

Testing of Fire Resistance and Smoke Resistant Assemblies



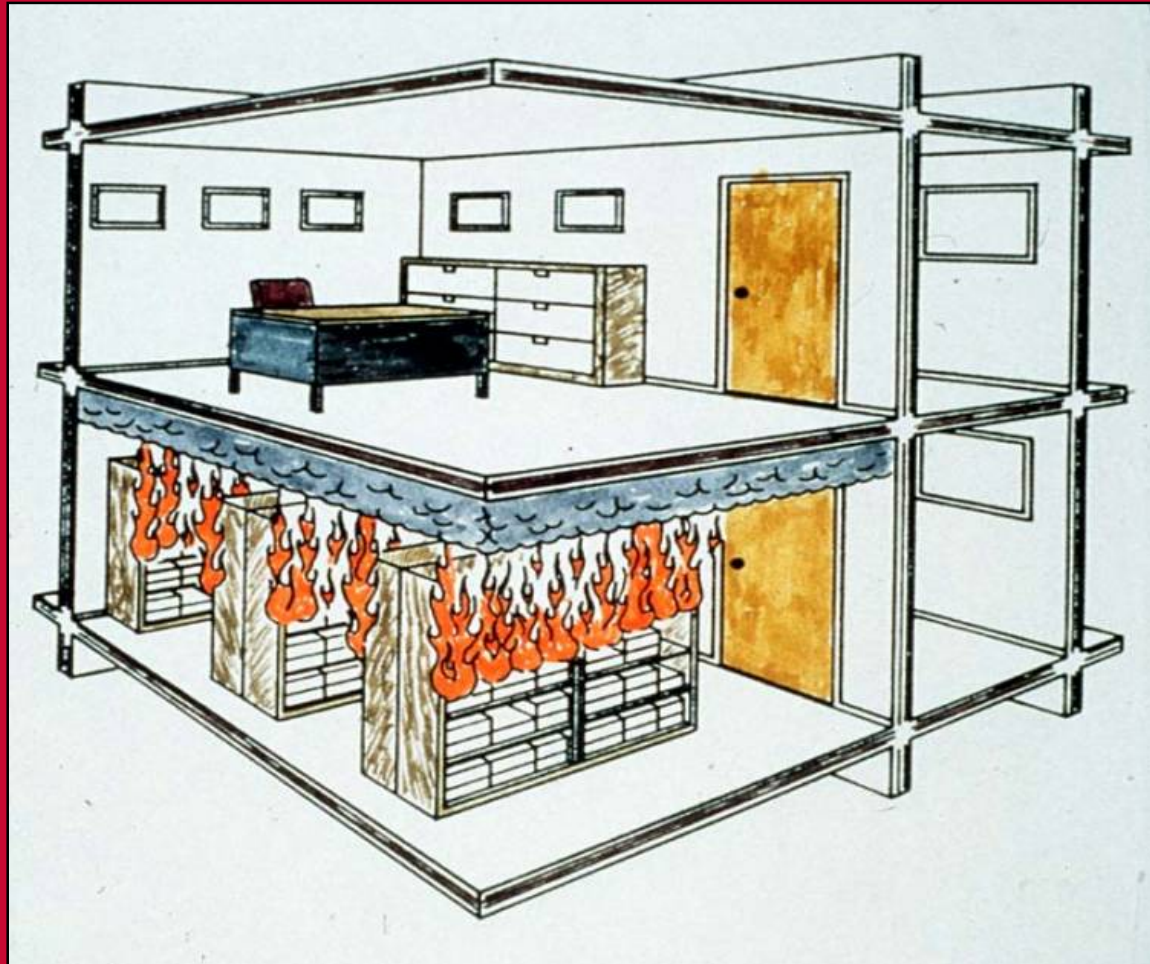
Jon Roberts

UL Codes and Advisory Services

Fire Containment

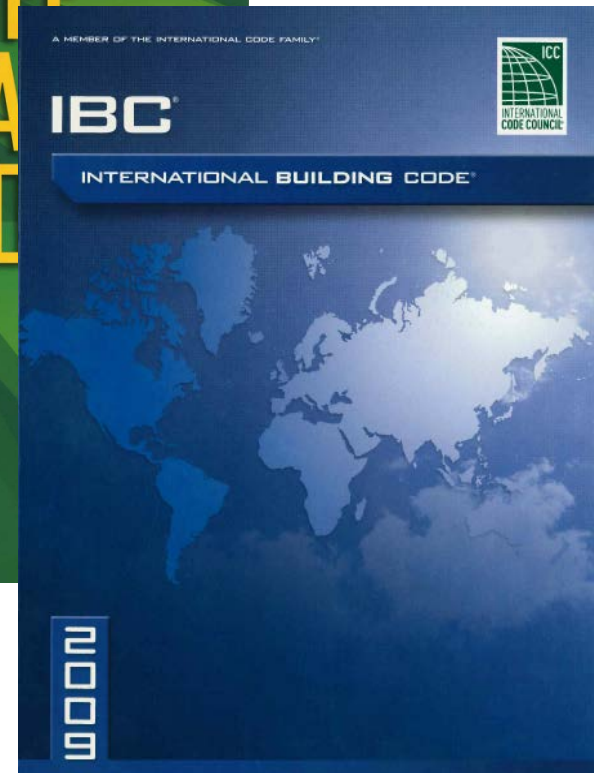
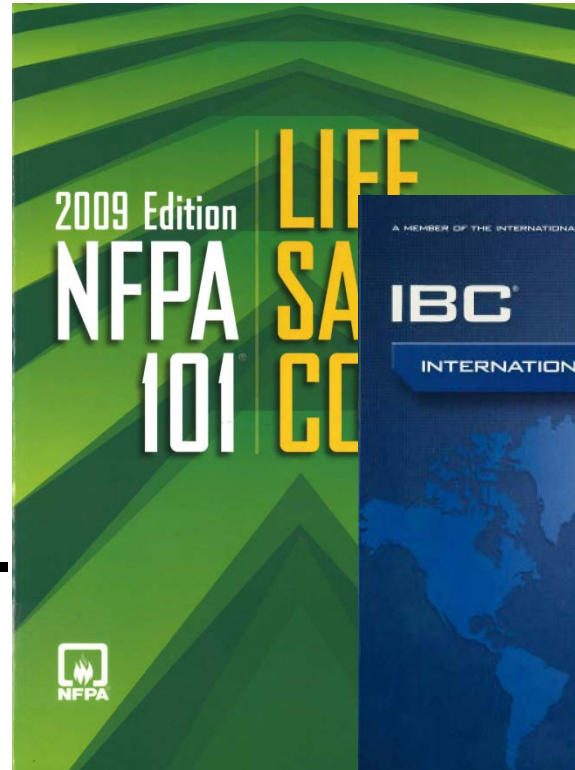
- Fire Resistance Rated Construction
- Breaches in Resistance Rated Construction
- Through and Membrane Penetration Fire Stop Systems
- Opening Protectives
- Where To Find Related Information

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 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



