RICHMOND
INTERNATIONAL CODE COUNCIL 2018

Welcome to the

2018 Annual Conference Educational Sessions

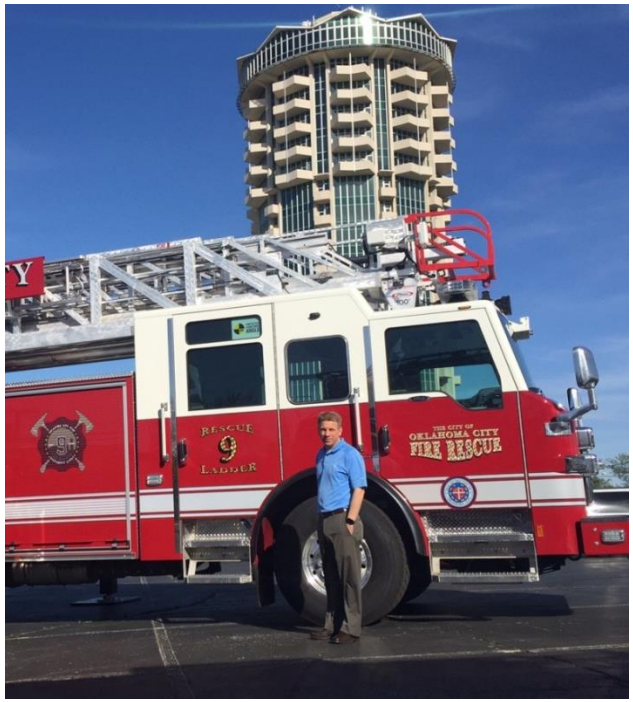
Session: 2018 IBC Essentials – Building Planning

Sponsored by ORACLE


UL


UL

Underwriters Laboratories



Jon Roberts

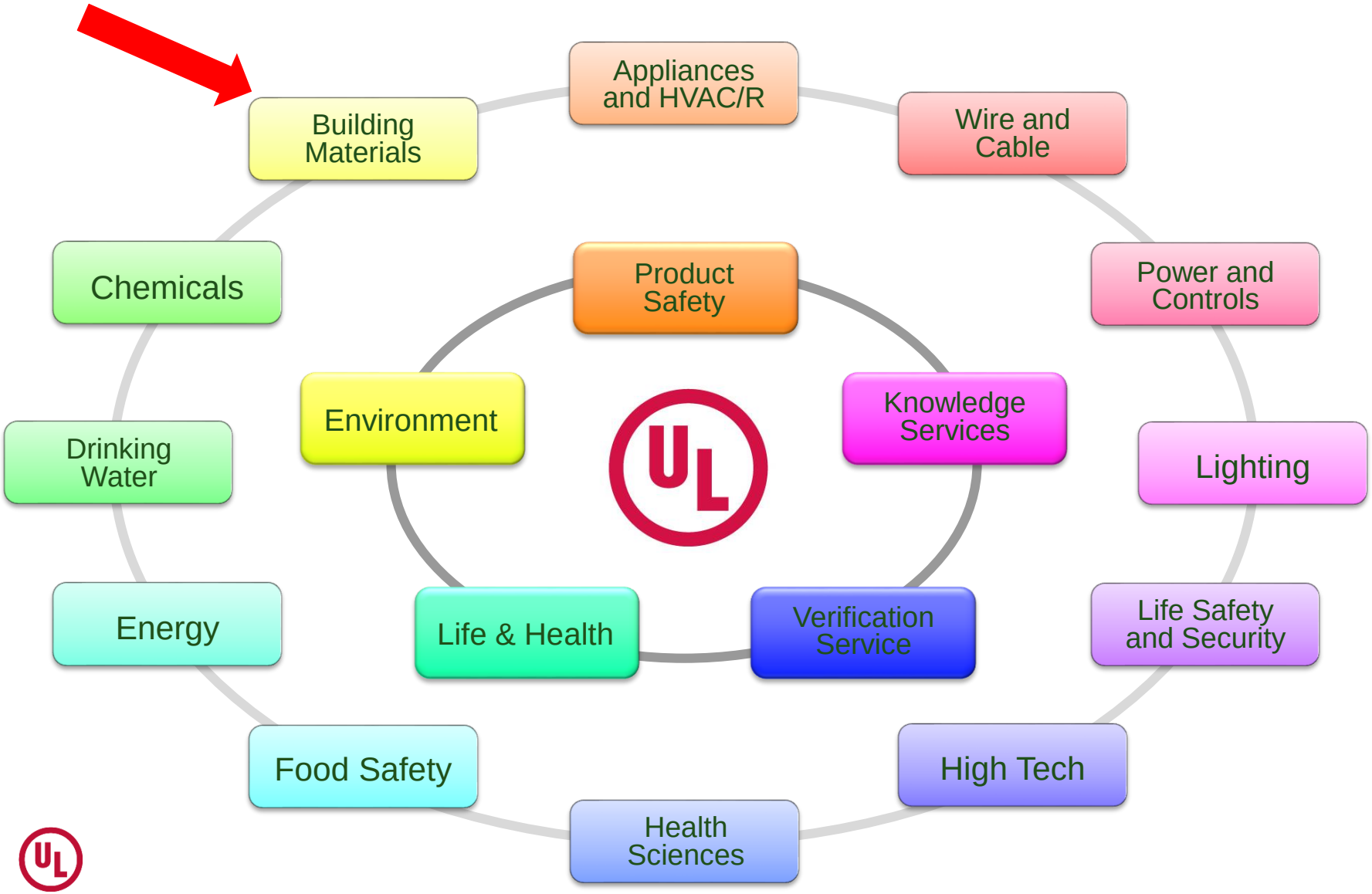
Codes and Advisory Services

UL Resources

- **Fire resistance rated assemblies**

- **UL is a global independent safety science company.**
- **Started in 1894**
- **Perform product testing and research to ensure safety.**
- **Tests performed in several different areas.**

UL Services


Appliances and HVAC/R
Wire and Cable
Power and Controls
Lighting
Life Safety and Security
High Tech
Health Sciences
Food Safety
Energy
Drinking Water
Chemicals
Building Materials
Product Safety
Knowledge Services
Verification Service
Life & Health
Environment

Fire Resistant Construction

Fire-Resistance-Rated Construction

International Fire and Building Code Requirements
for
Fire-Resistance-Rated Construction

Code Requirements

Why is this important to a Building Code Official?

IBC Section 703.2

- Fire-resistance ratings shall be determined in accordance with ANSI/UL 263 or ASTM E119

Why is this important to a Fire Official?

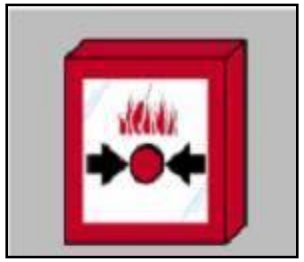
IFC Section 701.1

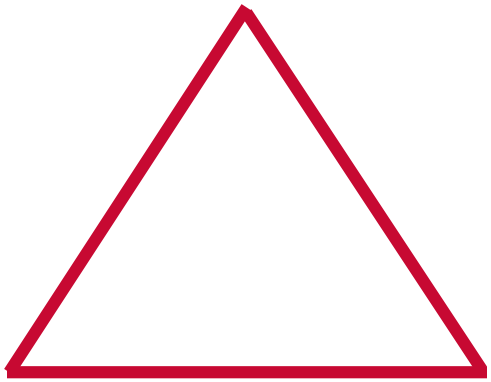
Governs maintenance of materials, systems, and assemblies used for:

- Structural fire resistance and fire-resistance-rated construction
- Separation of adjacent spaces to safeguard against the spread of fire and smoke within a building
- Safeguards against the spread of fire to or from buildings.
- **New buildings shall comply with the *International Building Code*.**

