



the standard in safety

F, T, L and W Ratings - What are the Code & Testing Requirements?

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Objective

- At the end of this lesson, you will:
 - Understand the requirements of Chapter 7 of the International Building Code relating to the protection of penetrations within fire-resistance-rated assemblies
 - Understand the Standards referenced in Chapter 7 of the International Building Code

Objective Cont.

- Understand the ratings contained in the Standards referenced in Chapter 7 of the International Building Code
- Understand the testing requirements contained in the Standards referenced in Chapter 7 of the International Building Code



Outline of Presentation

- Objectives
- Importance
- Overview of UL's Regulatory Services Department
- Through-Penetration Firestop Systems
 - International Building Code Requirements
 - Standards Referenced in Code



Outline of Presentation Cont.

- Ratings Referenced in Standards
 - F Rating
 - T Rating
 - L Rating
 - W Rating
- Testing Referenced in Standards
 - F Rating
 - T Rating
 - L Rating
 - W Rating
- Summary and Closing

Importance

- Protect the lives and property of those who live, work and play in the buildings you have firestopped
- Mandated by codes and standards
- Simplify the process of complying with the code requirements
- Protect you from liability

Importance Cont.



Importance Cont.

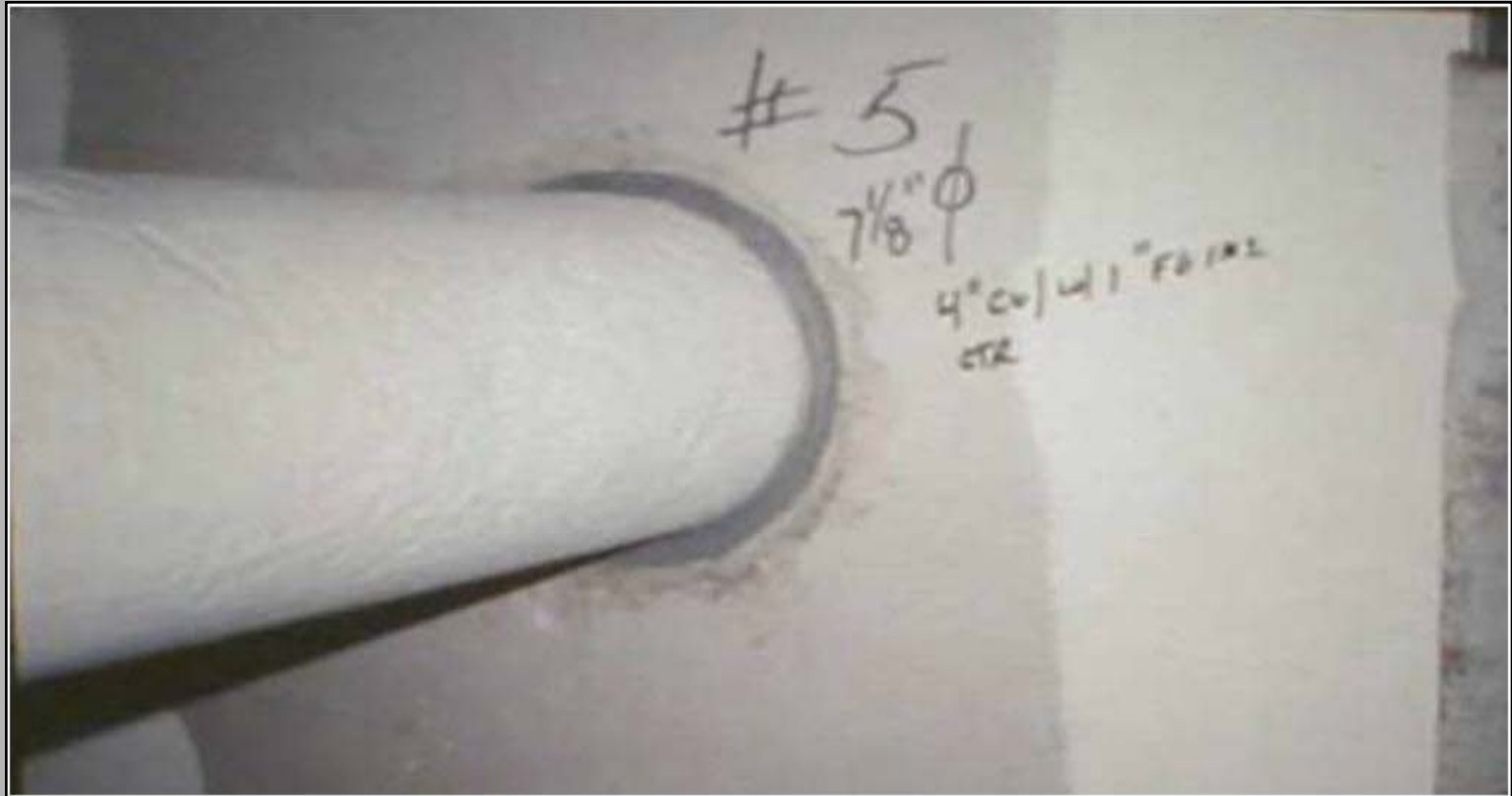
- Unsealed or improperly sealed openings cost lives and property!
 - Hilton Hotel, Las Vegas, NV – Fire spread from 8th to 23rd floor in 25 minutes. Eight fatalities.
 - First Interstate Bank, Los Angeles, CA – Fire spread from 13th to 16th floor through unprotected penetrations and perimeter joint. One fatality.
 - One Meridian Plaza, Philadelphia, PA – Fire spread from 22nd to 30th floor through perimeter joint.