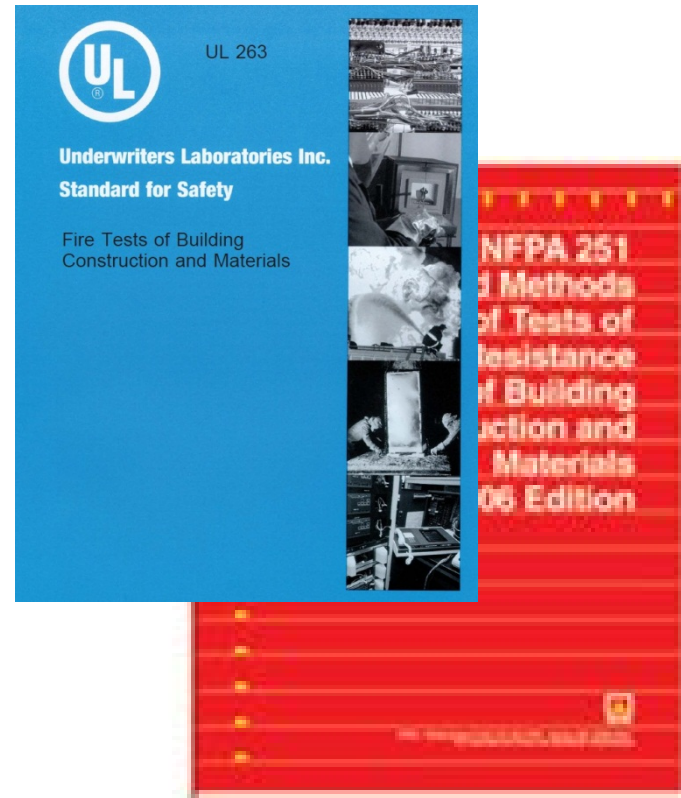
Fire-Resistance-Rated Construction

Establishing
Fire-Resistance
Ratings



Test Standards

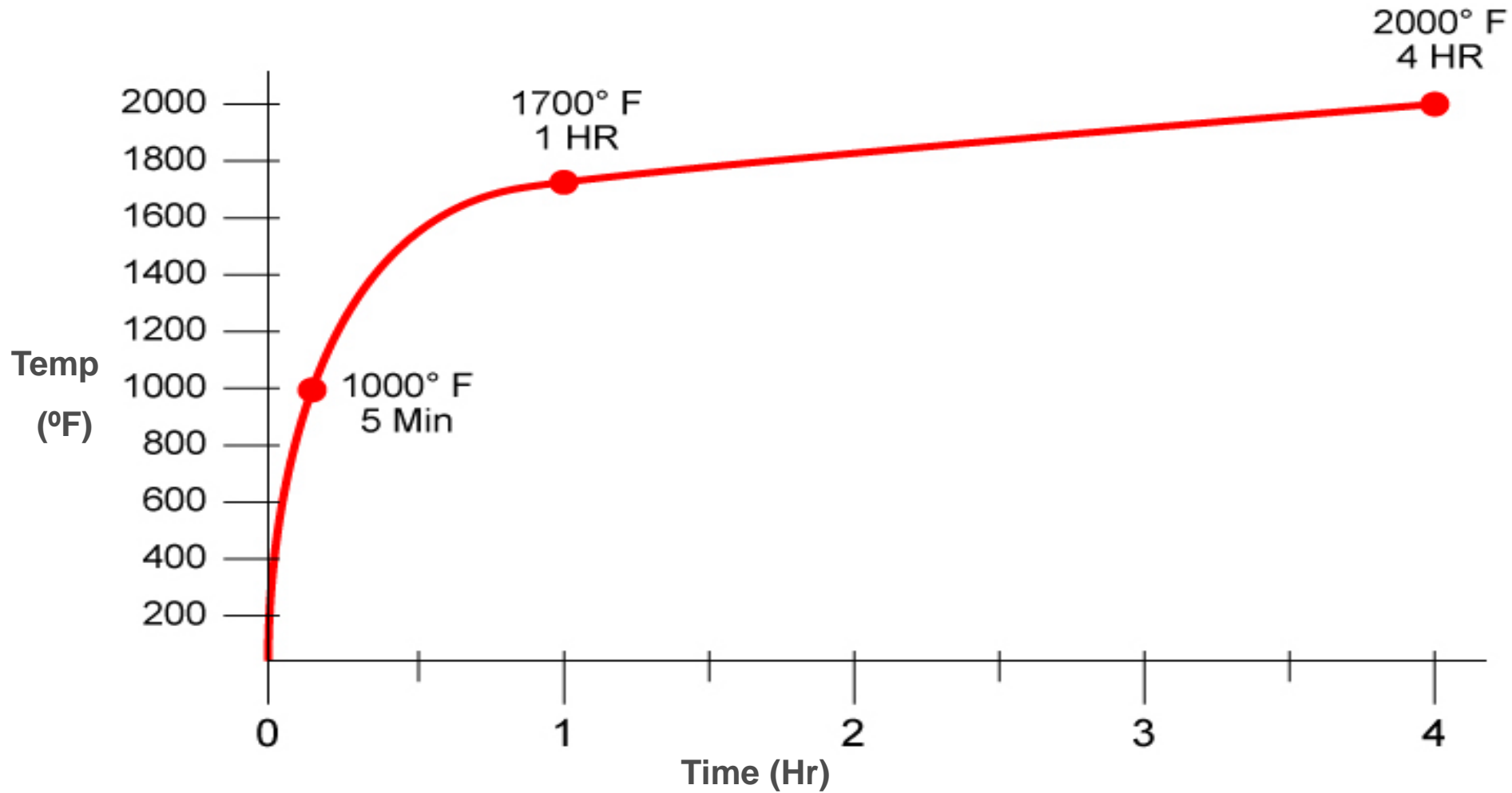
- ANSI/UL 263
- ASTM E119
- NFPA 251 (Withdrawn)



Building Components

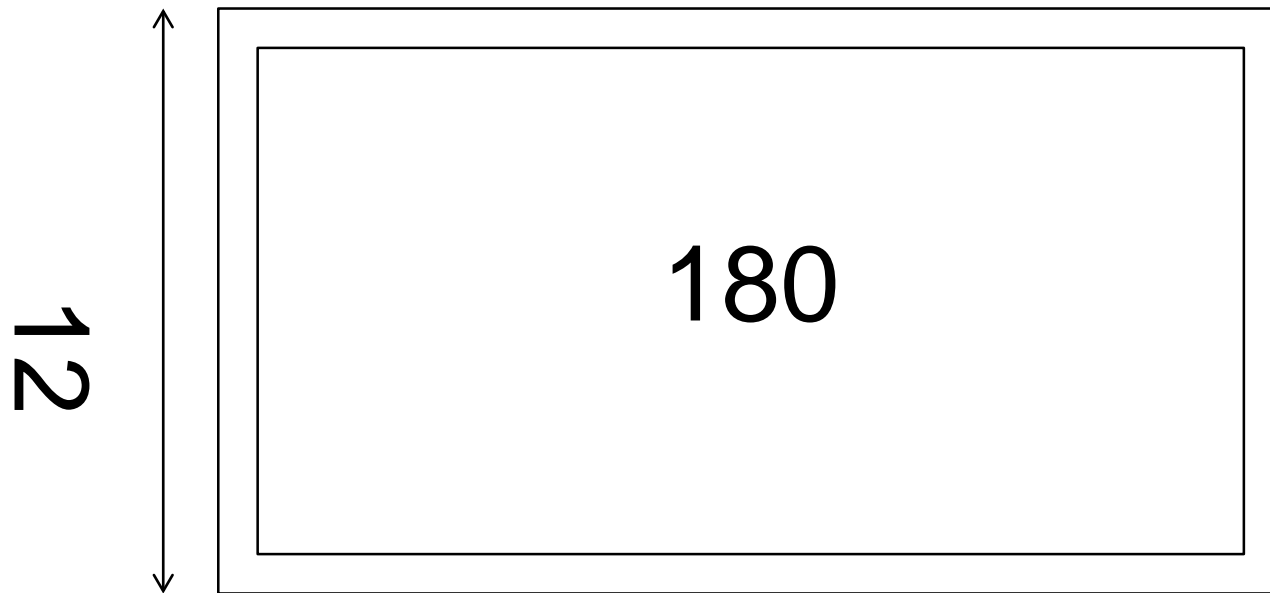
- Columns
- Beams
- Floor/Ceilings or Roof/Ceilings
- Walls