Fire Protection Triad

Detection

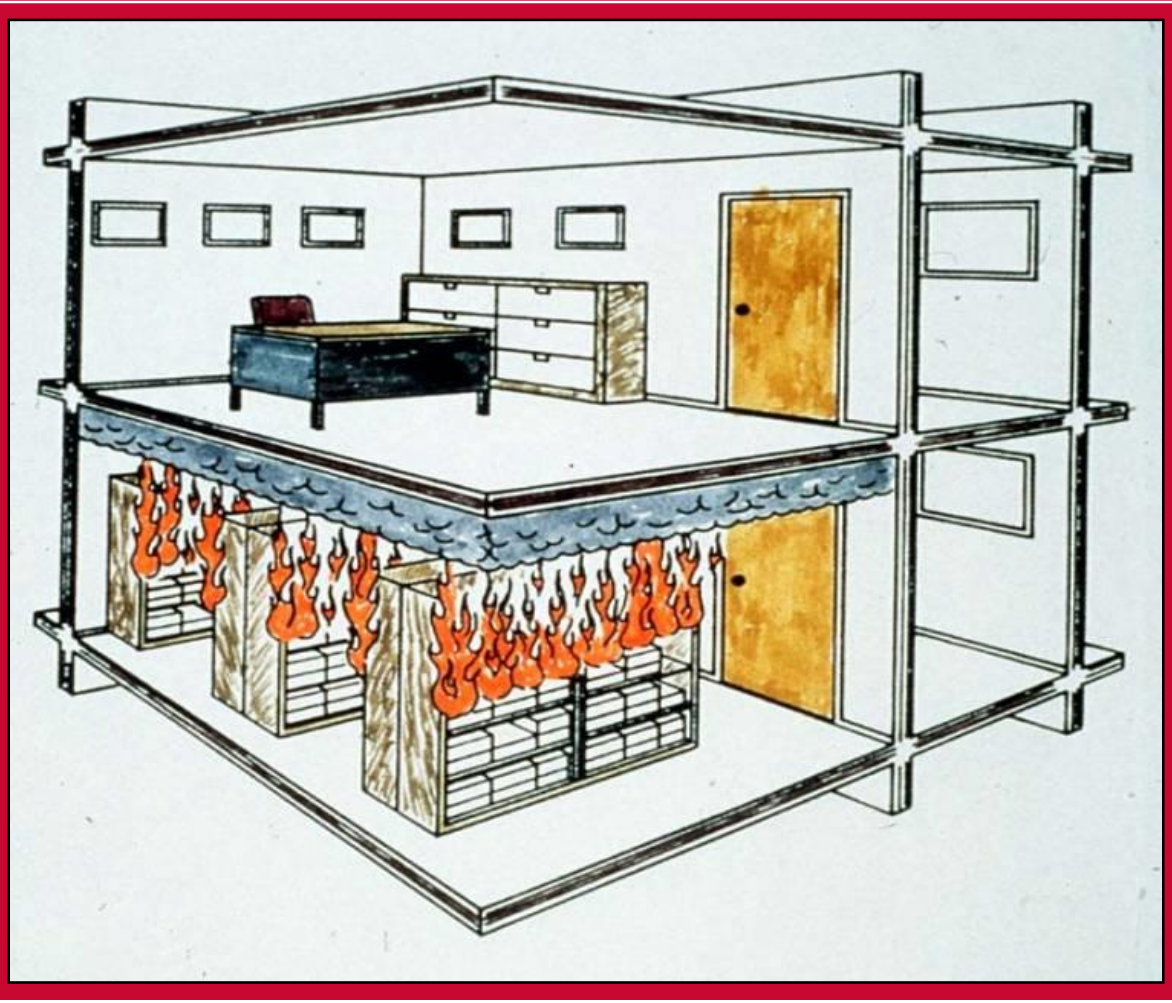




Containment

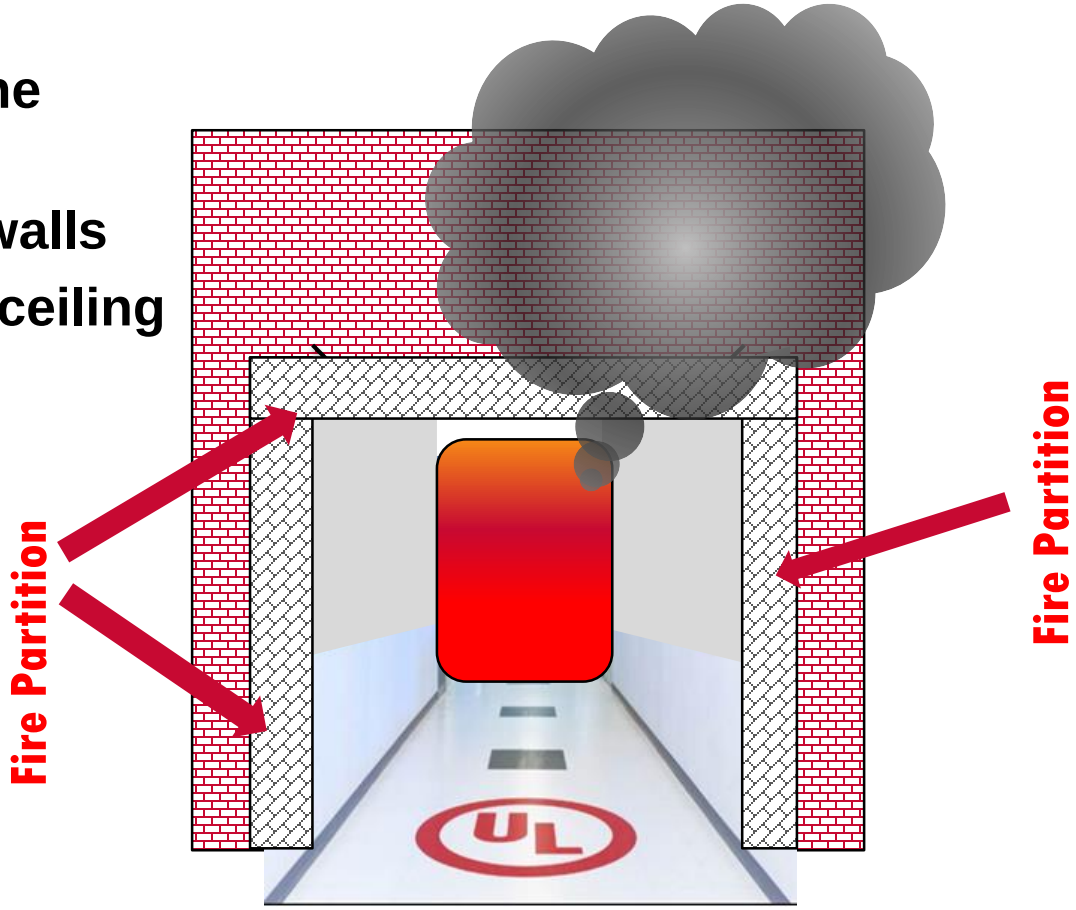
Suppression

Containment



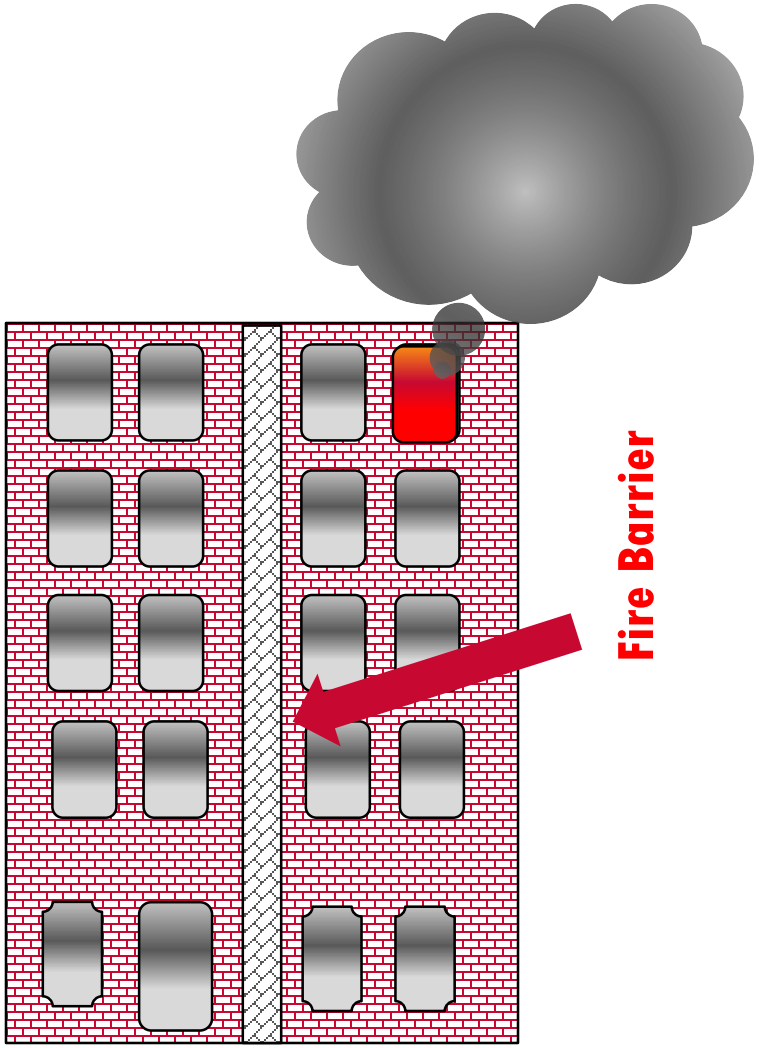
Fire Partition

- Rated assemblies constructed within the building
- Used as separation walls
- Extend from floor to ceiling above



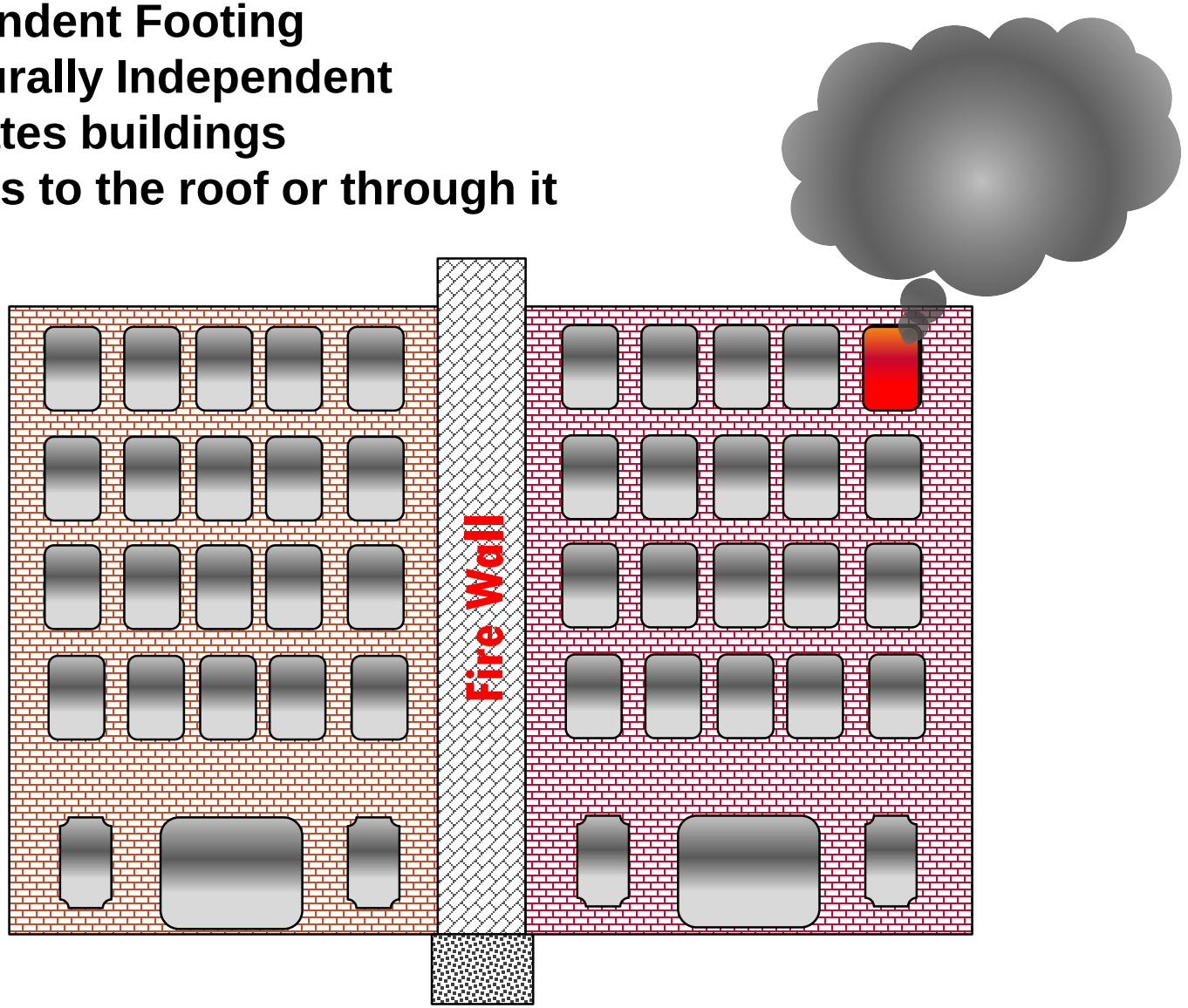
Fire Barriers

- Rated assemblies constructed within the building
- Used to separate fire areas or occupancies within the same building
- Extend from floor to floor or to the roof
- Not structurally independent
- 2 hour rating or greater (Except U)



