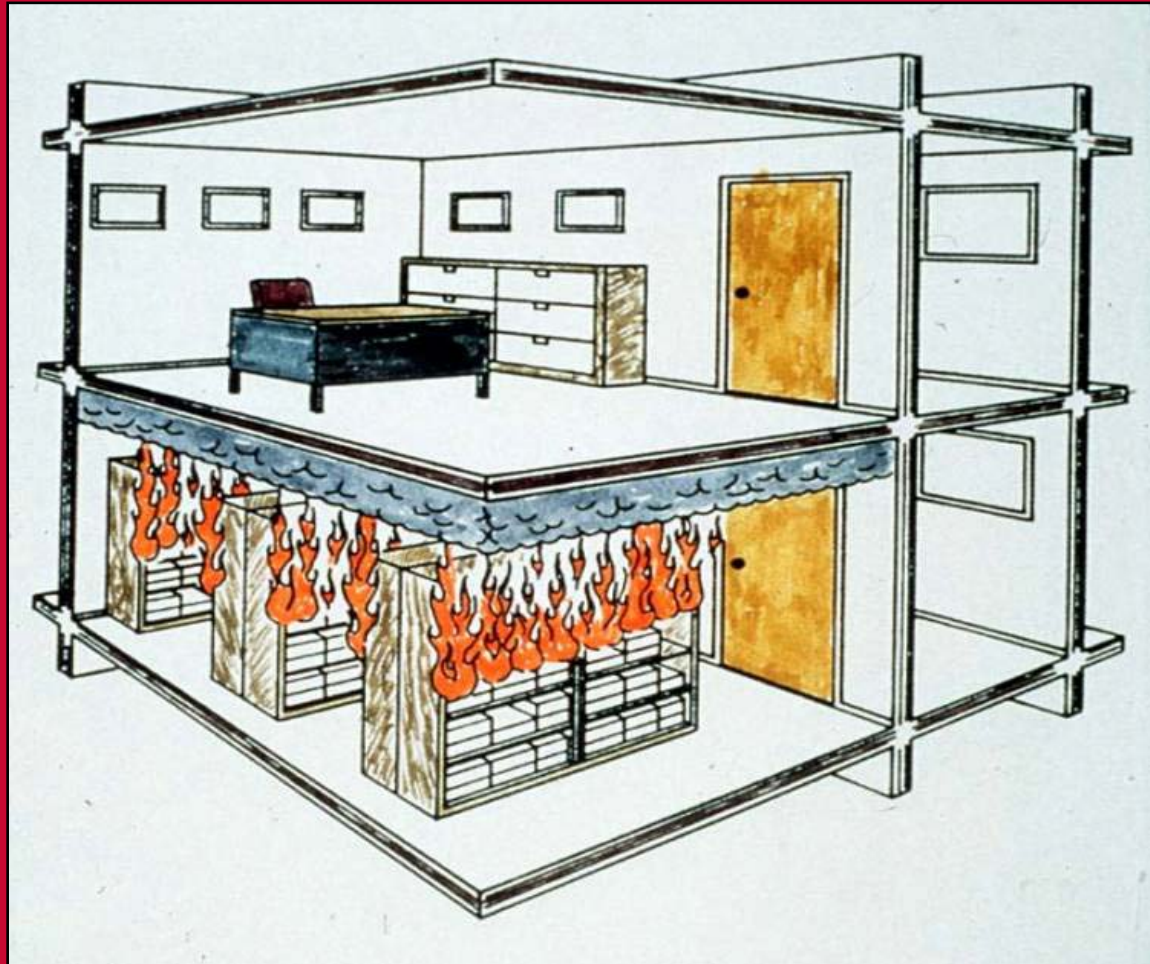


Testing of Fire Resistance and Smoke Resistant Assemblies



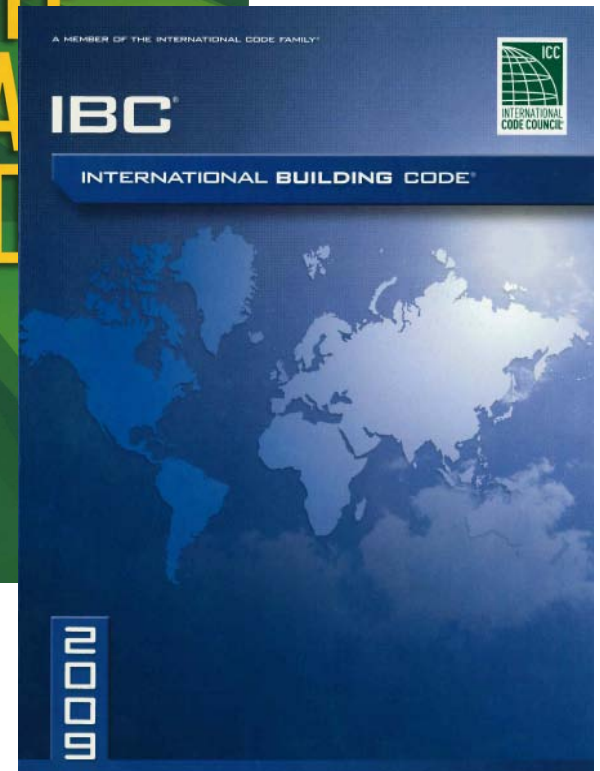
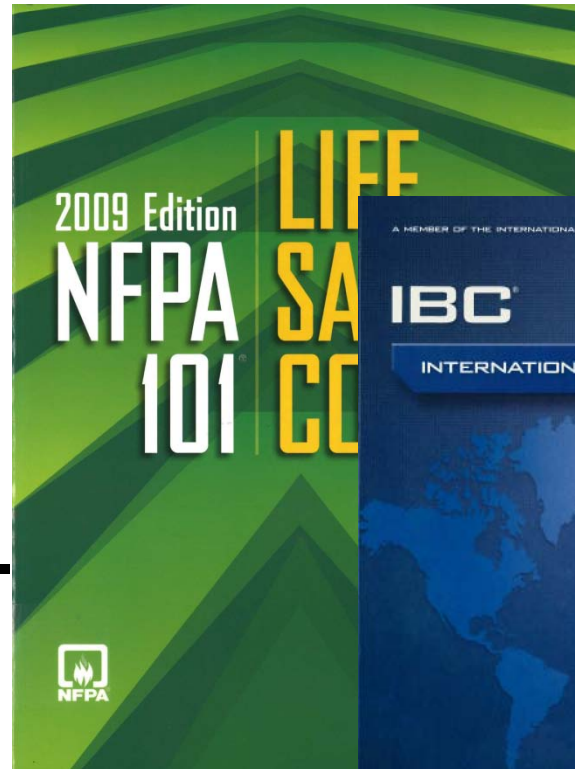
Rich Walke
UL Regulatory Services