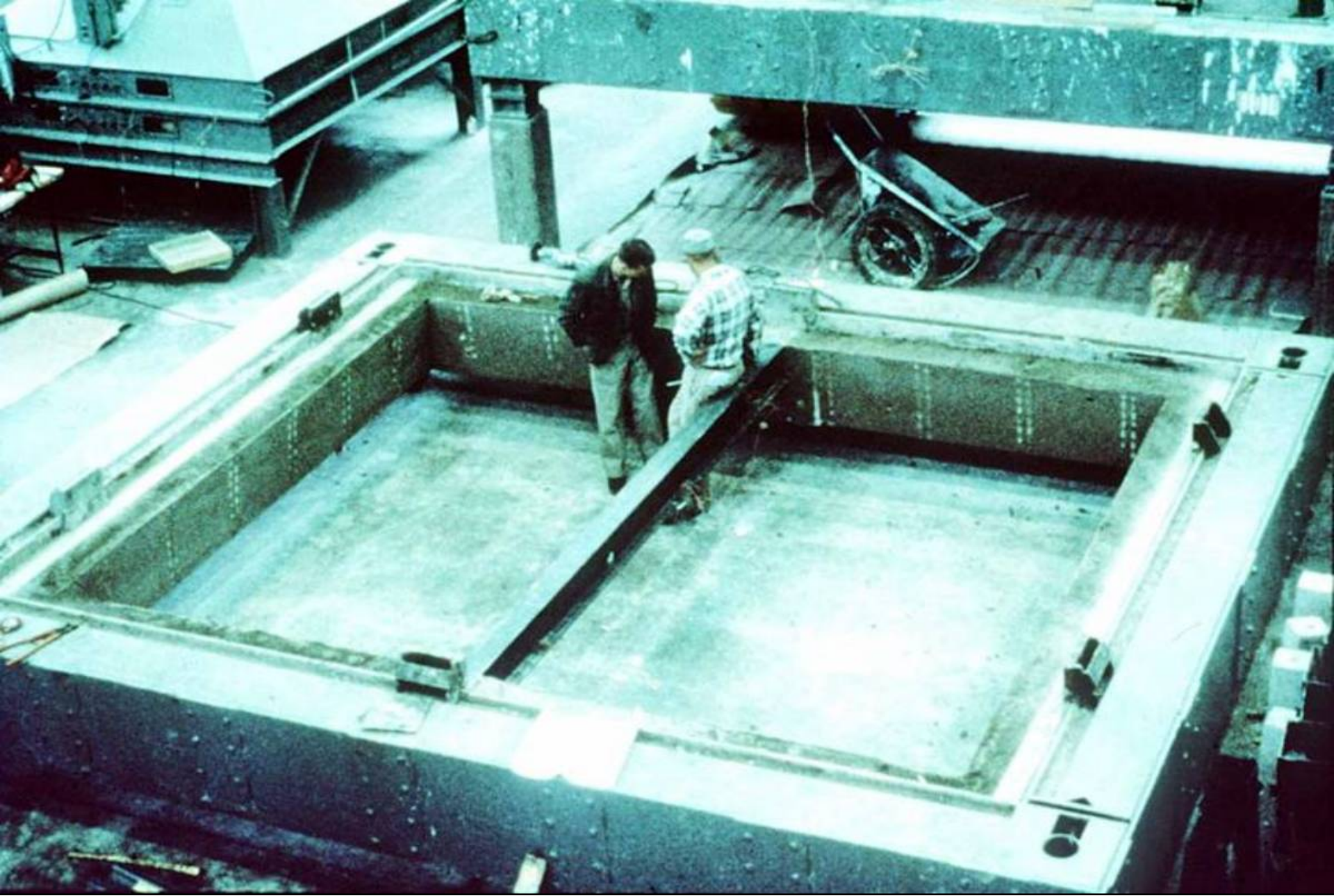
Time - Temperature Curve

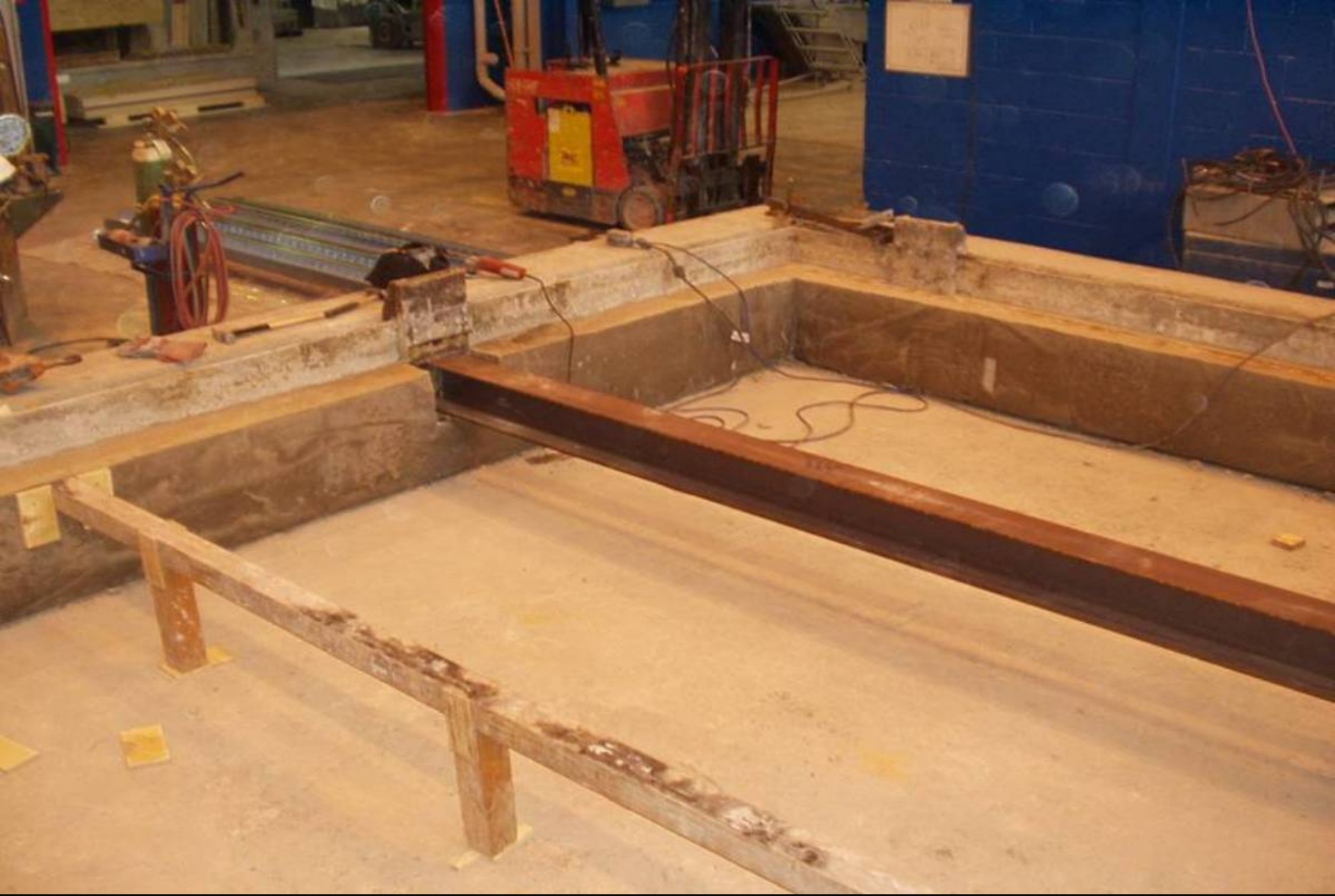


Floor/Ceiling or Roof/Ceilings

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

























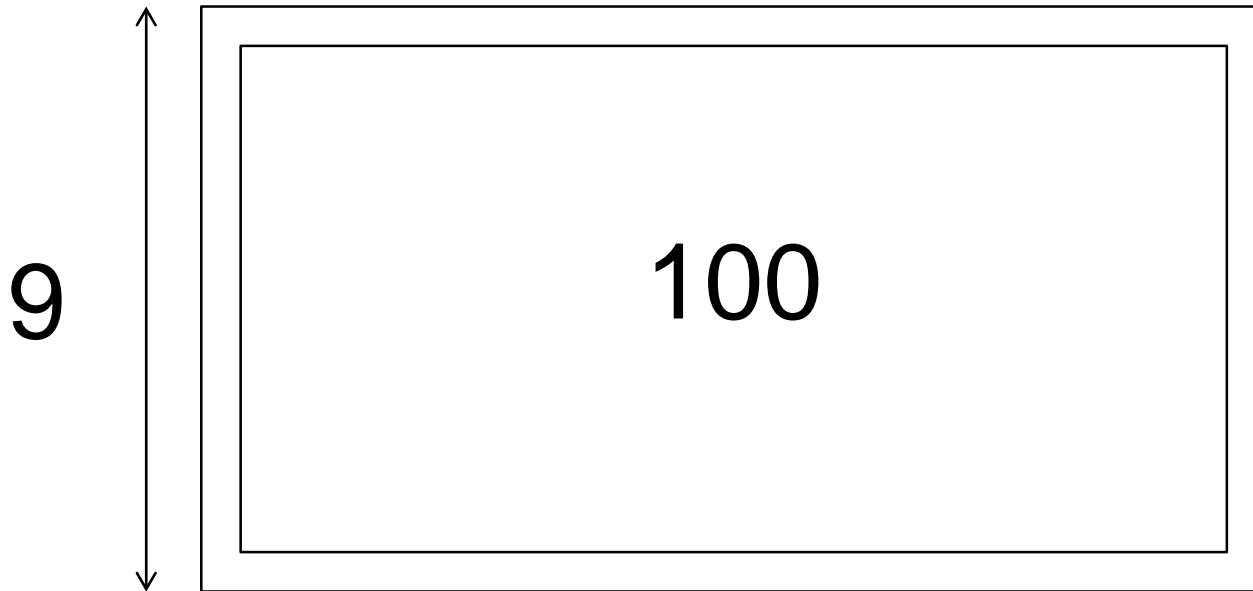
Conditions of Acceptance Floor/Ceilings or Roof/Ceilings

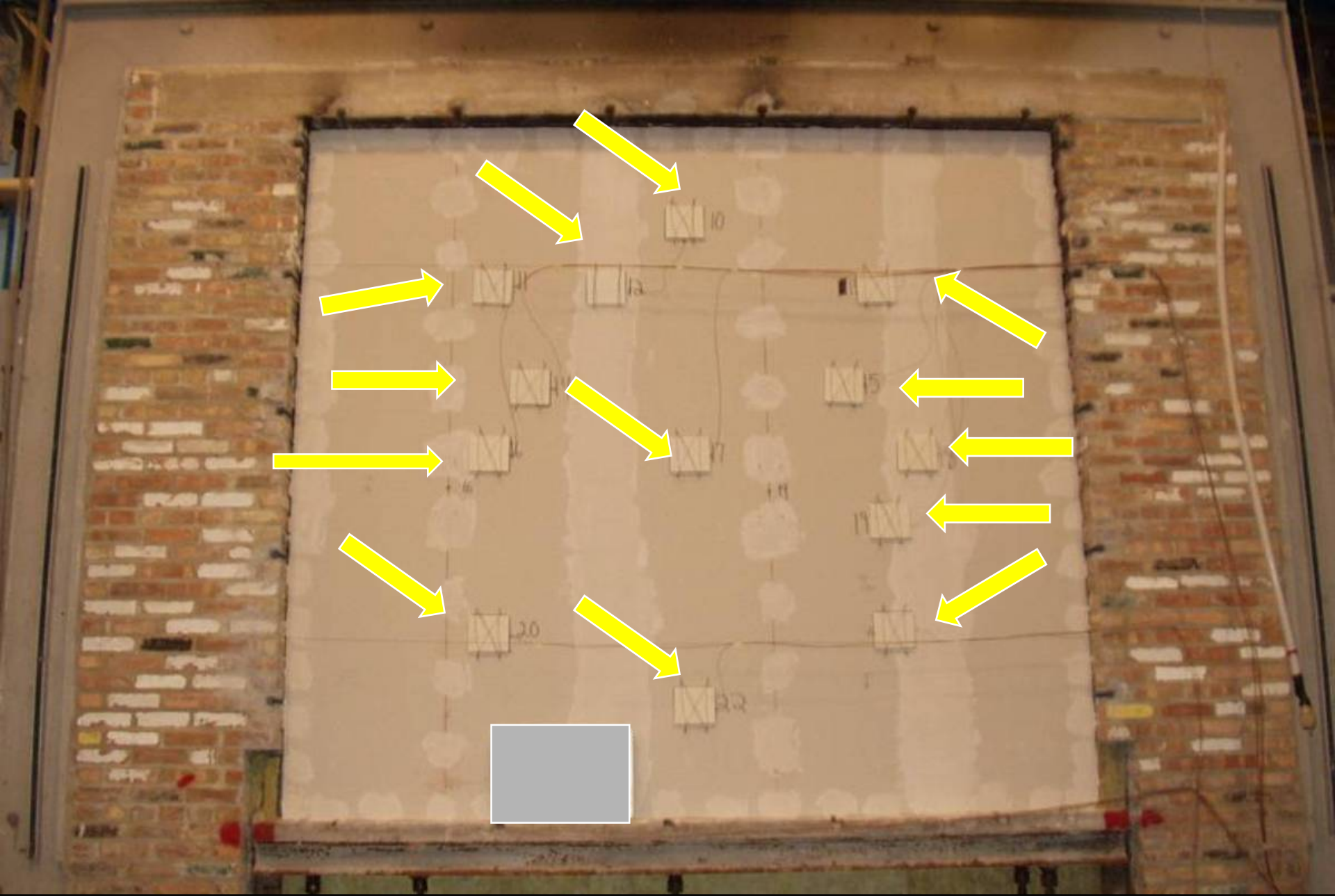
- Support load
- Flame passage
- 250°F / 325°F
- Support structure temp - 1100/1300



