

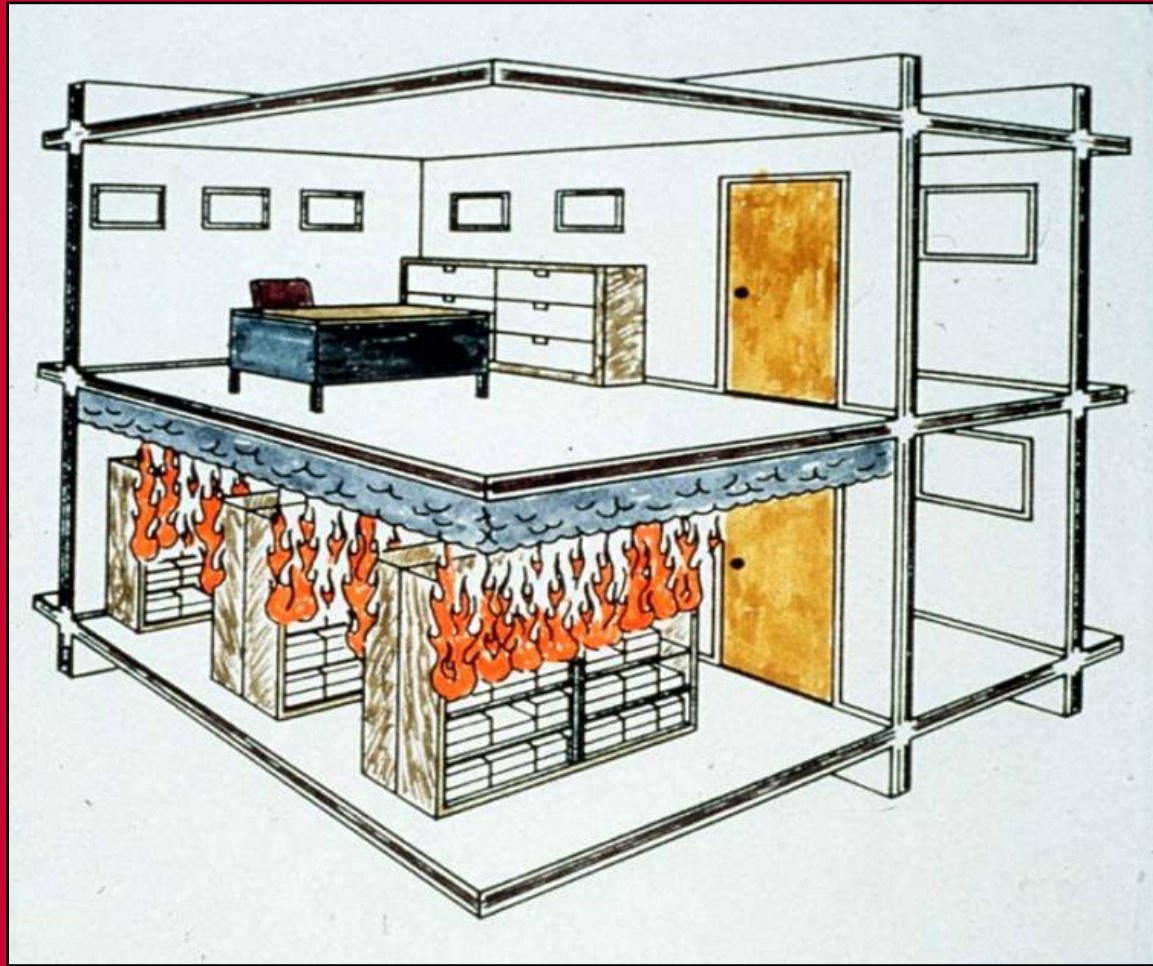
# Testing of Fire Resistance and Smoke Resistant Assemblies



Rich Walke

UL Codes and Advisory Services

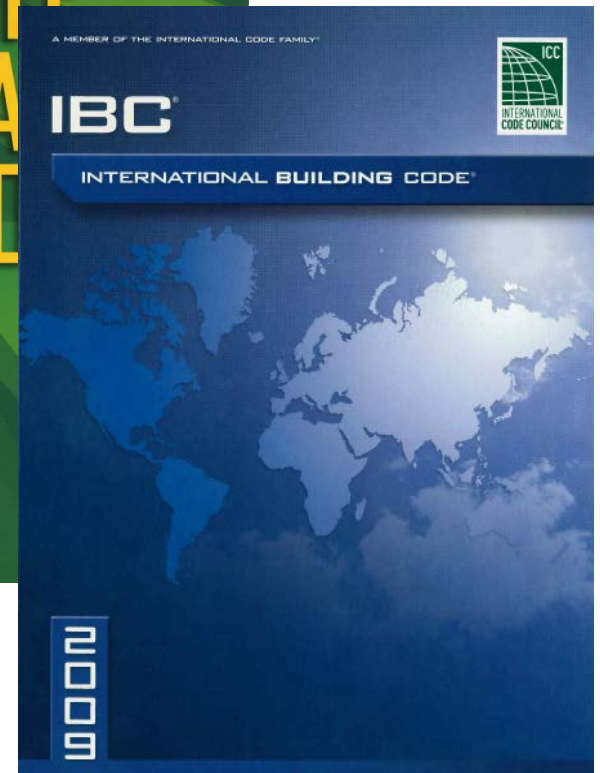
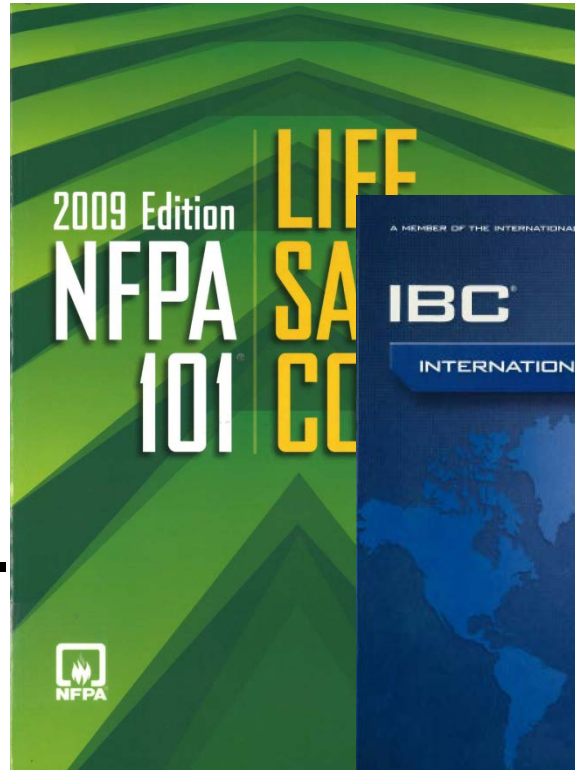
# Fire-Resistance-Rated Construction



# Fire-Resistance-Rated Construction

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Code  
Requirements  
for  
Fire-Resistance-  
Rated  
Construction



# Code Requirements

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- 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

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- 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

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Establishing  
Fire-Resistance  
Ratings



# Standards

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- NFPA 251 (Withdrawn)

