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.

• Unsealed or improperly sealed openings cost lives and property!
  • Hilton Hotel, Las Vegas, NV – Fire spread from 8\textsuperscript{th} to 23\textsuperscript{rd} floor in 25 minutes. Eight fatalities.
  • First Interstate Bank, Los Angeles, CA – Fire spread from 13\textsuperscript{th} to 16\textsuperscript{th} floor through unprotected penetrations and perimeter joint. One fatality.
  • One Meridian Plaza, Philadelphia, PA – Fire spread from 22\textsuperscript{nd} to 30\textsuperscript{th} 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
• 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
• 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
• 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
Except where 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, other than electrical boxes installed as tested to ANSI/UL 1479 / ASTM E 814, or an 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
• 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
• 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

- 1000°F for 5 minutes
- 1700°F for 1 hour
- 2000°F for 4 hours

Temp (°F)

Time (Hr)
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
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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
Two Purposes of W Rating

- Evaluate ability of firestop system to prevent incidental leakage of water
- Evaluates ability of firestop system to maintain its 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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