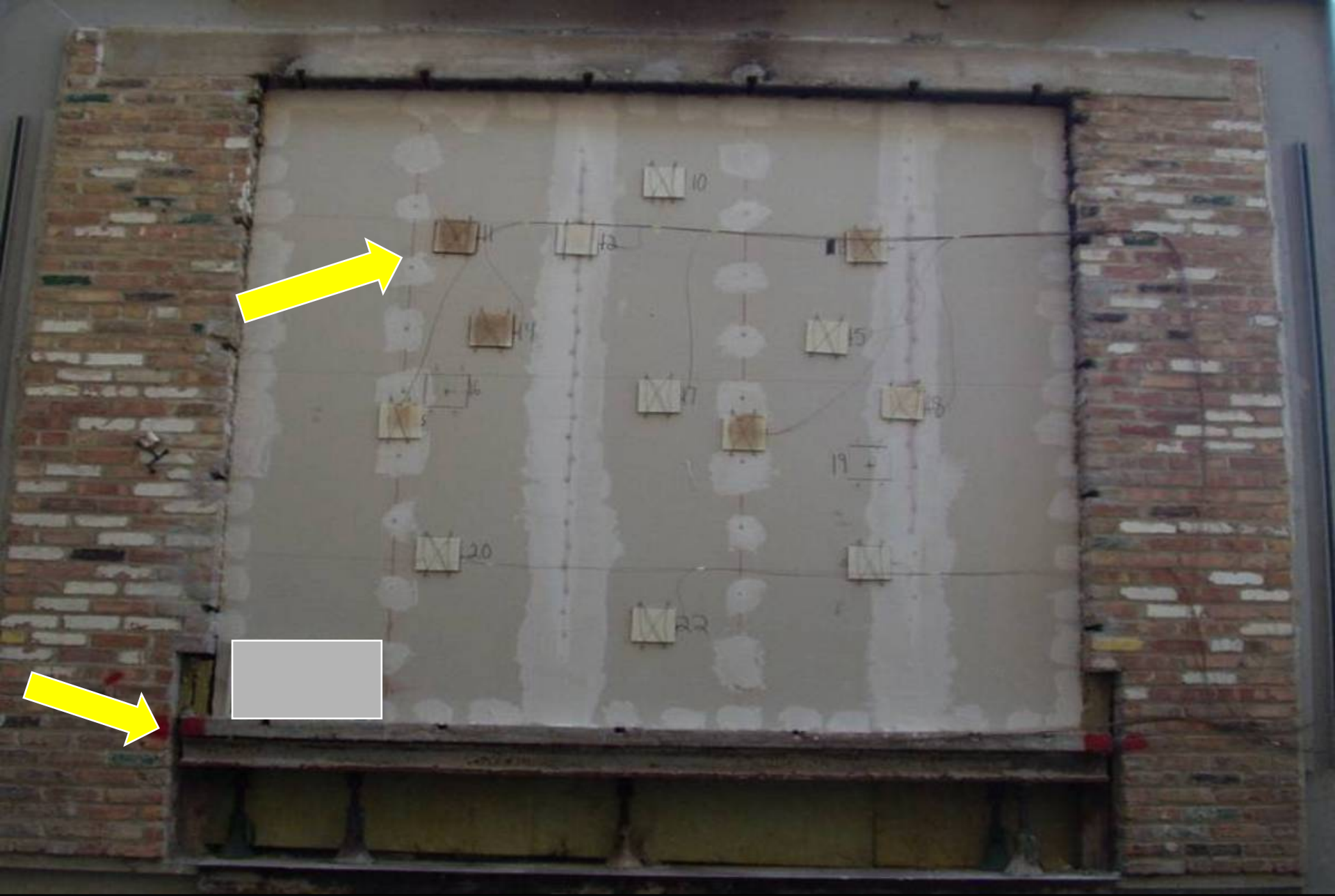
Walls

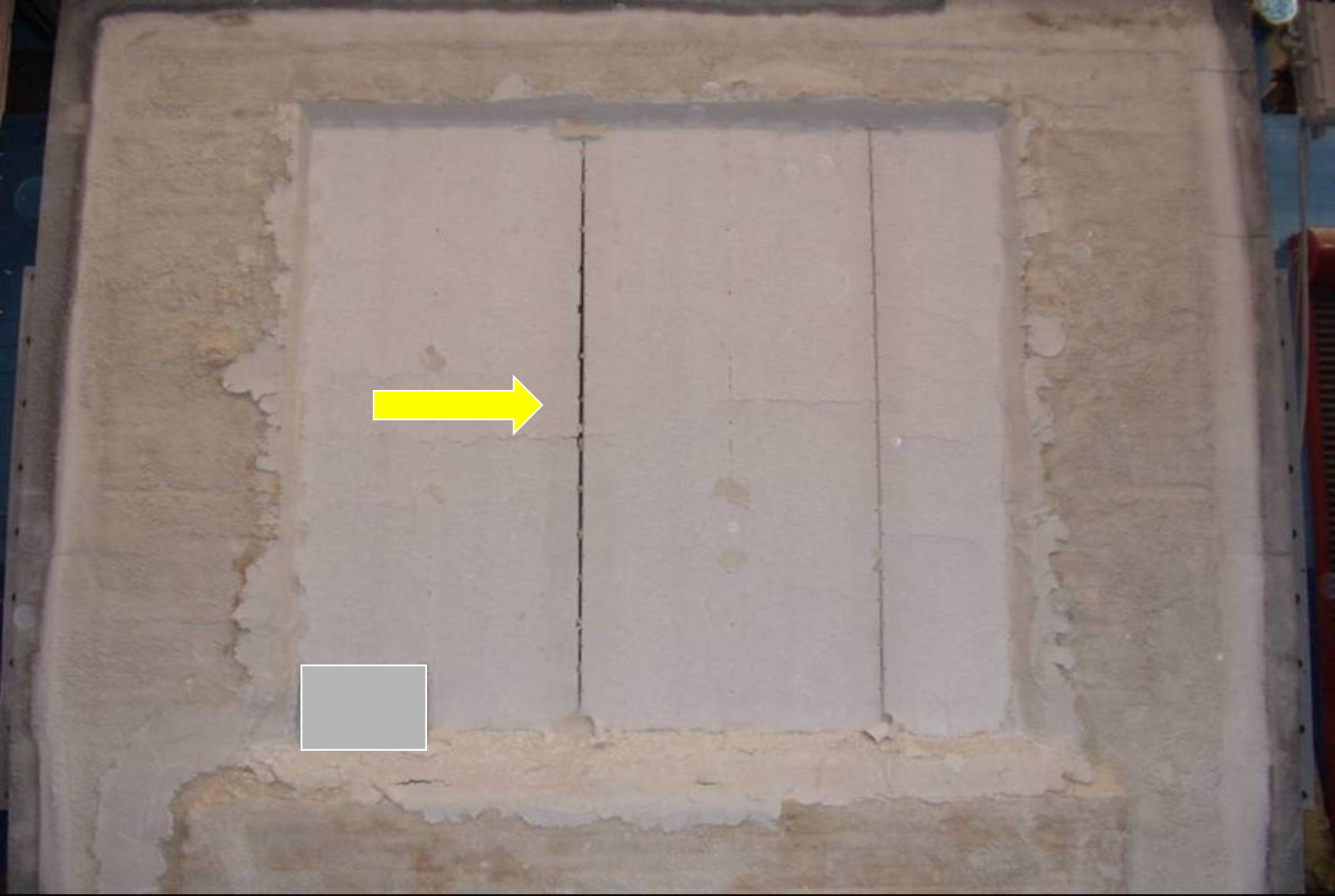
- Minimum Sample size - 100 sq ft / 9 ft
- Load applied - Per design