Fire-Resistance-Rated Construction



Fire-Resistance-Rated Construction

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

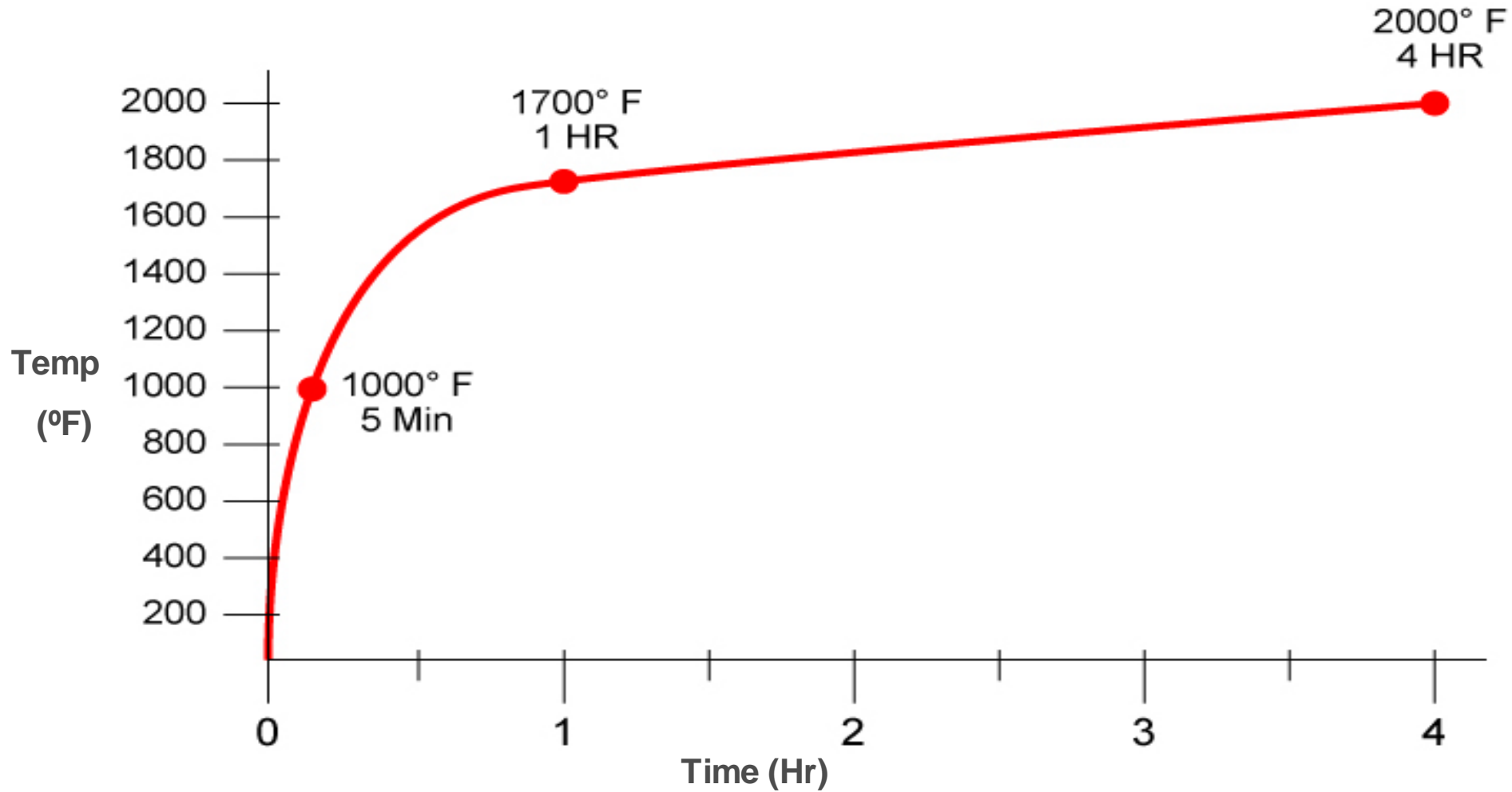
- ANSI/UL 263
- ASTM E 119
- NFPA 251



Building Components

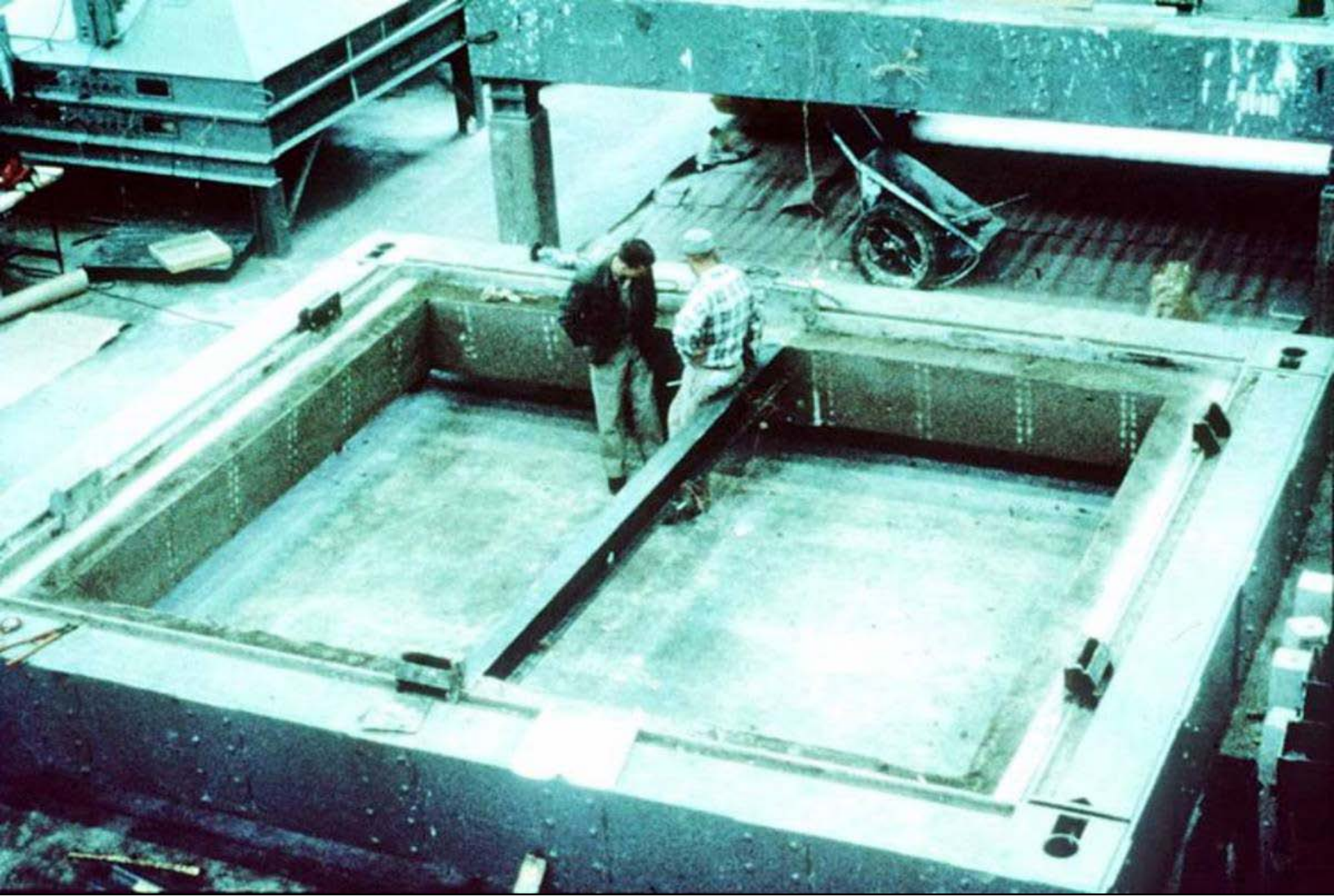
- Columns
- Beams
- Floor/Ceilings or Roof/Ceilings
- Walls

