

**Firestopping
& Standards**

An In-Depth Look at the Multiple Ratings of Firestop Systems

Rich Walke, Consultant to FCIA

FCIA – Firestop Contractors International Association

- **Thanks FCIA Members**
 - Firestop Contractors
 - Manufacturers, Consultants
 - Firestop Distributors, Reps, Friends
- **FREE PDF MOP/ Word Doc Spec** - Specifiers @ AE, Independents, AHJ's with Jurisdictions, More

FCIA – Firestop Contractors International Association

- **FREE Life Safety Digest**
- **UL/ULC, FM 4991 Contractor Programs, IAS AC 291 Inspection Agency Accreditation Program, Individual Knowledge**
- **ASTM Inspection Standards**
- **Tools @ FCIA.org for Specifiers, AHJ's, Building Owners, Firestop Contractors & Inspection Agencies**



“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 for Safety**

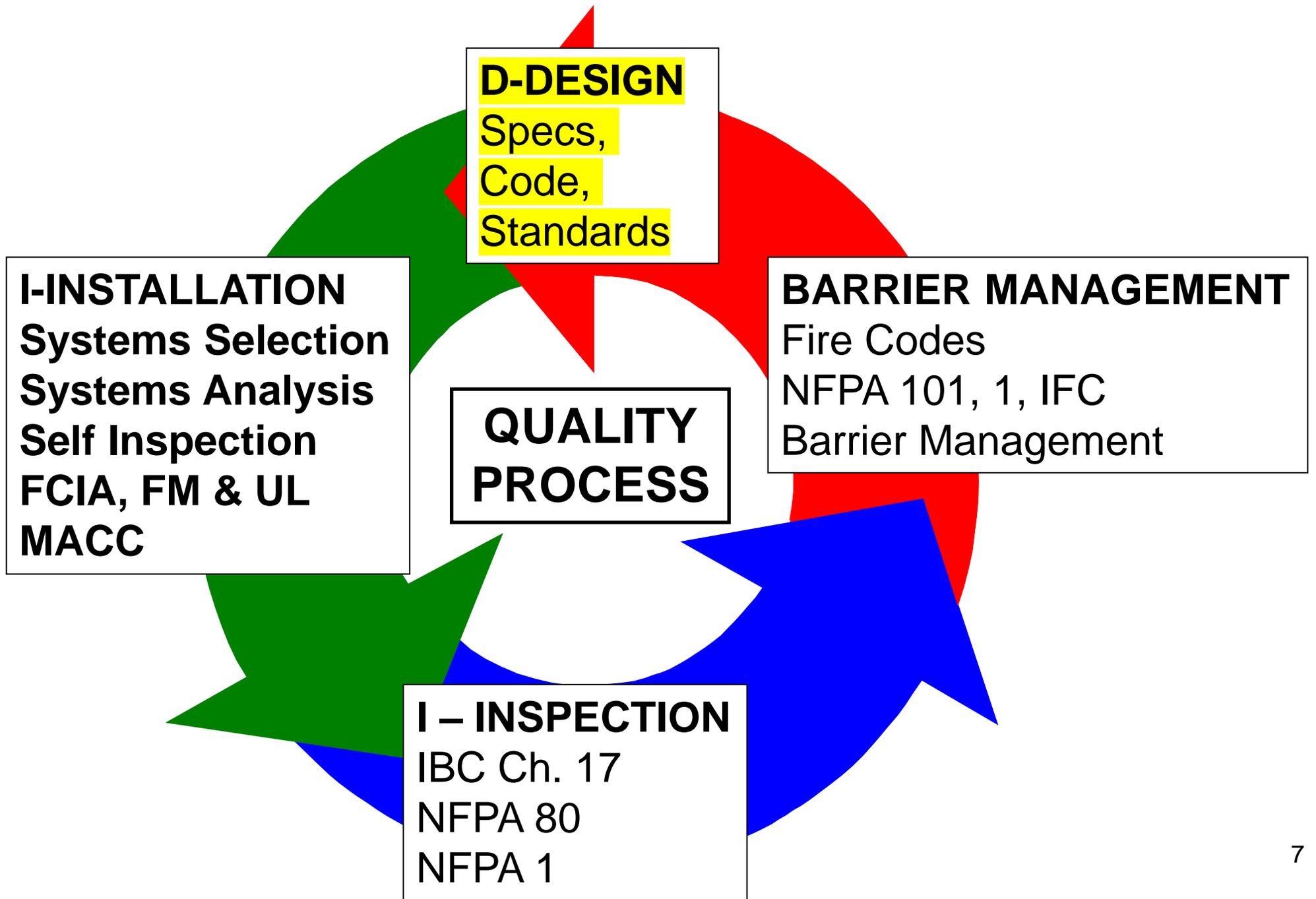
- Building Owners & Managers, Building Occupants and Firefighters

“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, UL1479, ASTM E1966, UL 2079, E2307, E2837, E2874, E3037
 - **Movement, (M) Smoke (L), Water (W)**
 - Professional *Installation* –
 - FCIA Member, UL/ULC Qualified Contractors, FM 4991 Approved
 - Properly *Inspected* –
 - ASTM E2174 / E2393, by IAS-AC291 Agency, UL/ULC, IFC, FM Exam
 - **Protection Maintained** – Annually – by FCIA Members

