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• NFPA 251 (Withdrawn)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

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

Temperature (°F):
- 0
- 200
- 400
- 600
- 800
- 1000
- 1200
- 1400
- 1600
- 1800
- 2000

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 Listings Found?

Hard Copy

CD-ROM

Online
Questions / Comments
Breaches in Fire-Resistance-Rated Construction

- Penetrations
- Joint Systems
- Opening Protectives
- Ducts and Air Transfer Openings
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 714 – Penetrations
  • Section 715 – Fire-Resistant Joint Systems
  • Section 716 – Opening Protectives
  • Section 717 – Ducts and Air Transfer Openings

• Each type of breach has a unique fire test standard associated with it which complements 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 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 - 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
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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 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 Listings Found?

Hard Copy

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Online
Questions / Comments
Opening Protectives

- Fire Door Assemblies
- Fire Window Assemblies
Opening Protective

Code Requirements for Fire Door Assemblies
Code Requirements

• Section 716 of the IBC
  • 716.5.1 – Side-hinged or pivoted swinging doors shall be tested to ANSI/UL 10C or NFPA 252
  • 716.5.2 – Other types of doors shall be tested to ANSI/UL 10B or NFPA 252
Code Requirements Cont.

• 716.5.3.1 – 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

• 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 Rating
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 Are Listings Found?

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Questions / Comments
Fire Resistive Construction

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UL’s Online Search Tools

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- Product Spec
- Code Link
Online Certifications Directory

- Helps you achieve code compliance
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Product Spec

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- Covers many model codes and editions (IBC, IFC, NEC, etc.)
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Questions / Comments
Thank You for Attending!!!

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