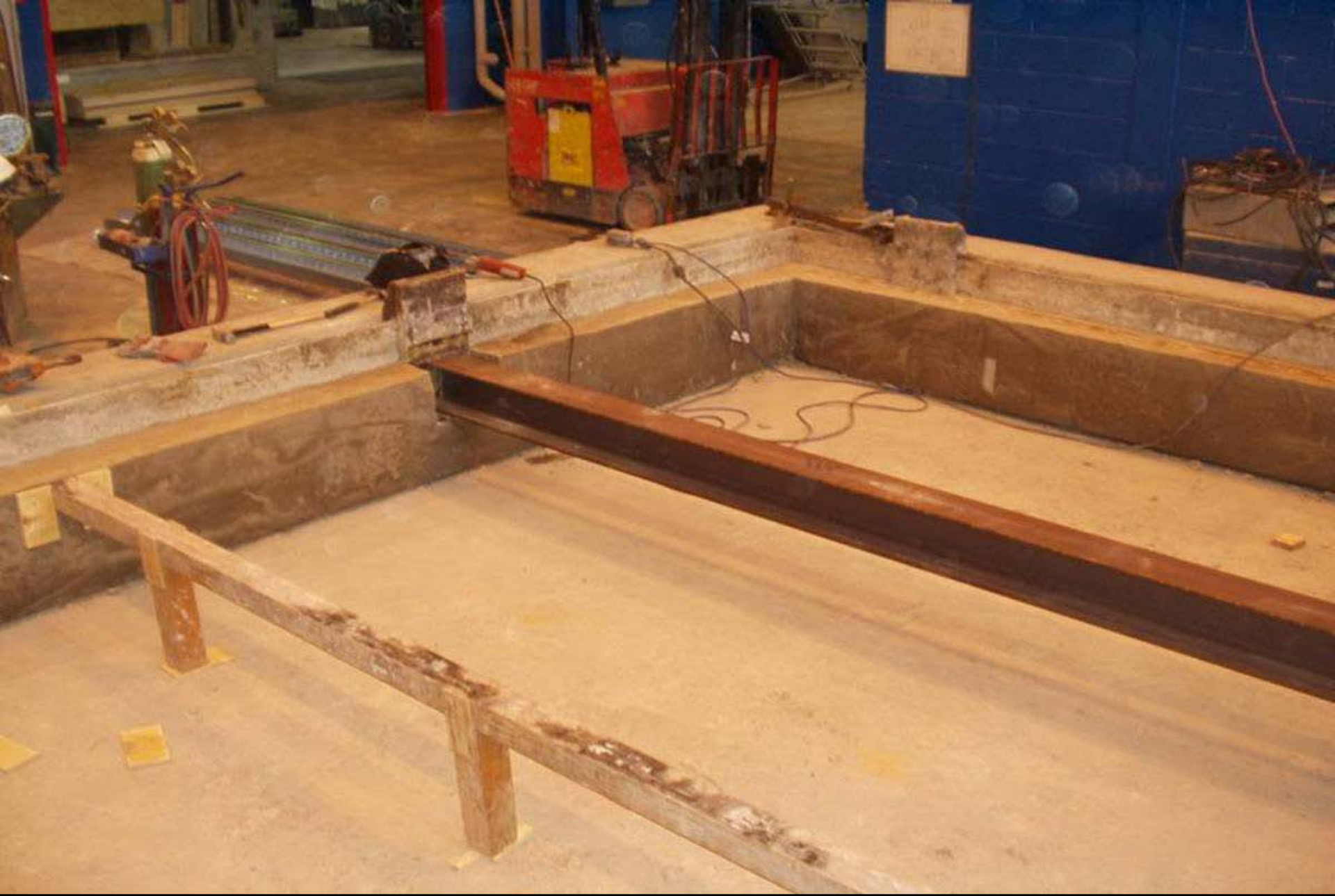
Time - Temperature Curve



Floor/Ceiling or Roof/Ceilings

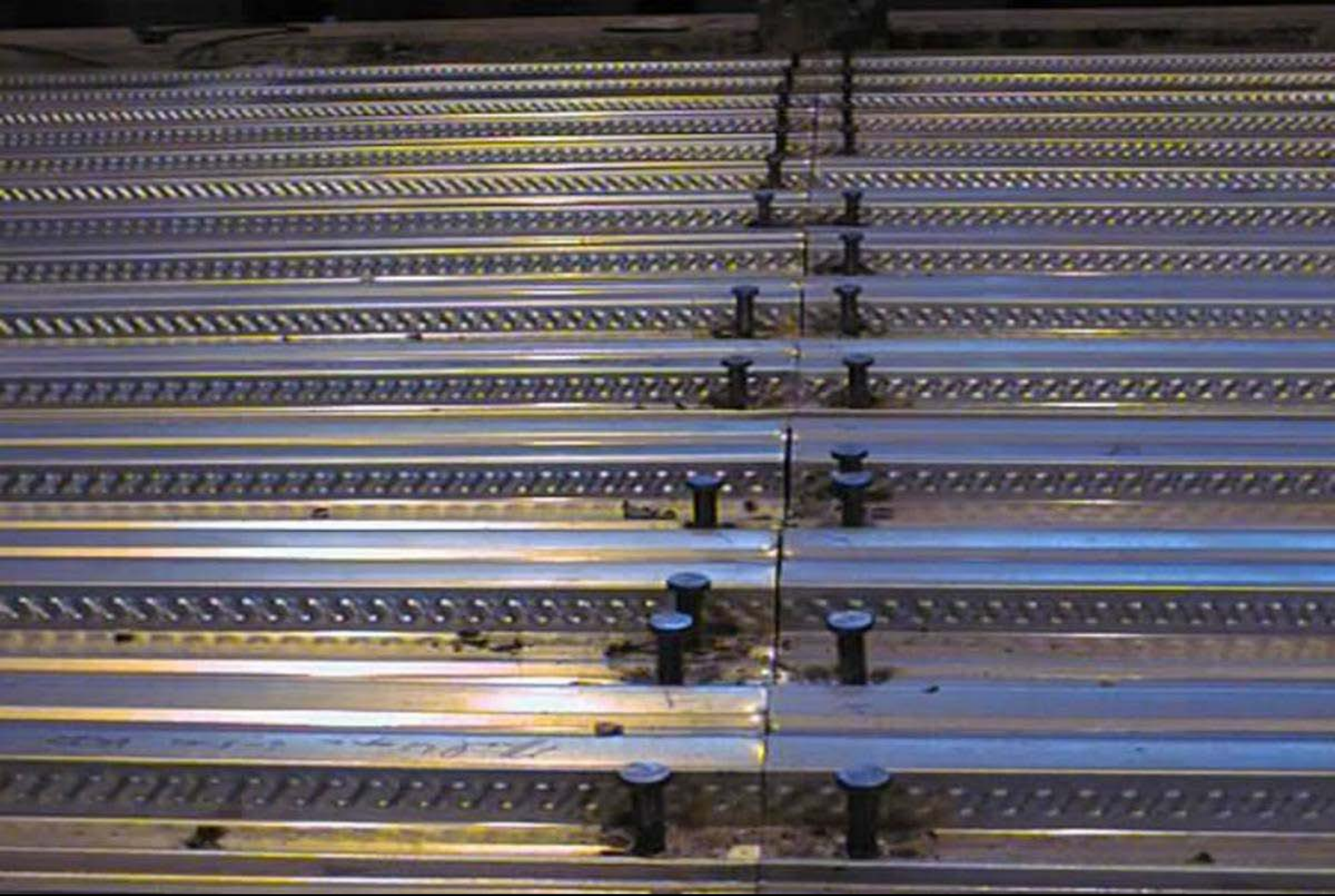
- Sample size – 180 sq ft / 12 ft
- Load applied – Per design























Conditions of Acceptance Floor/Ceilings or Roof/Ceilings

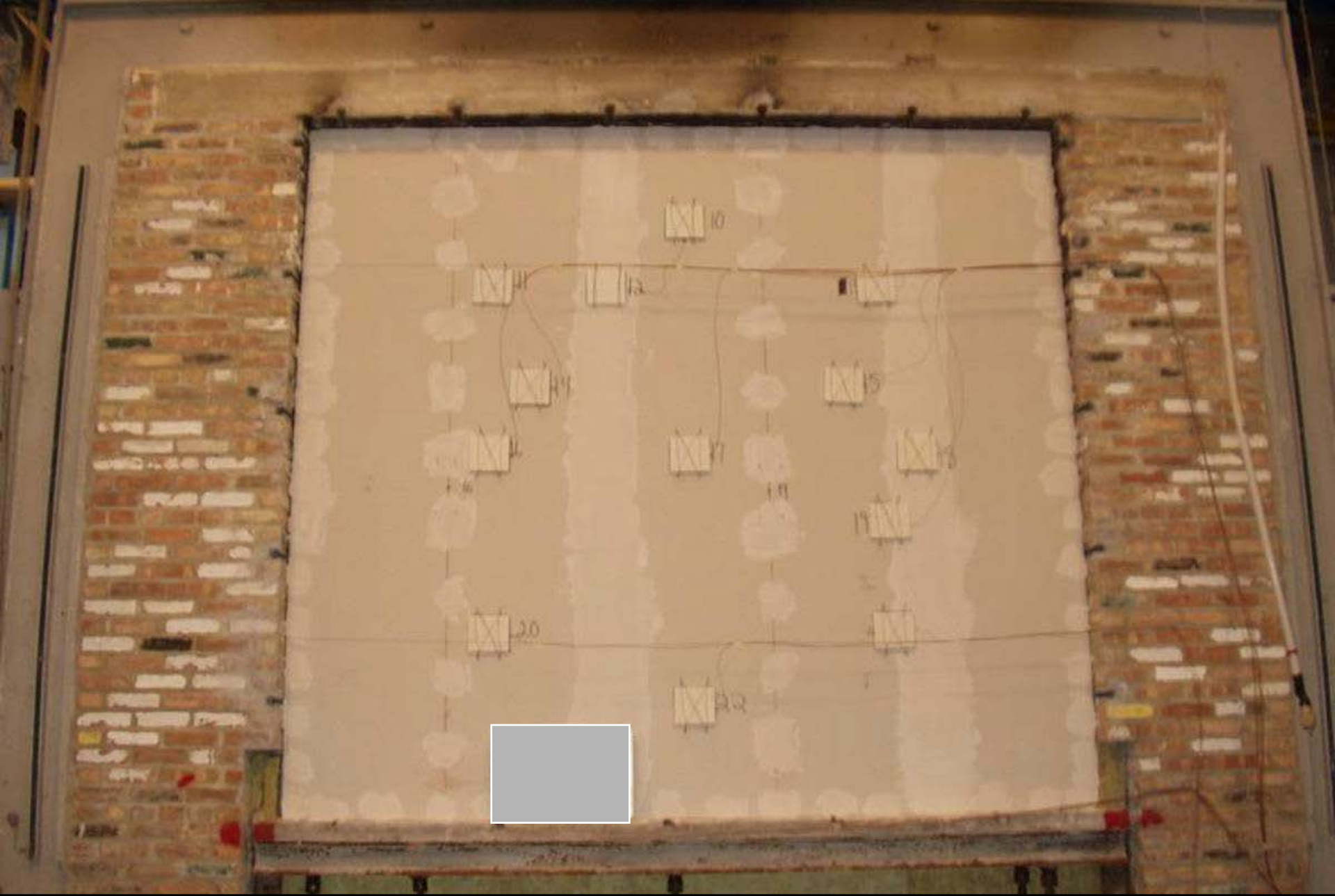
- Support load
- Flame passage
- 250°F / 325°F
- Support temperatures