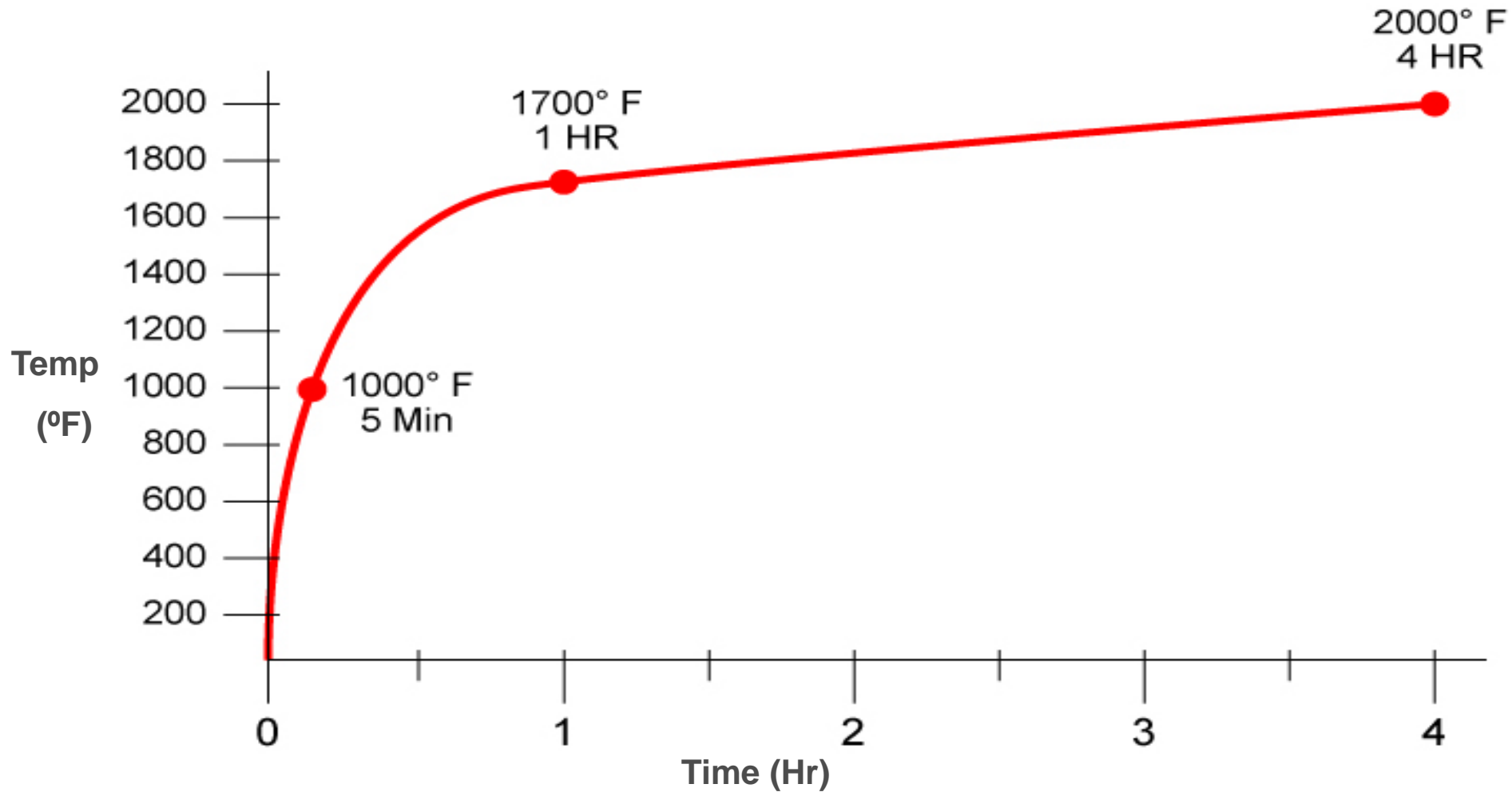
# Building Components

---

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



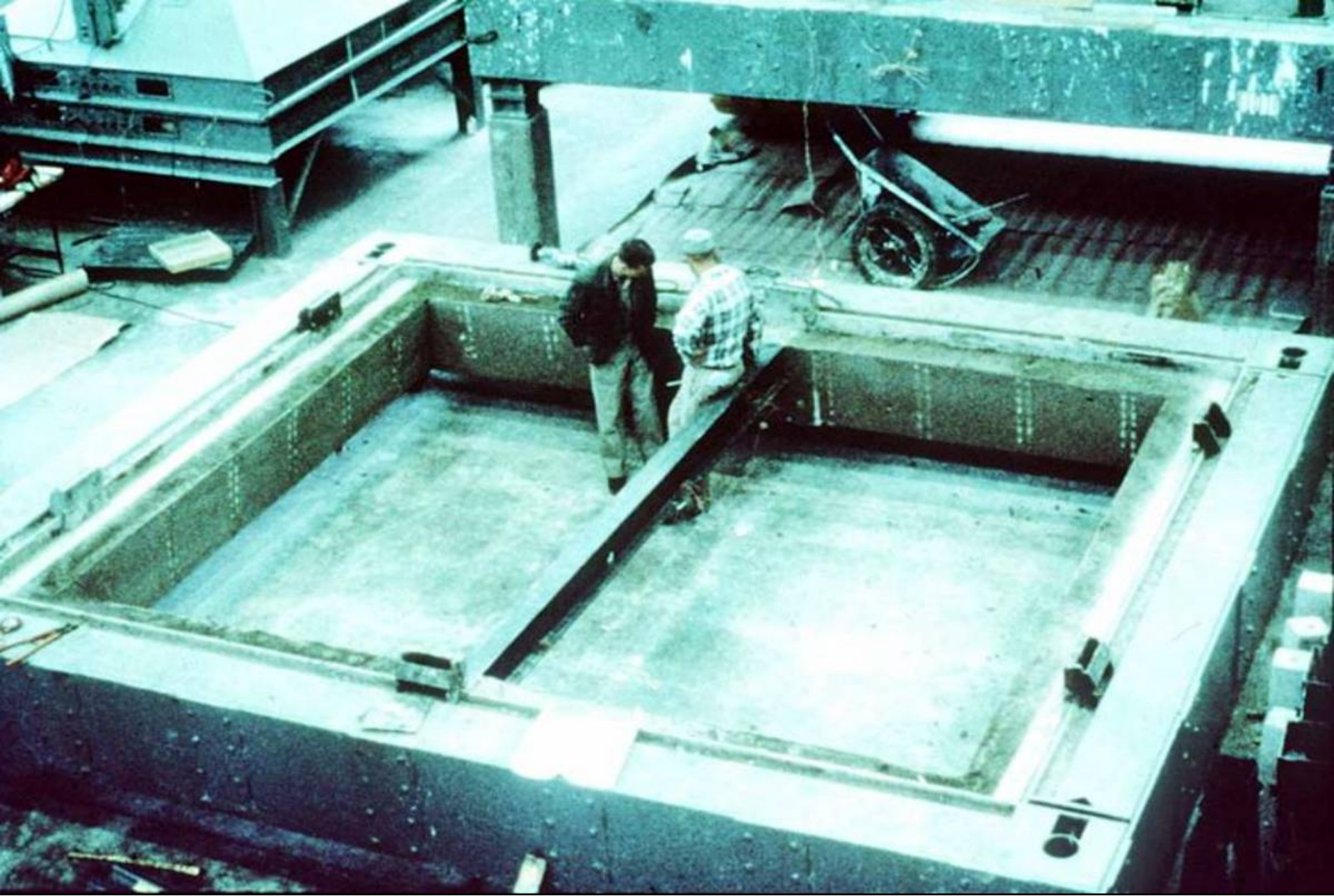
# Time - Temperature Curve



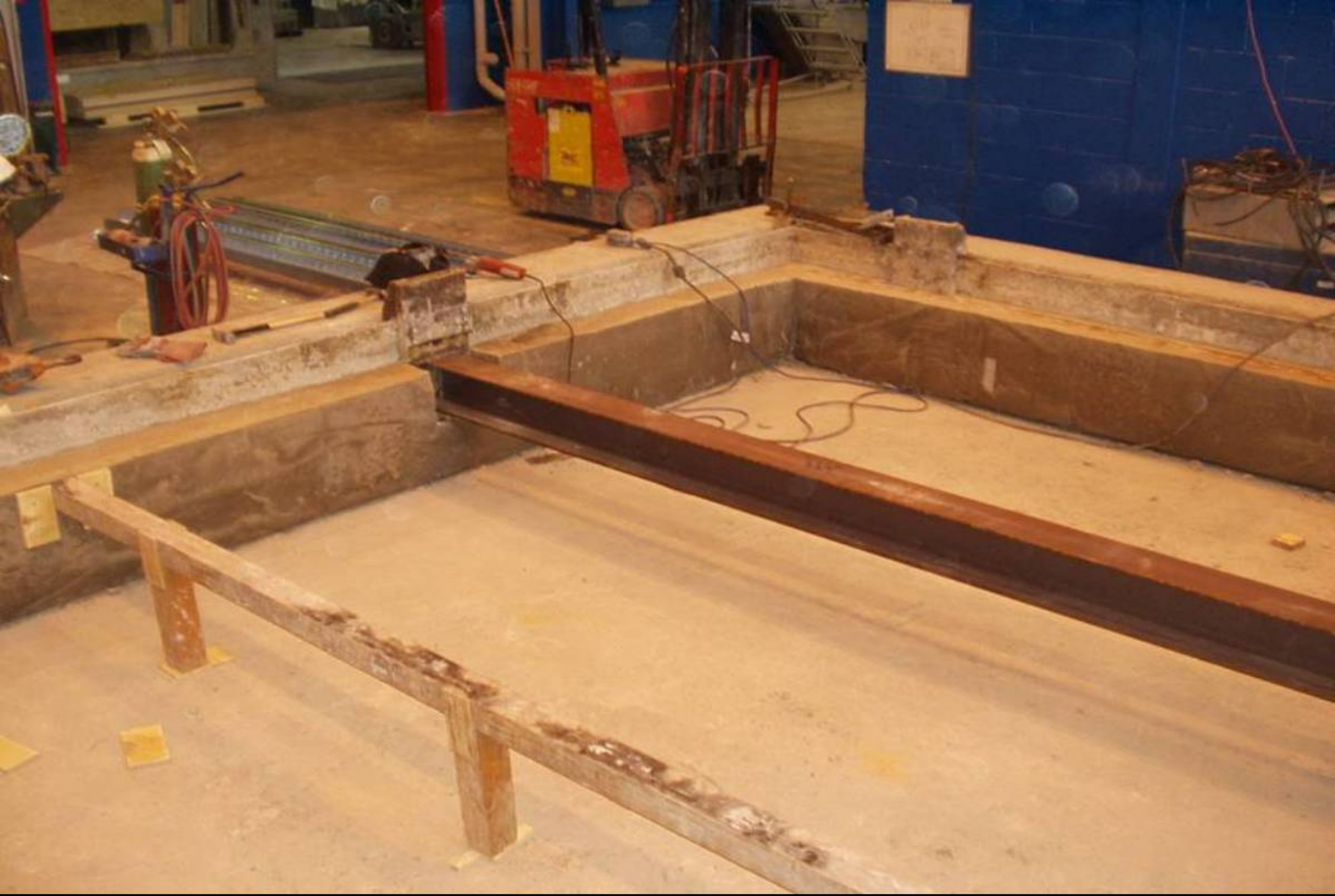
# Floor/Ceiling or Roof/Ceilings

---