UL's Regulatory Services Department

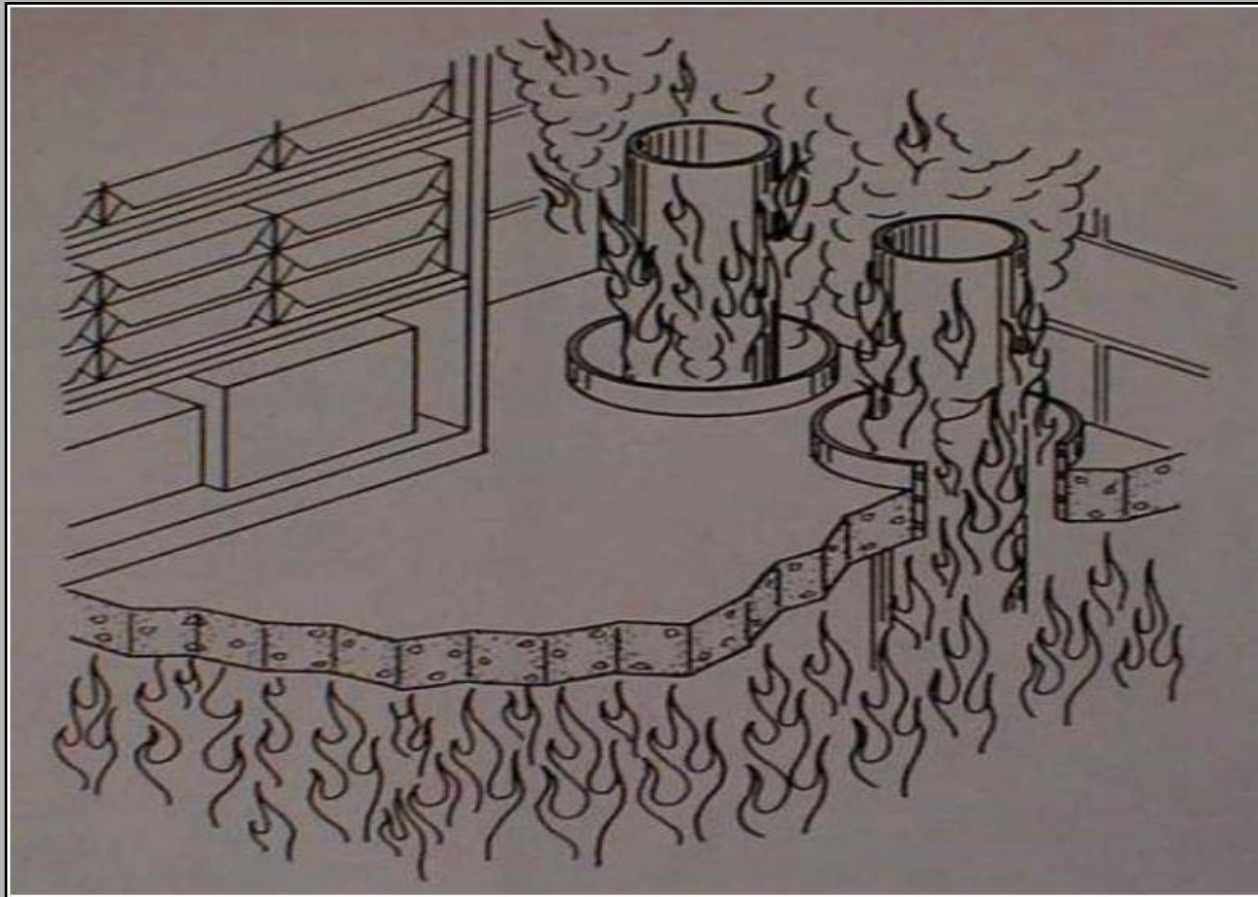
- Product Directories
- Periodicals
 - The Code Authority
 - Fire & Security Authority
 - TCA – Electrical Connections
 - EPH RegULator
- ULtimate Email
- Training Seminars
- Code Development
- Technical Assistance