Fire Wall

- Independent Footing
- Structurally Independent
- Separates buildings
- Extends to the roof or through it



Other Definitions

Fire-resistance:

- That property of materials or their assemblies that prevents or retards the passage of excessive heat, hot gases or flames under conditions of use. (IBC)

Other Definitions

Fire-resistance rating:

- The period of time a building element, component or assembly maintains the ability to confine a fire, continues to perform a given structural function, or both, as determined by the tests, or the methods based on tests, prescribed in Section 703.3 (IBC)

Other Definitions

Fire-protection rating **:**

- The period of time that an opening protective will maintain the ability to confine a fire as determined by tests prescribed in Section 715. Ratings are stated in hours or minutes. (IBC)

Expressing Fire Resistance

- Expressed as an Hourly Time Period
- Ratings range from 1/2 to 4 hours

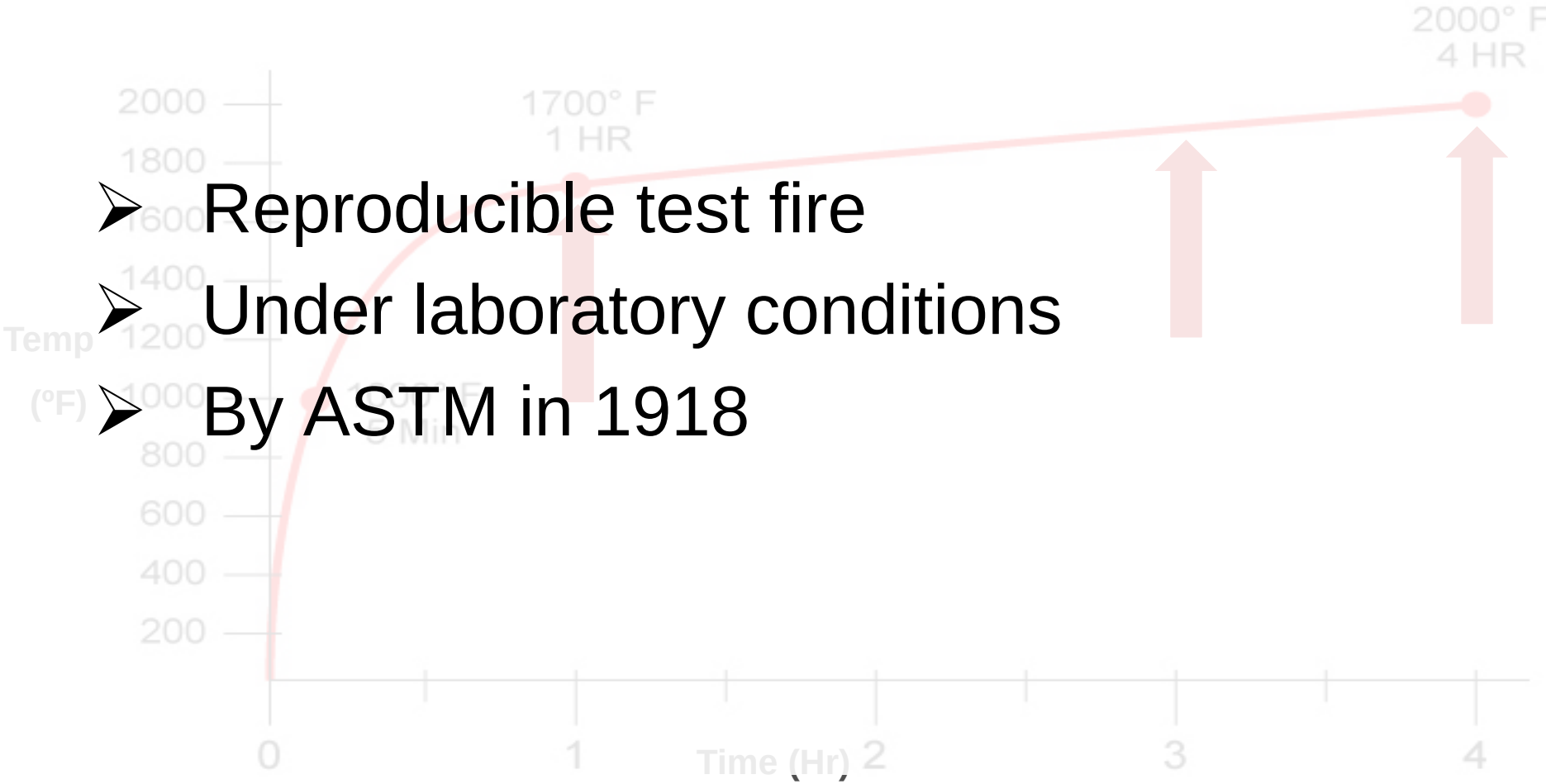
Contain the fire to the room or floor of origin

