Barrier Management Symposium Executive Summary
Part 1: Testing Standards for Effective Compartmentation

FCIA Virtual Education & Committee Action Conference
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Fire-Resistance-Rated Construction
Fire-Resistance-Rated Construction

Code Requirements for Fire-Resistance-Rated Construction
Code Requirements

• **IBC Section 703.2** – Fire-resistance ratings shall be determined in accordance with UL 263 or ASTM E119

• **LSC 8.2.3.1** – The fire-resistance of structural elements and building assemblies shall be determined in accordance with test procedures set forth in UL 263 or ASTM E119
Fire-Resistance

• Expressed as an Hourly Time Period
• Ratings range from 1/2 to 4 hours
• Contain Fire to Room or Floor of Origin and Maintain Structural Integrity
Fire-Resistance-Rated Construction

Establishing Fire-Resistance Ratings
Standards

- UL 263
- ASTM E119
- NFPA 251 (Withdrawn)
Building Components

- Columns
- Beams
- Floor/Ceilings or Roof/Ceilings
- Walls
Time - Temperature Curve

- 1000° F in 5 Min
- 1700° F in 1 HR
- 2000° F in 4 HR

Temp (°F) vs Time (Hr)
Walls

- Sample size - 100 sq ft / 9 ft
- Load applied - Per design
Conditions of Acceptance – Walls

- Flame passage
- 250°F / 325°F
- Support load
- Hose stream
Where Can I Find The Most Current Listing?

UL Product iQ on www.ul.com
Breaches in Fire-Resistance-Rated Construction

- Penetrations
- Joint Systems
- Opening Protectives
- Ducts and Air Transfer Openings
Breaches in Fire-Resistance-Rated Construction Cont.

Do breaches really impact the performance of a fire-resistance-rated assembly?

Absolutely!!!
Requirements for Protecting Breaches

• Each type of breach has a unique fire test standard associated with it which compliments UL 263 and ASTM E119. In addition, each breach has various ancillary standards.

  • **Penetrations**
    • Fire / Hose Stream Test Standards
      • ASTM E814 / **UL 1479** / ULC-S115 (Fire Testing), ASTM E2226 (Hose Stream)
    • Smoke Leakage Standard
      • **UL 1479**
Requirements for Protecting Breaches

- Fitness for Use Standards
  - ASTM E2750 (Extension of Data), ASTM E3037 (Movement), ASTM E3157 (Firestop Installations), UL 1479 (W Ratings)

- Inspections Standard
  - ASTM E2174

- Inspectors Standard
  - ASTM E3038
Requirements for Protecting Breaches

• **Fire-Resistant Joint Systems**
  • Fire / Hose Stream Test Standards
    • ASTM E1966 / UL 2079 / ULC-S115 (Fire Testing of Construction Joints),
      ASTM E2226 (Hose Stream), ASTM E2307 (Perimeter Fire Containment),
      ASTM E2837 (Cont. HW Joints)
  • Smoke Leakage Standard
    • UL 2079
  • Fitness for Use Standards
    • UL 2079 (W Ratings)
  • Inspections Standard
    • ASTM E2393
Requirements for Protecting Breaches

• Inspectors Standard
  • ASTM E3038

• Opening Protectives
  • Fire / Hose Stream Test Standards
    • NFPA 252 (Fire Doors), NFPA 257 (Fire Windows, FPR Glazing), UL 9 (Fire Windows, FPR Glazing), UL 10B and 10C (Fire Doors), UL 263 (FRR Glazing)
  • Smoke Leakage Standard
    • UL 1784

• Installation and Maintenance Standards
  • NFPA 80 (Fire Doors and Fire Windows), NFPA 105 (Smoke Rated Doors)
Requirements for Protecting Breaches

• Duct and Air Transfer Openings
  • Fire / Hose Stream Test Standards
    • UL 555 (Fire, Combination and Corridor Dampers), UL 263 and 555C (Ceiling Radiation Dampers)
  • Smoke Leakage Standard
    • UL 555S (Smoke, Combination and Corridor Dampers)
  • Installation and Maintenance
    • NFPA 80 (Fire, Combination, Corridor and Ceiling Radiation Dampers), NFPA 105 (Smoke, Combination and Corridor Dampers)
Through- and Membrane-Penetration Firestop Systems
Three Elements of a Firestop System

• Floor or Wall Assembly
• Penetrating Item
• Firestopping Products
Through- and Membrane-Penetration Firestop Systems

Code Requirements for Penetrations
Code Requirements

• **IBC Section 714** – Firestop systems shall be protected by an approved penetration firestop system installed as tested in accordance with ASTM E814 or UL 1479

• **LSC** – Firestop systems or devices shall be tested in accordance with ASTM E814 or UL 1479
Ratings – UL 1479

- F – Flame Occurrence
- T – Heat Transmission
- L – Leakage (Optional)
- W – Water Leakage (Optional)
Establishing F and T Ratings
Standards

• UL 1479
• ASTM E814
Full-Scale Wall Assembly
Small-Scale Wood Floor Assembly
Cables Through Wood Floor
Conduit Through Wood Floor
Time - Temperature Curve

- 1000°F in 5 Min
- 1700°F in 1 HR
- 2000°F in 4 HR
Hose Stream Test
Conditions of Acceptance

F Rating

• Passage of Flame
• Hose Stream
Conditions of Acceptance

T Rating

• Passage of Flame
• 325°F Temperature Rise
• Hose Stream
Establishing an L Rating

Through- and Membrane-Penetration Firestop Systems
L (Air Leakage) Ratings

• 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
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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 400ºF
• 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
Where Can I Find The Most Current Listing?

UL Product iQ on www.ul.com
Opening Protectives

- Fire Door Assemblies
- Fire Window Assemblies
Opening Protecitives

Code Requirements for Fire Door Assemblies
Code Requirements

• Section 716 of the IBC
  • **716.2.1.1** – Side-hinged or pivoted swinging doors shall be tested to UL 10C or NFPA 252
  • **716.2.1.2** – Other types of doors shall be tested to UL 10B or NFPA 252
• **716.2.1.4 & 716.2.2.1.1** – Doors in corridors and smoke barriers required to have leakage rating of 3 cfm per sq ft of door opening when tested to UL 1784

• **716.5.5** – Doors in exit enclosures and exit passageways shall have maximum transmitted temperature end point of not more than 450°F for 30 minutes
Code Requirements Cont.

• LSC
  • Fire protection ratings shall be determined in accordance with NFPA 252, UL 10B or UL 10C
Opening Protectives

Establishing Fire-Protection Ratings on Fire Door Assemblies
Standards

- ANSI / UL 10B
- ANSI / UL 10C
- NFPA 252
Time - Temperature Curve

- 1000°F, 5 Min
- 1700°F, 1 HR
- 2000°F, 4 HR
Conditions of Acceptance
Fire Door Assemblies

• Flame Passage
• Hose Stream After Full Duration Fire Exposure
Where Can I Find The Most Current Listing?

UL Product iQ on www.ul.com
Questions??
Thanks for Attending!!!

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