FCIA Actions - 2021

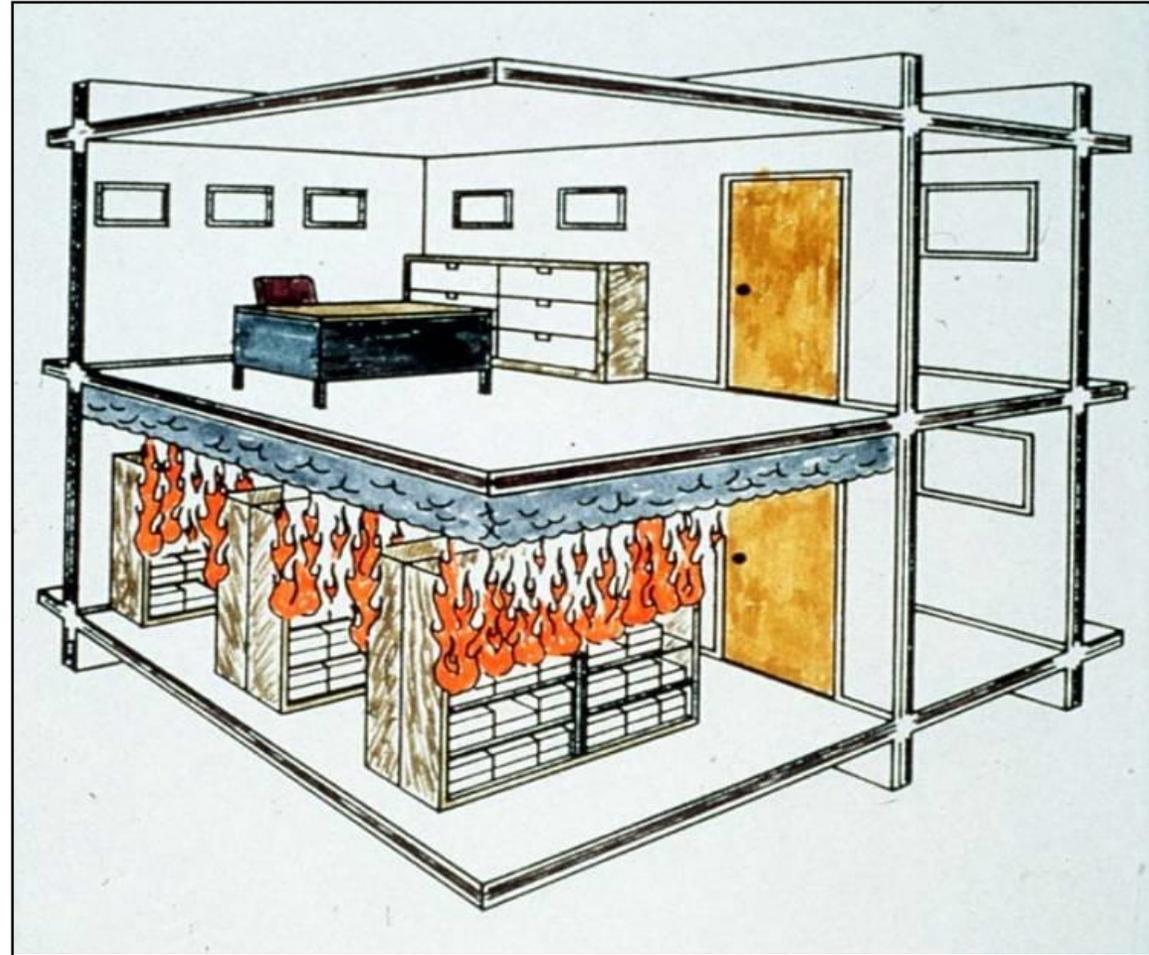
- Conferences
- Webinars
- Symposiums
- Code Hearings
- Standards Discussions
- Committees
- International Discussions
- New Education for Careers in Firestopping!!



Introduction

- Previous Webinar – December 16, 2020
 - ASTM E119 / UL 263 – Baseline for other fire resistive standards
 - *Overview* of complimentary standards and ratings developed on each unique method for protecting breaches in or through hourly rated assemblies
- 2021 Series of Webinars
 - Multiple webinars which will address the *details* of the standards and ratings developed on each unique method for protecting breaches in or through hourly rated assemblies
- Today's Webinar – Through- and Membrane-Firestop System

Maintaining Compartmentalization Through Use of Fire-Resistive Construction



Requirements for Protecting Breaches In or Through Fire-Resistance-Rated Construction

- Each type of breach of hourly rated construction has one or more unique fire test standards associated with it which compliment UL 263 and ASTM E119. In addition, each breach has various ancillary standards which relate to other characteristics of the protection materials.

Standards Relating to Fire Performance of Firestop Systems

- Fire / Hose Stream Test Standards
 - ASTM E814 / UL 1479 / ULC-S115 (Fire Testing), ASTM E2226 (Hose Stream)
- Smoke Leakage Standard
 - UL 1479 / ULC-S115

Standards Relating to Penetrations Cont.

- Fitness for Use Standards
 - UL 1479 (Water Leakage), UL 1479 (Aging), ASTM E3037 (Movement), ASTM E2923 (Aging), ASTM E2785 (Environmental Exposure)
- Applications Standards
 - ASTM E2750 (Extension of Data), ASTM E3157 (Firestop Installations)
- Inspections Standard
 - ASTM E2174

Ratings of Firestop Systems

- Currently Published Ratings
 - F (Fire) Rating
 - T (Temperature) Rating
 - L (Smoke Leakage) Rating
 - W (Water Leakage) Rating
 - M (Movement) Rating



Affinity Firestop Photo

Ratings of Firestop Systems

- *Future Ratings*
 - *A (Aging) Rating*
 - *E (Environmental Exposure) Rating*
 - *B (Biological) Rating*
 - *R (Radiation) Rating*
 - *Dream big – What else is needed?*



Affinity Firestop Photo

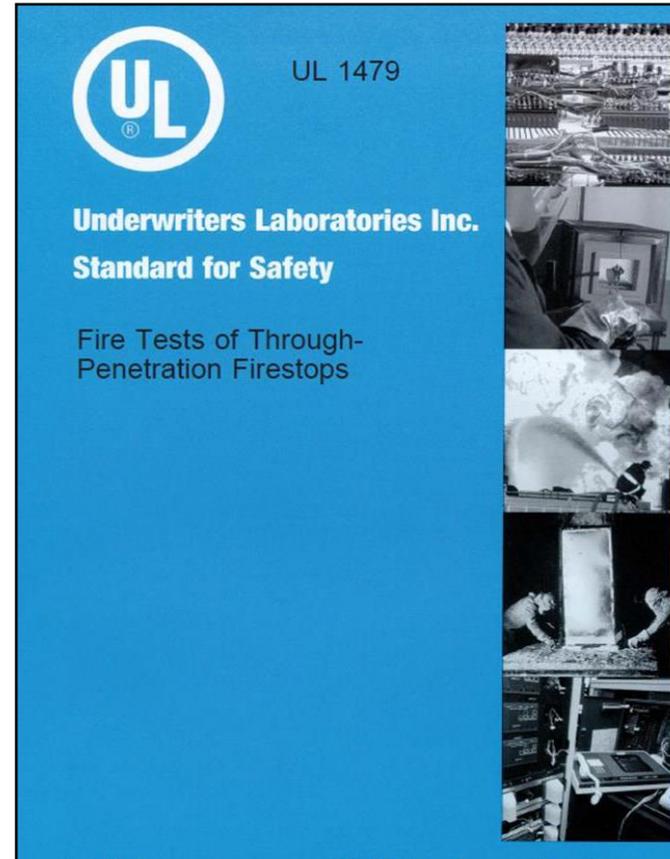
Through- and Membrane-Penetration Firestop Systems