Fire-Resistance-Rated Construction

Establishing Fire-Resistance Ratings

Standards Used to Evaluate Assemblies

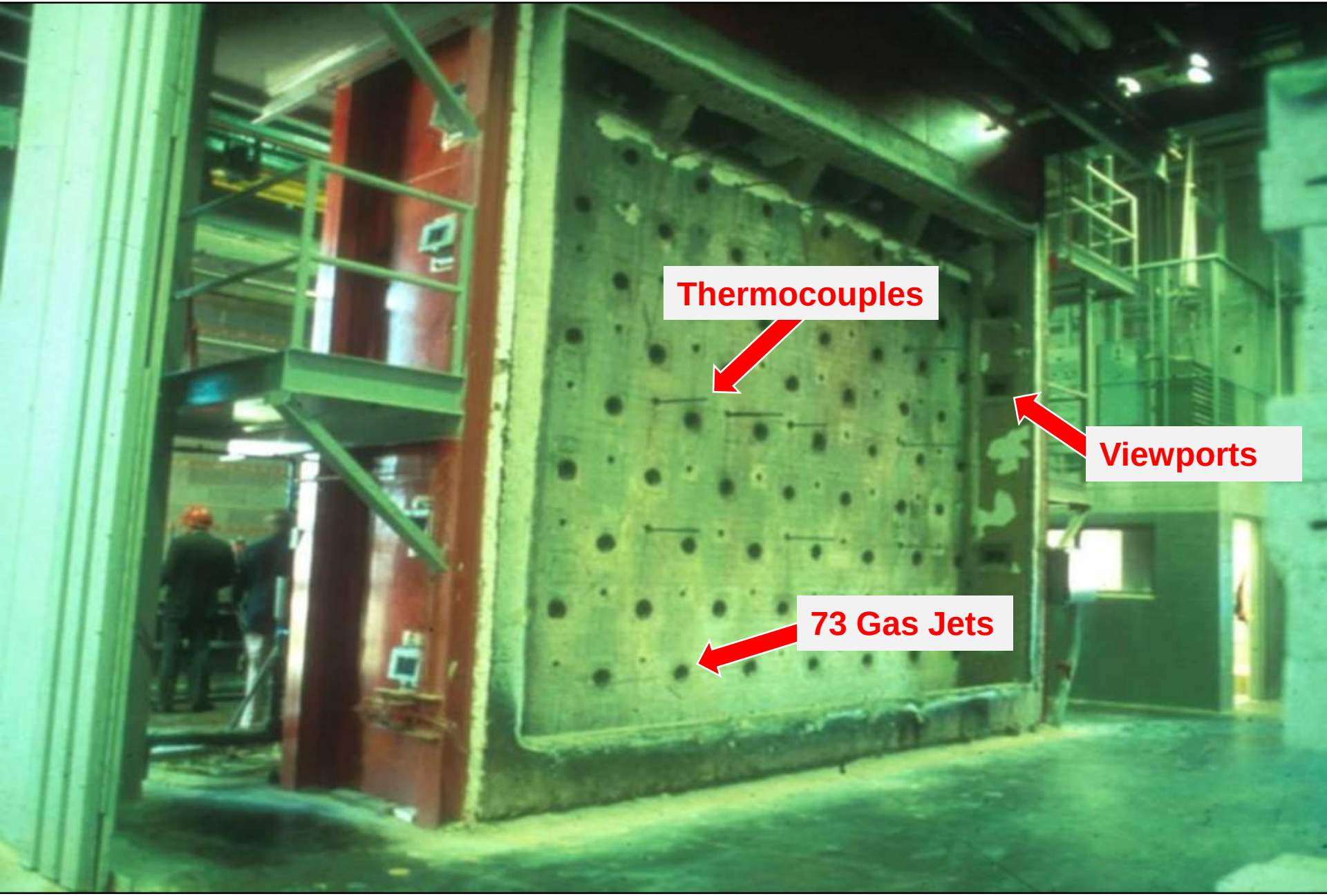
Time - Temperature Curve

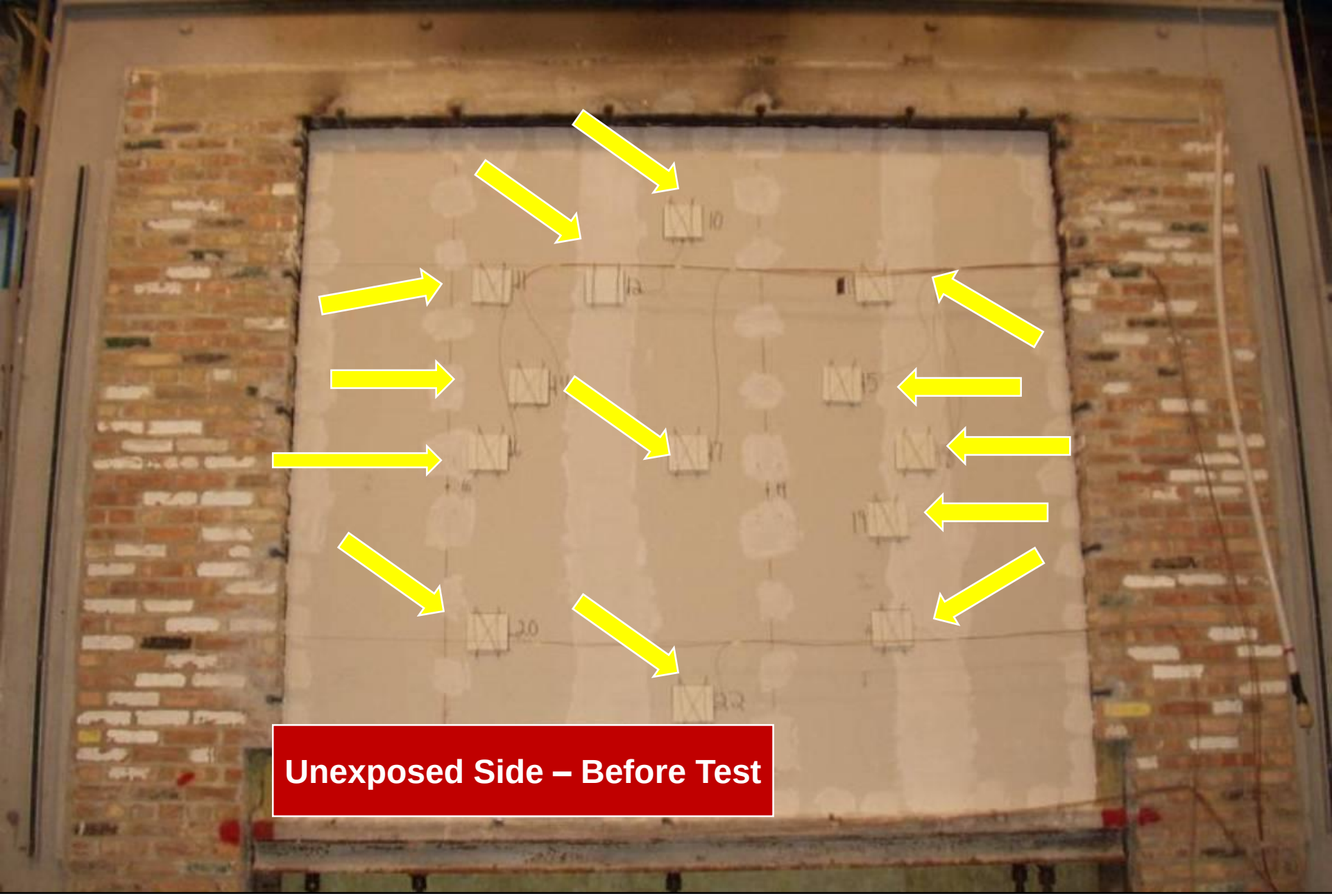


- Reproducible test fire
- Under laboratory conditions
- By ASTM in 1918

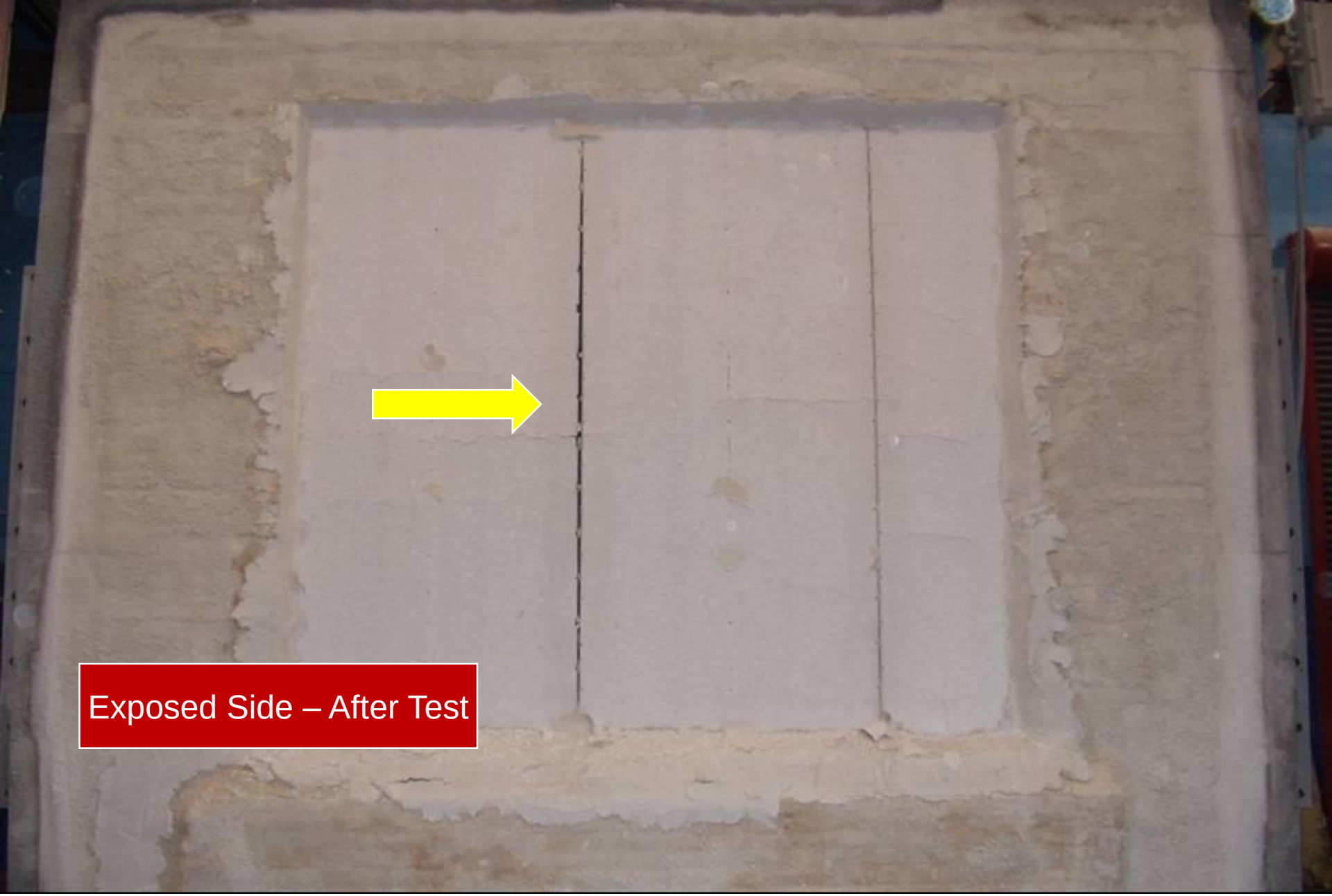
Building Components

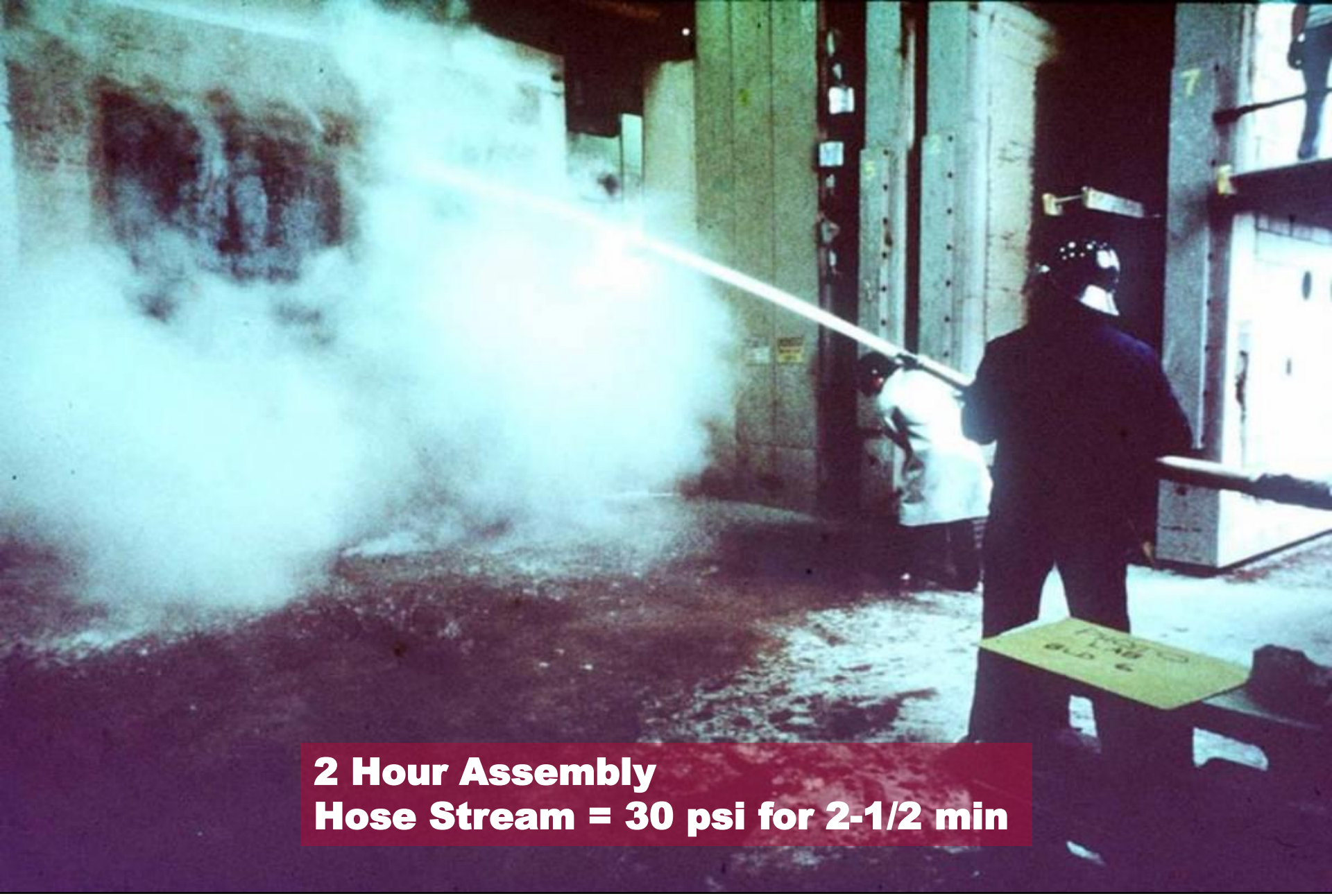
- Columns
- Beams
- Floor/Ceilings or Roof/Ceilings
- Walls