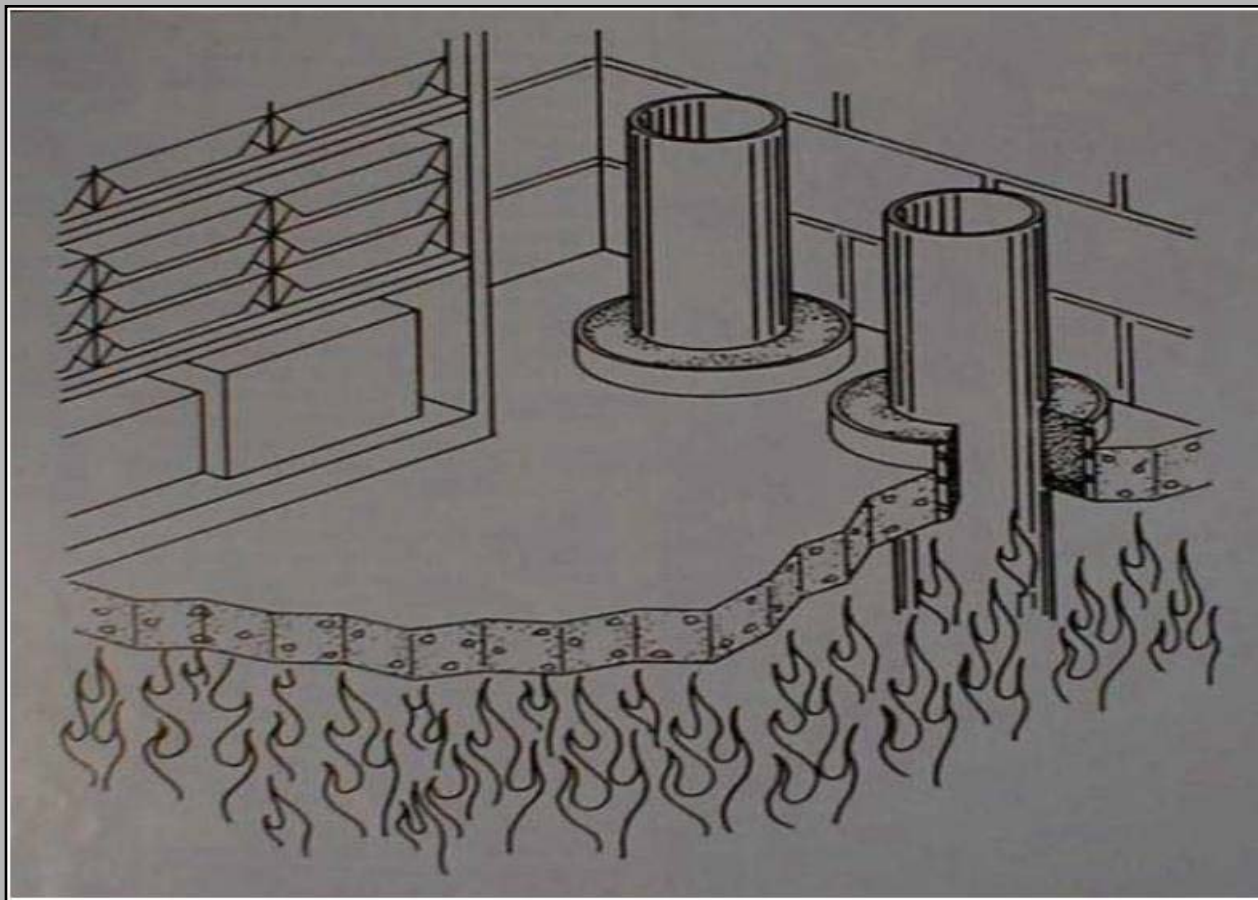
Firestop Systems



No Firestopping



Proper Firestopping



Code Requirements

General

- Section 713 of the 2009 IBC
- 713.3 – Penetrations into or through fire walls, fire barriers, smoke barrier walls and fire partitions shall be protected per Section 713.3
- 713.4 – Penetrations of horizontal assemblies not required to be protected by shaft enclosure shall be protected per Section 713.4

Code Requirements

Wall Assemblies

- Section 713.3 of the IBC
- 713.3.1 – Through penetrations shall be protected by one of the following:
 - As tested as part of the entire wall assembly
 - As tested to ANSI/UL 1479 / ASTM E 814
- Exceptions
 - Concrete, grout or mortar
 - Annular space protection material



Code Requirements

Wall Assemblies Cont.

- 713.3.1.2 – When tested to ANSI/UL 1479 / ASTM E 814, through penetrations shall have an F Rating of not less than the required rating of wall penetrated

Code Requirements

Wall Assemblies Cont.

- 712.3.2 – Membrane penetration shall be protected as follows:
 - As specified in 713.3.1 (i.e. through penetrations)
 - Recessed fixtures shall be installed so as not to reduce the required fire resistance

Code Requirements

Wall Assemblies Cont.

- Exceptions
 - Steel electrical boxes
 - Listed electrical boxes of any material installed per listing
 - Electrical boxes of any material listed as part of an opening protective material system
 - Boxes other than electrical boxes installed as tested to ANSI/UL 1479 / ASTM E 814
 - Annular space created by fire sprinklers



Code Requirements

Horizontal Assemblies

- Section 713.4 of the IBC
- 713.4.1.1 – Through penetration shall be protected by one of the following:
 - As tested as part of the entire horizontal assembly
 - As tested to ANSI/UL 1479 / ASTM E 814
 - Exceptions
 - Annular space protection material
 - Concrete, grout or mortar
 - Listed electrical boxes

Code Requirements

Horizontal Assemblies Cont.