F (Fire) and T
(Temperature)
Ratings

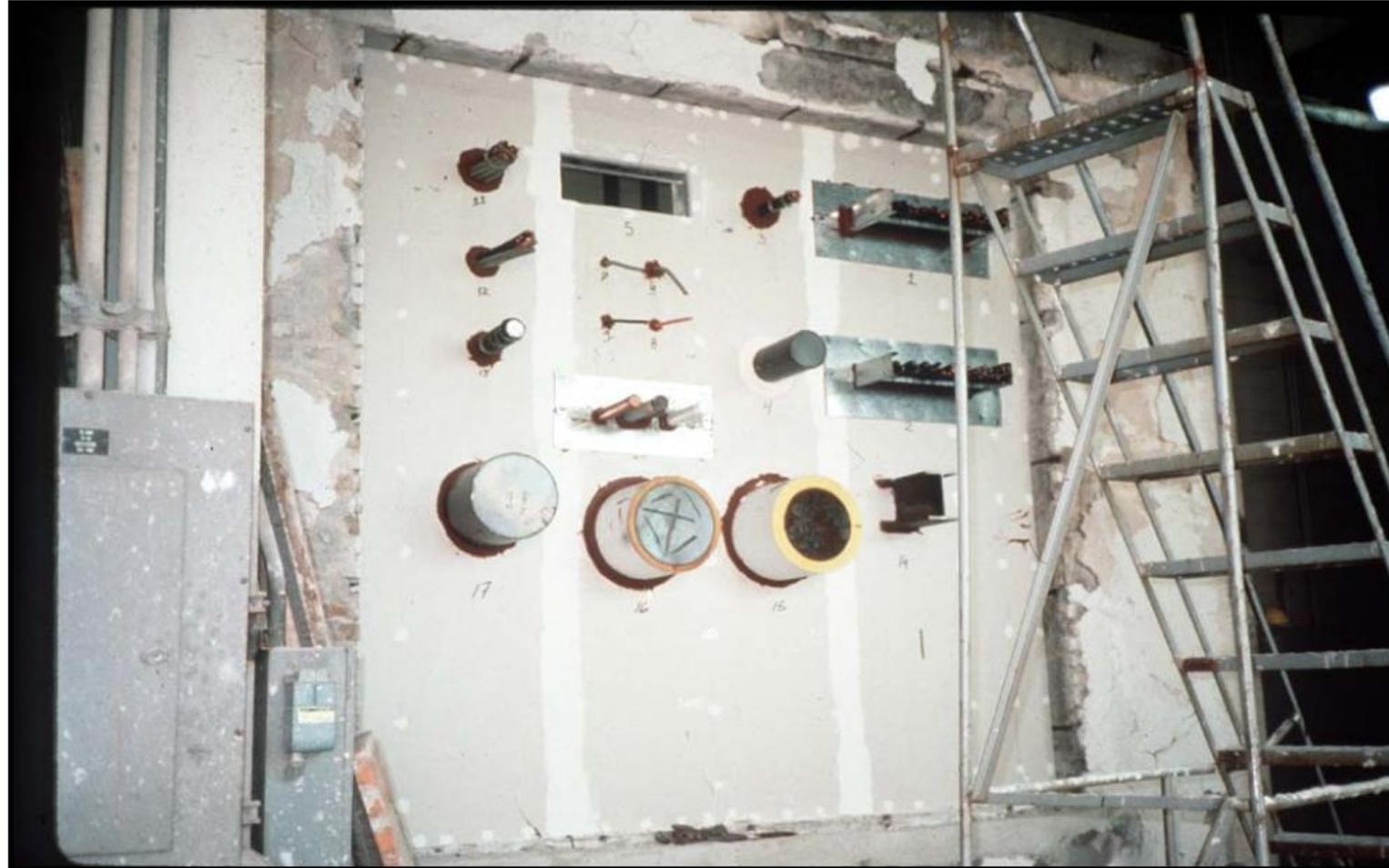


Standards

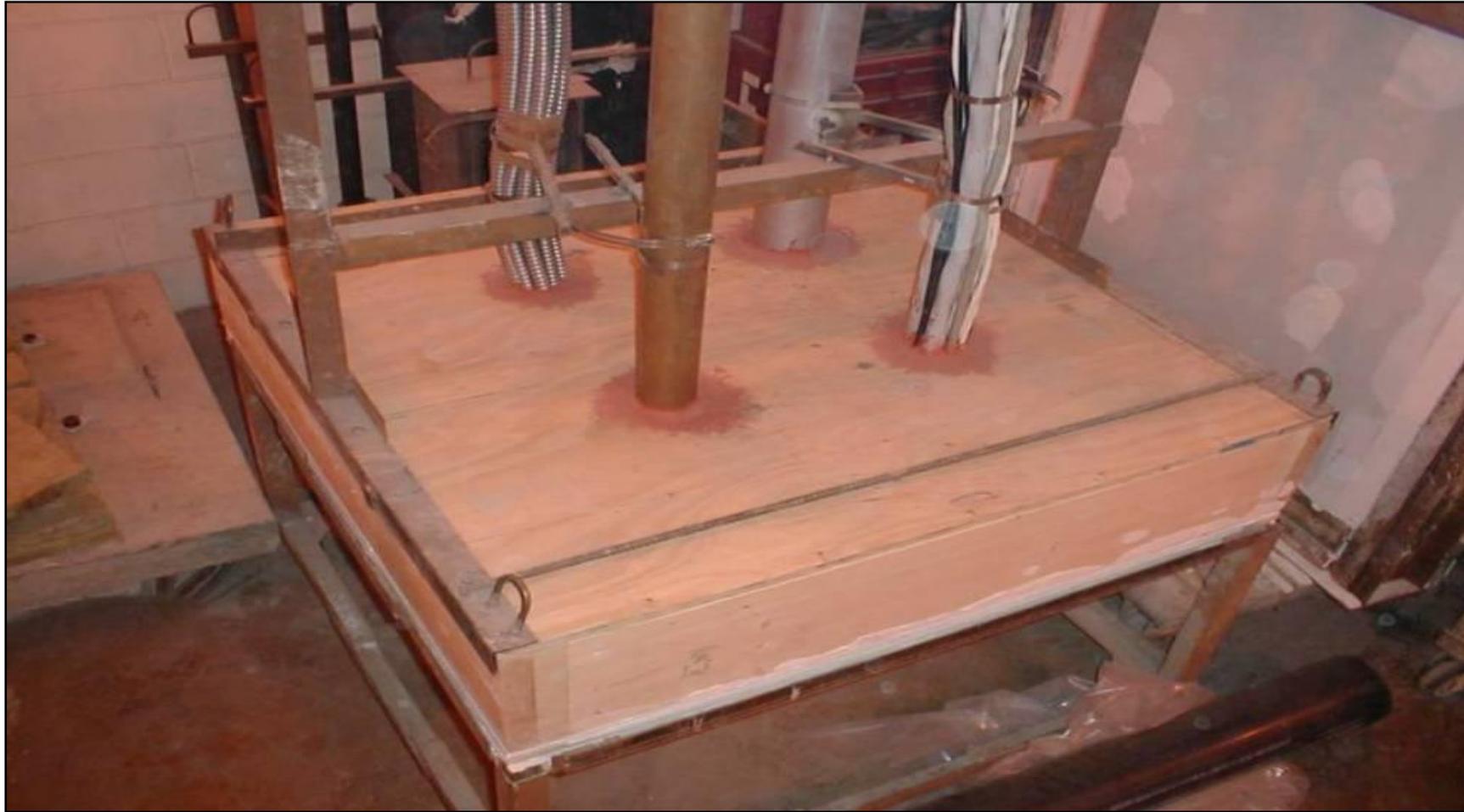
- Fire Test
 - UL 1479
 - ASTM E814
- Hose Stream
 - ASTM E2226