Thermocouples
Viewports
73 Gas Jets


Unexposed Side – Before Test


Unexposed Side – After Test


Exposed Side – After Test


2 Hour Assembly
Hose Stream = 30 psi for 2-1/2 min

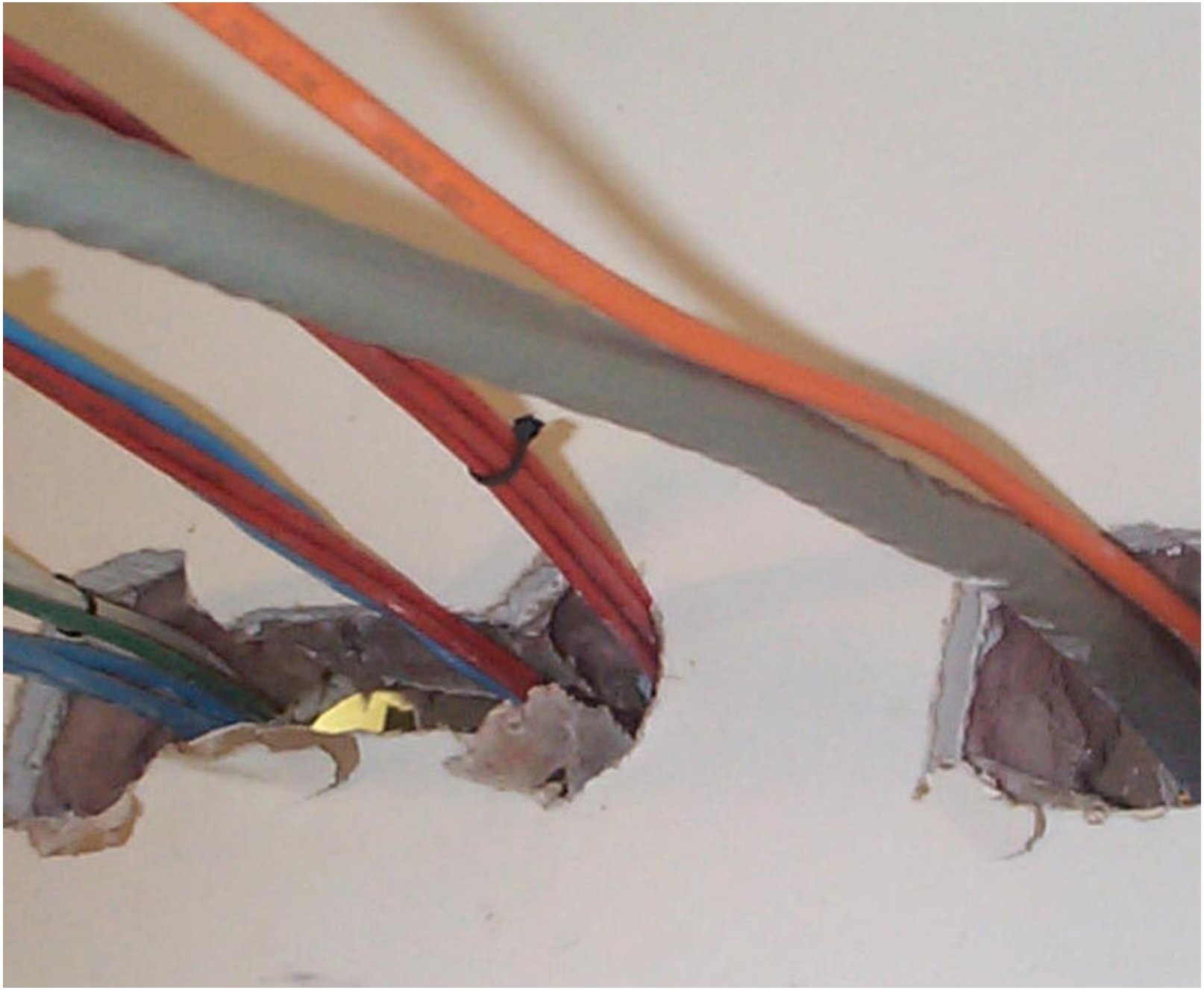

Exposed Side
After Hose Stream

Conditions of Acceptance – Walls

- Flame passage – Did fire spread?
- Limit heat transfer – 250ºF / 325ºF (average) ?
- Support load – Is it still standing?
- Hose stream – Did water penetrate?

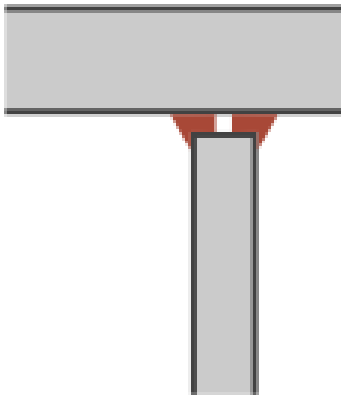
Gypsum Video

Maintaining Fire Resistant Walls




ERASE A HOLE
Fills Holes & Cracks in Plaster, Drywall & Wood
APPLY, WIPE & PAINT
5.5 OZ.

Breaches in Fire-Resistance-Rated Construction



Fire Resistive

Building Code Requirements

- IBC – Breaches shall be protected
  - Section 714 – ➢ UL 1479
  - Section 715 – ➢ UL 2079
  - Section 716 – ➢ UL 9, UL 10A, 10B, 10C
  - Section 717 – ➢ UL 555, UL 555S, UL 555C
- Each type of breach has a unique fire test standard associated with it which compliments ANSI/UL 263 and ASTM E119

Winecoff Hotel
Atlanta, GA - 1946

- Advertised as "absolutely fireproof“
- Fire spread for the 3rd floor up a stairwell.
- One stairwell in the building.
- No doors on stairwell
- 15 Stories
- 119 Died

MGM Grand
Las Vegas, NV – 1980

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

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?

Firestop Video

Absolutely!!!

Unsealed or improperly sealed breaches cost lives and property!