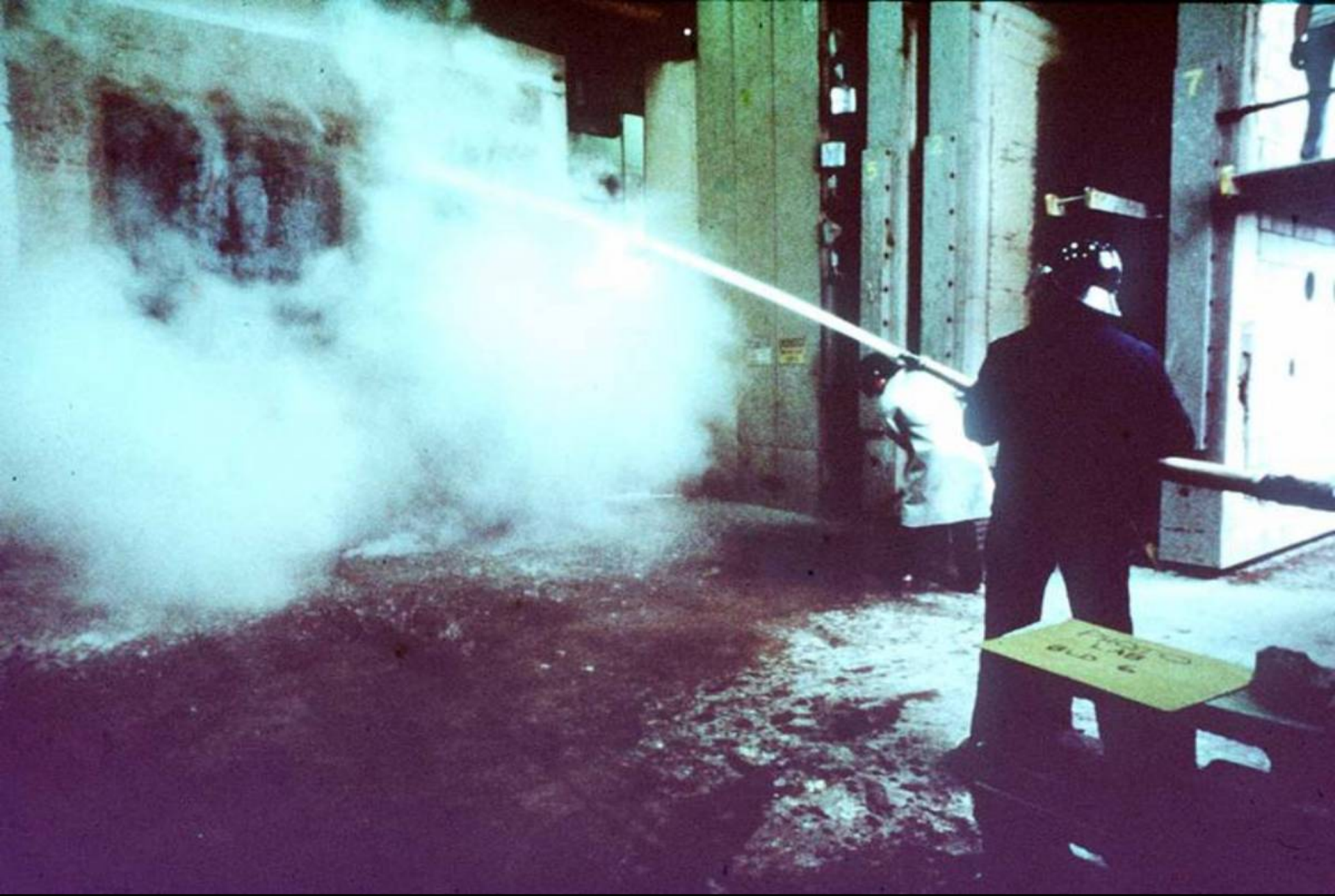














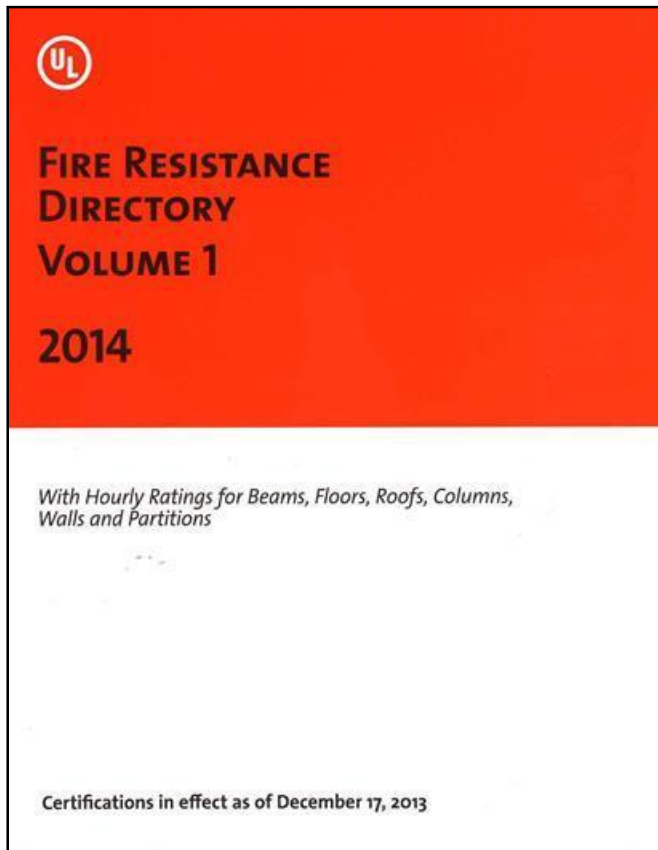
Conditions of Acceptance – Walls

- 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

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 compliments ANSI/UL 263 and ASTM E119

Code Requirements

- 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

MGM Grand Las Vegas, NV – 1980

- **Fire confined to 1st floor**
- **46 Stories**
- **679 injured, 85 fatalities.**
- **Most on upper floors.**



Hilton Hotel

Las Vegas, NV – 1981

- **Fire spread from 8th to 23rd floor in 25 minutes at exterior of building.**
- **8 fatalities.**



First Interstate Bank Los Angeles, CA -1988

- Fire spread from 12th to 16th floor through improperly protected penetrations and through unprotected perimeter joint.
- Lunch bags were used to protect penetrations.
- One fatality.



One Meridian Plaza Philadelphia, PA –1991

- Fire spread from 22nd to 30th floor through improperly protected penetrations and through perimeter joint.
- Three fire fighter fatalities, 24 FF injuries.



Breaches in Fire-Resistance-Rated Construction

Does a breach really impact the performance of a fire-resistance-rated assembly?

Absolutely!!!

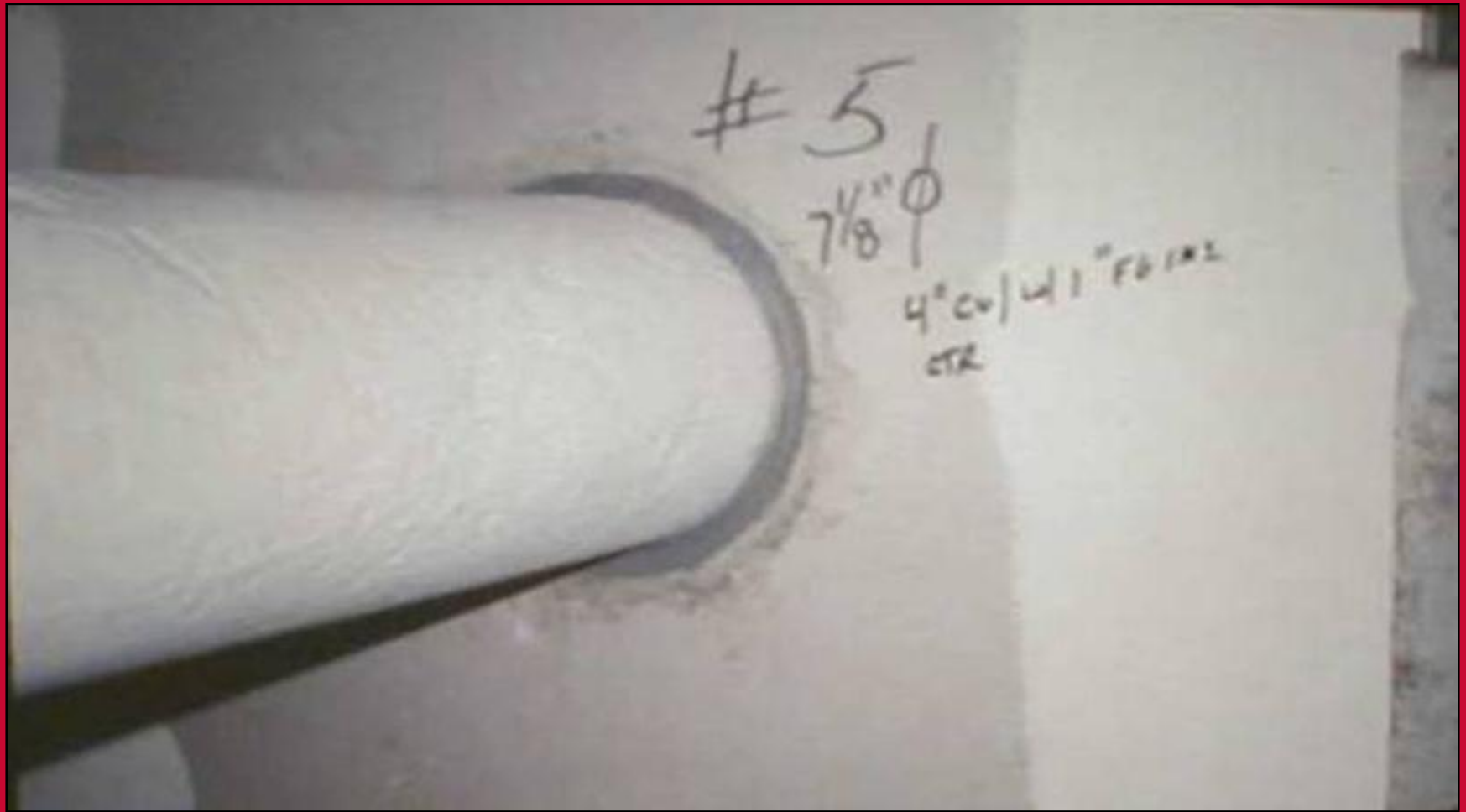
Unsealed or improperly sealed breaches cost lives and property!