Full-Scale Wall Assembly



Small-Scale Wood Floor Assembly



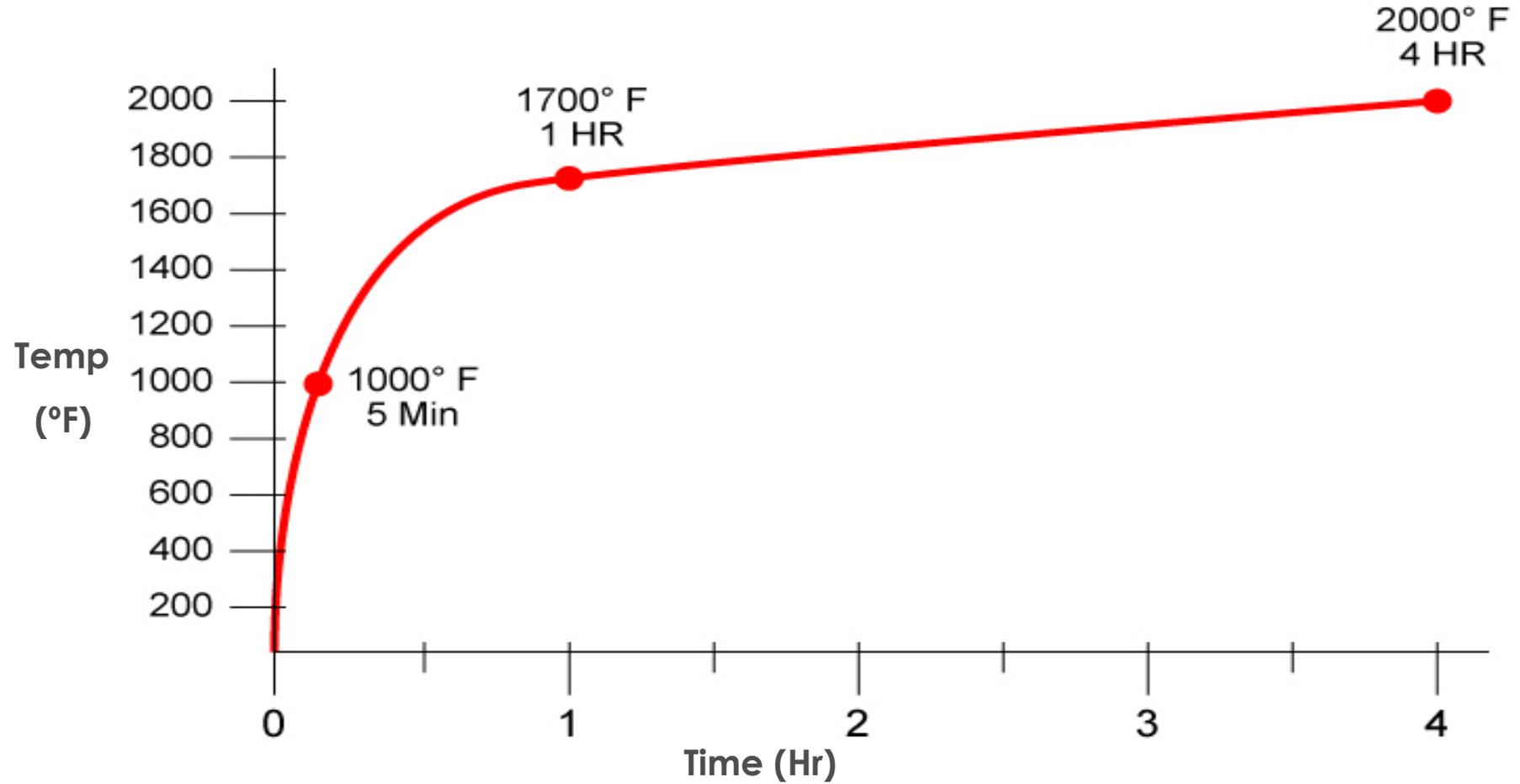
Cables Through Wood Floor



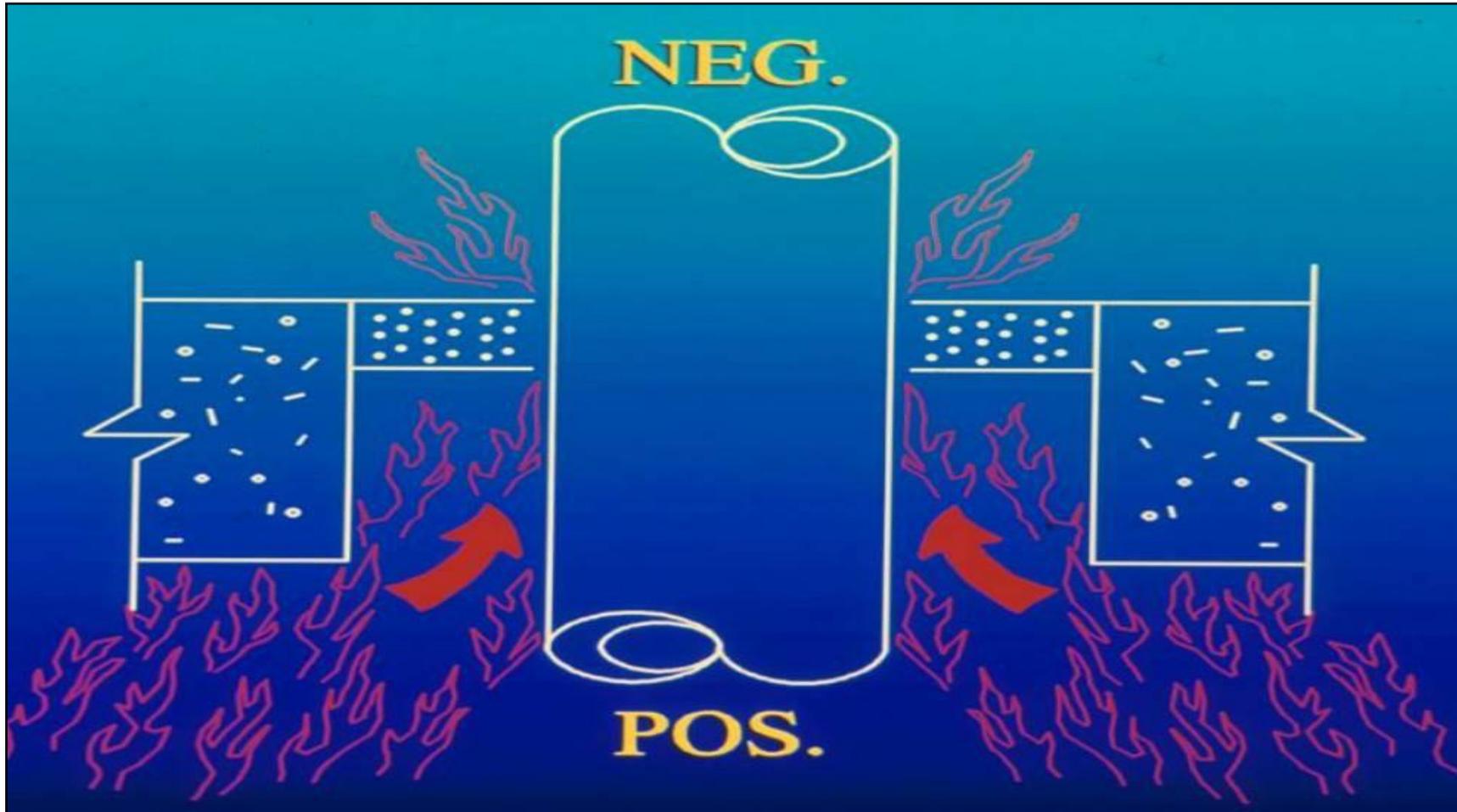
Conduit Through Wood Floor