Online Tools For Locating UL Designs

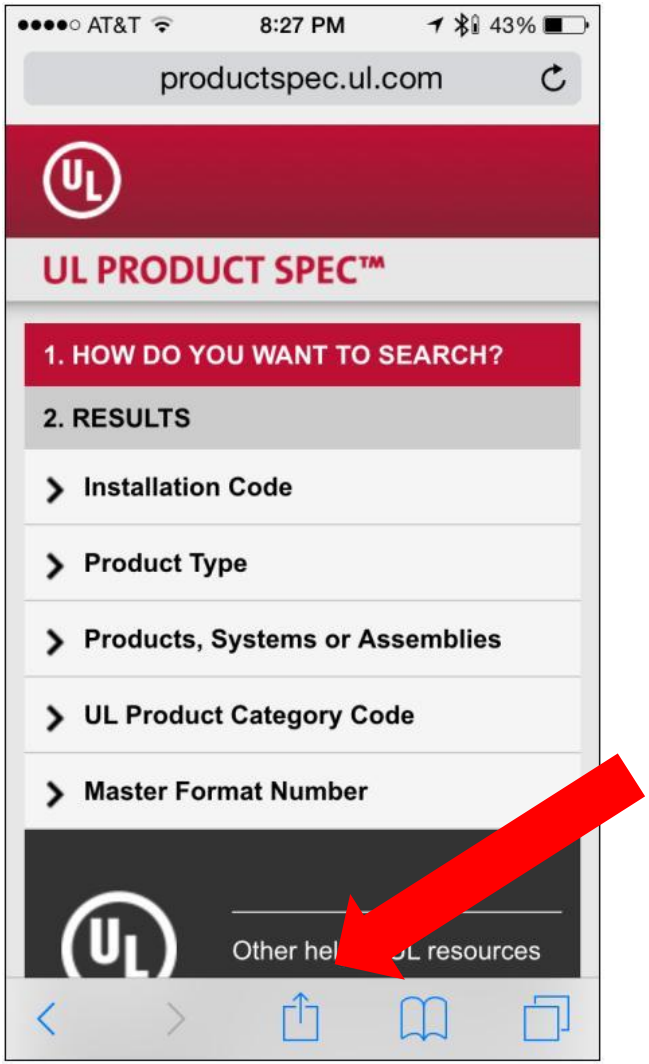
Traditional UL Directories

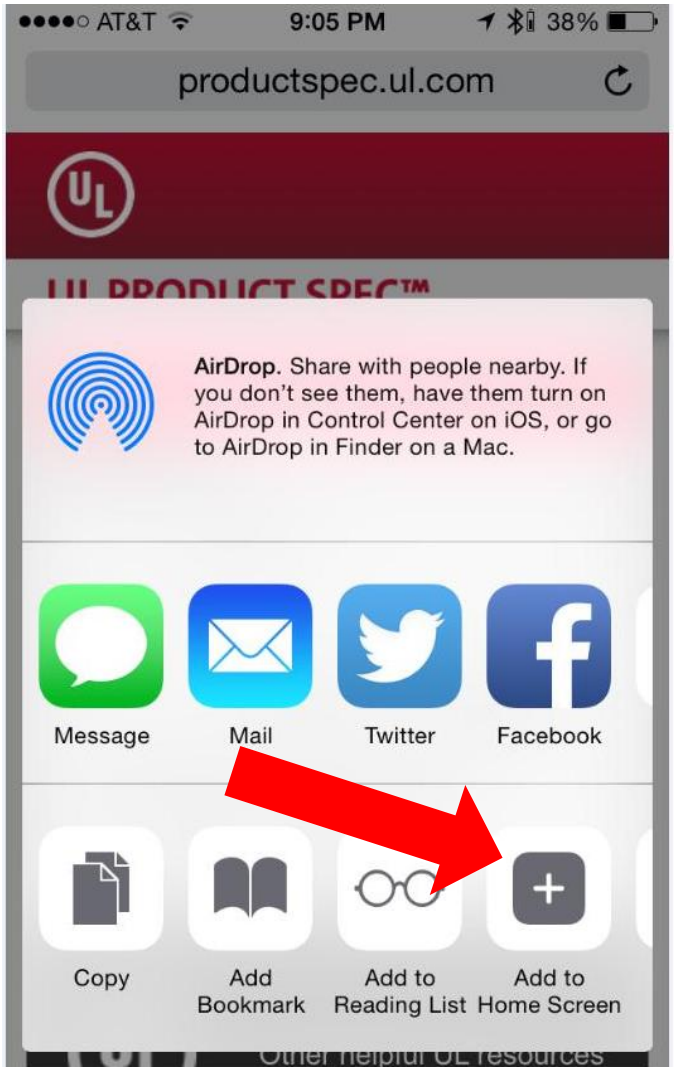
UL Product Spec

www.ul.com/productspec

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

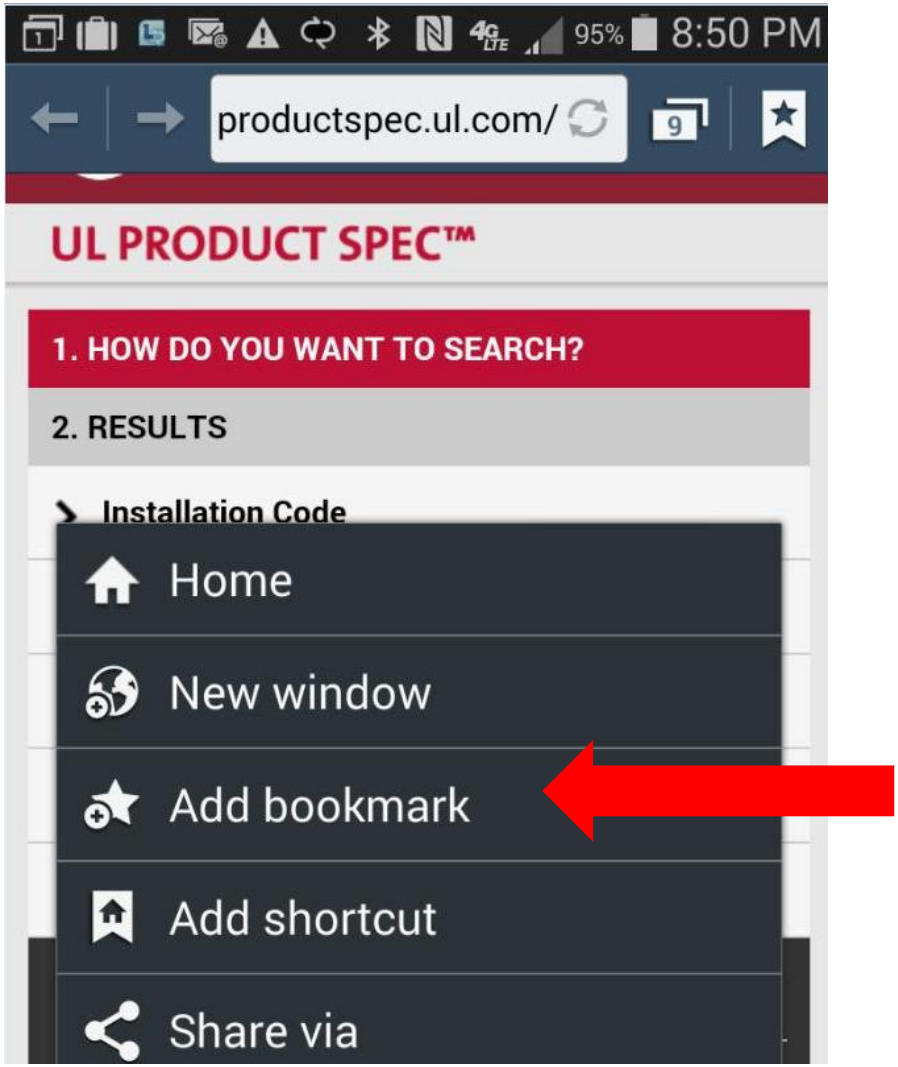
www.ul.com/productspec





Adding Product Spec On Android

www.ul.com/productspec



What does an assembly look like?

Wall Assembly

UL PRODUCT SPEC™

Quickly find, specify, or verify UL Certified products for your projects.

1. HOW DO YOU WANT TO SEARCH? | **2. RESULTS**

- Installation Code
- Product Type
- Products, Systems or Assemblies
- UL Product Category Code
- Master Format Number

Other helpful UL resources

UL PRODUCT SPEC™

Quickly find, specify, or verify UL Certified products for your projects.

1. HOW DO YOU WANT TO SEARCH? | **2. RESULTS**

Products, Systems or Assemblies

- Electrical
- Building or Fire Systems

Back

Other helpful UL resources

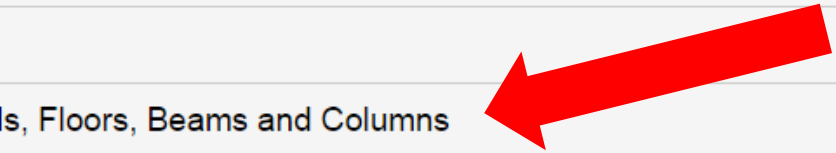
UL PRODUCT SPEC™

Quickly find, specify, or verify UL Certified products for your projects.

1. HOW DO YOU WANT TO SEARCH? | **2. RESULTS**

Building or Fire Systems

- Fire Protection Systems
- Commercial Cooking
- Elevators
- Fire Rated Walls, Floors, Beams and Columns
- Firestop Systems
- Passive Systems
- Roofing
- Windstorm Rated Products
- Egress Equipment
- Flammable Liquid Storage
- Green Buildings



Back

UL PRODUCT SPEC™

Quickly find, specify, or verify UL Certified products for your projects.

1. HOW DO YOU WANT TO SEARCH? | **2. RESULTS**

Fire Rated Walls, Floors, Beams and Columns

Search by Assembly Number

Search with Specific Parameters

Back

Other helpful UL resources

UL PRODUCT SPEC™

Quickly find, specify, or verify UL Certified products for your projects.

1. HOW DO YOU WANT TO SEARCH? | **2. RESULTS**

Search by Assembly Number

U306

Search

Back

Other helpful UL resources

Assembly Usage Disclaimer

BXUV - Fire Resistance Ratings - ANSI/UL 263

BXUV7 - Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

See General Information for Fire-resistance Ratings - ANSI/UL 263

See General Information for Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

Design No. U306

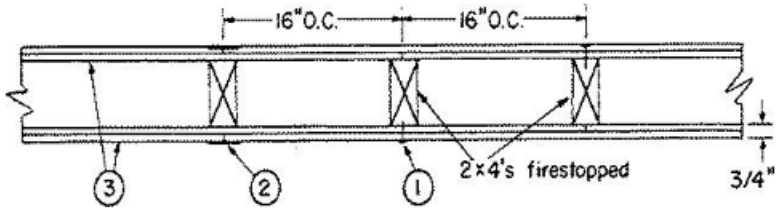
January 21, 2010

Bearing Wall Rating — 1 HR.

Finish Rating — 20 Min.

This design was evaluated using a load design method other than the Limit States Design Method (e.g., Working Stress Design Method). For jurisdictions employing the Limit States Design Method, such as Canada, a load restriction factor shall be used — See Guide BXUV or BXUV7

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**



1. **Nailheads** — Exposed or covered with joint compound.

2. **Joints of Exposed Boards** — Exposed joints covered with joint compound and paper tape. Joint compound and paper tape may be omitted when square edge boards are used.

3. **Gypsum Board*** — 3/8 in. thick gypsum wallboard, applied in two layers, the first layer of boards placed vertically and temporarily nailed in position, the second layer coated with glue, applied against the first layer and nailed to studs 6 in. OC at edges of boards and 8 in. OC at intermediate studs with 1-7/8 in., 6d, cement coated nails.
CERTAINTEED GYPSUM INC — Type DDG2.

GEORGIA-PACIFIC GYPSUM L L C — Type GPFS1.

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2010-01-21

FIRE-RESISTANCE DESIGN

Assembly Usage Disclaimer

BXUV - Fire Resistance Ratings - ANSI/UL 263

BXUV7 - Fire Resistance Ratings - CAN/ULC-S10[illegible] for Canada

See General Information for Fire-resistance Ratings - ANSI/UL 263

See General Information for Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

Design No. U306

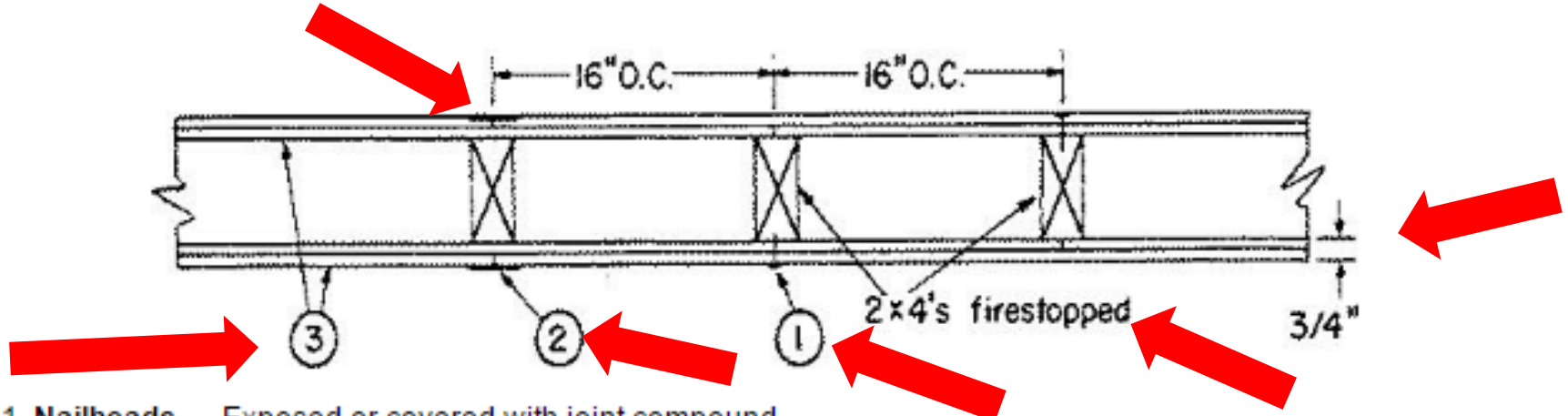
January 21, 2010

Bearing Wall Rating — 1 HR.