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

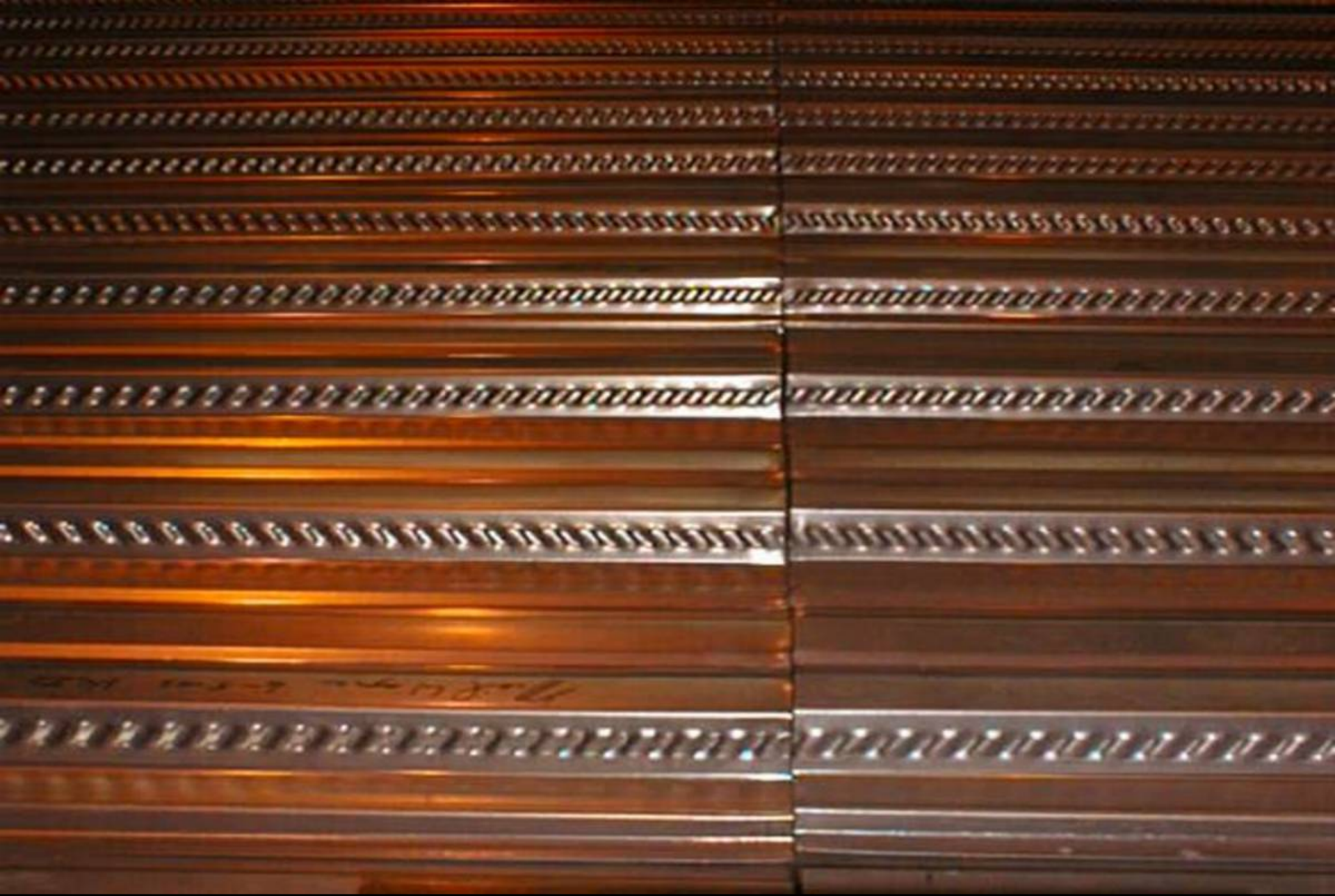




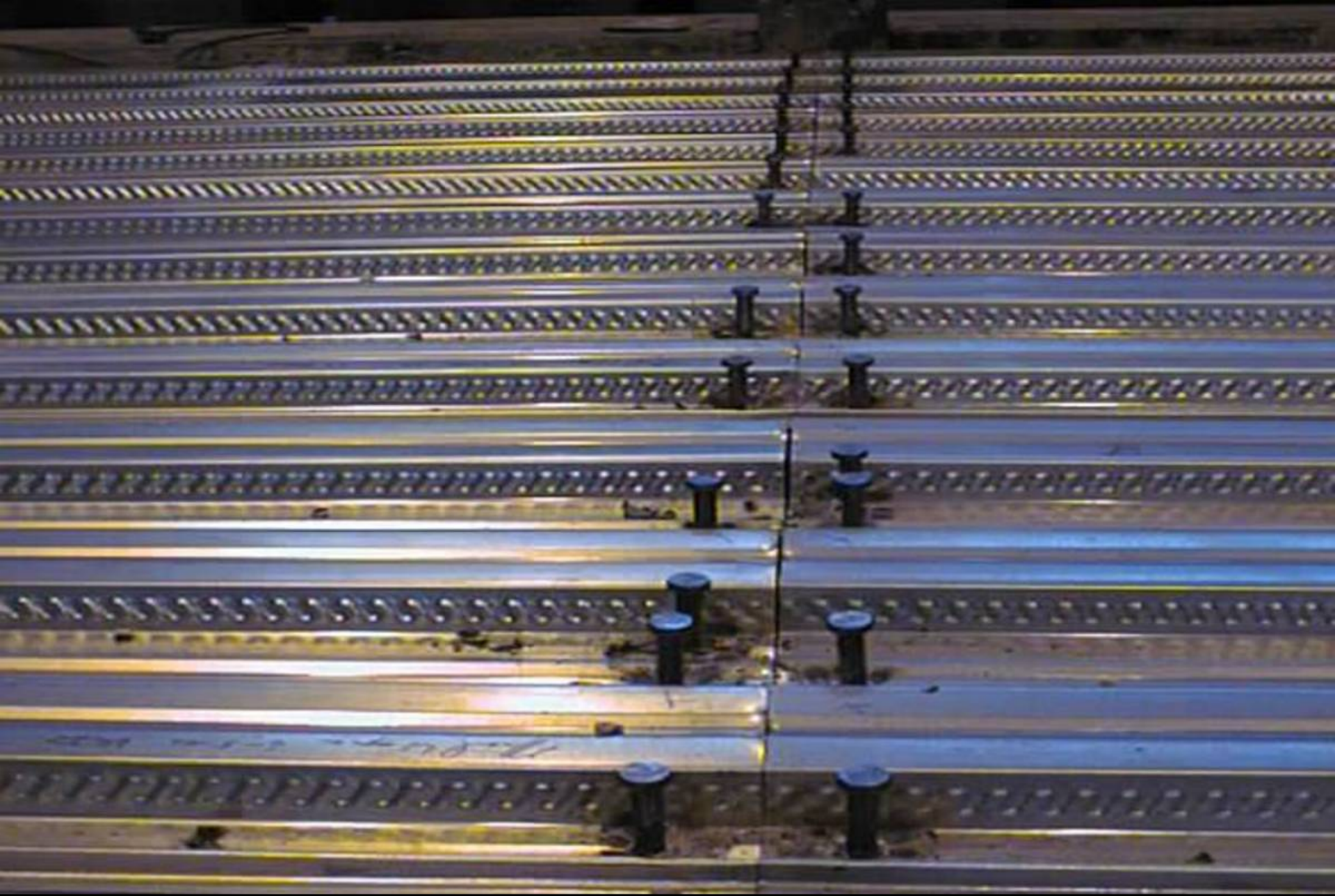
































# Conditions of Acceptance Floor/Ceilings or Roof/Ceilings

