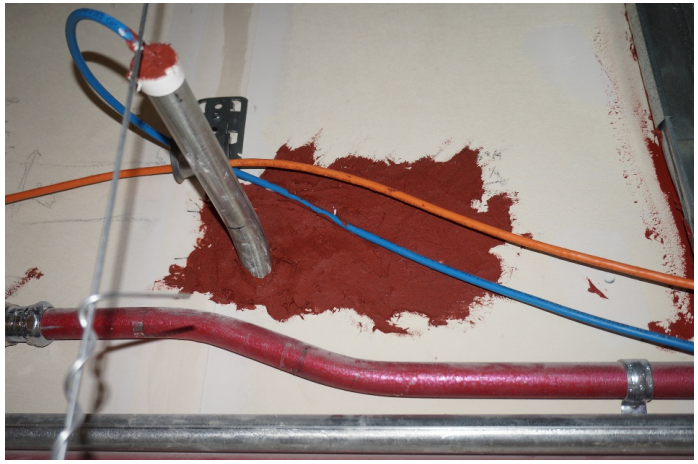
Summary Information

CRC utilized destructive testing on the standpipe penetrations through the floor and 10% or greater witness testing on the remainder of the penetrations.

Inspection Form ID	Firestop System Type I.D.	Penetration Type	Penetrant	Base material	Substrate	Installer	Quantity Inspected	Quantity Passed	Quantity Failed	Quantity Repaired
1	P-F-N3	Through Floor	Metal pipe (0-3")	Caulk	Concrete	Firestop Contractor	15	12	3	3
2	P-W-N3	Through Wall	Metal pipe (0-3")	Caulk	Gypsum	Firestop Contractor	115	91	24	24
3	E-W-M	Membrane	NM Junction Box	Putty Pack	Gypsum	Firestop Contractor	3	3	0	0
4	E-W-N	Through Wall	Electrical Condit	Caulk	Gypsum	Firestop Contractor	145	122	23	23
5	P-W-C2	Through Wall	CPVC Pipe <2"	Caulk	Gypsum	Firestop Contractor	5	4	1	1

424 assemblies were inspection. 86 Deficiencies (20%) relating to firestopping were noted and all were corrected on the project.

Destructive Inspections Common Issues



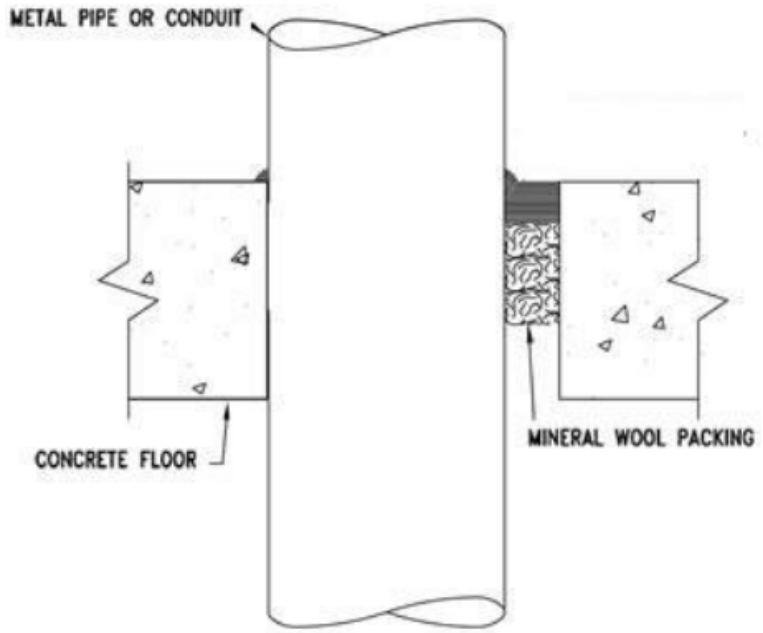
Common Issues- Annular Space and Angle of Piping