Questions / Comments

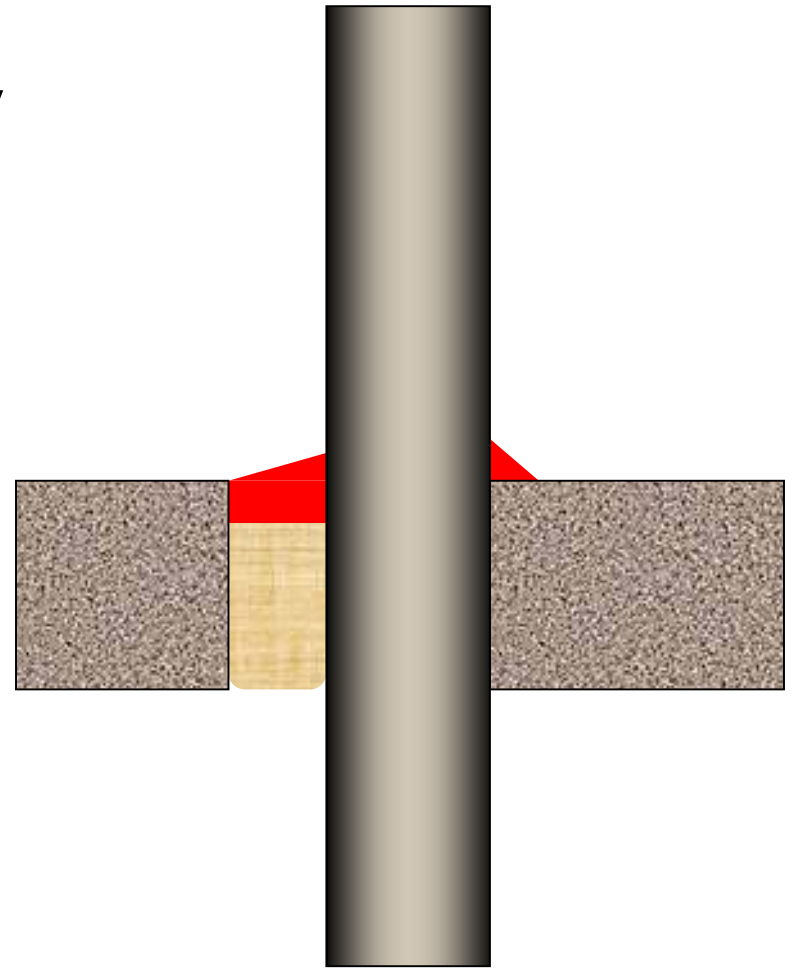


Through- and Membrane-Penetration Firestop Systems



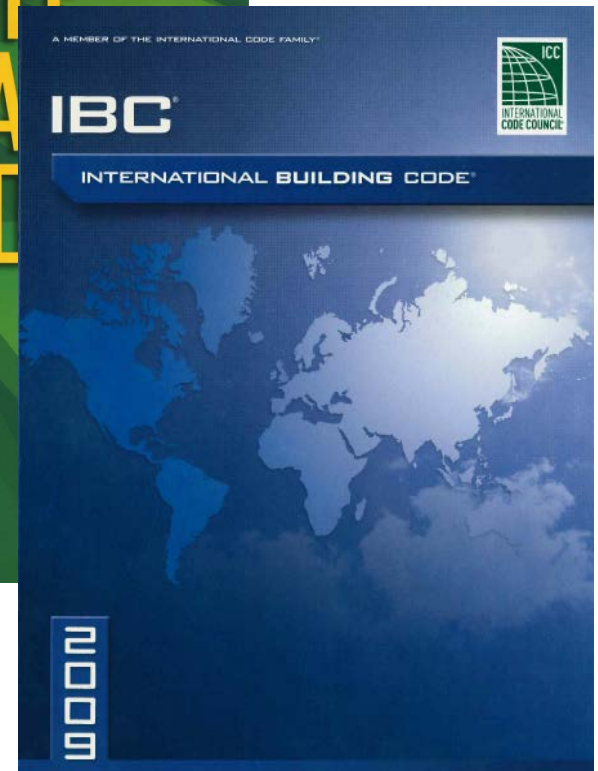
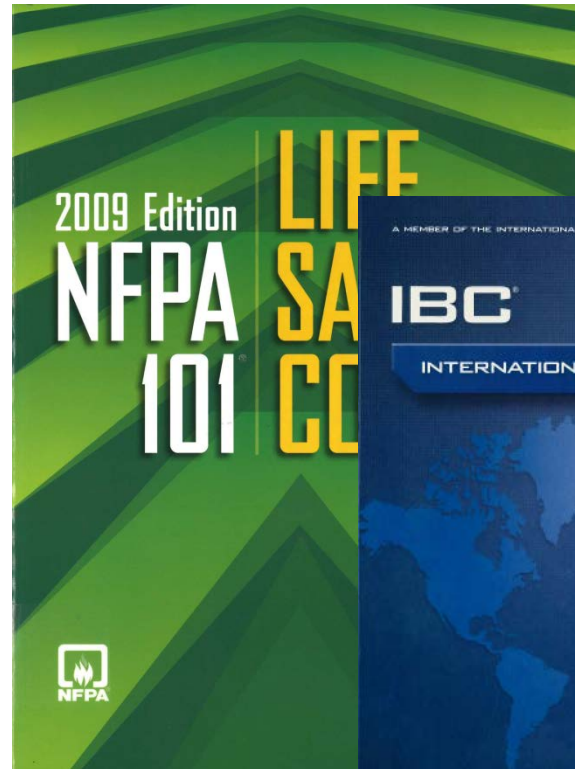
Three Elements of a Firestop System

- 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 – E814

- F - Flame Occurrence
- T - Heat Transmission (+325 °F)

Ratings - ANSI/UL 1479

- F - Flame Occurrence
- T - Heat Transmission (+325 °F)
- 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



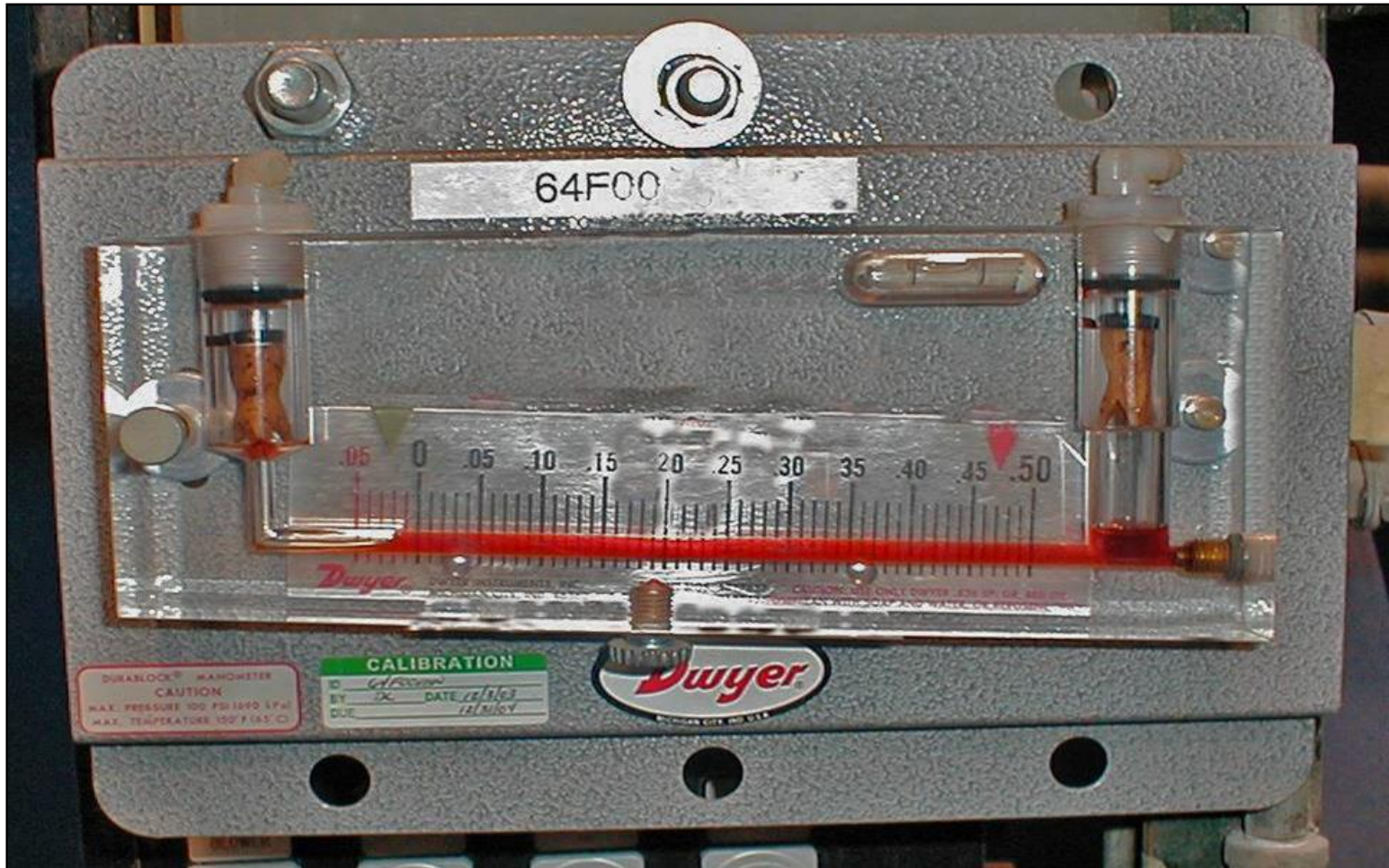
L (Air Leakage) Ratings



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

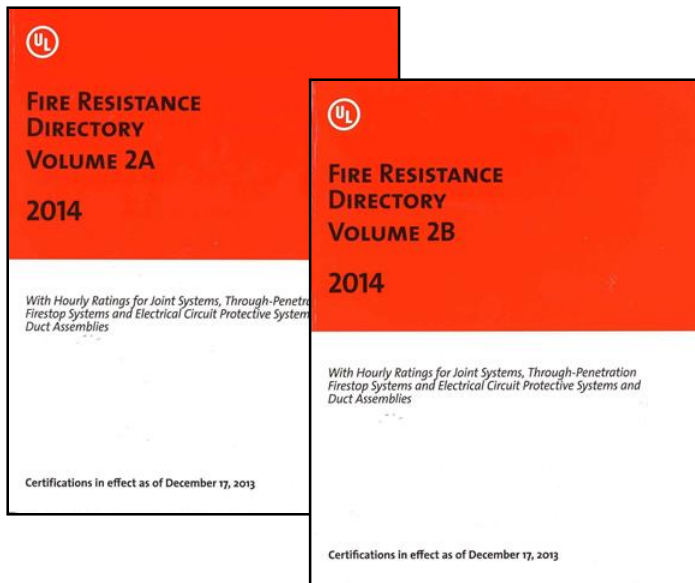
Test Procedure Cont.

- 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



Where Are Listings Found?