- 713.4.1.1.2 – When tested to ANSI/UL 1479 / ASTM E 814, through penetrations shall have F and T Ratings of not less than 1 hour but not less than required rating of assembly penetrated



Code Requirements

Horizontal Assemblies Cont.

- 713.4.1.2 – Membrane penetration shall be protected as follows:
 - As specified in 713.4.1.1 (i.e. through penetrations)
 - Recessed fixtures shall be installed so as not to reduce the required fire resistance

Code Requirements

Horizontal Assemblies Cont.

- Exceptions
 - If less than 100 sq in. per 100 sq ft, metallic penetrants may be either firestopped or fireblocked
 - Steel electrical boxes installed per prescriptive requirements
 - Electrical boxes of any material listed as part of an opening protective material system
 - Listed electrical boxes of any material installed per listing
 - Annular space created by fire sprinklers

Code Requirements

Miscellaneous

- 713.3.3 and 713.4.1.4 – Noncombustible penetrants shall not be connected to combustible penetrants beyond point of firestop system
- 713.5 – Penetrations in smoke barriers shall have an L Rating at ambient and 400 °F
 - Max 5.0 CFM / sq ft of opening
 - Max cumulative leakage of 50 cfm for any 100 square feet of wall or floor area

Standards

- ANSI / UL 1479
- ASTM E 814



Three Elements of Firestop Systems

- Floor or Wall Assembly
- Penetrating Item
- Firestopping Products

Ratings

- F - Flame Occurrence
- T - Heat Transmission
- L - Leakage (Optional)
- W - Water Leakage (Optional)

Conditions of Acceptance F Rating

- Passage of Flame
- Hose Stream



Conditions of Acceptance T Rating

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



L Rating

- Air Leakage Rate at Ambient Temperature
- Air Leakage Rate at 400°F



W Rating

- Optional program, applicable to incidental water
- 3 Ft WC Pressure Head / 72 Hr Exposure
- Firestop subjected to water exposure, followed by standard fire and hose stream tests
- Firestop systems assigned a W Rating