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

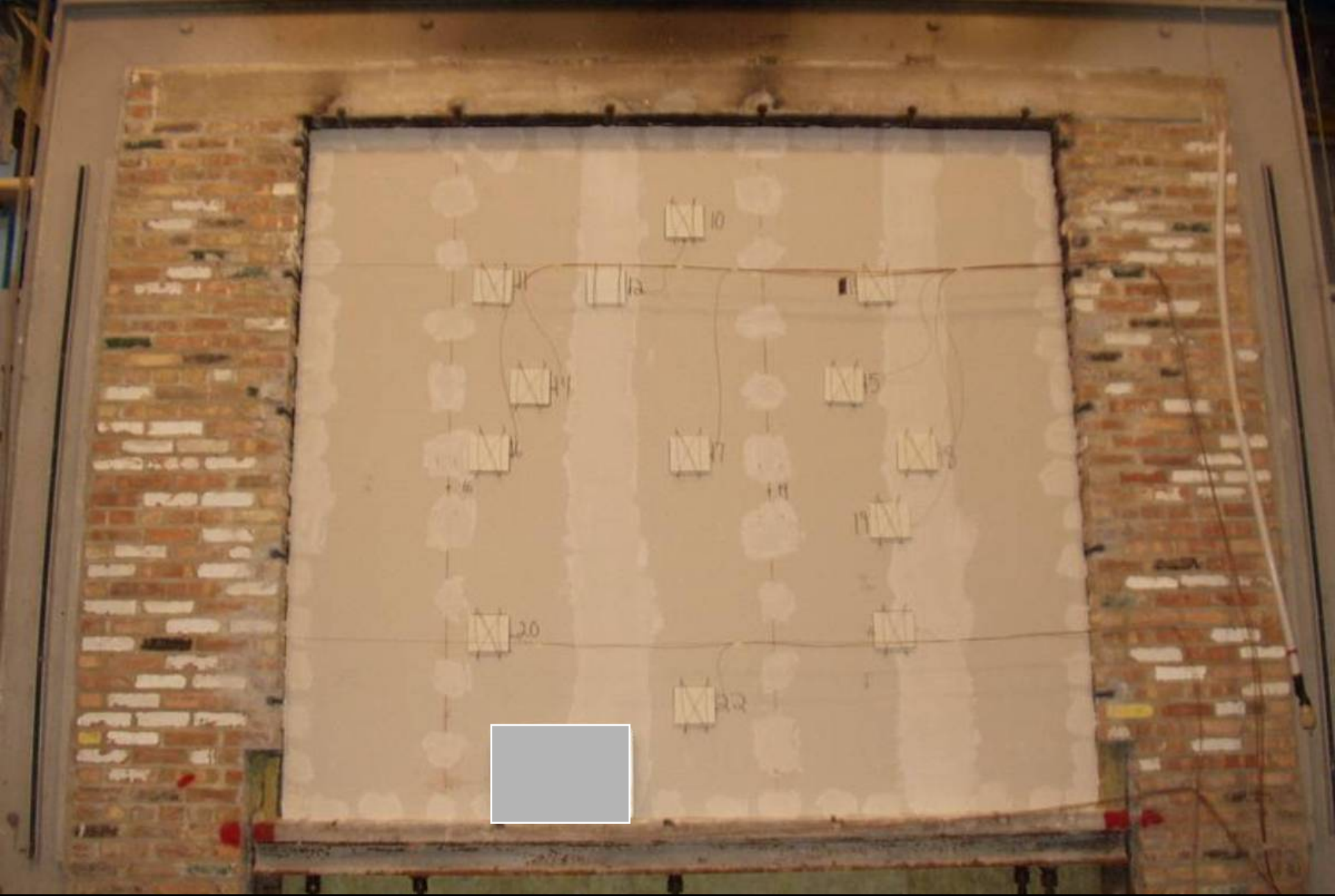


# Walls

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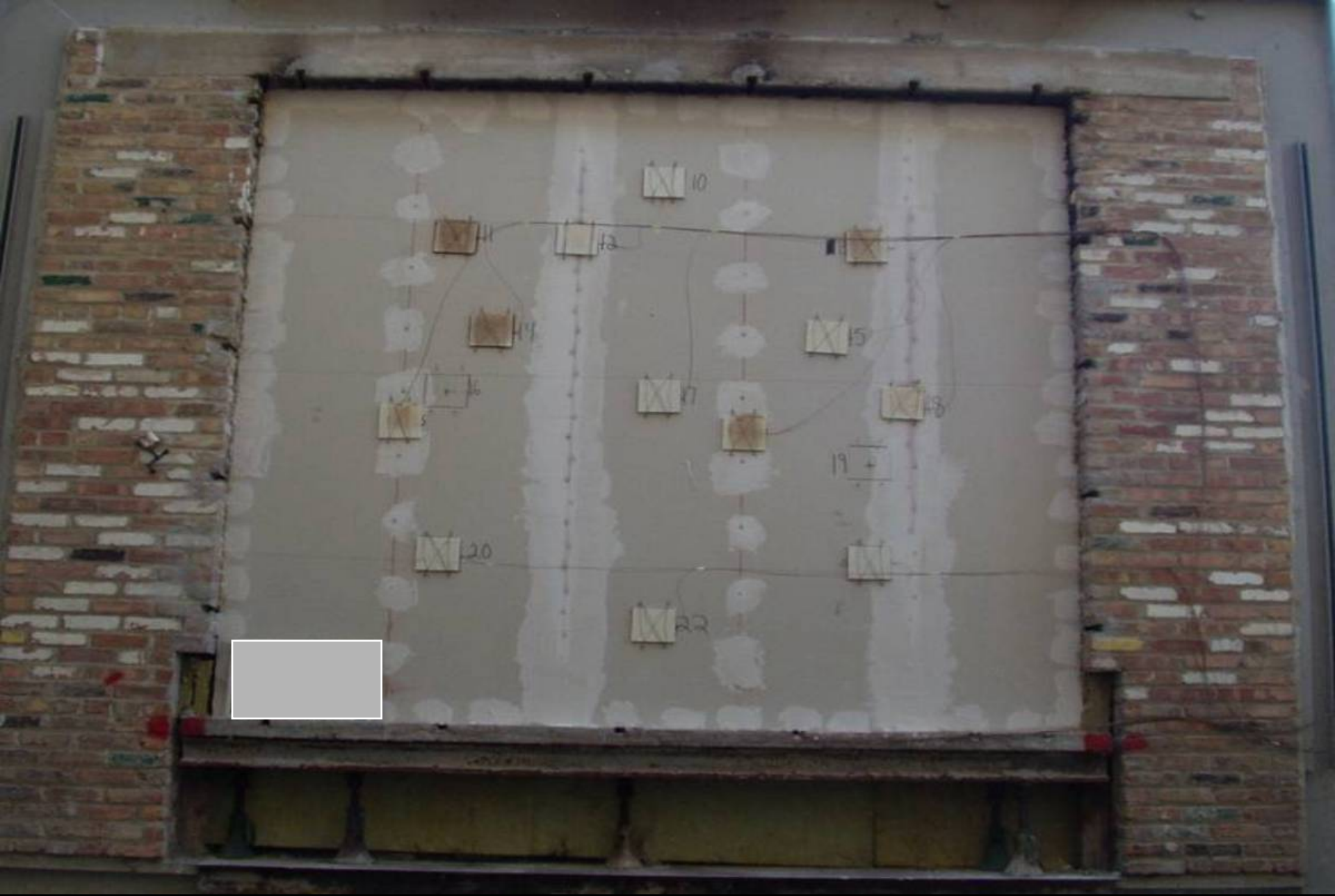
- Sample size - 100 sq ft / 9 ft
- Load applied - Per design