Common Issue- Incomplete Installation

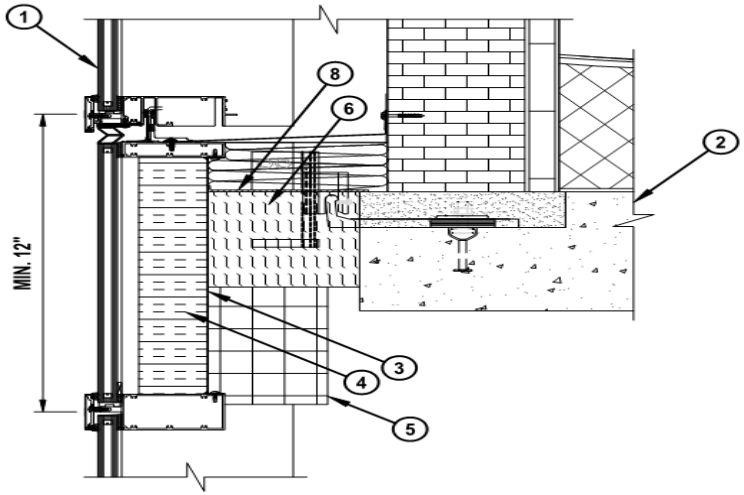
Common Issues- Multiple Penetrations in Single Opening

Common Issue- Missing Portions of the Assembly

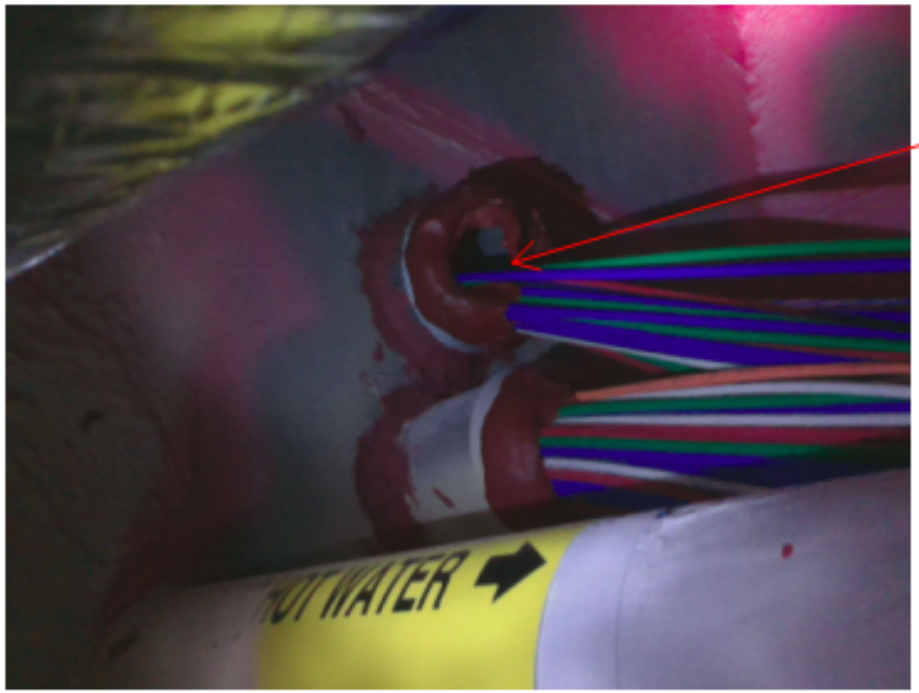
Common Issue- Mineral Wool Missing or Not Installed Correctly