Fire Testing Requirements

Full-Scale Wall Assembly



Fire Testing Requirements

Small-Scale Concrete Floor Assembly

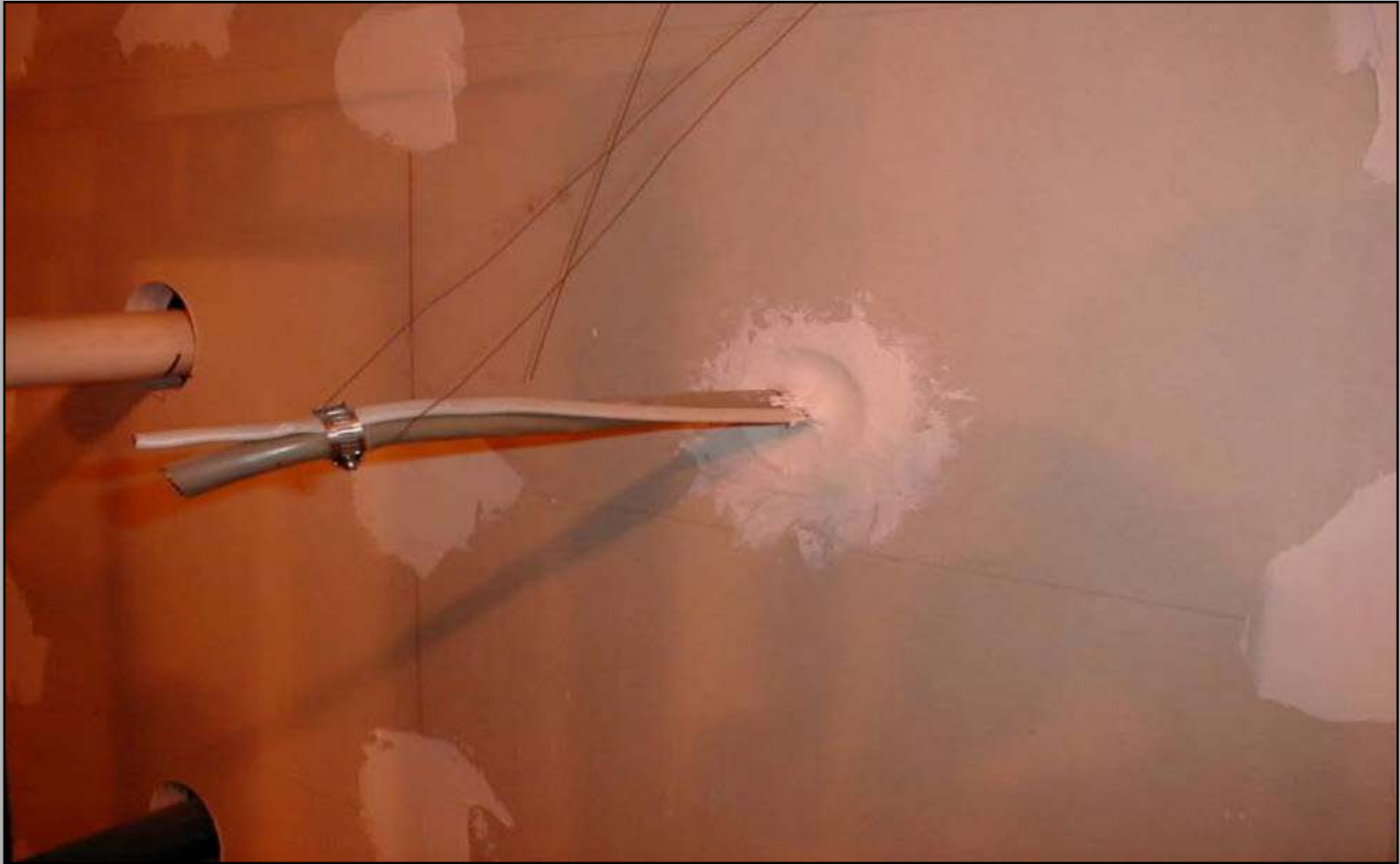


Fire Testing Requirements

Small-Scale Wood Floor Assembly



Fire Testing Requirements Cables Through Gypsum Wall



Fire Testing Requirements

PVC Pipe Through Gypsum Wall

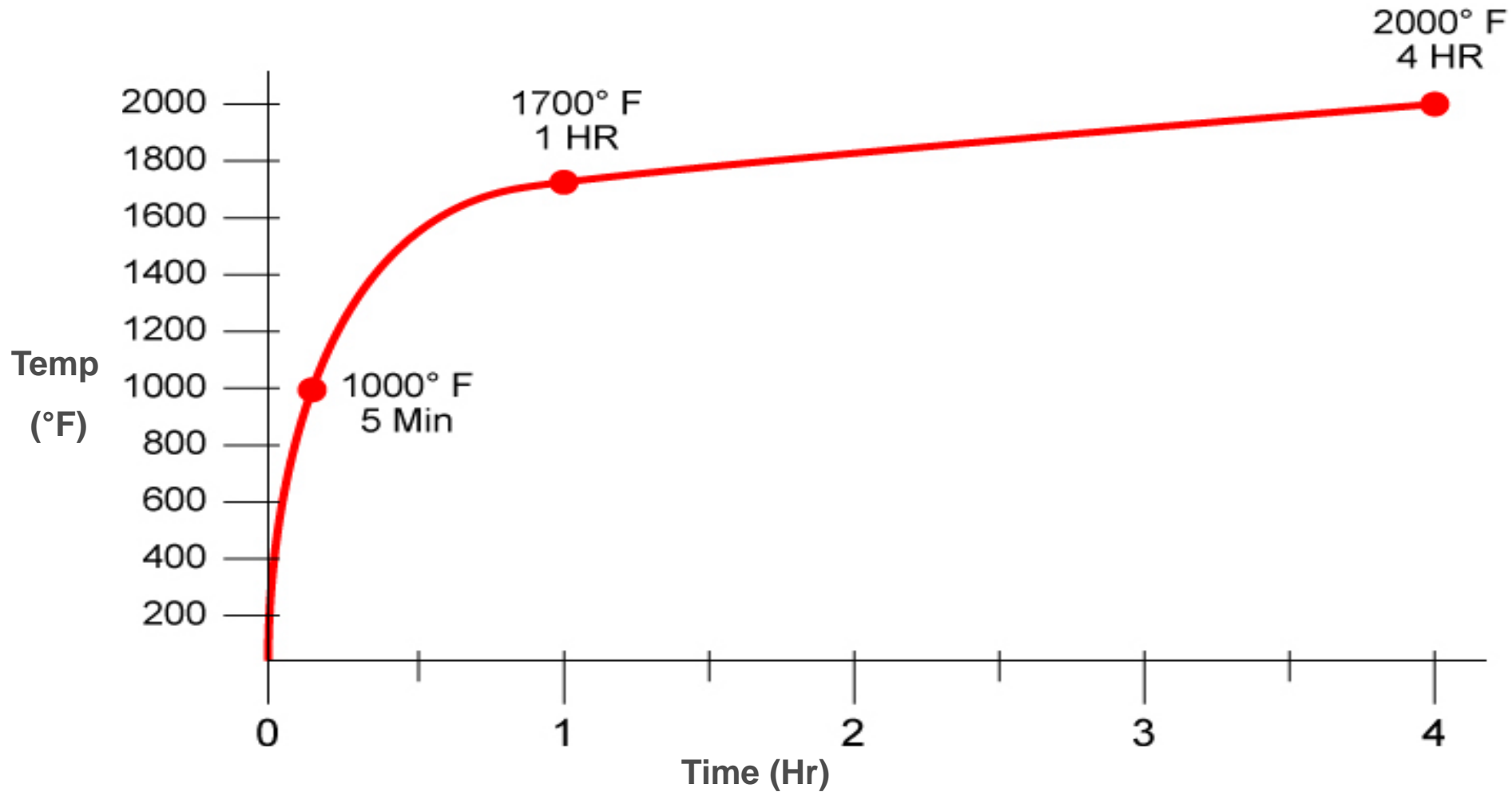


Fire Testing Requirements

Blank Opening in Concrete Floor

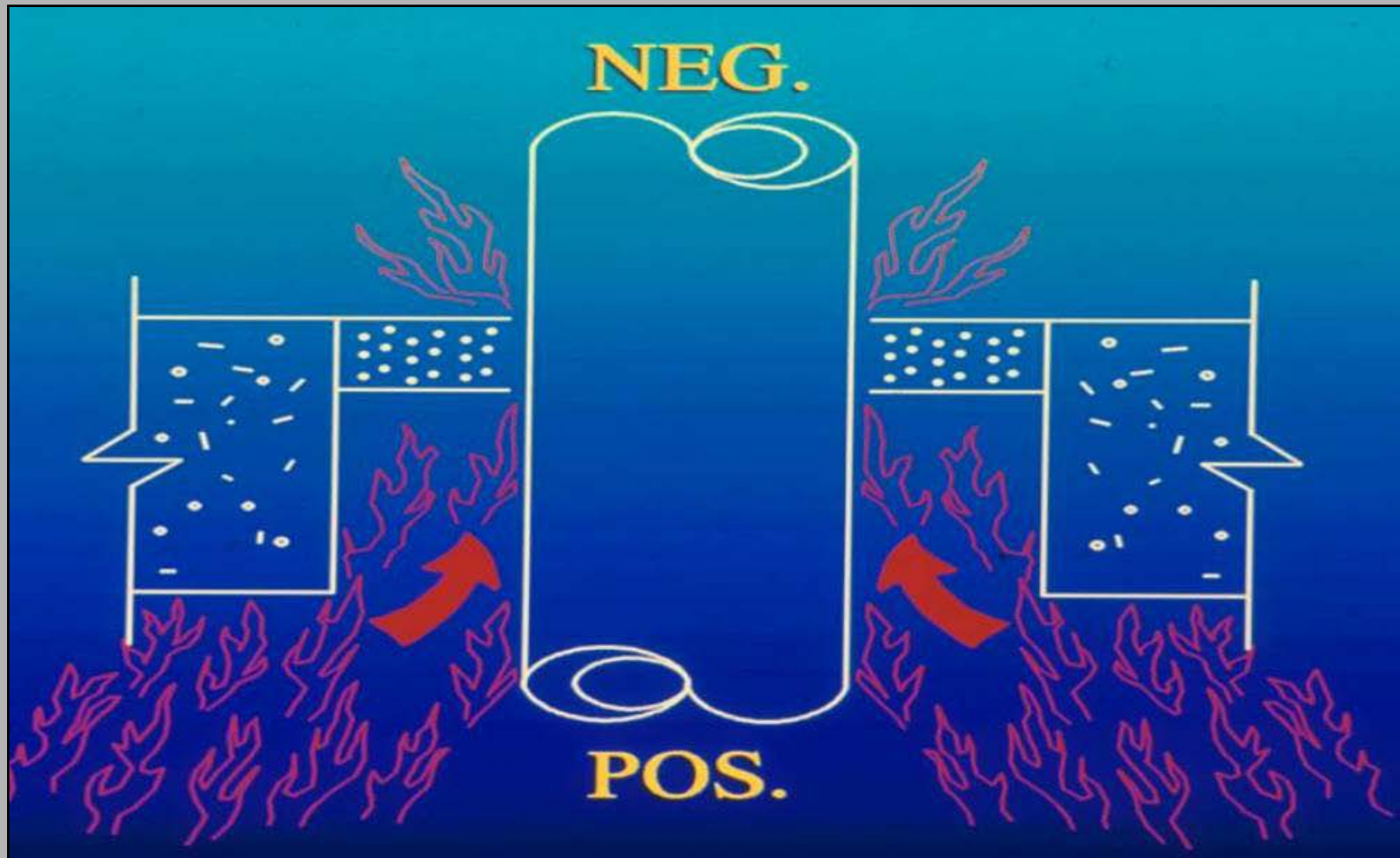


Fire Testing Requirements Time – Temperature Curve