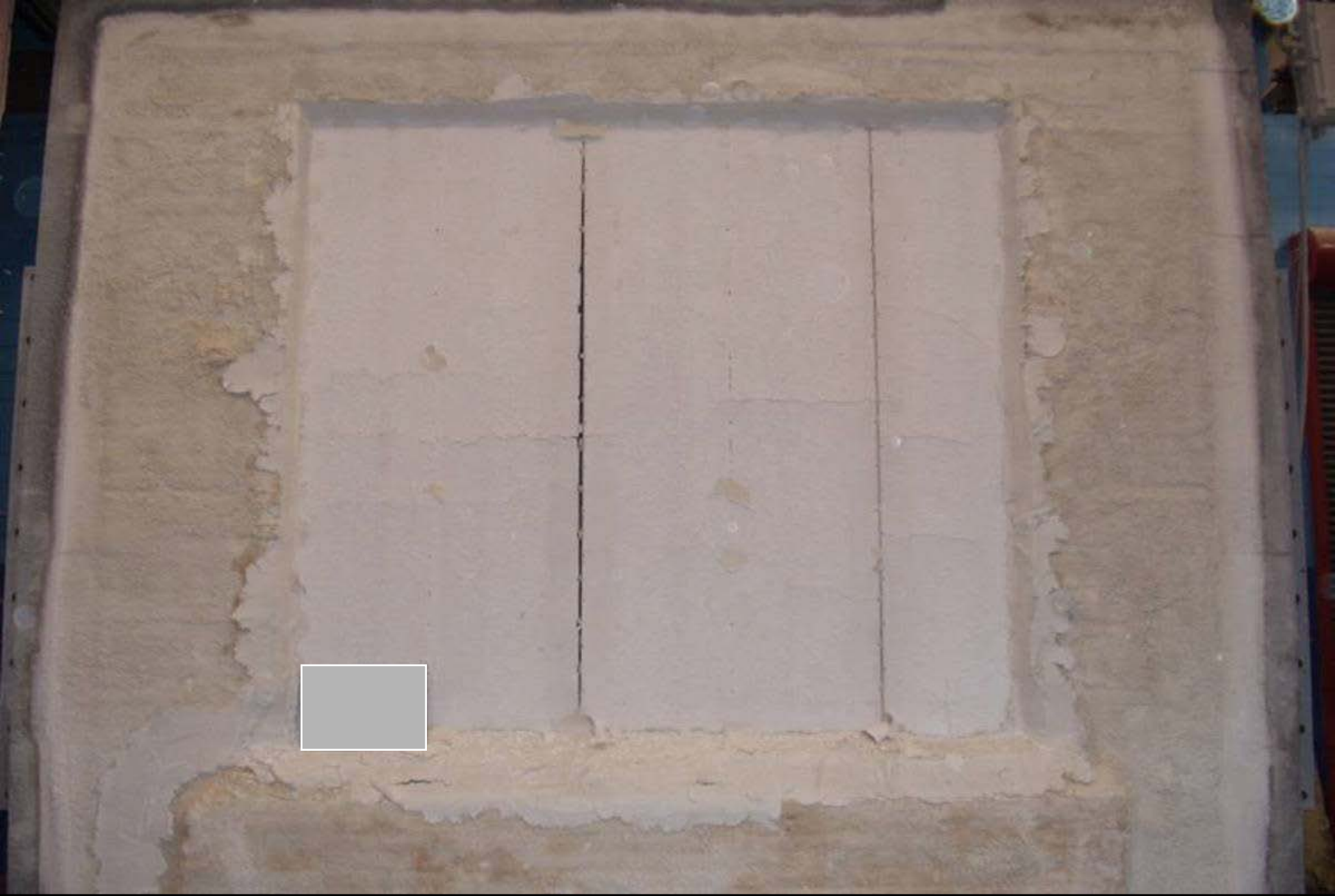
Walls

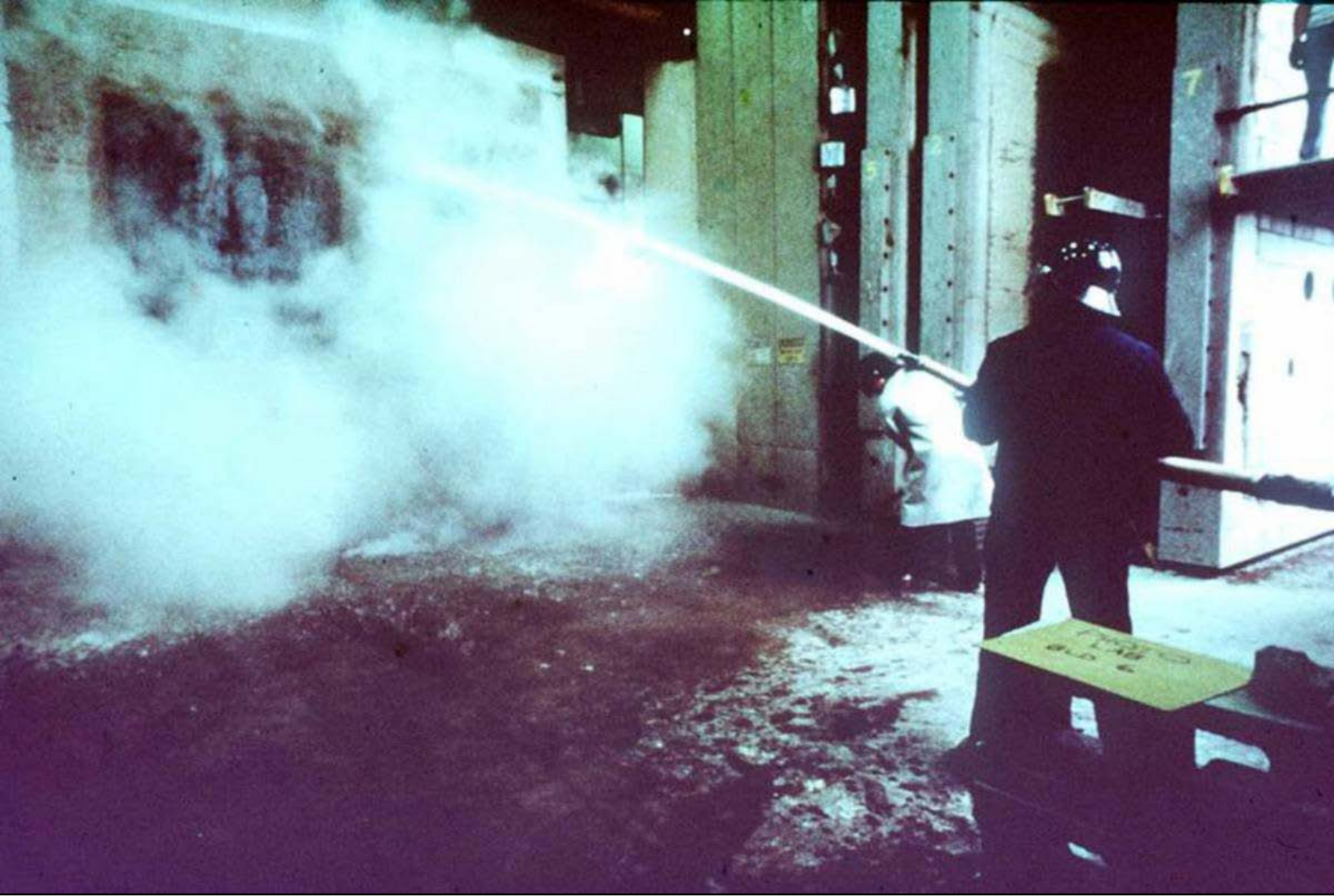
- Sample size - 100 sq ft / 9 ft
- Load applied - Per design