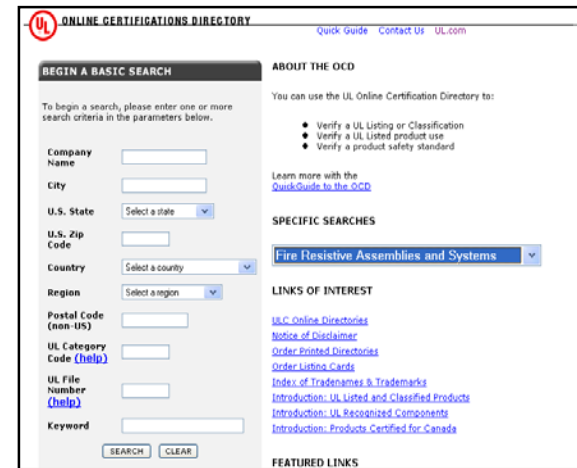
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Questions / Comments



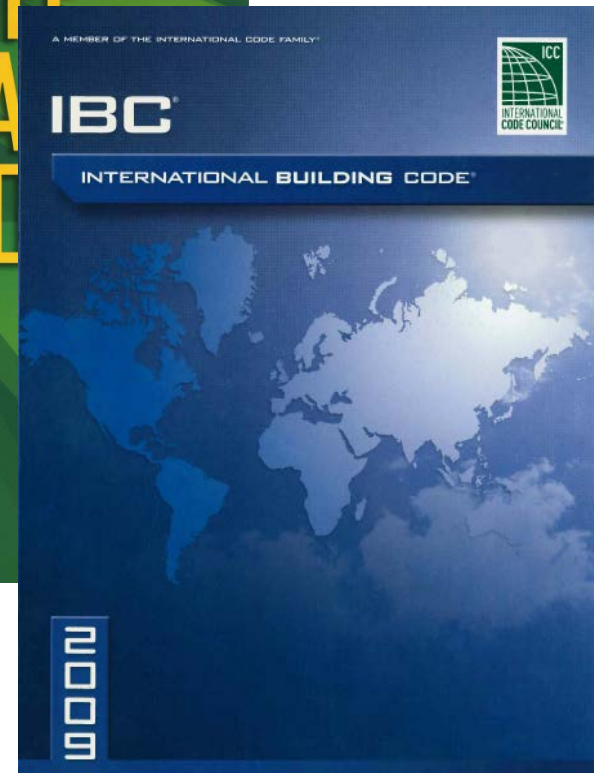
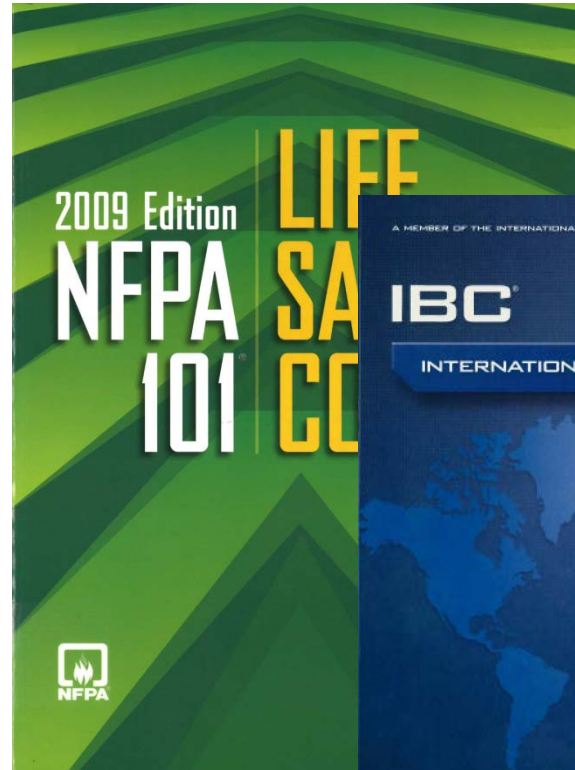
Opening Protectives

- Fire Door Assemblies
- Fire Window Assemblies



Opening Protective

Code Requirements for Fire Door Assemblies



IBC Code Requirements

- Section 716
 - 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



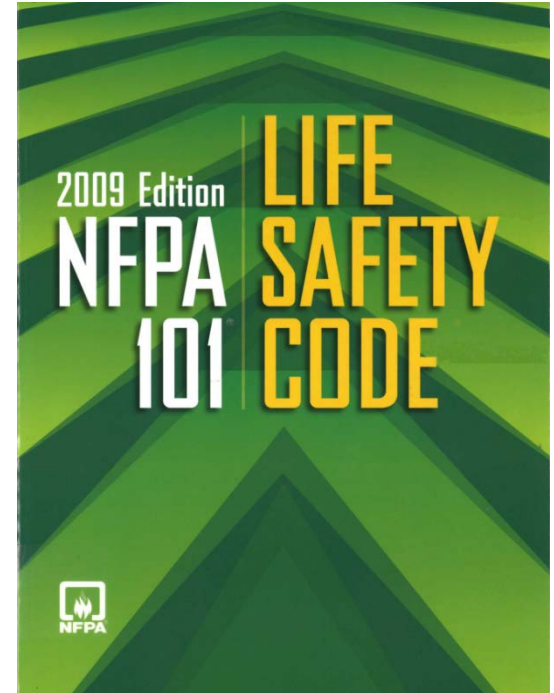
IBC Code Requirements

- 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



Life Safety Code Requirements

- Fire protection ratings shall be determined in accordance with NFPA 252, UL 10B or UL 10C



Opening Protectives

Establishing
Fire-Protection
Rating

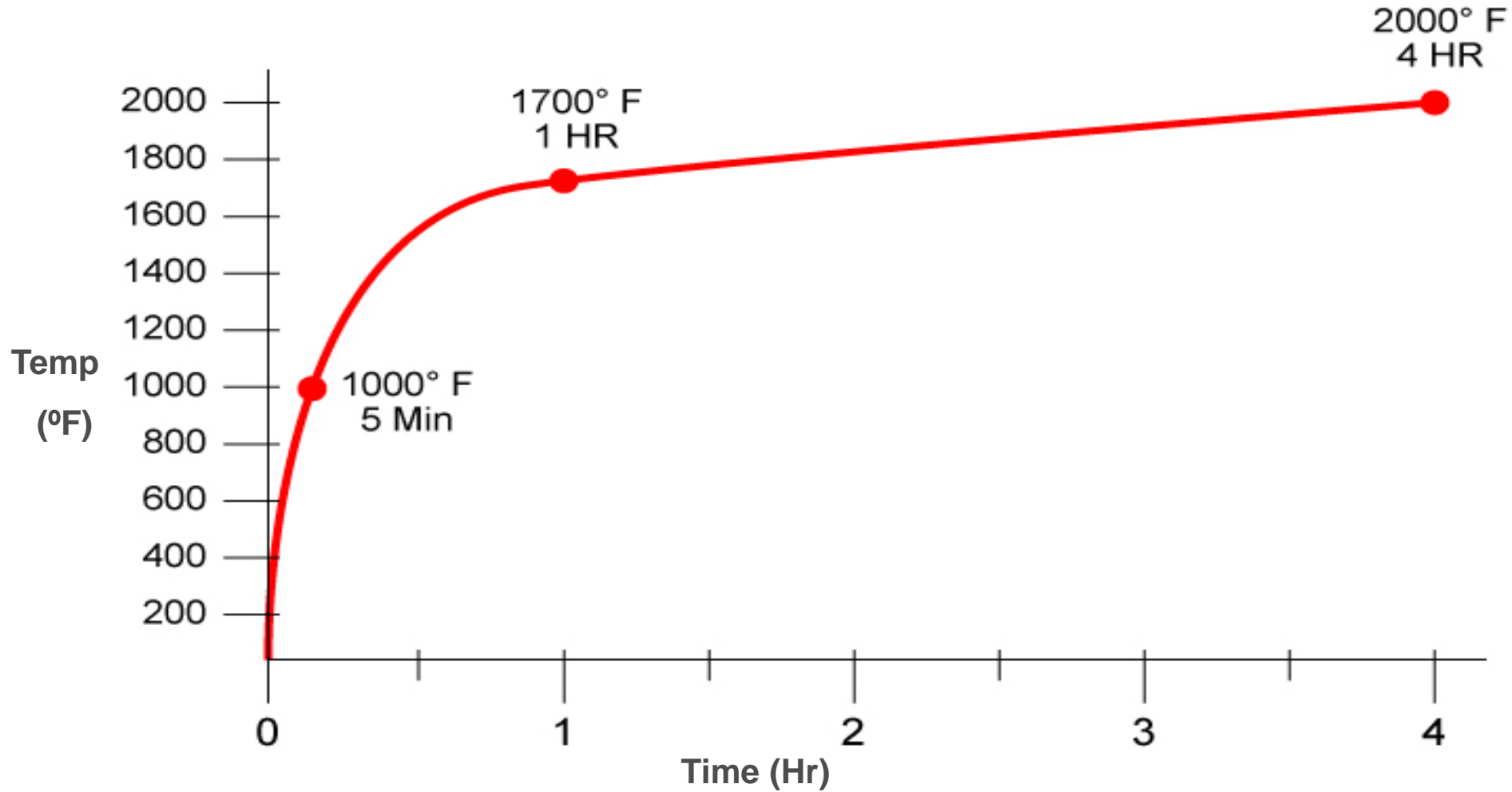


Standards

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



Time - Temperature Curve







- Inside the test furnace

- Hose Stream Test
- After Full Duration Fire Exposure

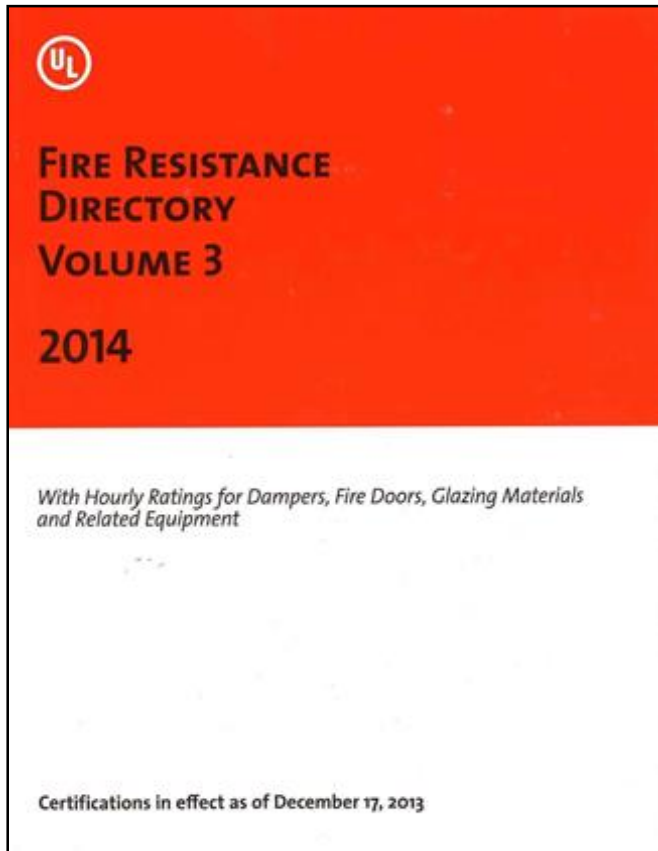


Conditions of Acceptance Fire Door Assemblies

- No Flame Passage
- No Water Penetration

Where Are Listings Found?

