‘D’esign & Testing, Codes – How Do We Achieve Fire-Resistance- or Smoke-Resistance-Ratings?

FCIA Virtual ‘DIIM’ Firestop & Effective Compartmentation Symposium Middle East

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Building & Fire Code Requirements

- UAE Fire and Life Safety Code
  - New and Existing Buildings – Chapter 1
  - Existing Building Maintenance – Chapter 1, Section 21
- International Codes
  - New and Existing Buildings – International Building Code – Chapter 7
  - International Fire Code – Chapter 7
- NFPA
  - New and Existing Buildings – NFPA 5000 & 101 – Chapter 8
  - Fire Code – NFPA 1 – Chapter 12

- Minimum requirements - Construction & Maintaining Protection
IBC Fire and Smoke Protection Features

- Fire-resistance-rated assemblies:
  - Structural Members
  - Exterior Walls
  - Fire Walls
  - Fire Barriers
  - Fire Partitions
  - Smoke Barriers
  - Horizontal Assemblies
  - Shaft Enclosures

- Smoke-resistant assemblies:
  - Smoke Barriers – Intended to “… restrict movement of smoke.”
  - Smoke Partitions – Intended to “… limit the transfer of smoke.”
Code Referenced Test Standard

- **Referenced Test Standards**
  - **Structural Elements & Assemblies** – ASTM E119 / UL 263
  - **Fire & Smoke Barriers** – ASTM E119 / UL 263
  - **Firestopping** – ASTM E814 / UL 1479, ULC-S115, FM 4990, ASTM E1966 / UL 2079, ASTM E2307, E2837, E3037, …test method…”
  - **Swinging/Rolling Fire Doors** – UL 10B, 10C, NFPA 257
  - **Fire Rated Glazing** – UL 9, NFPA 252
  - **Fire/Smoke Dampers** – UL 555, UL 555S, UL 555C

- **SYSTEM Testing** = Suitability statement for use of a product in a specific *system*/design application
Fire-Resistance-Rated Construction

Establishing Fire-Resistance Ratings
Fire-Resistance

• Expressed as an Hourly Time Period
• Ratings range from 1/2 to 4 hours
• Contain Fire to Room or Floor of Origin and Maintain Structural Integrity
Standards

- 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- NFPA 251 (Withdrawn)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
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
Breaches in Fire-Resistance-Rated Construction

- Penetrations
- Joint Systems
- Opening Protectives
- Ducts and Air Transfer Openings
Requirements for Protecting Breaches

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

  • **Penetrations**
    • Fire / Hose Stream Test Standards
      • ASTM E814 / UL 1479 / ULC-S115 (Fire Testing), ASTM E2226 (Hose Stream)
    • Smoke Leakage Standard
      • UL 1479 / ULC-S115
Requirements for Protecting Breaches

- **Fire-Resistant Joint Systems**
  - Fire / Hose Stream Test Standards
    - ASTM E1966 / UL 2079 / ULC-S115 (Fire Testing of Construction Joints), ASTM E2226 (Hose Stream), ASTM E2307 (Perimeter Fire Containment), ASTM E2837 (Cont. HW Joints)
  - Smoke Leakage Standard
    - UL 2079
Requirements for Protecting Breaches

• Opening Protectives
  • Fire / Hose Stream Test Standards
    • NFPA 252 (Fire Doors), NFPA 257 (Fire Windows, FPR Glazing), UL 9 (Fire Windows, FPR Glazing), UL 10B and 10C (Fire Doors), UL 263 (FRR Glazing)
  • Smoke Leakage Standard
    • UL 1784
Requirements for Protecting Breaches

• **Duct and Air Transfer Openings**
  • Fire / Hose Stream Test Standards
    • UL 555 (Fire, Combination and Corridor Dampers), UL 263 and 555C (Ceiling Radiation Dampers)
  • Smoke Leakage Standard
    • UL 555S (Smoke, Combination and Corridor Dampers)
Establishing an L Rating
L (Air Leakage) Ratings

- Optional L Rating methodology added to ANSI/UL 1479 in 1993
- Leakage determined at 0.3 in. WC
- Tested at Ambient and 400ºF
- 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 along with F and T Ratings
Questions??
Thanks for Attending!!!

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