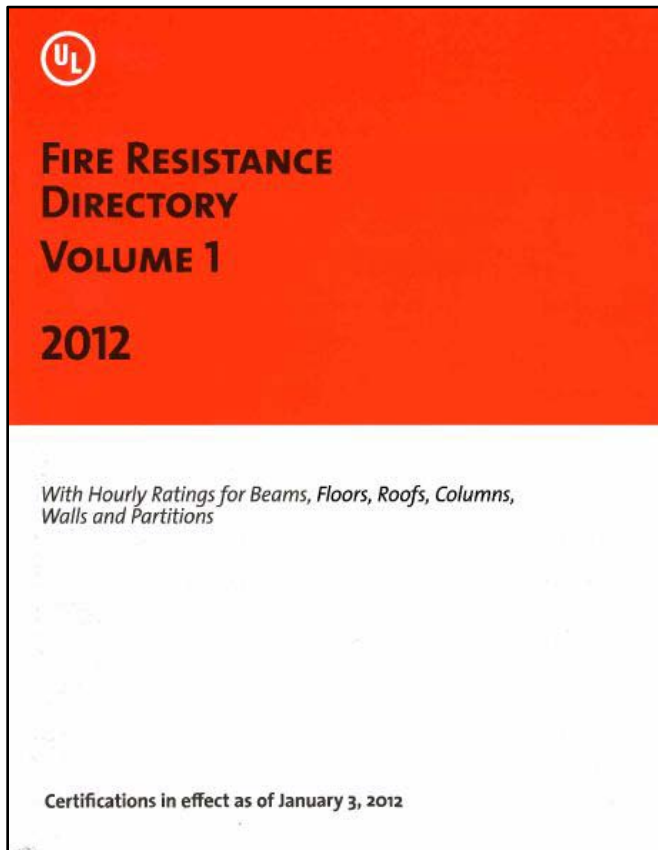
Conditions of Acceptance – Walls

- Flame passage
- 250°F / 325°F
- Support load
- Hose stream



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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

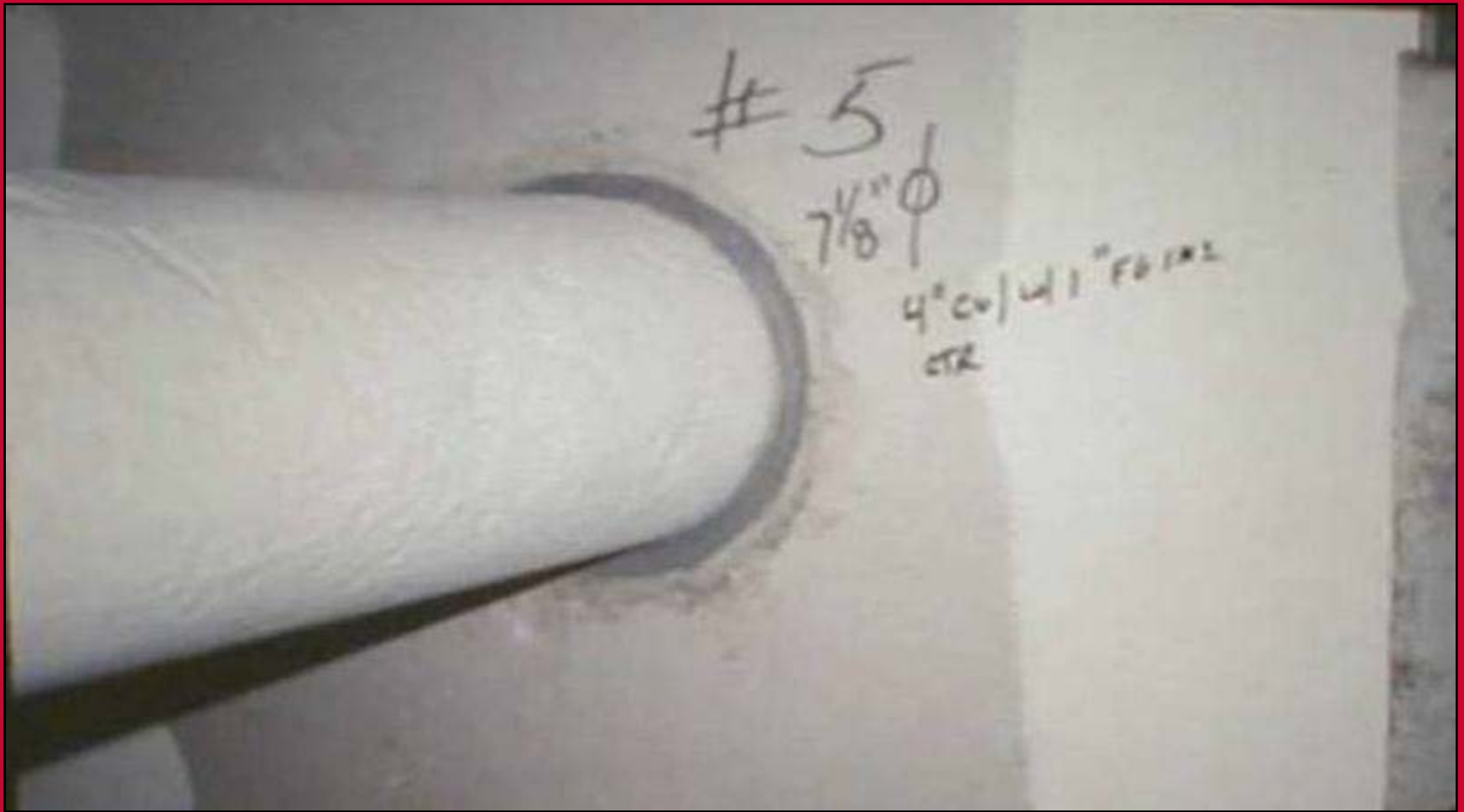
Code Requirements Cont.