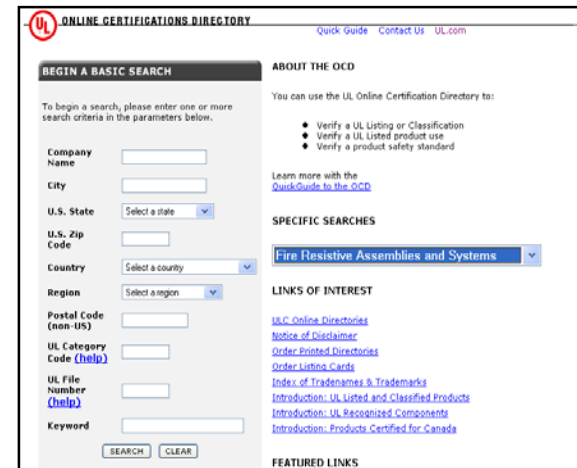
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Questions / Comments



Fire Resistive Construction

UL's Online Search Tools




UL's Online Search Tools

- Online Certifications Directory
- Product Spec



Online Certifications Directory

- Helps you achieve code compliance
- Is continuously updated
- Needs no password
- Is free – no charge for use
- www.ul.com/database

 ONLINE CERTIFICATIONS DIRECTORY

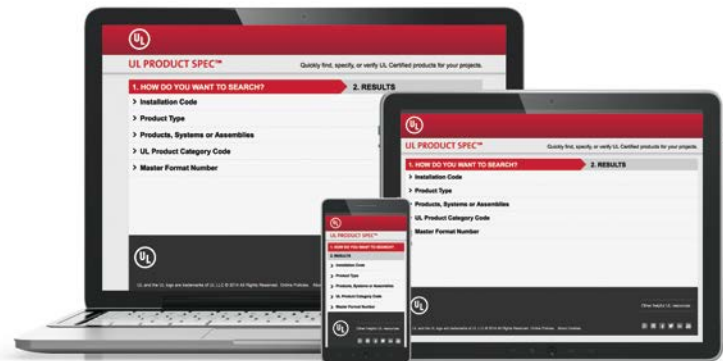
BEGIN A BASIC SEARCH

To begin a search, please enter one or more search criteria in the parameters below.

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City	<input type="text"/>
US State	<input type="text" value="Select a state"/>
US Zip Code	<input type="text"/>
Country	<input type="text" value="Select a country"/>
Region	<input type="text" value="Select a region"/>
Postal Code (non-US)	<input type="text"/>
UL Category Code (options)	<input type="text"/>
UL File Number (help)	<input type="text"/>
Keyword	<input type="text"/>

Product Spec

- Supplements OCD
- Identify designs meeting certain parameters
- Needs no password
- Is free – no charge for use



Product Spec

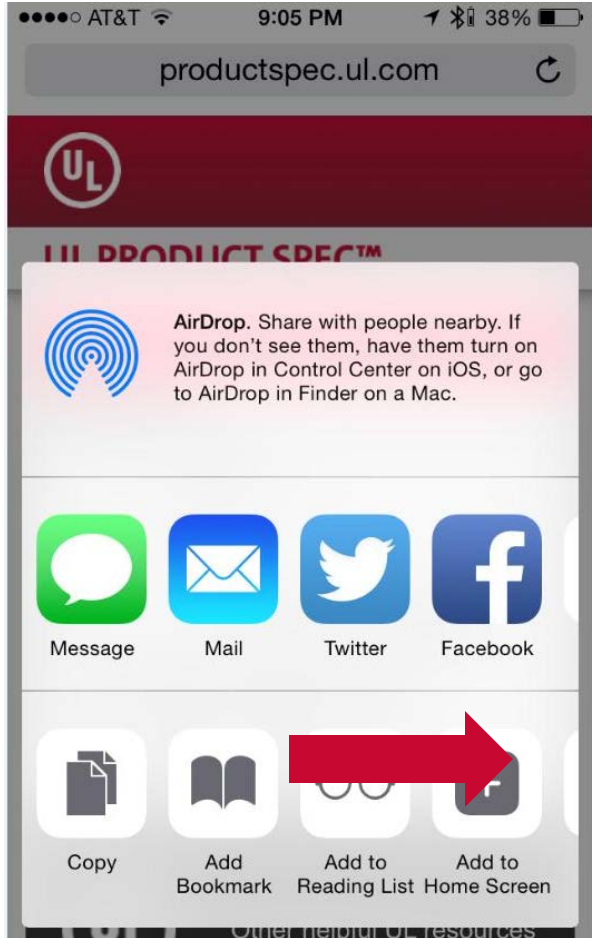
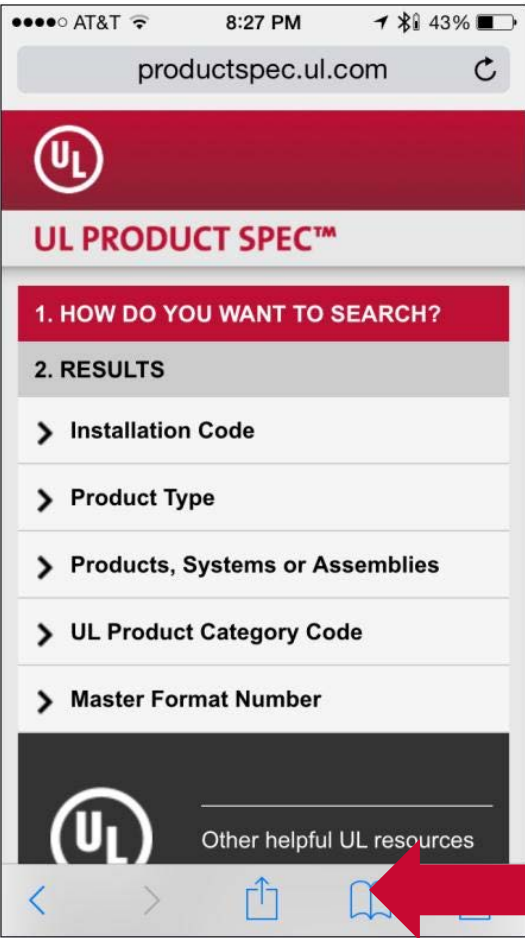


www.ul.com/productspec

- Works on all web connected devices regardless of platform or OS
- Responsive Web site- Right sizes to your screen size, smartphone, tablet or PC
- Save to the home screen on your phone or tablet home screen and it acts just like an app

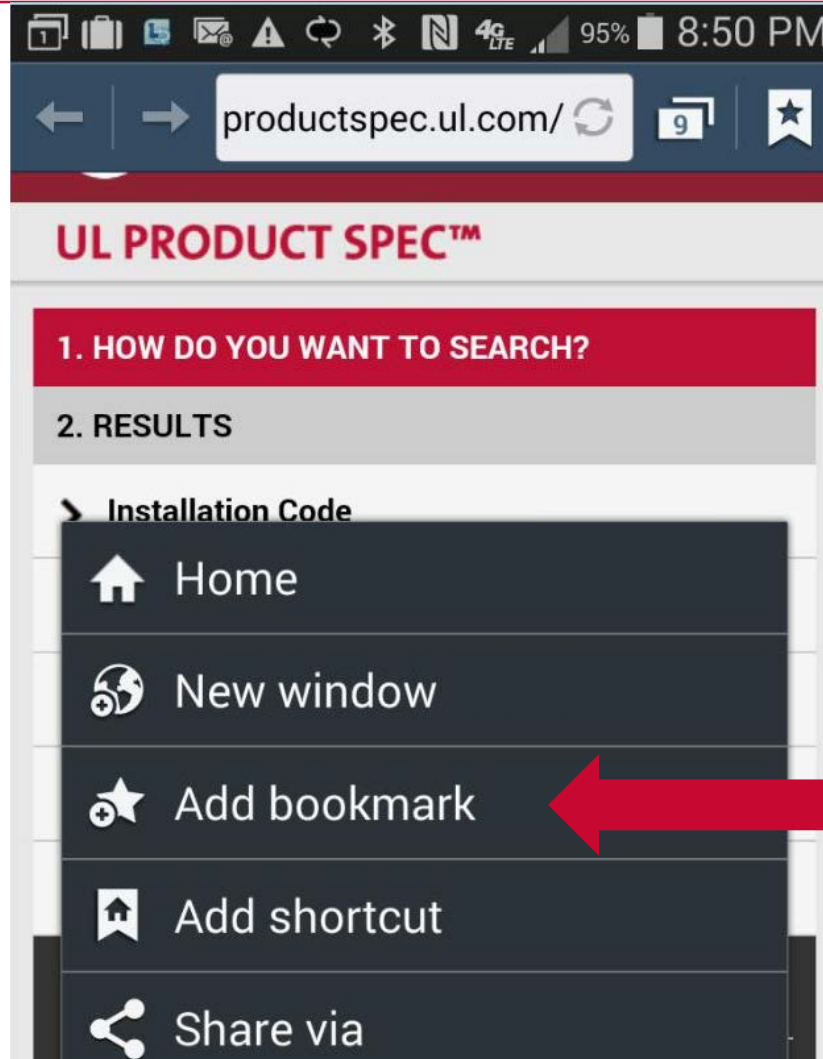
On Apple IOS (I-phone and I-pad)

• www.ul.com/productspec



Adding Product Spec On Android

- www.ul.com/productspec



Summary

- Fire Resistance Rated Construction
- Breaches in Resistance Rated Construction
- Through and Membrane Penetration Fire Stop Systems
- Opening Protectives
- Where To Find Related Information

Thank You for Attending!!!

Jon Roberts

Codes and Advisory Services Department

Underwriters Laboratories, 6608 N. Western Ave. #280

Oklahoma City, OK. 73116

jonathan.roberts@UL.com

(405)760-6724

www.ul.com



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