Common Issue- Slab Edge Firestopping

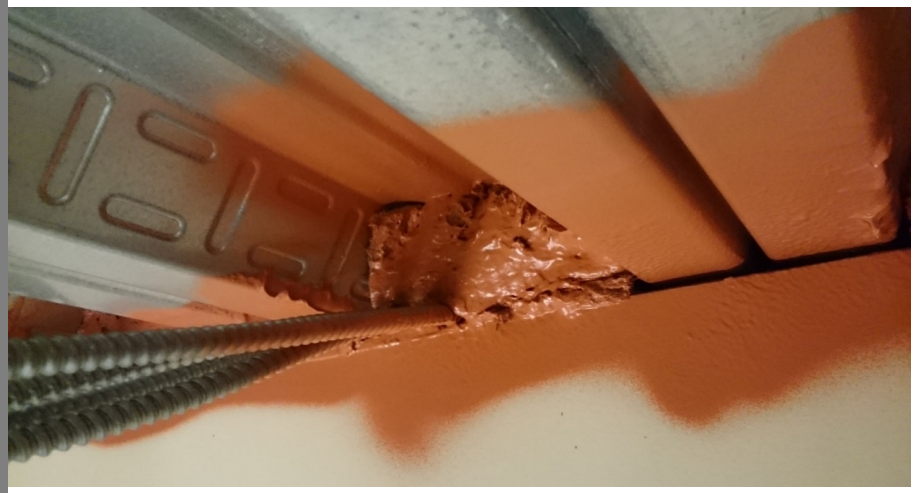


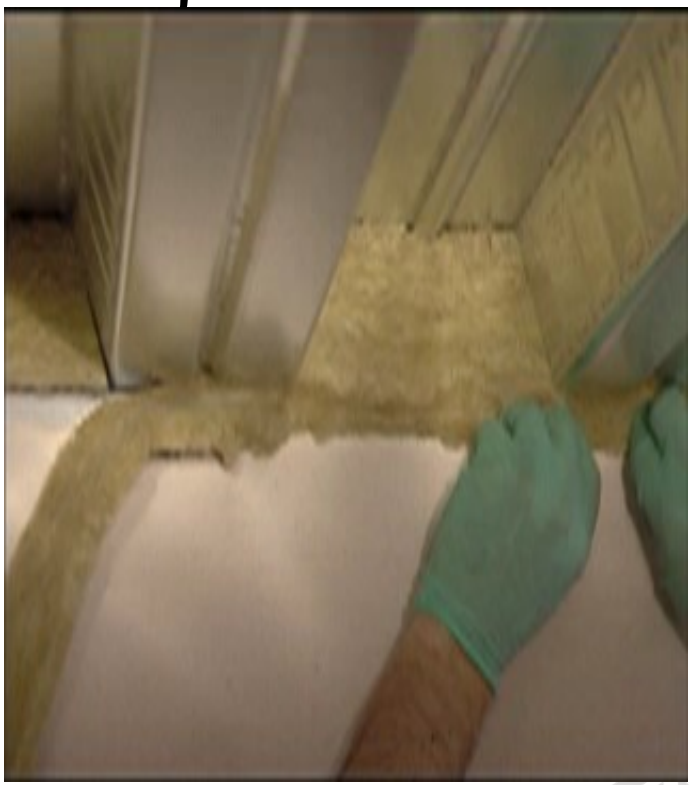
Common Issues-Coordination of Trades

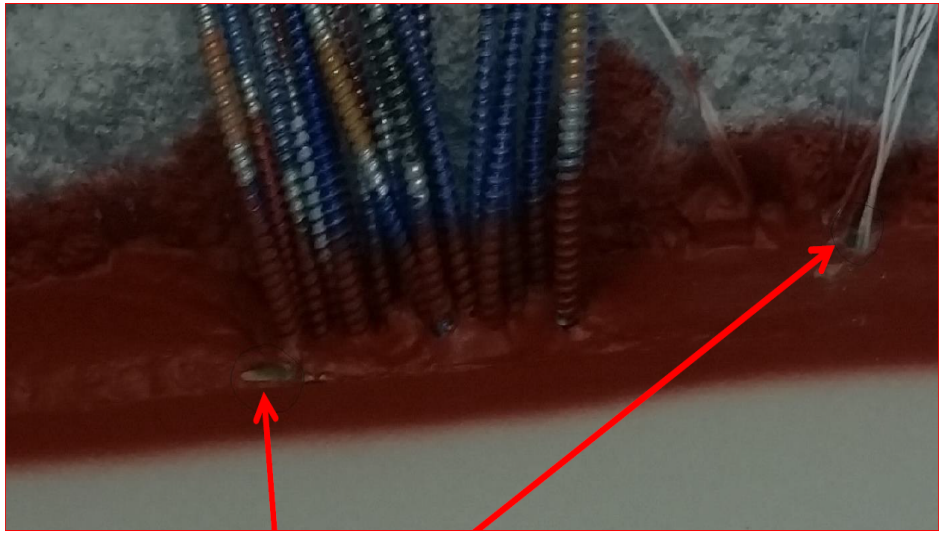


Common Issues- Thru pens in joints

Top of Wall with cables??