Time - Temperature Curve



Positive Furnace Pressure

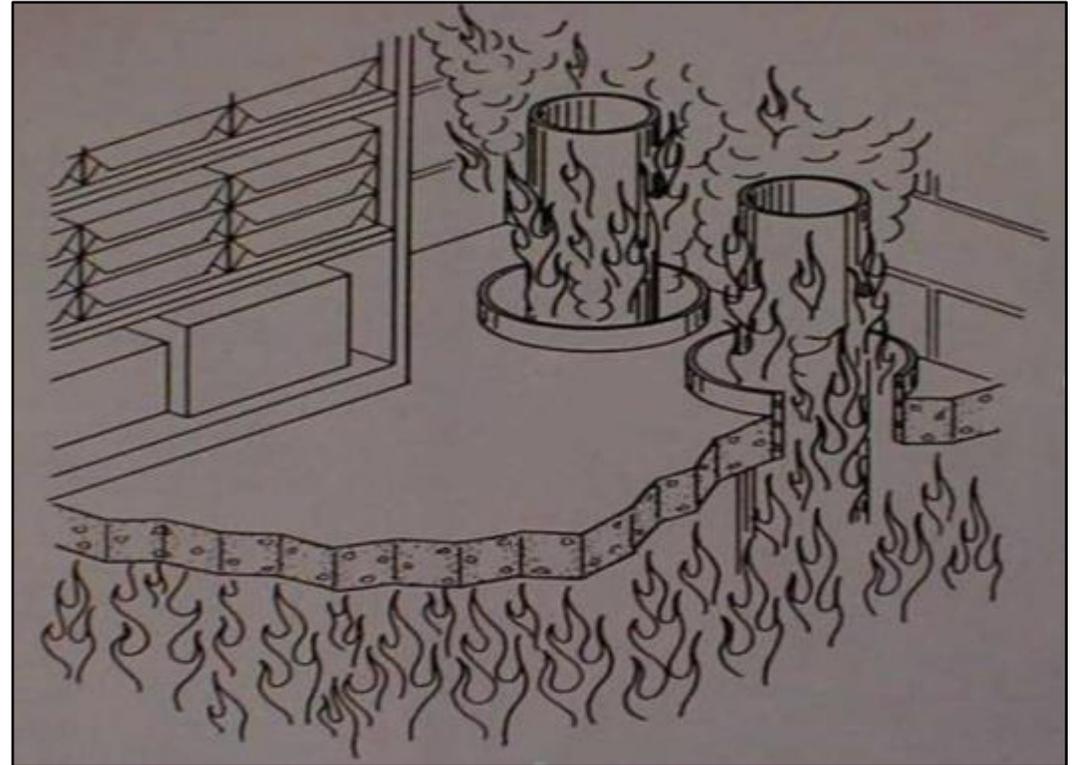


Hose Stream Test



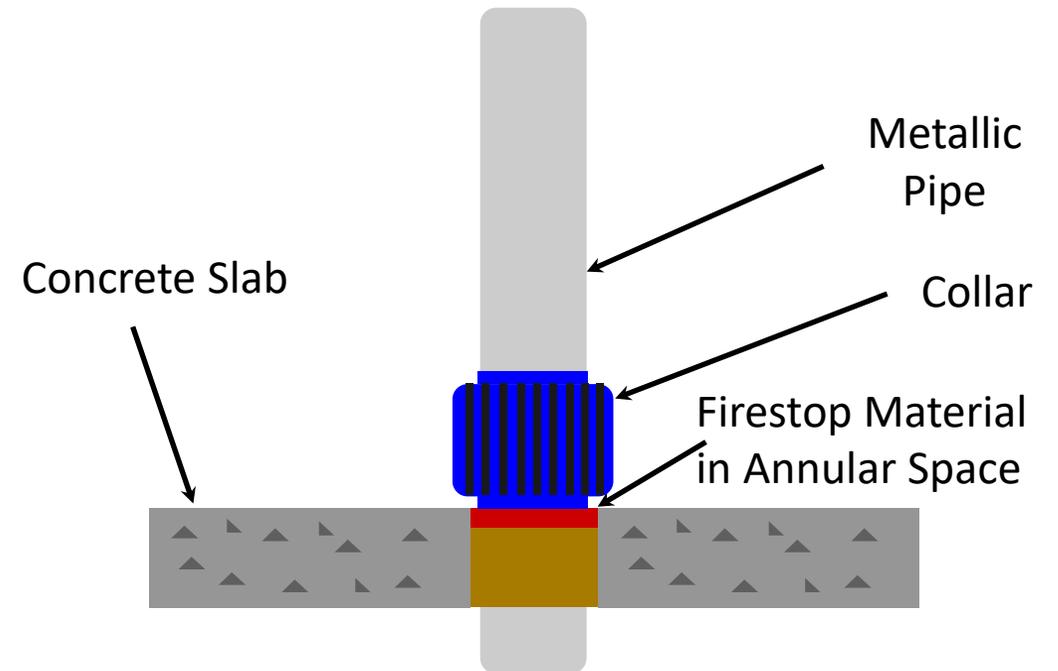
Conditions of Acceptance F (Fire) Rating

