Membrane Penetrations and Other Testing Issues in Firestopping

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Topics for Discussion

• Membrane Penetrations
• Sleeved Firestops
• Angled Firestops
• Patching of Firestops and Joint Systems
• Evaluating Aged Joints for Movement
Membrane Penetrations
Membrane Penetration Firestop Systems

- No Passage of Flame
- 325°F Temperature Rise
- Withstand Hose Stream
Membrane Penetration Firestop Systems

- No Passage of Flame
- 325°F Temperature Rise
- Withstand Hose Stream
# Membrane Penetration Test Methods

<table>
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<tr>
<th>Rated Assembly</th>
<th>Scale</th>
<th>Test Method</th>
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<tr>
<td>Vertical - Wall</td>
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<td>UL 1479</td>
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<td>Horizontal - Floor</td>
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<tr>
<td>Horizontal - Floor</td>
<td>Small</td>
<td>TBD</td>
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Combustible Floor Ceiling without Penetration

- Maintain Load.
- Limit Openings and Flaming.
- Limit Temperature Rise on Unexposed Side.

Wood Subfloor

Wood Joist

Gypsum Ceiling
Membrane Penetration Firestop Systems

- Maintain Load?
- Limit Openings and Flaming?
- Limit Temperature Rise on Unexposed Side?
Through Penetration Firestop Systems used as Membrane Firestop Systems

• USE A TESTED AND LISTED SYSTEM.

• UL does not suggest using ½ of a through penetration system as a solution for a membrane penetration system.
  • Do not want to de-rate wall/floor. Walls tested for flame and temperature, hose stream and sometimes load.
  • Full system was required to achieve full rating. Doesn’t mean half of a system will provide needed coverage.
  • Single layer of gypsum may be gone in 20 minutes. Will a ½ of a caulk and walk system work from 20 to 60 minutes? Will it withstand a hose stream?
Through Penetration Firestop Systems used as Membrane Firestop Systems

- **USE A TESTED AND LISTED SYSTEM.**
- For a plastic pipe, will pipe close off in time if not directly exposed to fire initially?
  - What if collar is shielded from heat?
- Non-symmetrical systems behave differently.
- Expansion of penetrant may interrupt firestop system.
- Stressed cable systems may behave differently if bent into cavity.
- Systems with F and T ratings need all the material to satisfy the F and T rating. Using half of it may not offer same protection and rating.
- Firestopping is not linear.
Membrane Penetrations of Horizontal Assemblies – Points of Consideration

1. Floor-ceiling assemblies need to be tested to UL 263/ ASTM E119 to ensure the membrane penetration contributes to the floor-ceiling to maintain imposed load and compartmentation.

2. F-rating and a T-rating that equals the fire-resistance rating of a floor-ceiling assembly.

3. Industry supported test to correlate the relationship between large and small scale and develop small scale criteria (e.g. Ceiling Dampers).
Membrane Penetration Firestop Systems – Proposed Test Method

Comparative Test:
1. Control test on a blank listed floor-ceiling assembly.
2. Record temperature on the surface of the structural elements, plenum and underside of floor.
3. The temperature recorded at the same locations at any given time during the test with the membrane penetration shall not exceed the temperature recorded during the control test by more than 10° C (18° F), simply to account for slight test variances.
4. Could be done small scale.

• May need to limit the density of penetrations in a given ceiling area.
• Similar practice is done for ceiling dampers and luminaires.
Sleeved Firestops
Sleeved Firestop Systems

- Sleeves are considered part of the firestop system.
- Must be evaluated for T-rating.
- Some alternate constructions may still afford same protection performance.
- Limitations on extension of sleeve for some wall systems. (XHEZ.W-L-2569)
Sleeved Systems – Typical = Tested, OK

- Sleeve
- Penetrant
- Firestop System
- Concrete Slab
Sleeved Systems – Extension, Recessed = OK
Sleeved Systems – Extension, Flush = OK
Sleeved Systems – Extended Up, Flush = **NOT OK, Must Test**
Sleeved Systems – Extended Down, Flush = NOT OK, Must Test

Concrete Slab

Sleeve

Penetrant

Firestop System
What to do with Sleeved Firestop Systems?

• Some deviations OK for specific applications when in concrete floor only.
• Must be tested and listed for inclusion in firestop system.
• Deviation from listing may void the rating, e.g. sleeve extends beyond bottom of floor slab.
• May impact T-rating and/or F-rating.
• Any other construction or scenario should be tested.
Angled Firestops Systems
Angled Firestop Systems

- Updated XHEZ Guide Information.
- Permits specific firestop systems that are specified perpendicular in the design to also be permitted to be installed at an angle.
- Must still meet design requirements, such as min/max annular space etc.
- Some limitations apply:
  - Insulated Pipe
  - Plastic Pipe
  - Fill material only, not devices etc.
Angled Penetrants - XHEZ Guide Information

Where the penetrating item in the individual design is indicated as a metallic pipe, conduit, tube, duct or cable, and the firestop system consists at minimum of a fill material (such as sealants, putty or mortar), and a packing material the penetrant may pass through the opening in the wall or floor assembly at any angle, provided the annular space is maintained on both sides of the wall or floor assembly and all other specifications in the design are satisfied. In all other cases, except where otherwise indicated in the system, the penetrating item should penetrate the wall or floor assembly at a 90° angle.
Patching of Firestops and Joint Systems
Patching of Firestops and Joint Systems

• To be discussed amongst UL Standards Technical Panel

• Items to consider:
  • Must be proven by test.
  • Maximum size to patch/repair.
  • Use same material as originally installed.
  • Install to same or greater depth of material.
  • Ensure minimum overlap of new product on to existing product.
Evaluating Aged Joints for Movement
Evaluating Aged Joints for Movement

- To be discussed amongst UL Standards Technical Panel
- Does aged material still afford the same elasticity, movement and adhesion as younger material?
- Will it still cycle?
- Will it still perform as intended?
- Should a long term test be included in the test standard?
UL Firestop Resources

UL.com
UL Fire Resistance Directory
UL Product Spec
Code Correlation Database
Architectural Services
archservices@us.ul.com
UL TSA/FSA Newsletters
UL Fire Wizard
UL (+1.877.854.3577)
Thank You

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