Finish Rating — 20 Min.

This design was evaluated using a load design method other than the Limit States Design Method (e.g., Working Stress Design Method). For jurisdictions employing the Limit States Design Method, such as Canada, a load restriction factor shall be used — See Guide BXUV or BXUV7

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**



1. **Nailheads** — Exposed or covered with joint compound.

2. **Joints of Exposed Boards** — Exposed joints covered with joint compound and paper tape. Joint compound and paper tape may be omitted when square edge boards are used.

3. **Gypsum Board*** — 3/8 in. thick gypsum wallboard, applied in two layers, the first layer of boards placed vertically and temporarily nailed in position, the second layer coated with glue, applied against the first layer and nailed to studs 6 in. OC at edges of boards and 8 in. OC at intermediate studs with 1-7/8 in., 6d, cement coated nails.
CERTAINTEED GYPSUM INC — Type DDG2.

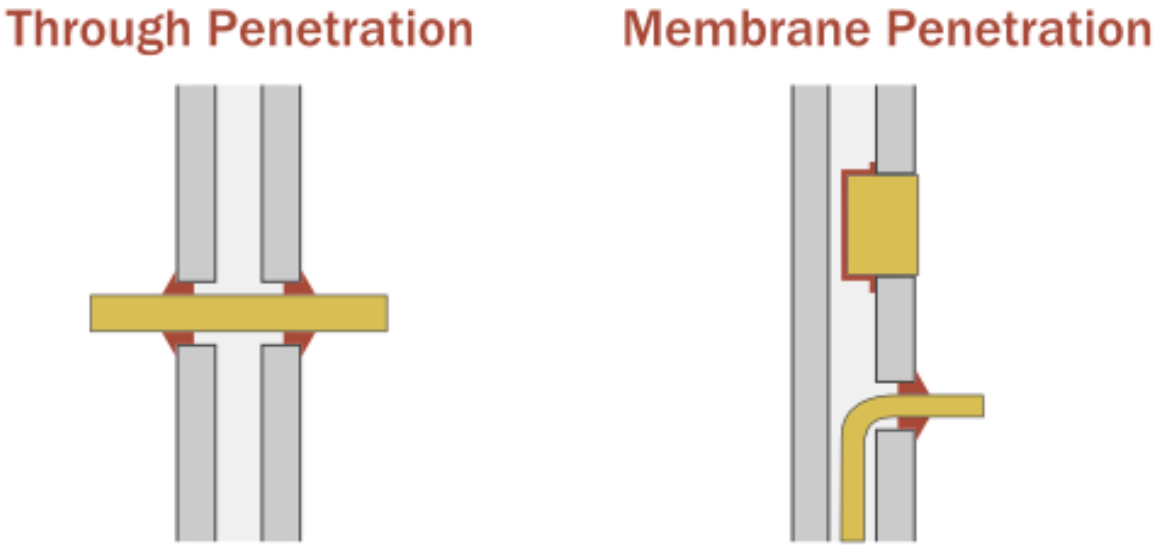
GEORGIA-PACIFIC GYPSUM L L C — Type GPFS1.

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Fire Stop Assembly

Penetration Fire Stop Types

- Two Types – Through and Membrane



- Vertical – Floor or ceiling
- Horizontal – Wall

Penetration Fire Stopping

- Firestop Systems tested to ASTM E 814 or UL 1479 result in hourly ratings.
  - F Rating - The amount of time before flame pokes through openings to the unexposed side of the test assembly.
  - T Rating - The amount of time for the surface of the penetrating item on the non-fire side of the test assembly to rise 250F plus ambient temperature.
  - "L" Rating - The L Rating measures the amount of air that moves through an opening in cubic feet per minute per square foot of opening area, at ambient temperatures and 400F.
  - "W" Rating - The W Rating quantifiably measures resistance of a firestop product to water in buildings.

Finding Proper Fire Stopping

Design No. U306

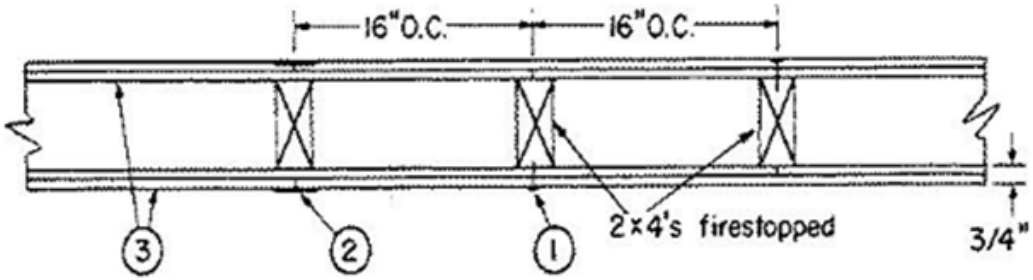
January 21, 2010

Bearing Wall Rating — 1 HR.

Finish Rating — 20 Min.

This design was evaluated using a load design method other than the Limit States Design Method (e.g., Working Stress Design Method). For jurisdictions employing the Limit States Design Method, such as Canada, a load restriction factor shall be used — See Guide BXUV or BXUV7

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

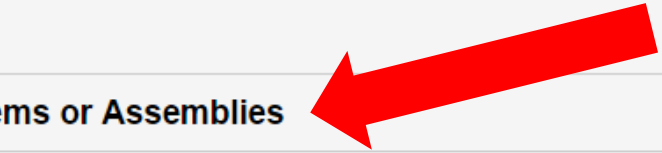


UL PRODUCT SPEC™

Quickly find, specify, or verify UL Certified products for your projects.

1. HOW DO YOU WANT TO SEARCH? | **2. RESULTS**

- Installation Code
- Product Type
- Products, Systems or Assemblies
- UL Product Category Code
- Master Format Number



Other helpful UL resources

UL PRODUCT SPEC™

Quickly find, specify, or verify UL Certified products for your projects.

1. HOW DO YOU WANT TO SEARCH? | **2. RESULTS**

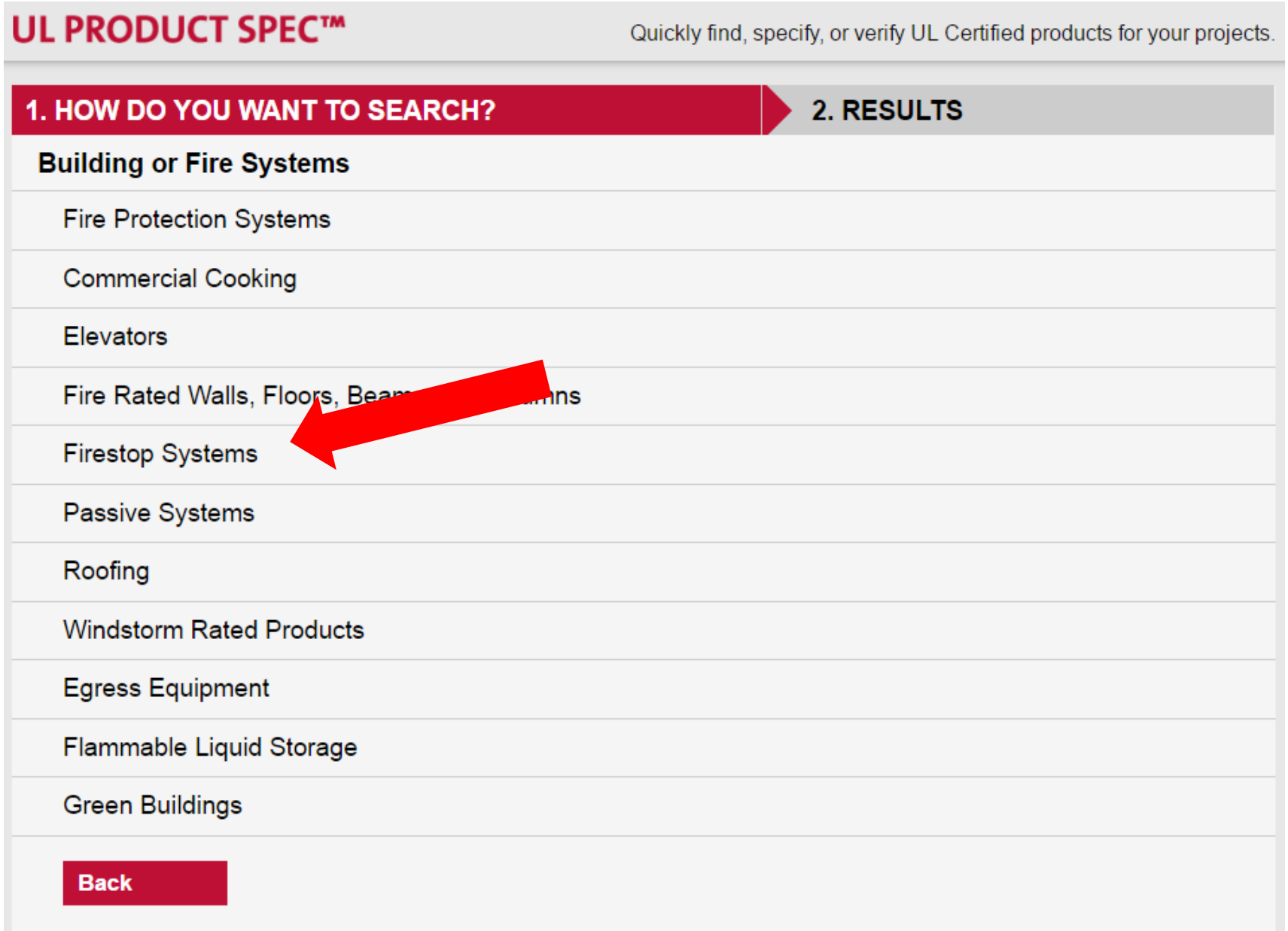
Products, Systems or Assemblies

Electrical

Building or Fire Systems

Back

Other helpful UL resources


UL PRODUCT SPEC™
Quickly find, specify, or verify UL Certified products for your projects.
1. HOW DO YOU WANT TO SEARCH?
2. RESULTS
Building or Fire Systems
Fire Protection Systems
Commercial Cooking
Elevators
Fire Rated Walls, Floors, Bea
ns
Firestop Systems
Passive Systems
Roofing
Windstorm Rated Products
Egress Equipment
Flammable Liquid Storage
Green Buildings
Back

UL PRODUCT SPEC™

Quickly find, specify, or verify UL Certified products for your projects.