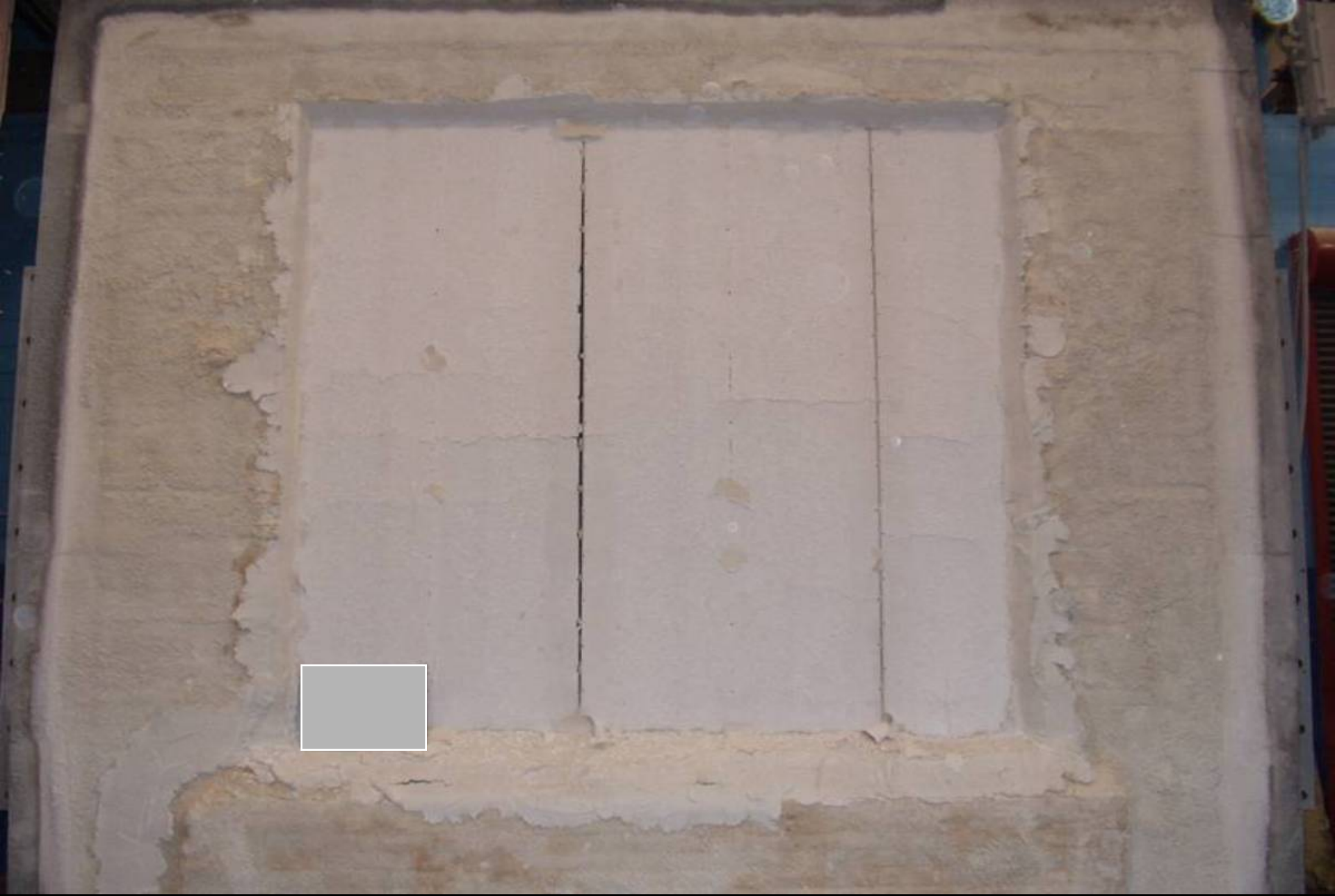


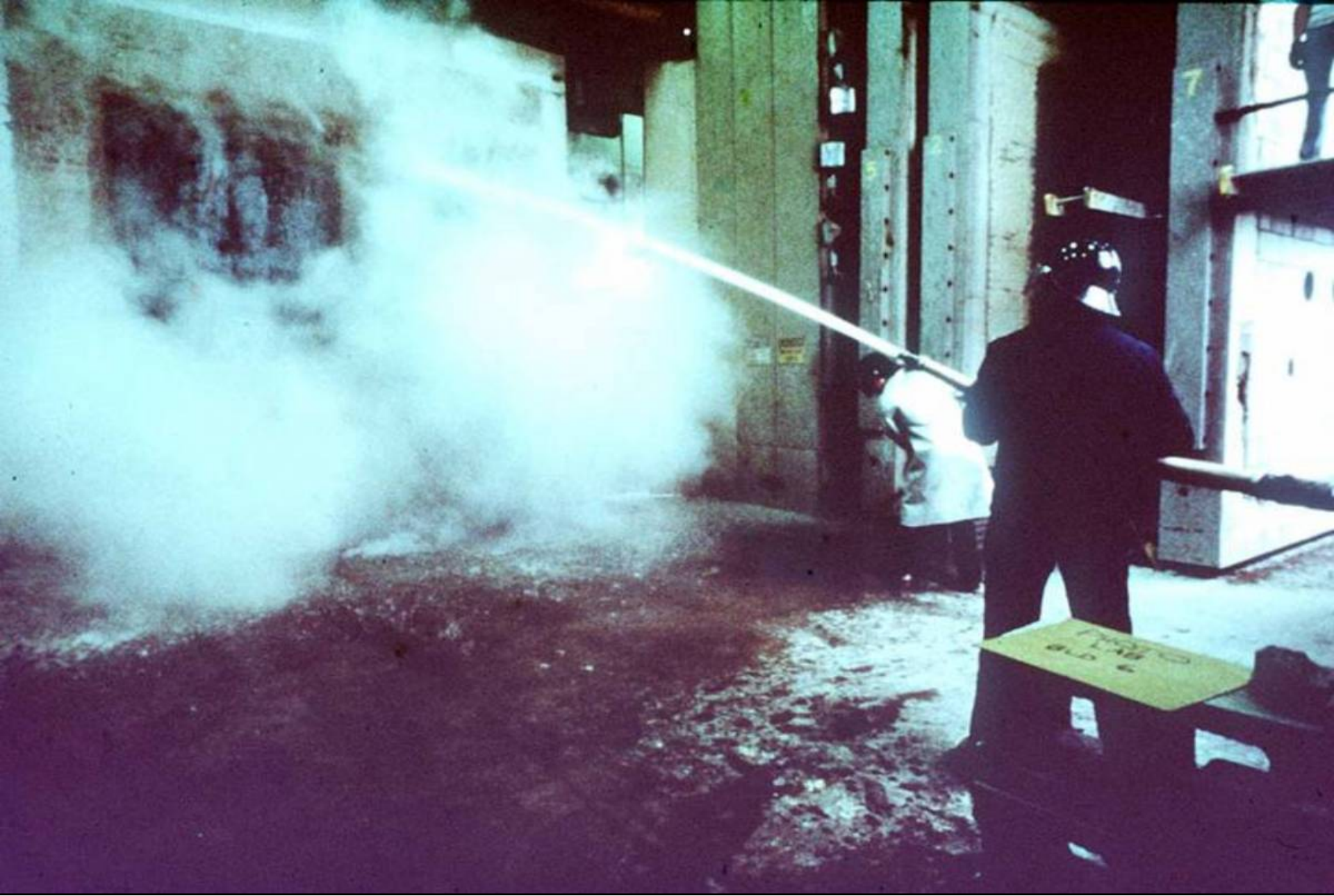
















# Conditions of Acceptance – Walls

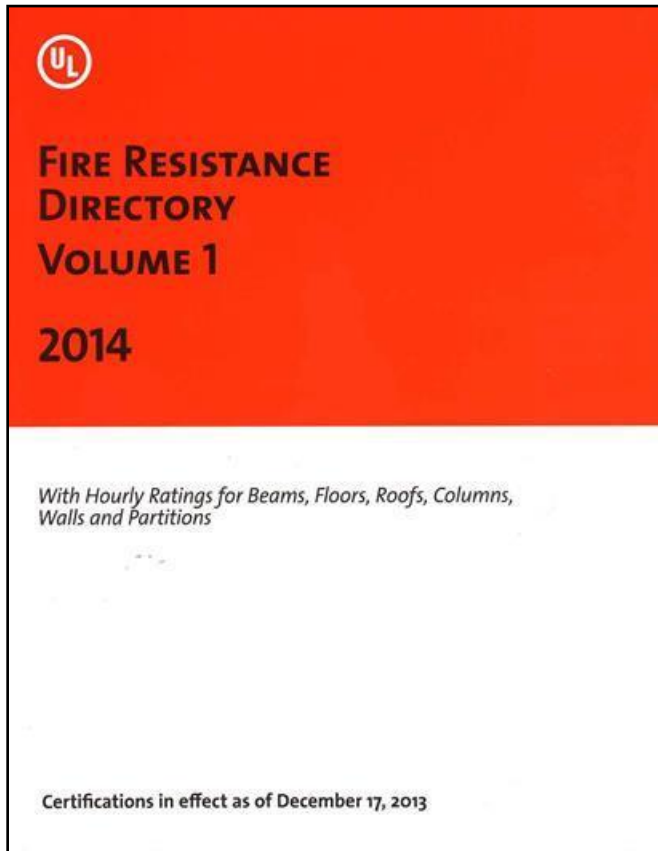
---

- 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

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- Penetrations
- Joint Systems
- Opening Protectives
- Ducts and Air Transfer Openings

# Breaches in Fire-Resistance-Rated Construction Cont.

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Do breaches really impact the performance of a fire-resistance-rated assembly?

Absolutely!!!



