Testing of Fire Resistance and Smoke Resistant Assemblies

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Fire-Resistance-Rated Construction
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Code Requirements for Fire-Resistance-Rated Construction
Code Requirements

• IBC Section 703.2 – Fire-resistance ratings shall be determined in accordance with ANSI/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 NFPA 251 (i.e. ANSI/UL 263 or ASTM E119)
Fire Resistance

- Expressed as an Hourly Time Period
- Ratings range from 1/2 to 4 hours
- Containment of Fire to Room or Floor of Origin
Fire-Resistance-Rated Construction

Establishing Fire-Resistance Ratings
Standards

• ANSI/UL 263
• ASTM E119
• NFPA 251 (Withdrawn)
Building Components

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

- 2000°F after 4 hours
- 1700°F after 1 hour
- 1000°F after 5 minutes
Floor/Ceiling or Roof/Ceilings

- Sample size – 180 sq ft / 12 ft
- Load applied – Per design
Conditions of Acceptance
Floor/Ceilings or Roof/Ceilings

• Support load
• Flame passage
• 250°F / 325°F
• Support temperatures
Walls

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

- Flame passage
- 250ºF / 325ºF
- Support load
- Hose stream
Navigating the UL Directories

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Questions / Comments
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!!!
MGM Grand
Las Vegas, NV – 1980

• Fire confined to 1st floor
• 679 injured, 85 fatalities
• Most fatalities on upper floors due to smoke inhalation
Hilton Hotel
Las Vegas, NV – 1981

• Fire spread from 8th to 23rd floor in 25 minutes at exterior of building
• 8 fatalities
First Interstate Bank
Los Angeles, CA – 1988

• Fire spread from 12th to 16th floor through improperly protected penetrations and through unprotected perimeter joint
• Lunch bags were used to protect penetrations
• One fatality
One Meridian Plaza
Philadelphia, PA – 1991

• Fire spread from 22nd to 30th floor through improperly protected penetrations and through perimeter joint
• Three fire fighter fatalities, 24 FF injuries
Code Requirements

- IBC – Breaches shall be protected
  - Section 712 – Penetrations
  - Section 713 – Fire-Resistant Joint Systems
  - Section 715 – Opening Protectives
  - Section 716 – Ducts and Air Transfer Openings
- Each type of breach has a unique fire test standard associated with it which compliments ANSI/UL 263 and ASTM E119
Code Requirements Cont.

- LSC – Breaches shall be protected
  - Penetrations
  - Joint Systems
  - Opening Protectives
  - Ducts and Air Transfer Openings
- Each type of breach has a unique fire test standard associated with it which compliments NFPA 251
Questions / Comments
Through- and Membrane-Penetration Firestop Systems
Three Elements of a Firestop System

- Floor or Wall Assembly
- Penetrating Item
- Firestopping Products
Penetrations

Code Requirements for Penetrations
Code Requirements

- IBC Section 712 – 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 - ANSI/UL 1479

• F - Flame Occurrence
• T - Heat Transmission
• L - Leakage (Optional)
• W - Water Leakage (Optional)
Fire-Resistance-Rated Construction

Establishing an L Rating
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
L (Air Leakage) Ratings
L (Air Leakage) Ratings
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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 determined 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 in UL Fire Resistance Directory along with F and T Ratings.
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UL PRODUCT SPEC™

1. HOW DO YOU WANT TO SEARCH?
   - Installation Code
   - Product Type
   - Products, Systems, or Assemblies
   - UL Product Category Code
   - Master Format Number

2. RESULTS
Questions / Comments
Opening Protectives

- Fire Door Assemblies
- Fire Window Assemblies
Opening Protective Code Requirements for Fire Door Assemblies
Code Requirements

• Section 715 of the IBC
  • 715.4.1 – Side-hinged or pivoted swinging doors shall be tested to ANSI/UL 10C or NFPA 252
  • 715.4.2 – Other types of doors shall be tested to ANSI/UL 10B or NFPA 252
Code Requirements Cont.

- 715.4.3.1 – 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
- 715.4.4 – 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 Rating
Standards

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

Temp (°F)

1700° F
1 HR

1000° F
5 Min

2000° F
4 HR

Time (Hr)
Conditions of Acceptance
Fire Door Assemblies

• Flame Passage
• Hose Stream After Full Duration Fire Exposure
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UL’s Online Search Tools

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• Product Spec
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Online Certifications Directory

• Helps you achieve code compliance
• Is continuously updated
• Needs no password
• Is free – no charge for use
• www.ul.com/database
Product Spec

• Helps identify designs meeting project parameters
• Needs no password
• Is free – no charge for use
• Covers everything discussed at this symposium
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Code Link

• Correlates model code sections to UL product categories
• Covers many model codes and editions (IBC, IFC, NEC, etc.)
• Flexible search capabilities
• Powerful tool to locate appropriate Listings
• www.ul.com/codelink
Questions / Comments
Thank You for Attending!!!

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