- Passage of Flame
- Hose Stream



Conditions of Acceptance T (Temperature) Rating

- Passage of Flame
- 325°F Temperature Rise
- Hose Stream



Through- and Membrane-Penetration Firestop Systems

L (Leakage) Rating



L (Leakage) Rating (Optional, Based on UL 1479)

- Optional L Rating methodology added to ANSI/UL 1479 in 1993
- Leakage determined at 0.3 in. WC
- Tested at Ambient and 400°F
- Results published in either CFM or CFM per sq ft

L (Air Leakage) Ratings



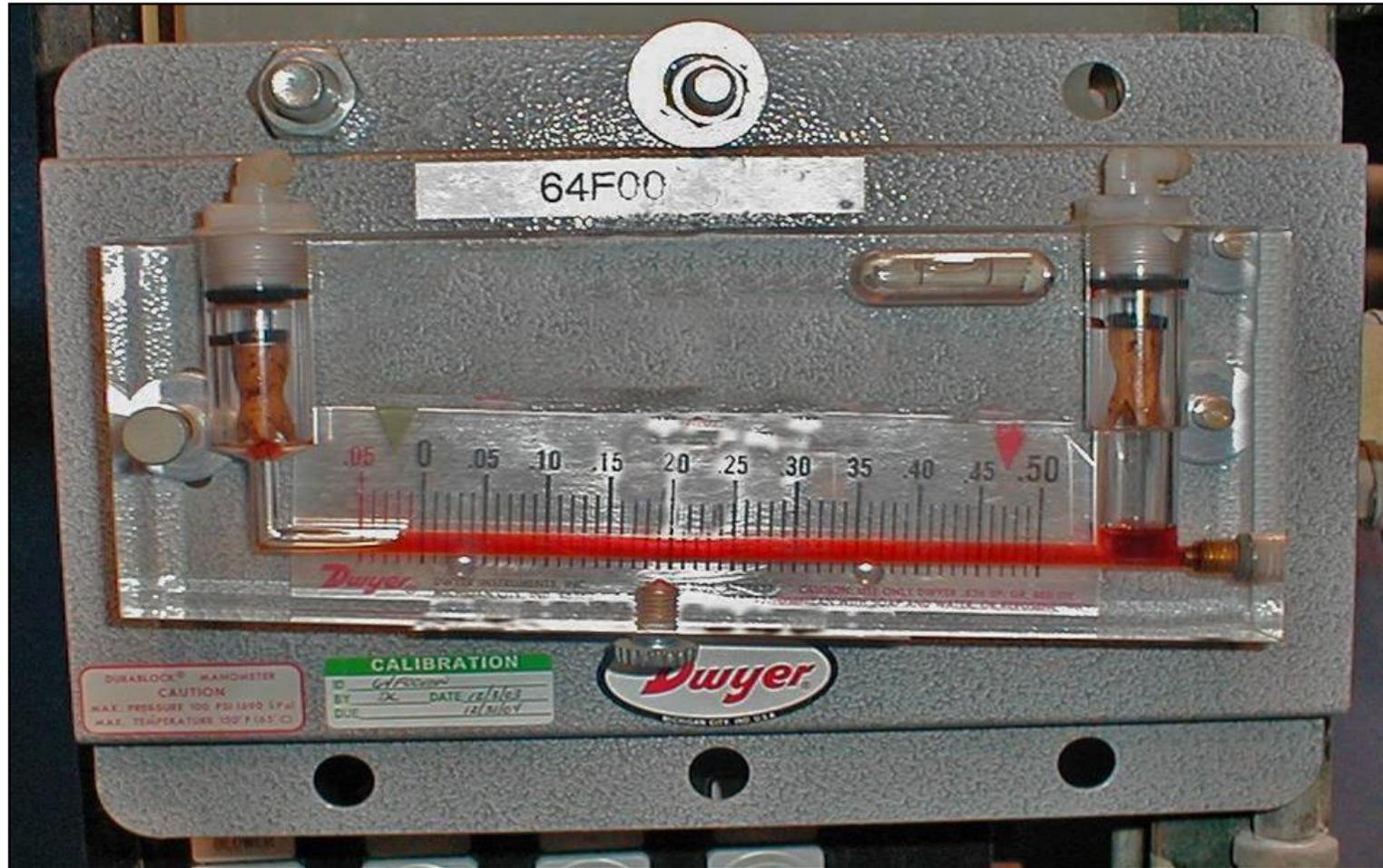
L (Air Leakage) Ratings



L (Air Leakage) Ratings



L (Air Leakage) Ratings



Test Procedure

- Incidental chamber leakage determined using blank slab
- Air leakage of test sample determined at ambient temperature
- Air leakage of test sample determine at 400°F
- Incidental chamber leakage rechecked after cooling

Test Procedure Cont.

- Firestop system assigned L Rating at ambient and 400°F, by subtracting incidental chamber leakage from test sample leakage
- L Ratings of firestop systems published along with F and T Ratings

L (Leakage) Rating (Optional, Based on UL 1479)

- Air Leakage Rate at Ambient Temperature
- Air Leakage Rate at 400°F
- Firestop system assigned an L Rating at both temperatures
- Approximately 1950 UL systems have an L Rating
- L Rating required by code for systems installed in Smoke Barriers



Through- and Membrane-Penetration Firestop Systems

W (Water) Rating



W (Water) Rating (Optional, Based on UL 1479)

- Optional W Rating methodology added to UL 1479 in 2004
- Applicable to incidental water
- Intent is to:
 - Confirm system will prevent water leakage
 - Verify system will protect penetration after water exposure
- Class I Leakage – 3 Ft. WC Pressure Head / 72 Hr Exposure

W (Water) Rating (Optional, Based on UL 1479)



Firestop
System
installed
into floor
assembly

Water vessel
(PVC pipe)
placed over
firestop system,
siliconed to slab,
and once cured,
filled with 36 in.
of water.

