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
Time - Temperature Curve

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

FIRE RESISTANCE DIRECTORY
VOLUME 1
2012

Certifications in effect as of January 3, 2012

CD-ROM

Online
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

- 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
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
L (Air Leakage) Ratings
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 determine at 400°F
• Incidental chamber leakage rechecked after cooling
Test Procedure Cont.

• Firestop system assigned L Rating at ambient and 400ºF, 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 minutes
- 1700°F for 1 hour
- 2000°F for 4 hours
Conditions of Acceptance
Fire Door Assemblies

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

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CD-ROM

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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](http://www.ul.com/codelink)
Questions / Comments
Thank You for Attending!!!

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