Fire Testing Requirements

Positive Furnace Pressure



Fire Testing Requirements

Hose Stream Test



Testing Requirements

L (Air Leakage) Ratings

- 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



Testing Requirements L (Air Leakage) Ratings



Testing Requirements

L (Air Leakage) Ratings

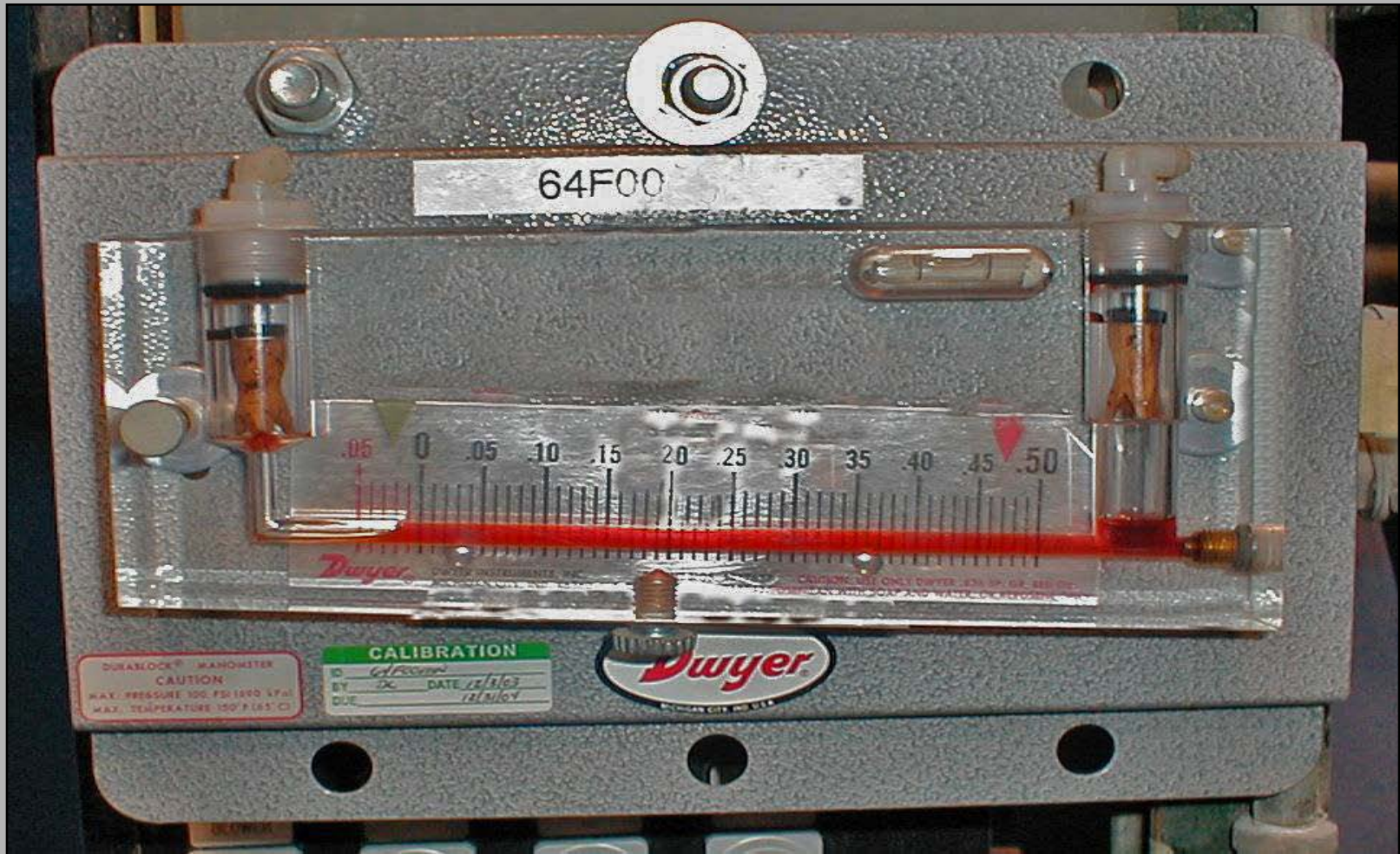


Testing Requirements

L (Air Leakage) Ratings



Testing Requirements L (Air Leakage) Ratings



Testing Requirements

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

Testing Requirements

Test Procedure Cont.

- Firestop system assigned L Rating at ambient and 400°F, by subtracting incidental chamber leakage from test sample leakage
- Results published in either CFM or CFM per sq ft



Testing Requirements

W (Water Leakage) Ratings

- Two Purposes of W Rating
 - Evaluate ability of firestop system to prevent incidental leakage of water
 - Evaluates ability of firestop system to maintain it's F and T Ratings after exposure to water



Testing Requirements

Testing Procedure



Testing Requirements

Testing Procedure Cont.



Testing Requirements

Testing Procedure Cont.

- Firestop subjected to 3 ft water column for 72 hrs
- No water leakage whatsoever is permitted.
- Test assembly subjected to ANSI/UL 1479 fire exposure and hose stream tests after water exposure
- Firestop system assigned W Rating

Summary

Firestop Systems

- ANSI / UL 1479 / ASTM E 814
- Complete System Tested
- F Rating / T Rating / L Rating / W Rating



Thank You For Attending

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