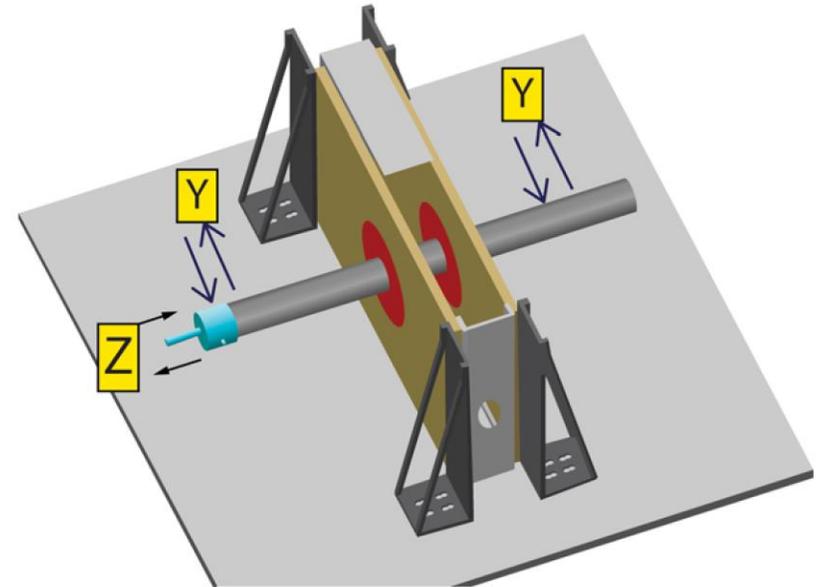


W (Water) Rating (Optional, Based on UL 1479)

- If no water leakage for 72 hrs, firestop system is subjected standard fire and hose stream tests
- Firestop system assigned a W Rating
- Approximately 500 UL systems have a W Rating
- W Rating is not required by certification organizations or codes

Through- and Membrane-Penetration Firestop Systems

M (Movement) Rating



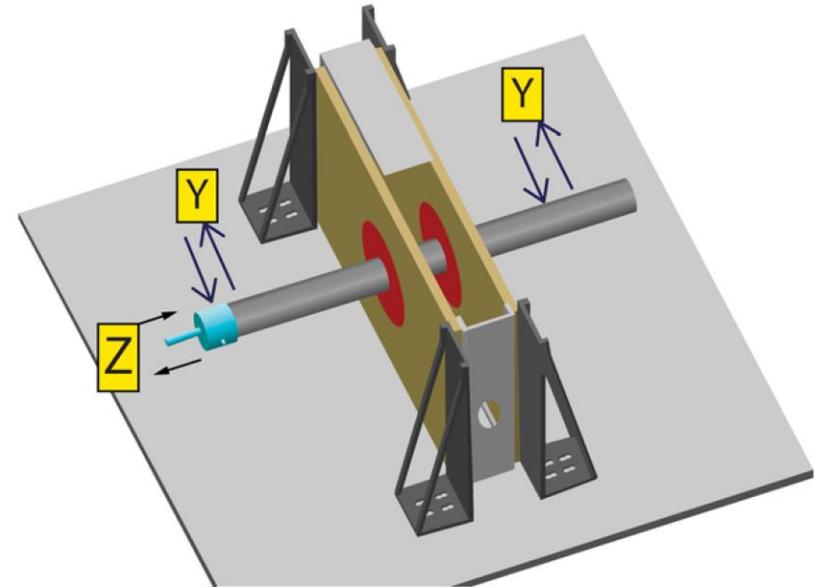
M (Movement) Rating

(Optional, Based on ASTM E3037)

- Applicable to movement of penetrating item with respect to the barrier
- Penetrating item moved perpendicular and/or in plane of barrier – ASTM E3037
- After movement, firestop subjected to standard fire and hose stream tests
- Firestop systems – M Rating
 - Rating within plane based on percentage of the minimum annular space of the field installation
 - Rating perpendicular to barrier based on dimension

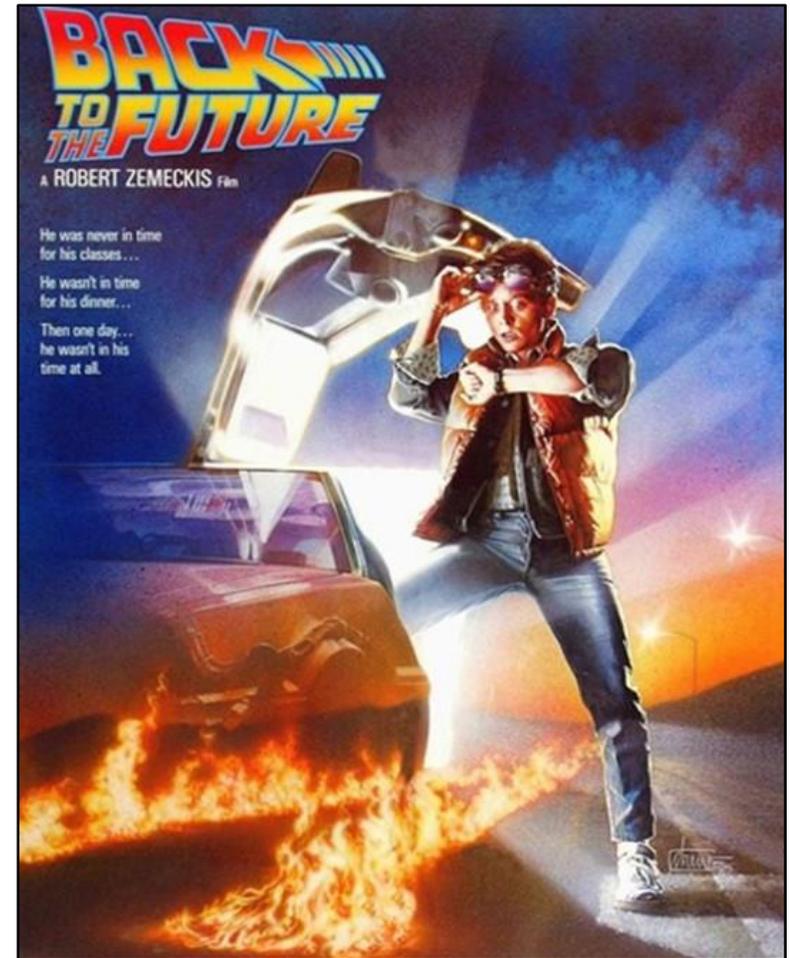
M (Movement) Rating (Optional, Based on ASTM E3037)

- Approximately 10 UL systems have an M Rating
- M Rating is not required by certification organizations or codes



Through- and Membrane-Penetration Firestop Systems

Possible Future
Rating –
A (Aging) Rating



A (Aging) Rating (Required by UL 1479)

- UL Requirements
 - Evaluates ability of firestop system to maintain its performance over time
 - Added to UL 1479 in 2000 as mandatory requirement. As such, it is not a true “Rating”
 - Requires intumescent firestopping materials to maintain their intumescent performance after aging and high humidity exposure
 - After exposure, materials are subjected to expansion pressure and expansion factor testing

A (Aging) Rating (Required by UL 1479)