# Breaches in Fire-Resistance-Rated Construction Cont.

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- Unsealed or improperly sealed breaches cost lives and property!
  - MGM Grand, Las Vegas, NV – Fire confined to 1<sup>st</sup> floor. Eighty-four fatalities, most on upper floors.
  - Hilton Hotel, Las Vegas, NV – Fire spread from 8<sup>th</sup> to 23<sup>rd</sup> floor in 25 minutes at exterior of building. Eight fatalities.
  - First Interstate Bank, Los Angeles, CA – Fire spread from 12<sup>th</sup> to 16<sup>th</sup> floor through improperly protected penetrations and through unprotected perimeter joint. One fatality.
  - One Meridian Plaza, Philadelphia, PA – Fire spread from 22<sup>nd</sup> to 30<sup>th</sup> floor through improperly protected penetrations and through perimeter joint. Three fatalities.

# Code Requirements

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- 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 Cont.

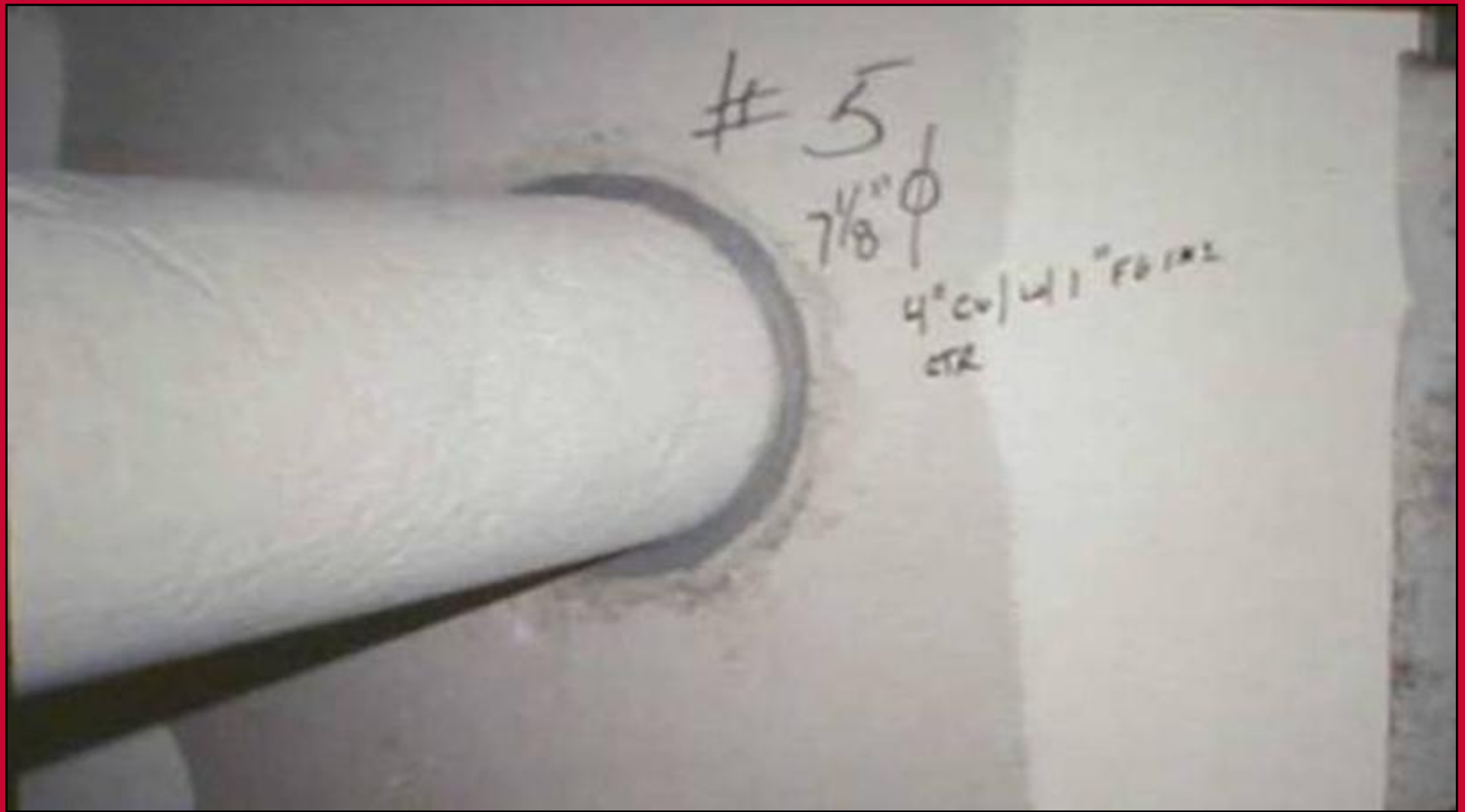
---

- 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



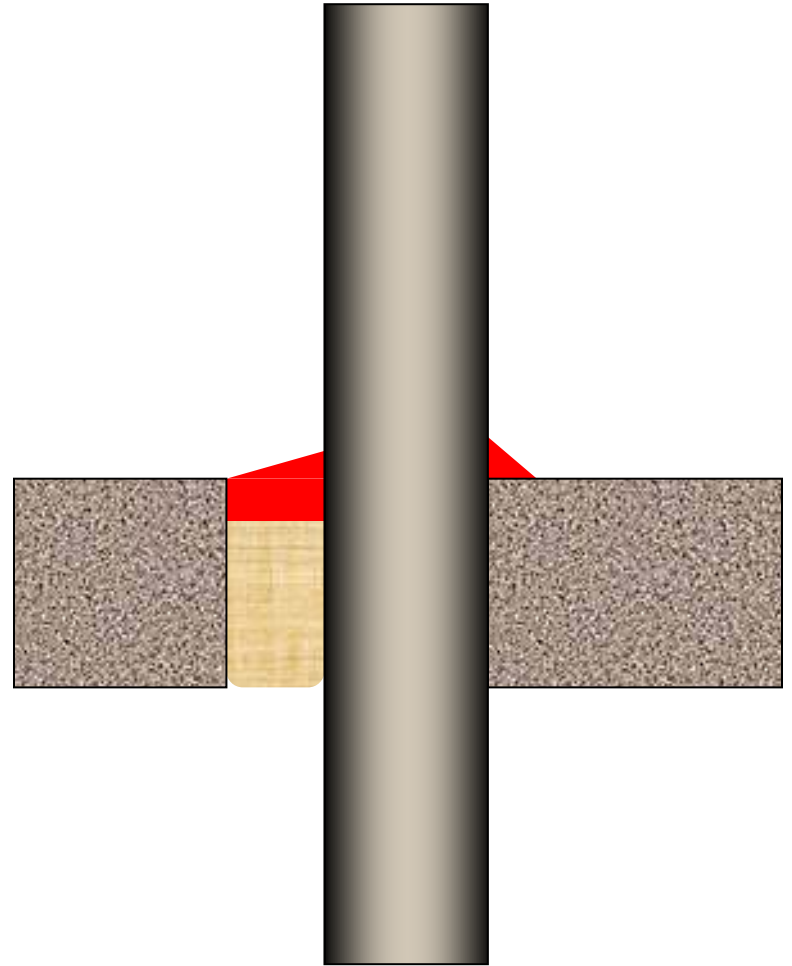
# Through- and Membrane-Penetration Firestop Systems



# Three Elements of a Firestop System

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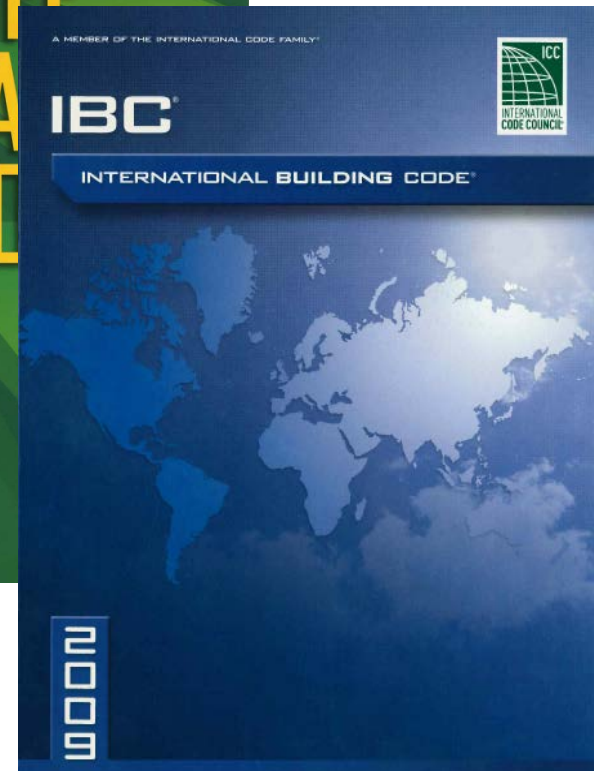
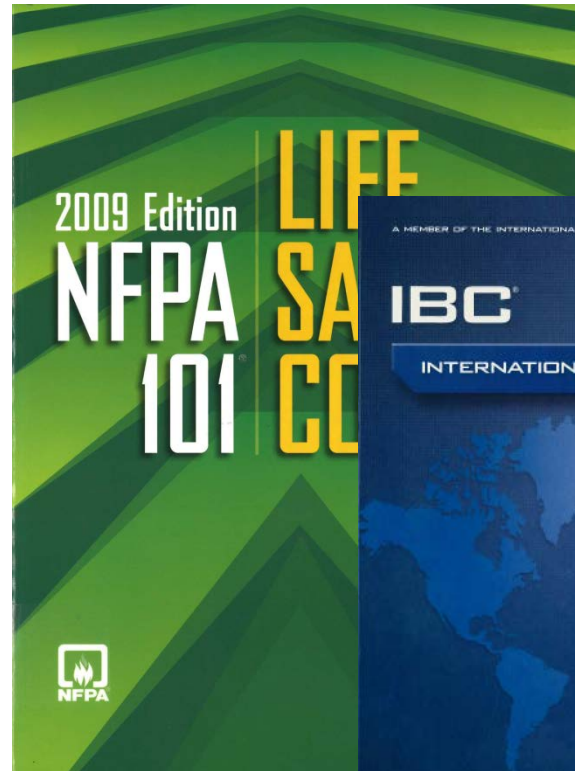
- Floor or Wall Assembly
- Penetrating Item
- Firestopping Products