- 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

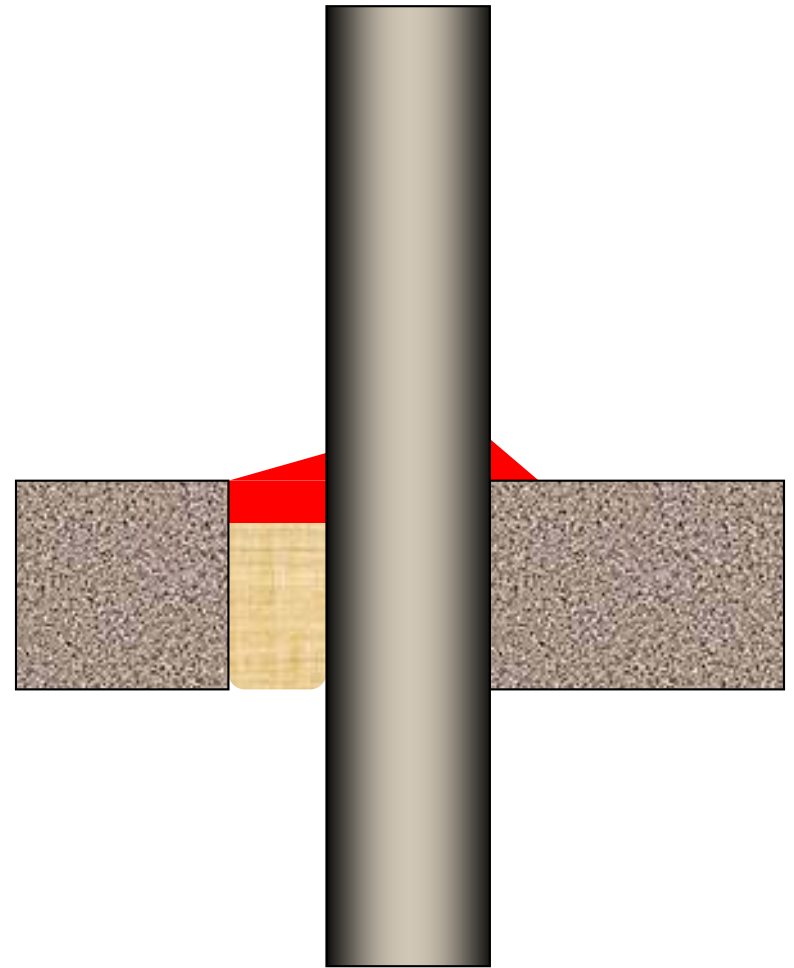


Through- and Membrane-Penetration Firestop Systems



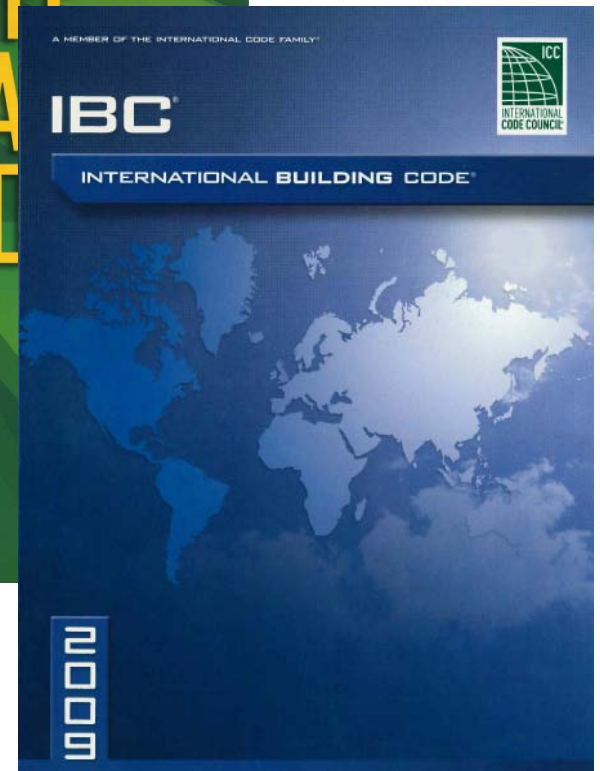
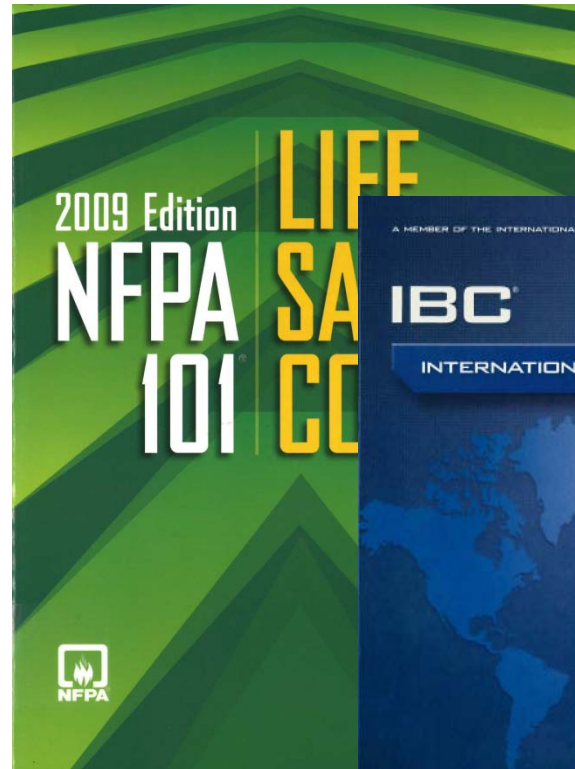
Three Elements of a Firestop System

