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 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• NFPA 251 (Withdrawn)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, 4 HR
- 1700°F, 1 HR
- 1000°F, 5 Min

Temp (°F)

Time (Hr)

0 1 2 3 4
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
• 250°F / 325°F
• Support load
• Hose stream
Where are the Listings Found?

Hard Copy

Fire Resistance Directory
Volume 1
2015

With Hourly Ratings for Beams, Floors, Roofs, Columns, Walls and Partitions

Certifications in effect as of April 8, 2015

Online

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
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!!!
Breaches in Fire-Resistance-Rated Construction Cont.

• Unsealed or improperly sealed breaches cost lives and property!
  • MGM Grand, Las Vegas, NV – Fire confined to 1st floor. Eighty-four fatalities, most on upper floors.
  • Hilton Hotel, Las Vegas, NV – Fire spread from 8th to 23rd floor in 25 minutes at exterior of building. Eight fatalities.
  • First Interstate Bank, Los Angeles, CA – Fire spread from 12th to 16th floor through improperly protected penetrations and through unprotected perimeter joint. One fatality.
  • One Meridian Plaza, Philadelphia, PA – Fire spread from 22nd to 30th floor through improperly protected penetrations and through perimeter joint. Three fatalities.
IBC Requirements

• IBC – Breaches shall be protected
  • Section 714 – Penetrations
  • Section 715 – Fire-Resistant Joint Systems
  • Section 716 – Opening Protectives
  • Section 717 – Ducts and Air Transfer Openings
IBC Requirements Cont.

- Each type of breach has a unique fire test standard associated with it which compliments ANSI/UL 263 and ASTM E119

- Where breach occurs in, through or between assemblies intended to restrict the movement of smoke, the IBC also sets limits on the leakage through the breach
LSC Requirements

• LSC – Breaches shall be protected
  • Penetrations
  • Joint Systems
  • Opening Protectives
  • Ducts and Air Transfer Openings
LSC Requirements Cont.

• Each type of breach has a unique fire test standard associated with it which compliments ANSI/UL 263 and ASTM E119

• Where breach occurs in, through or between assemblies intended to restrict the movement of smoke, the LSC also sets limits on the leakage through the breach.
Firestop Systems

Code Requirements for Penetrations of Smoke Resistant Construction
Firestop Systems

• Three elements
  • Floor or Wall Assembly
  • Penetrating Item
  • Firestopping Products

• Tested in accordance with ANSI/UL 1479
Ratings

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

• IBC 714.4.4 – Penetrations in smoke barriers shall have an L Rating at ambient and 400°F
  • Max 5.0 CFM / sq ft of opening for each system
  • Cumulative 50 CFM for all systems in any 100 sq ft of barrier

• LSC 8.5.6.2 – Penetrations shall be protected by a system or material capable of restricting the transfer of smoke
Establishing Leakage Ratings
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
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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 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
Where are the Listings Found?

Hard Copy

Online

FIRE RESISTANCE DIRECTORY
VOLUME 1
2015

With Hourly Ratings for Beams, Floors, Roofs, Columns, Walls and Partitions

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Questions / Comments
Fire Resistive Construction

UL’s Online Search Tools
UL’s Online Search Tools

• Online Certifications Directory
• Product Spec
• Code Link
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
• www.ul.com/productspec
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