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 E 119

• 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 E 119)
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 E 119
• NFPA 251
Building Components

• Columns
• Beams
• **Floor/Ceilings or Roof/Ceilings**
• Walls
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 Listings Found?

- **Hard Copy**
  - UL Fire Resistance Directory Volume 1
  - 2012

- **CD-ROM**
  - 2012 Directories
    - Building Materials
    - Roofing Materials & Systems
    - Fire Protection Equipment
    - Fire Resistance

- **Online**
  - UL Online Certification Directory
  - Search by Company Name, City, U.S. State, U.S. Zip Code, Country, Region
  - Links to Specific Searches
  - Links of Interest
  - UL List of Recognized Standards
  - UL Registered Trademarks
  - UL Recognized Components
  - UL Recognized for Canada

Certifications in effect as of January 3, 2012.
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.
Code Requirements

- IBC – Breaches shall be protected
  - Section 713 – Penetrations
  - Section 714 – 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 E 119
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 713 – Firestop systems shall be protected by an approved penetration firestop system installed as tested in accordance with ASTM E 814 or UL 1479
- LSC – Firestop systems or devices shall be tested in accordance with ASTM E 814 or UL 1479
Ratings

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

Establishing F and T Ratings
Standards

- ANSI / UL 1479
- ASTM E 814
Full-Scale Wall Assembly
Small-Scale Wood Floor Assembly
Cables Through Wood Floor
Conduit Through Wood Floor
Time - Temperature Curve

- 2000° F (4 HR)
- 1700° F (1 HR)
- 1000° F (5 Min)

Temp (°F)

- 2000
- 1800
- 1600
- 1400
- 1200
- 1000
- 800
- 600
- 400
- 200

Time (Hr)

- 0
- 1
- 2
- 3
- 4
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
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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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 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 in UL Fire Resistance Directory along with F and T Ratings
Where Are Listings Found?

Hard Copy

CD-ROM

Online
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
• 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

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

Temp (°F)

Time (Hr)
Conditions of Acceptance
Fire Door Assemblies

• Flame Passage
• Hose Stream After Full Duration Fire Exposure
Where Are Listings Found?

Hard Copy

CD-ROM

Online
Questions / Comments
Fire Resistive Construction

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

• Online Certifications Directory
• ULtimate Fire Wizard
• Code Correlation Database
Online Certifications Directory

- Helps you achieve code compliance
- Is continuously updated
- Needs no password
- Is free – no charge for use
- [www.ul.com/database](http://www.ul.com/database)
ULTimate Fire Wizard

- Helps identify designs meeting project parameters
- Needs no password
- Is free – no charge for use
- Saves search results in Design Lists
- [www.ul.com/firewizard](http://www.ul.com/firewizard)
Code Correlation Database

• 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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