# 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

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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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# L (Air Leakage) Ratings

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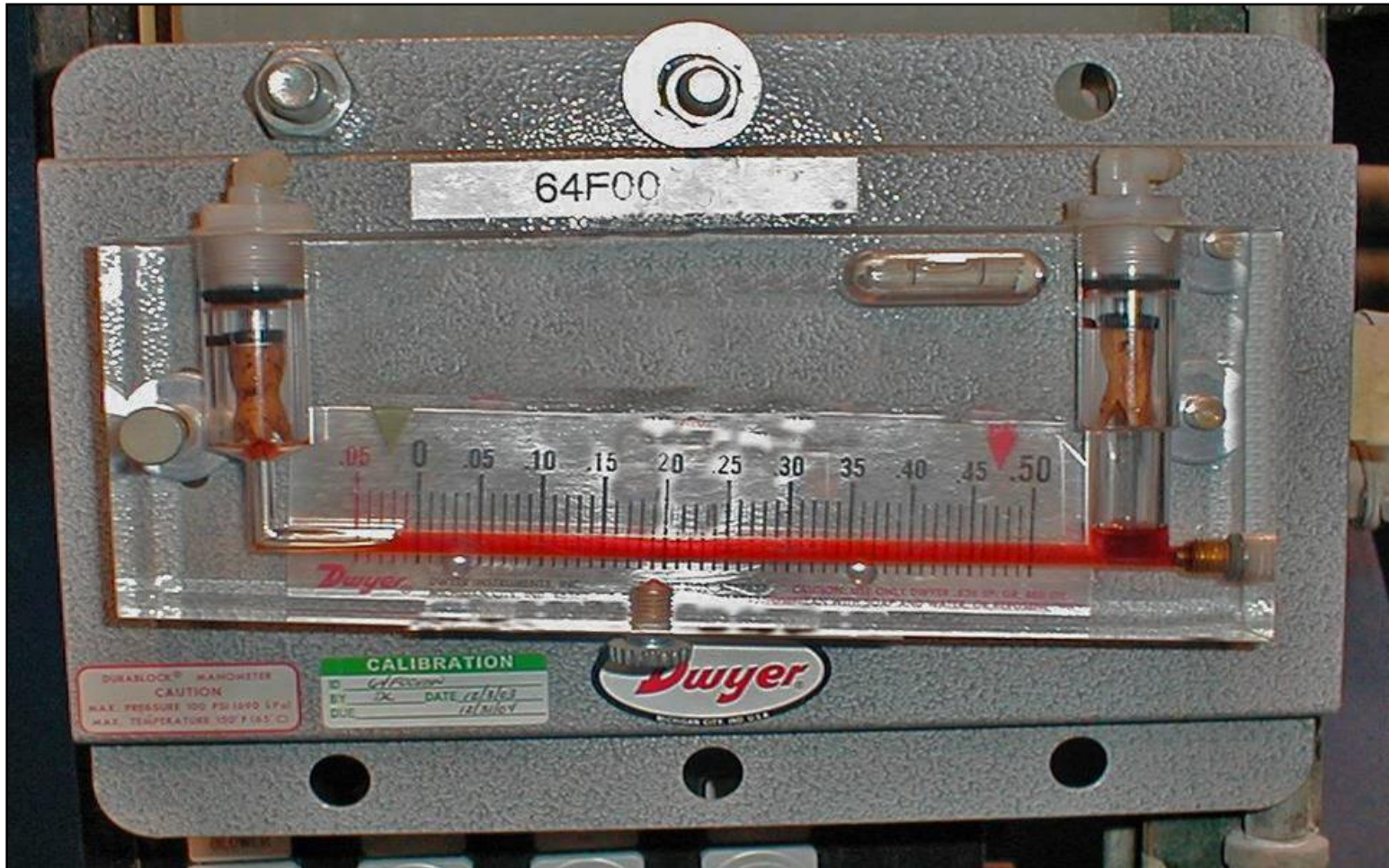


# L (Air Leakage) Ratings





# L (Air Leakage) Ratings



# Test Procedure

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- 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.

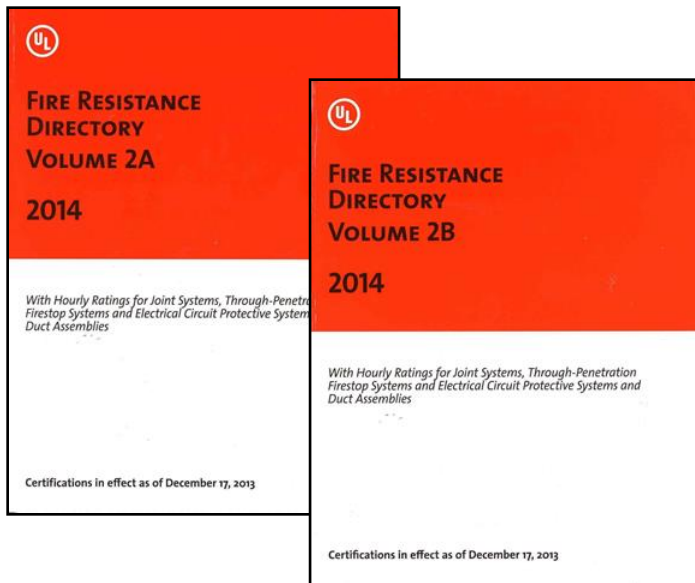
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- Firestop system assigned L Rating at ambient and 400°F, by subtracting incidental chamber leakage from test sample leakage
- L Ratings of firestop systems published in UL Fire Resistance Directory along with F and T Ratings



# Where Are Listings Found?

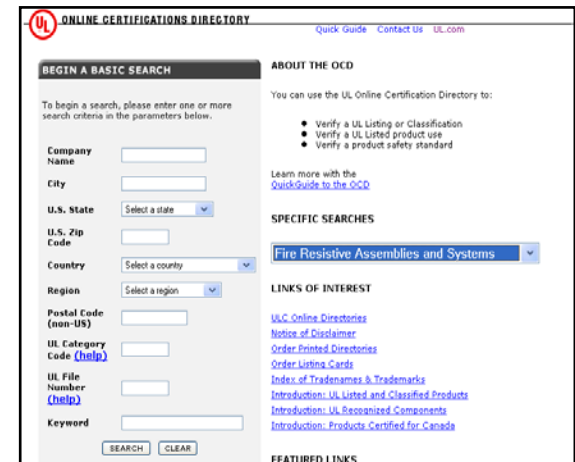
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# Questions / Comments



