Testing of Fire Resistance and Smoke Resistant Assemblies

Rich Walke
UL Codes and Advisory Services
Code Requirements for Fire and Smoke Protection Features
Constructions Requiring Protection

- Building Elements
  - Beams
  - Columns
  - Horizontal Assemblies
  - Walls
- Through- and Membrane-Penetrations
- Fire-resistant joint systems (i.e. construction joints and perimeter joints)
- Opening protectives (i.e. fire-rated doors and windows)
- Air ducts and air transfer openings (i.e. dampers)
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- NFPA 251 (Withdrawn)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

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

Temperature (°F) vs. Time (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 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
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, or
  - 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
Firestop Systems

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
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 400°F, by subtracting incidental chamber leakage from test sample leakage

• L Ratings of firestop systems are published in our product directories along with the F and T Ratings
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 Online Certifications Directory*

*UL PRODUCT SPEC™*

Quickly find, specify, or verify UL Certified products for your projects.
Questions / Comments
Breaches in Fire-Resistance-Rated Construction

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 1\textsuperscript{st} floor. Eighty-four fatalities, most on upper floors.
  • Hilton Hotel, Las Vegas, NV – Fire spread from 8\textsuperscript{th} to 23\textsuperscript{rd} floor in 25 minutes at exterior of building. Eight fatalities.
  • First Interstate Bank, Los Angeles, CA – Fire spread from 12\textsuperscript{th} to 16\textsuperscript{th} floor through improperly protected penetrations and through unprotected perimeter joint. One fatality.
  • One Meridian Plaza, Philadelphia, PA – Fire spread from 22\textsuperscript{nd} to 30\textsuperscript{th} 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.
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
Thank You for Attending!!!

Rich Walke
Codes and Advisory Services Department
Underwriters Laboratories
333 Pfingsten Road
Northbrook, IL  60062
Richard.N.Walke@UL.com
(847) 664-3084

www.ul.com