- 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

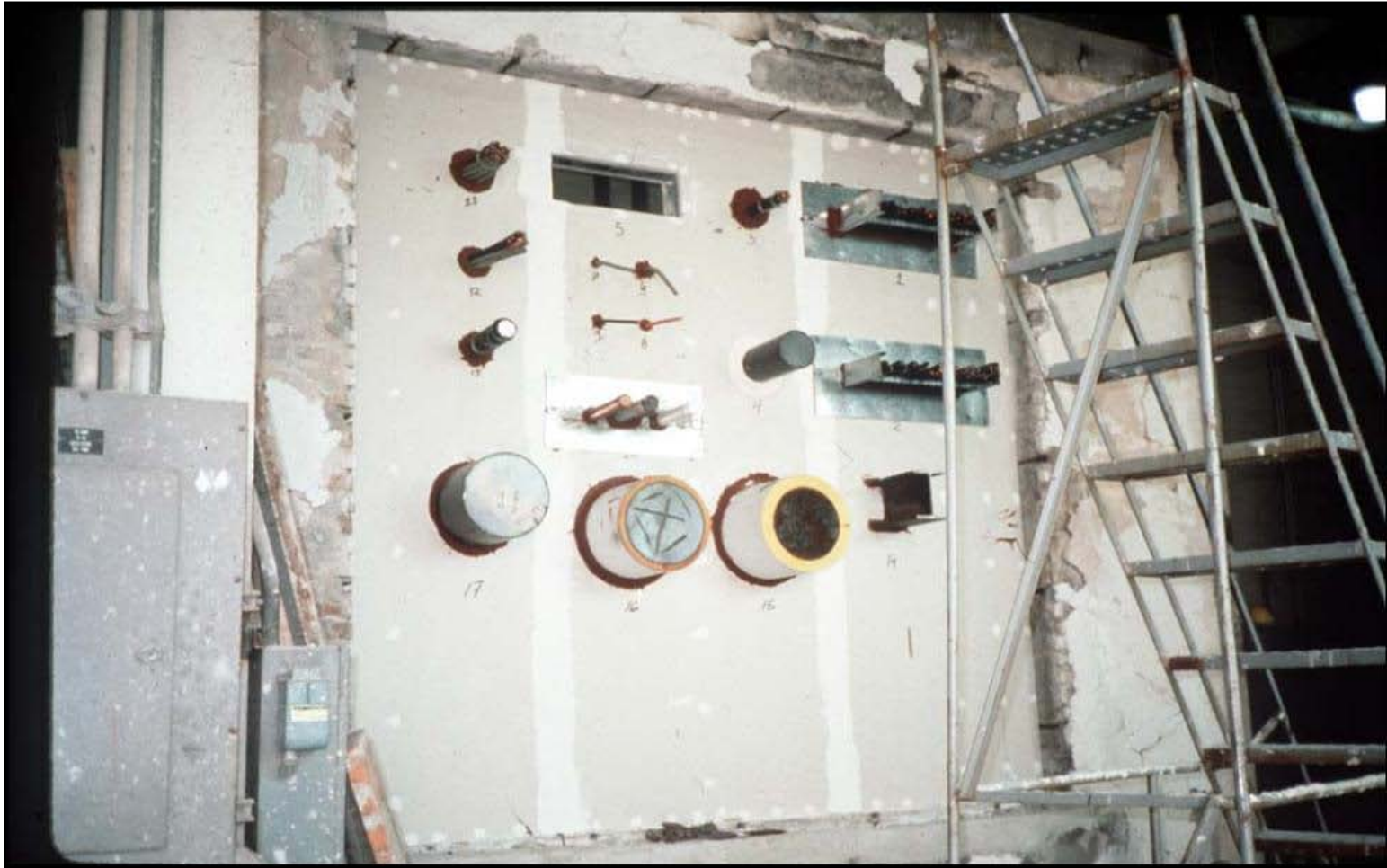


Standards

- ANSI / UL 1479
- ASTM E 814



Full-Scale Wall Assembly



Small-Scale Wood Floor Assembly



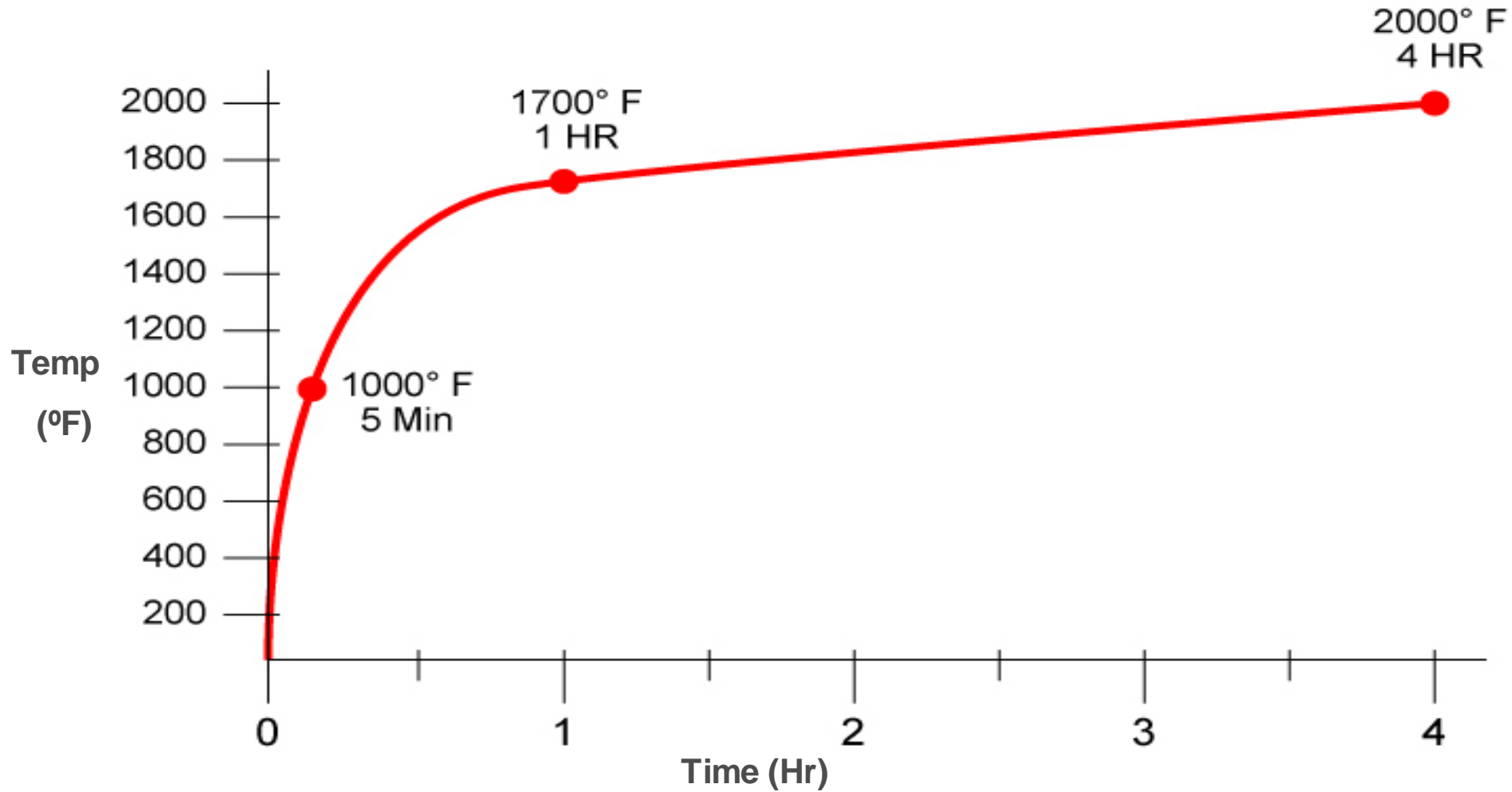
Cables Through Wood Floor



Conduit Through Wood Floor



Time - Temperature Curve



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



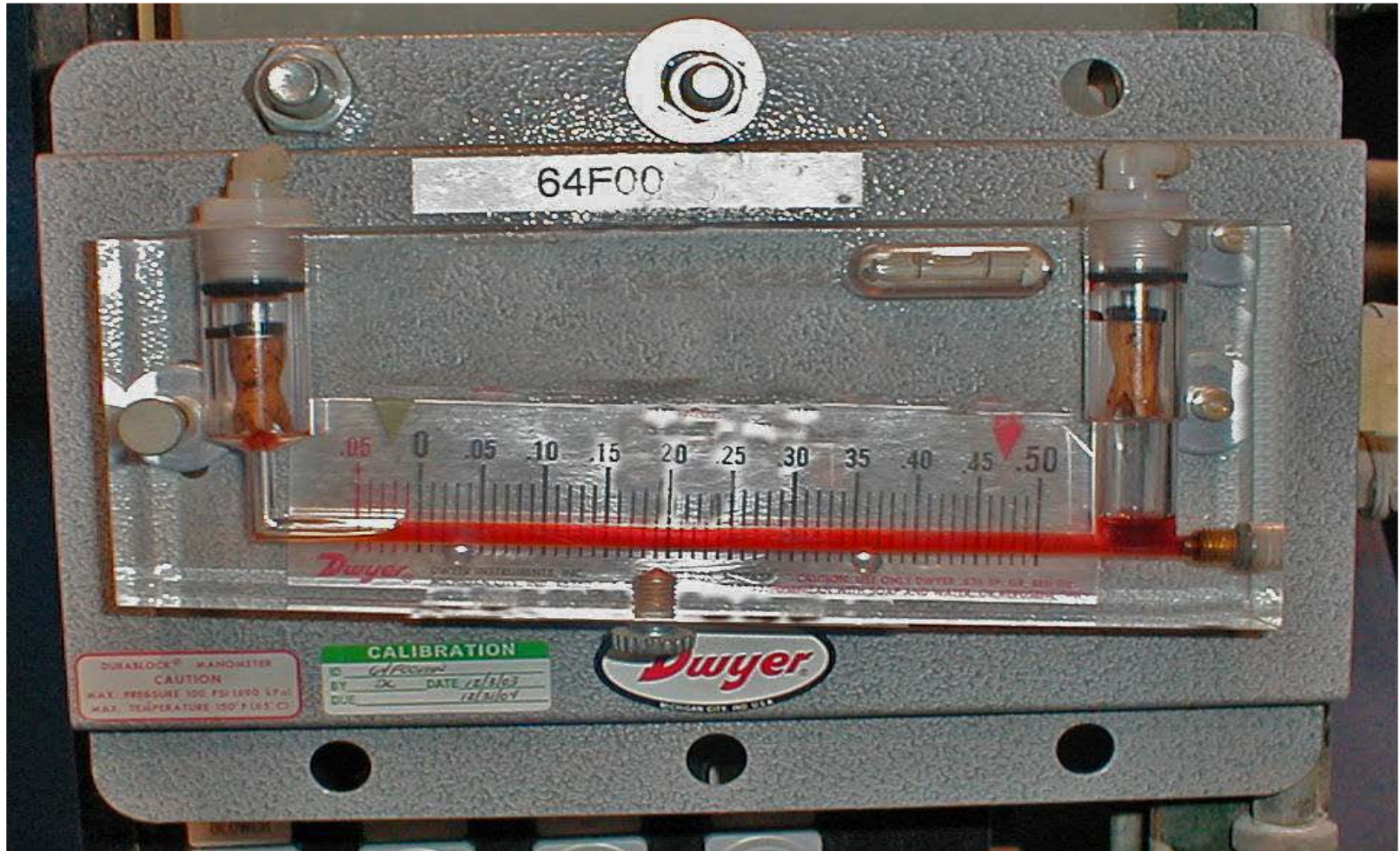
L (Air Leakage) Ratings



L (Air Leakage) Ratings



L (Air Leakage) Ratings



Test Procedure

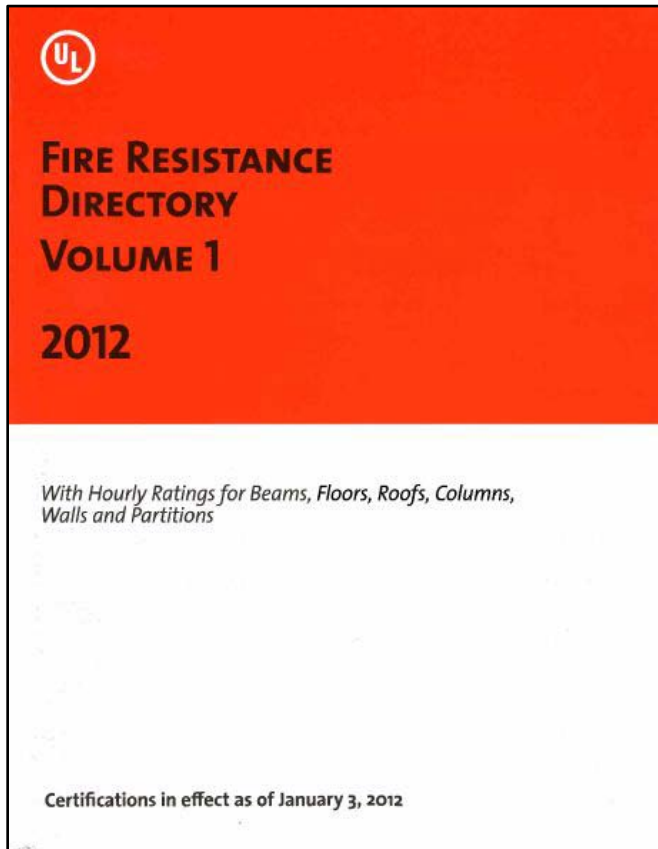
- Incidental chamber leakage determined using blank slab
- Air leakage of test sample determined at ambient temperature
- Air leakage of test sample determine at 400°F
- Incidental chamber leakage rechecked after cooling

Test Procedure Cont.