# Opening Protectives

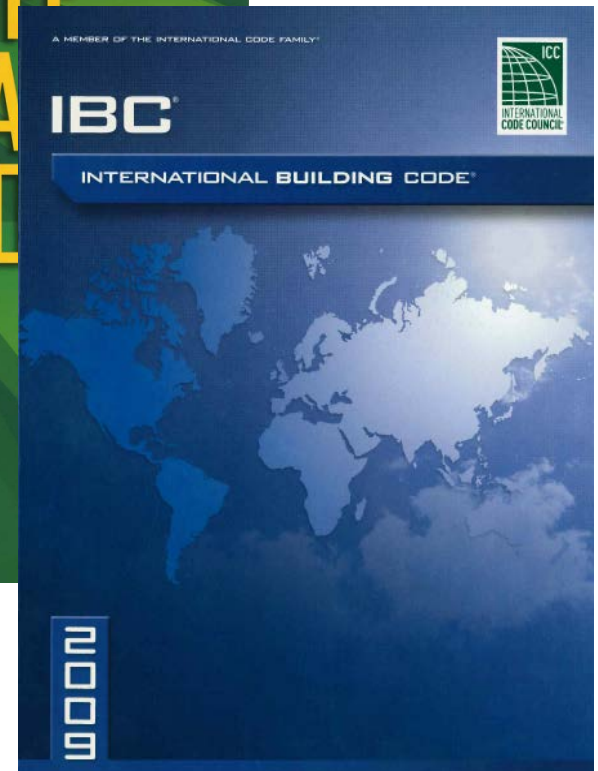
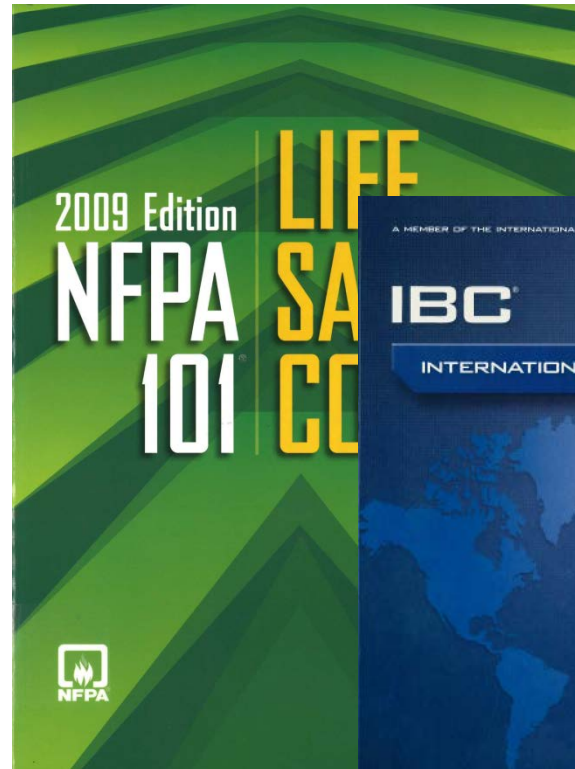
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- Fire Door Assemblies
- Fire Window Assemblies



# Opening Protective

## Code Requirements for Fire Door Assemblies



# Code Requirements

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- 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.

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- 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.

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

# Opening Protectives

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Establishing  
Fire-Protection  
Rating



# Standards

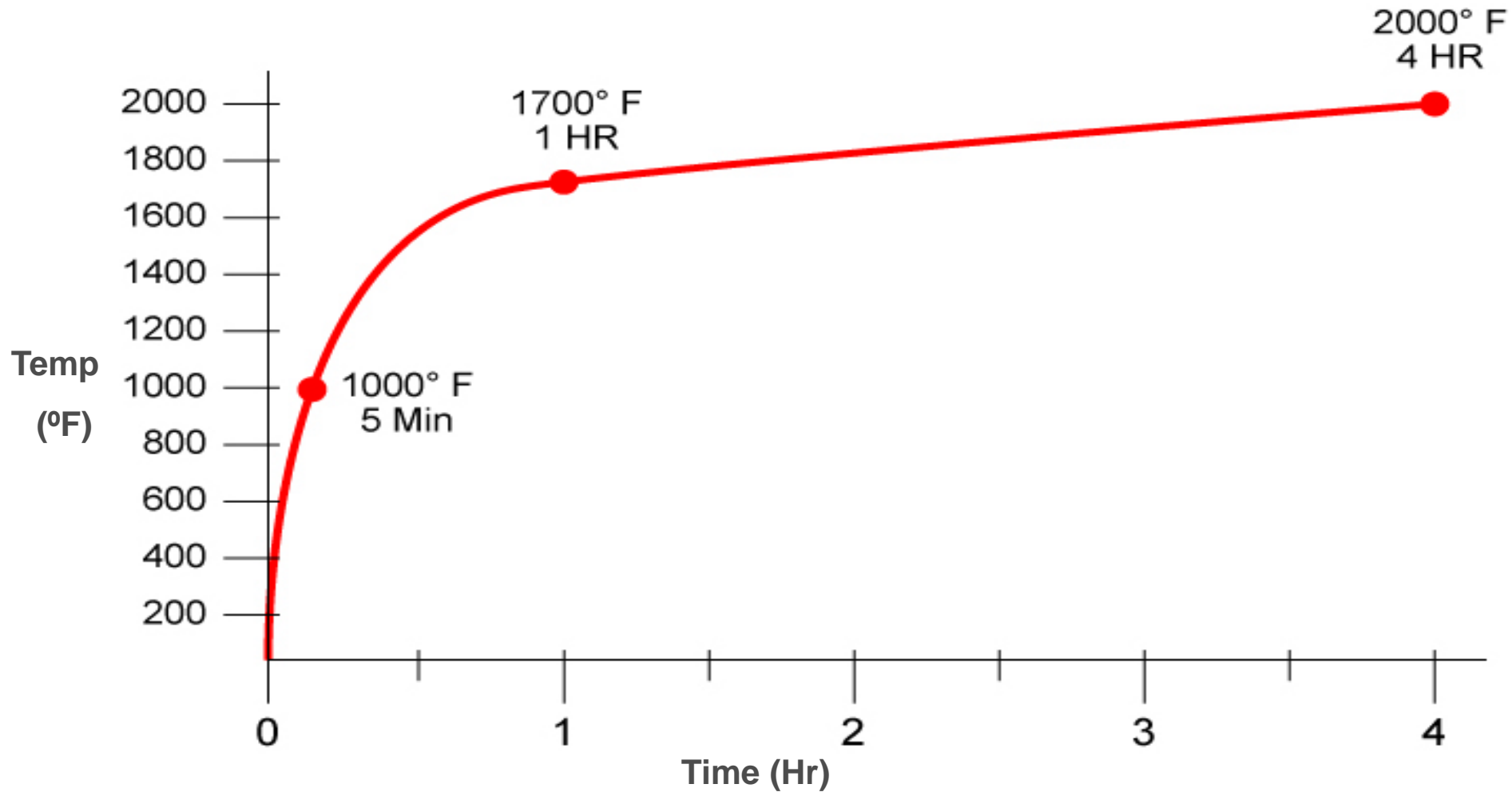
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- ANSI / UL 10B
- ANSI / UL 10C
- NFPA 252





# Time - Temperature Curve













# Conditions of Acceptance Fire Door Assemblies

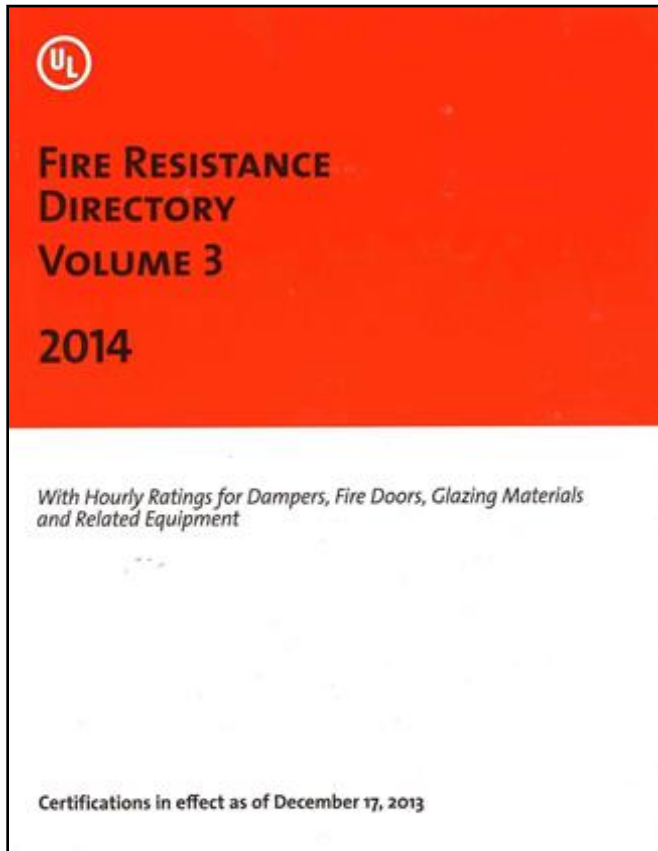
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- Flame Passage
- Hose Stream After Full Duration Fire Exposure



# Where Are Listings Found?

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# Questions / Comments



# Fire Resistive Construction

## UL's Online Search Tools





# UL's Online Search Tools

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- Online Certifications Directory
- Product Spec
- Code Link



# Online Certifications Directory

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- Helps you achieve code compliance
- Is continuously updated
- Needs no password
- Is free – no charge for use
- [www.ul.com/database](http://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](http://www.ul.com/productspec)

# Code Link

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- Correlates model code sections to UL product categories
- Covers many model codes and editions (IBC, IFBC, NEC, etc.)
- Flexible search capabilities
- Powerful tool to locate appropriate Listings
- [www.ul.com/codelink](http://www.ul.com/codelink)





# Questions / Comments



# Thank You for Attending!!!

---

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[www.ul.com](http://www.ul.com)