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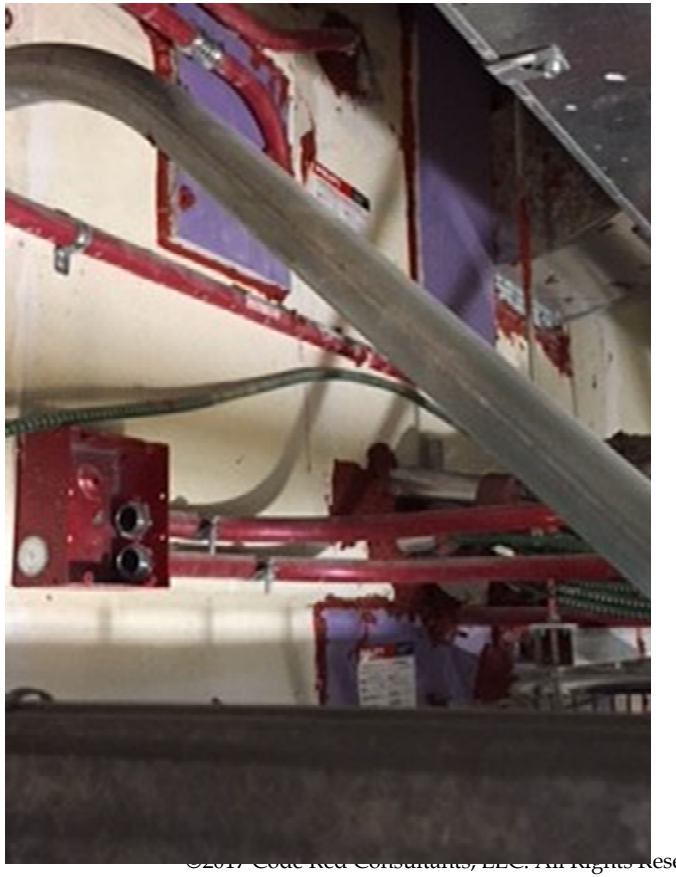
Common Issues- Mixing through penetrations and Joints

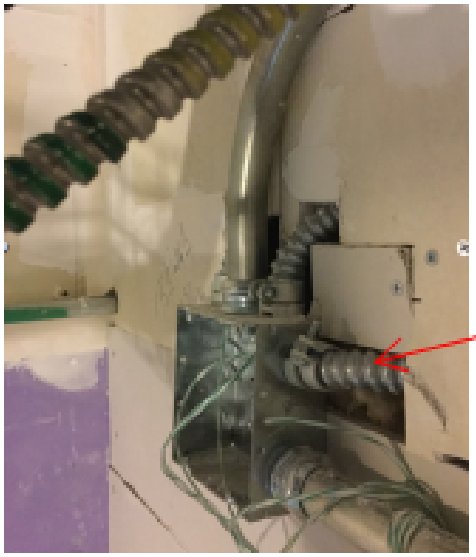
- Joints required to pass temperature rise requirements
- Through wall penetrations are not
- Often will get Engineering Judgements which may not be acceptable

NOTES : 1. MAXIMUM WIDTH OF JOINT = 0".
2. T-RATING MAY NOT EQUAL F-RATING IN ACCORDANCE WITH UL 2079.
3. FIRE-RATING OF ASSEMBLY IS DEPENDENT UPON THE PERFORMANCE OF GYPSUM WALL ASSEMBLY AND CONCRETE COLUMN UNDER FIRE CONDITIONS.
4. THIS SYSTEM IS DESIGNED AS A STATIC SYSTEM ONLY.

Firestopping vs. Drywall Repair



Drywall need to be correct before Firestopping is Installed



Drywall patching not tied to studs. Junction box needed to be removed and the drywall reinstalled behind before firestopping

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Common Issue- Ducts Run In Plane of Rated Walls

Recommended Best Practices- Preinstall Training

- Review with trades how they will be inspected
- Get in to the weeds with them
- Ask for QA/QC contract per trade and dedicated installers
  - Need ownership from all parties
- Contractors building walls need to be present
- Strongly recommend mock ups

Best Practices- Identification of Assemblies and EJs Pre Install

- Most critical step for success
- Typically has fallen to the trades
- Need to have a knowledgeable PM to execute this
- EJ's can take time to turn around
- Manufacturer's can help and have BIM software now to help identify assemblies
- Strongly recommend requiring labels

Methods for Reducing Points of Failures

- Work with a single manufacturer for all trades
  - Reduces overall number of assemblies
  - Eliminates potential for mixing materials

Engage an experienced installer who is qualified to perform the firestop work

- FM 4991 Approved Firestop Contractor
- UL Qualified Firestop Contractor Program

FM APPROVED 4991

Underwriters Laboratories
Qualified Firestop Contractor Program

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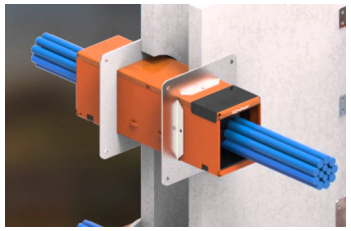
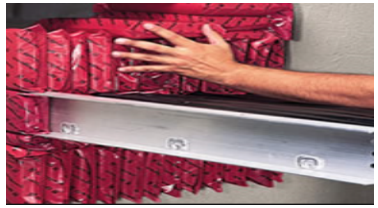
Methods for Reducing Points of Failures

- Consider preformed devices rather than metered installations





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Thank You For Your Time

Questions?

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