- Firestop system assigned L Rating at ambient and 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

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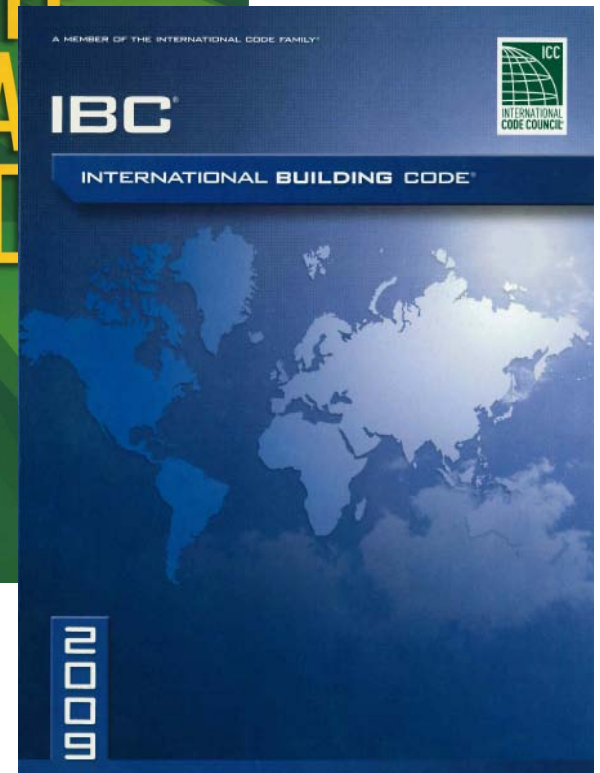
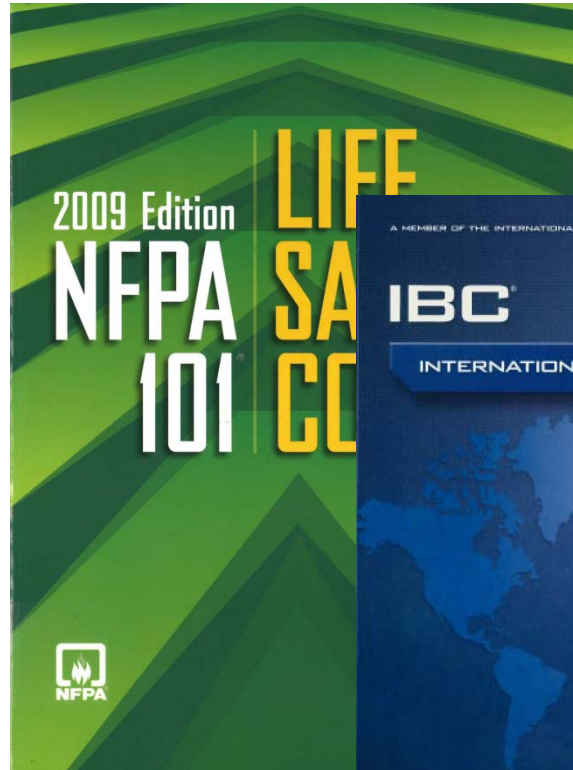
Opening Protectives

- 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



Code Requirements Cont.

- 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

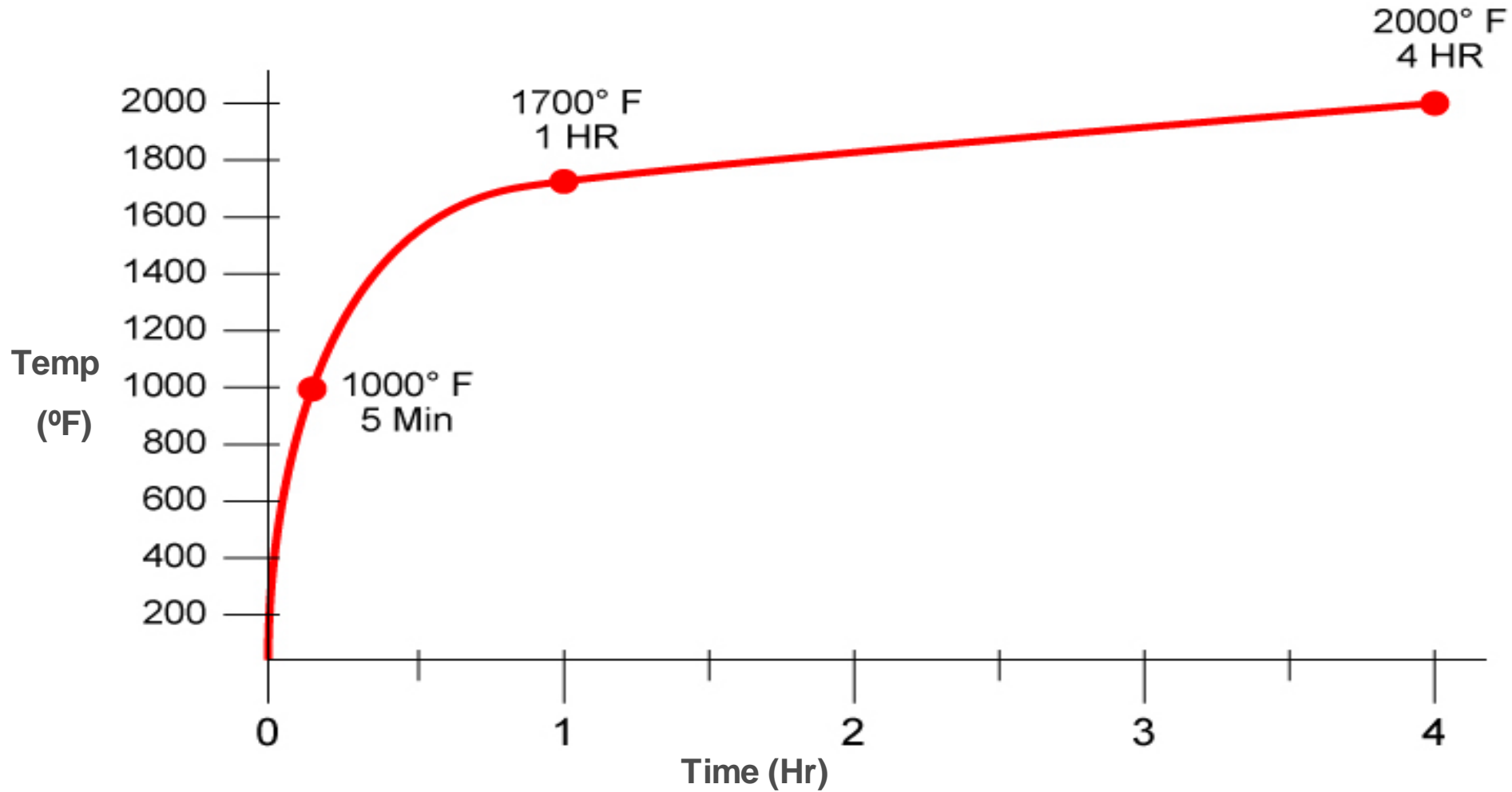


Standards

- ANSI / UL 10B
- ANSI / UL 10C
- NFPA 252



Time - Temperature Curve









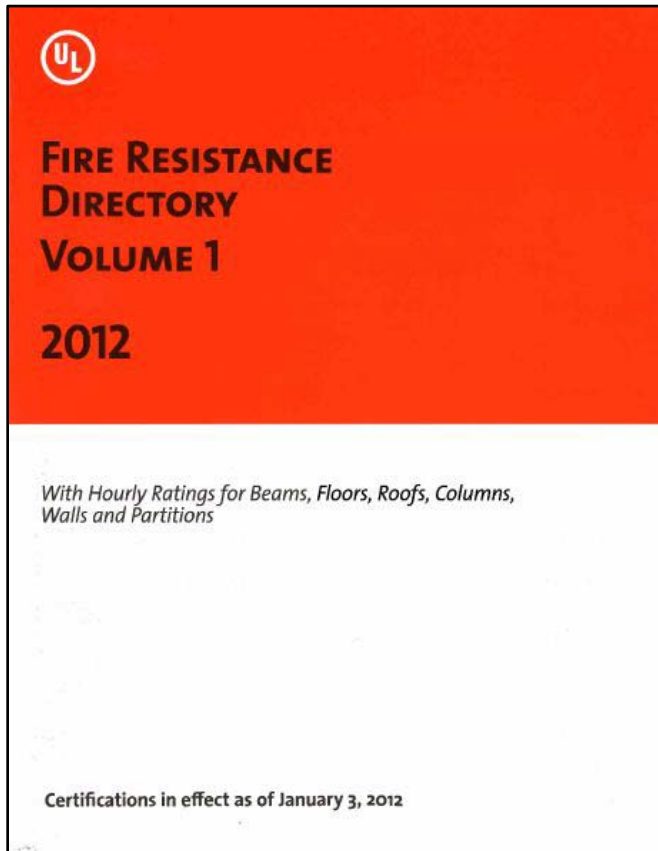
Conditions of Acceptance Fire Door Assemblies

- Flame Passage
- Hose Stream After Full Duration Fire Exposure



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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

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



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!!!

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

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