- Product must maintain its performance as compared to unconditioned control sample
- If performance deteriorates, entire firestop system subjected to conditioning, followed by standard fire exposure and hose stream tests to establish F and T Ratings
- All UL Certified intumescent firestopping materials have met this requirement

A (Aging) Rating (Optional, Based on ASTM E2923)

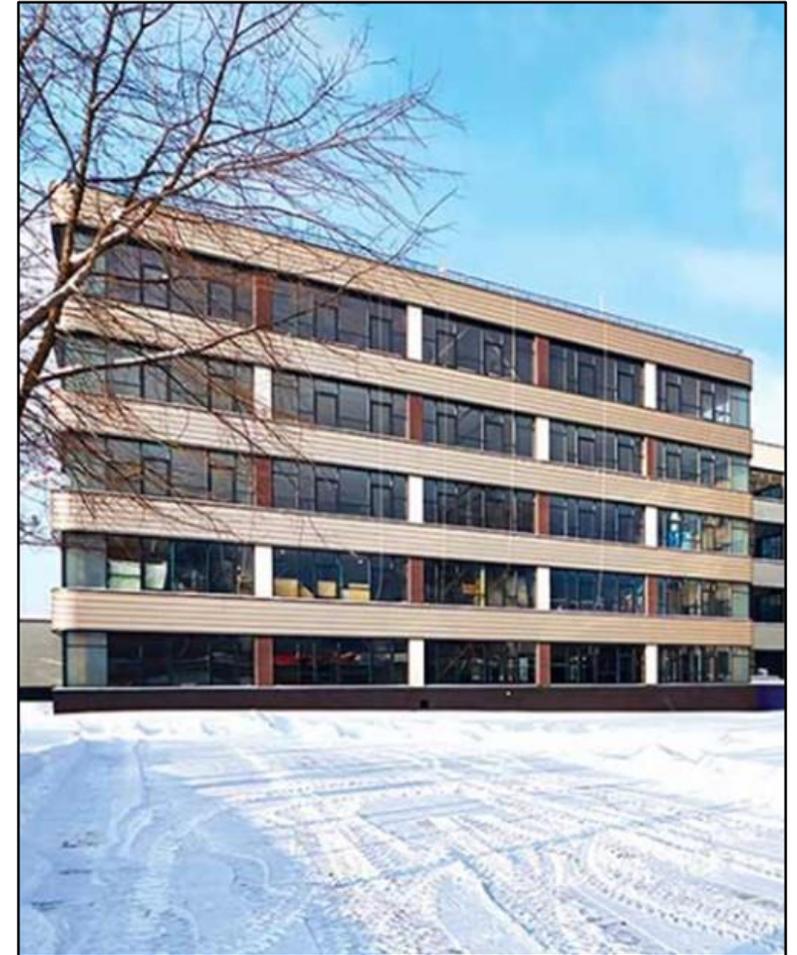
- ASTM Standard E2923
 - Could be used in the future as the basis for an A Rating
 - Evaluates whether firestopping materials are expected to maintain their performance characteristics over time
 - Uses a Differential Scanning Calorimeter conducted on samples exposed to a pure dry air and exposed to an airflow that is saturated with water. Following the scanning, the conversion rate of the firestopping material is calculated at a time of 270 days at 70°C and at 30 years at 50°C.

A (Aging) Rating (Optional, Based on ASTM E2923)

- When minimal differences in the conversion rates are determined, it can be reasonably assumed the firestop material would provide acceptable performance for 30 years if the temperature did not exceed 50°C
- A Rating by this method is not required by certification organizations or codes

Through- and Membrane-Penetration Firestop Systems

Possible Future
Rating –
E (Environmental
Exposure) Rating



E (Environmental Exposure) Rating (Optional, Based on ASTM E2785)

- ASTM Standard E2785
 - Could be used in the future as the basis for an E Rating
 - Evaluates ability of firestop system to maintain their physical properties after exposure to various environments
 - Individual samples of the firestopping materials are subjected to environment exposures consisting of an elevated temperature exposure, a high humidity exposure, a CO₂ and SO₂ exposure, a water immersion exposure, a temperature cycling exposure, a wet-freeze-dry cycling exposure and a weathering exposure

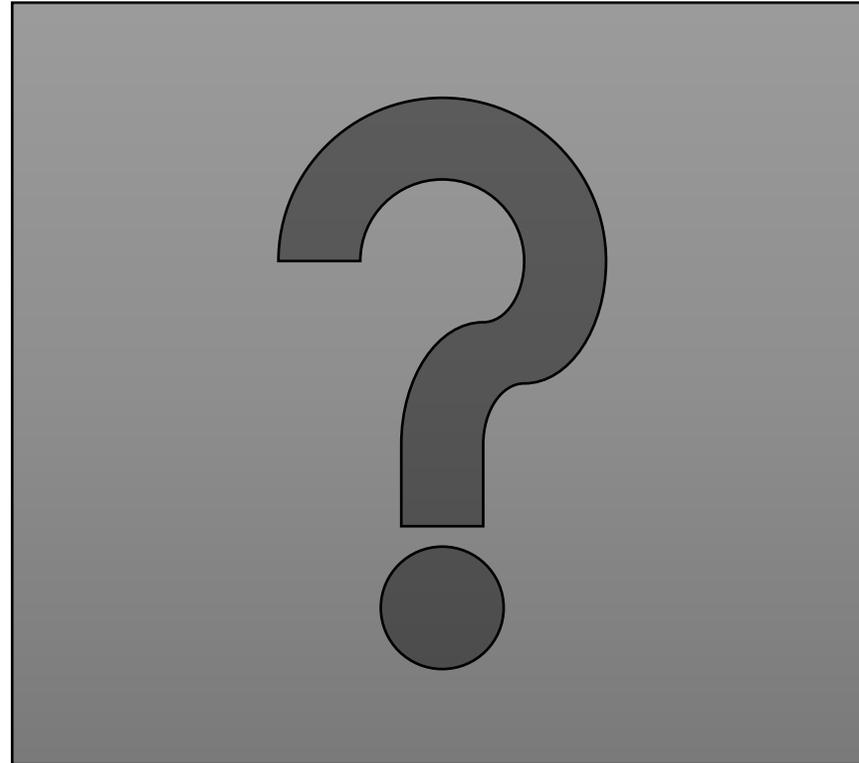
E (Environmental Exposure) Rating (Optional, Based on ASTM E2785)

- After exposure, materials are subjected to physical property testing to determine the change in performance as compared to unconditioned control samples
- E Rating is not required by certification organizations or codes

Other Possible Future Ratings

- *B (Biological) Rating*
- *R (Radiation) Rating*
- *What else is needed?*

Questions??



Thanks for Attending!!!

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