1. HOW DO YOU WANT TO SEARCH? | **2. RESULTS**

Firestop Systems

Search by System Number

Search with Specific Parameters

Back

1. HOW DO YOU WANT TO SEARCH? 2. RESULTS

Search with Specific Parameters

Select from the following menus, then click Search.

Assembly type:

Framed walls

Penetrating item:

Nonmetallic pipe, conduit or tubing

Required rating:

F Rating ≥ 1 hr and < 2 hr

Manufacturer (optional):

Example: "XYZ Co."

Keyword (optional):

Example: "plastic"

Search

Back

UL PRODUCT SPEC™

Quickly find, specify, or verify UL Certified products for your projects.

1. HOW DO YOU WANT TO SEARCH?

2. RESULTS

Search Assembly type: Framed walls; Penetrating item: Nonmetallic pipe, conduit or tubing; Rating: F Rating ≥ 1 hr and < 2 hr

Results viewing 51-75 of 359

SYSTEM	UL PRODUCT CATEGORY & CODE	
System No. W-L-2124	Through-penetration Firestop Systems: XHEZ.W-L-2124	DWG
System No. W-L-2126	Through-penetration Firestop Systems: XHEZ.W-L-2126	DWG
System No. W-L-2127	Through-penetration Firestop Systems: XHEZ.W-L-2127	DWG
System No. W-L-2128	Through-penetration Firestop Systems: XHEZ.W-L-2128	DWG
System No. W-L-2129	Through-penetration Firestop Systems: XHEZ.W-L-2129	DWG
System No. W-L-2134	Through-penetration Firestop Systems: XHEZ.W-L-2134	DWG
System No. W-L-2135	Through-penetration Firestop Systems: XHEZ.W-L-2135	DWG
System No. W-L-2136	Through-penetration Firestop Systems: XHEZ.W-L-2136	DWG

THROUGH-PENETRATION FIRESTOP SYSTEM

Assembly Usage Disclaimer

Search Parameters

Assembly type

Framed walls

Penetrating item

Nonmetallic pipe, conduit or tubing

Rating

F Rating ≥ 1 hr and < 2 hr

XHEZ - Through-penetration Firestop Systems

See General Information for Through-penetration Firestop Systems

System No. W-L-2126

December 07, 2002

XHEZ - Through-penetration Firestop Systems

See General Information for Through-penetration Firestop Systems

System No. W-L-2126

1. **Wall Assembly —** The 1, 2, 3 or 4 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs —** Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 3-5/8 in. wide and spaced max 24 in. OC.

B. **Gypsum Board*** **—** The gypsum board type, thickness, number of layers, fasteners type and sheet orientation shall be as specified in the individual U300 or U400 Series Design. In the UL Fire Resistance Directory. Max diam of opening is 3-1/8 in.

The hourly F and T Ratings of the firestop system is equal to the hourly fire rating of the assembly in which it is installed.

2. **Through Penetrants —** One nonmetallic pipe or tubing installed either concentrically or eccentrically within the firestop system. Pipe or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of nonmetallic pipes or tubing may be used:

A. **Chlorinated Polyvinyl Chloride (CPVC) Pipe —** Nom 2 in. diam (or smaller) SDR 11 CPVC pipe for use in closed (process or supply) piping systems. The annular space between pipe and periphery of opening shall be min 1/4 in. to max 1/2 in.

B. **Crosslinked Polyethylene (PEX) Tubing —** Nom 1-1/2 in. diam (or smaller) SDR 9 PEX tubing for used in closed (process or supply) piping systems. The annular space between tubing and periphery of opening shall be min 1/4 in. to max 3/8 in.

C. **Polyvinyl Chloride (PVC) Pipe —** Nom 2 in. diam (or smaller) Schedule 40 solid or cellular core PVC pipe for use in closed (process or supply) piping systems.

3. **Fill, Void or Cavity Material*** **— Sealant —** Min 5/8 in. thickness of fill material for a 1 hr rated wall assembly, min 1 in. thickness of fill material for 2, 3 and 4 hr rated wall assemblies applied within the annulus, flush with both surfaces of wall. **PASSIVE FIRE PROTECTION PARTNERS** — 3600EX, 4800DW

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Fire Resistance-Rated Construction

Changes to Designs

Allowable Changes

UL PRODUCT SPEC™

Quickly find, specify, or verify UL Certified products for your projects.

1. HOW DO YOU WANT TO SEARCH? | 2. RESULTS

FIRE-RESISTANCE DESIGN

Fire-resistance Ratings - ANSI/UL 263, BXUV

Guide Information for Fire-resistance Ratings

Design Information Section

The Design Information Section supplements the individual published designs and is organized as follows:

I. INTRODUCTION

1. Rapid-rise Fire Test	
2. Definitions	

II. GENERAL

1. Metric Dimensions	12. Dampers
2. Loading of Test Specimens	13. Wood Structural Panels
3. Finish Ratings	14. Blanket Insulation
4. Nails and Screws	15. Sound Transmission Class (STC)
5. Interior and Exterior Applications	16. Impact Insulation Class (IIC)

Where do we find the guide?

In this case the BXUV Guide Info

- ul.com/bxuvguide

FIRE-RESISTANCE DESIGN

Assembly Usage Disclaimer

BXUV - Fire Resistance Ratings - ANSI/UL 263

BXUV7 - Fire Resistance Ratings - CAN/ULC-S10[illegible] for Canada

See General Information for Fire-resistance Ratings - ANSI/UL 263

See General Information for Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

Design No. U306

January 21, 2010

Bearing Wall Rating — 1 HR.

Finish Rating — 20 Min.

This design was evaluated using a load design method other than the Limit States Design Method (e.g., Working Stress Design Method). For jurisdictions employing the Limit States Design Method, such as Canada, a load restriction factor shall be used — See Guide BXUV or BXUV7

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Hands on exercises

Product Spec - Questions Key

1. How many layers of gypsum are installed on each side of a U305 design?
   - One layer of 5/8 on each side of the assembly.

2. Is a U347 design configuration A rated for fire exposure from both sides of the wall?
   - Exposed to fire from area separation wall side only.

3. Is a U415 designed to be built from one side?
   - Yes, this is a shaft wall.

4. Is a U438 a bearing wall?
   - No, it’s a non bearing 2hour wall

Product Spec - Questions Key

5. What is the rating for an L501 Floor/Ceiling Assembly and how many allowable systems are there?
   - **1 hour, and there are 18 different systems. (One is withdrawn.)**

6. On a M512 Floor/Ceiling Assembly can I leave the screw heads exposed or do they need to be covered with tape and mud?
   - **No, item 8 would require that they be covered by tape and mud.**

7. What is the minimum depth and spacing for structural wood members in a M535 Floor/Ceiling design?
   - **Min 9-1/2 in. deep, spacing is a maximum of 24 inches.**

Product Spec - Questions Key

8. What is the largest aluminum tube that a C-AJ-1039 through penetration firestop system can accommodate?
   - **Item 2, nominal 4 inch or smaller pipe.**
9. What is the minimum thickness of the mastic intumescent coating applied to a column protected by an X624 design for a one hour rating?
   - **The minimum is 0.21**
10. On a S724 roof beam design what is the minimum thickness, in inches, of the spray applied fire resistive material for a 1 hour rated unrestrained beam?
   - **¾ of an inch.**

BXUV Guide - Questions Key

1. Where are **leakage rated (smoke) dampers** intended to be installed?
   - **Where air ducts and air-transfer openings traverse smoke barriers. (Section II, Item 12)**
2. According to the guide does type C gypsum board have a better or worse fire performance than type X?
   - **Type C boards have a better fire performance. (Section II, Item 9)**
3. According to the guide is oriented strand board (OSB) considered a wood structural panel?
   - **Yes. (Section I, item 2)**

BXUV Guide - Questions Key

4. In floor ceiling/roof ceiling assemblies the surface area of individual electrical boxes should not exceed how many square inches?
   - **16 sq Inches (Section III, item 6)**

5. According to the section of the guide entitled **Walls and Partitions** are wood structural panels allowed to be added to a fire-rated gypsum board wall assemblies?
   - **The addition of wood structural panels in fire-rated gypsum board wall assemblies is permitted as described in section (Section VI, Item 6)**

BXUV Guide - Questions Key

6. According to the guide the addition of insulation in the concealed space between the ceiling membrane and the floor or roof structure may reduce the hourly rating of an assembly? True or false?
   - **True (Section III, Item 17)**

7. According to the guide section dealing restrained and unrestrained assemblies if you had **steel framing** made up of steel beams welded, riveted, or bolted to the framing would that be restrained or unrestrained?
   - **Restrained (Section III, item 15, table C1.1, IIA)**

BXUV Guide - Questions Key

8. Most roof assemblies are tested with Class A roof covering? True or false?
   - **False (Section III, Item 19)**

9. In **Steel Stud Wall Assemblies** are the dimensions and gauge of steel studs found in the design a minimum or maximum? The dimensions and gauge of steel studs are minimums?
   - **The dimensions and gauge of steel studs are minimums (Section VI, Item 4)**

BXUV Guide - Questions Key

10. According to the section of the guide entitled **Walls and Partitions** are additional layers of gypsum board or great thicknesses of gypsum board allowed to be added to a design? True or false?

- **Yes. Greater thicknesses of gypsum board are permitted as long as the fastener length is increased (Section VI, Item 1)**

We give you these tools so you can help make the a safer world.

And so you can build an assembly…..

Using product spec:

Build an assembly

Disregard Insulation

Make note of:

- **The fasteners - how far apart, type, length**
- **The rating – how many hours**
- **The load capacity – is it bearing or non bearing**

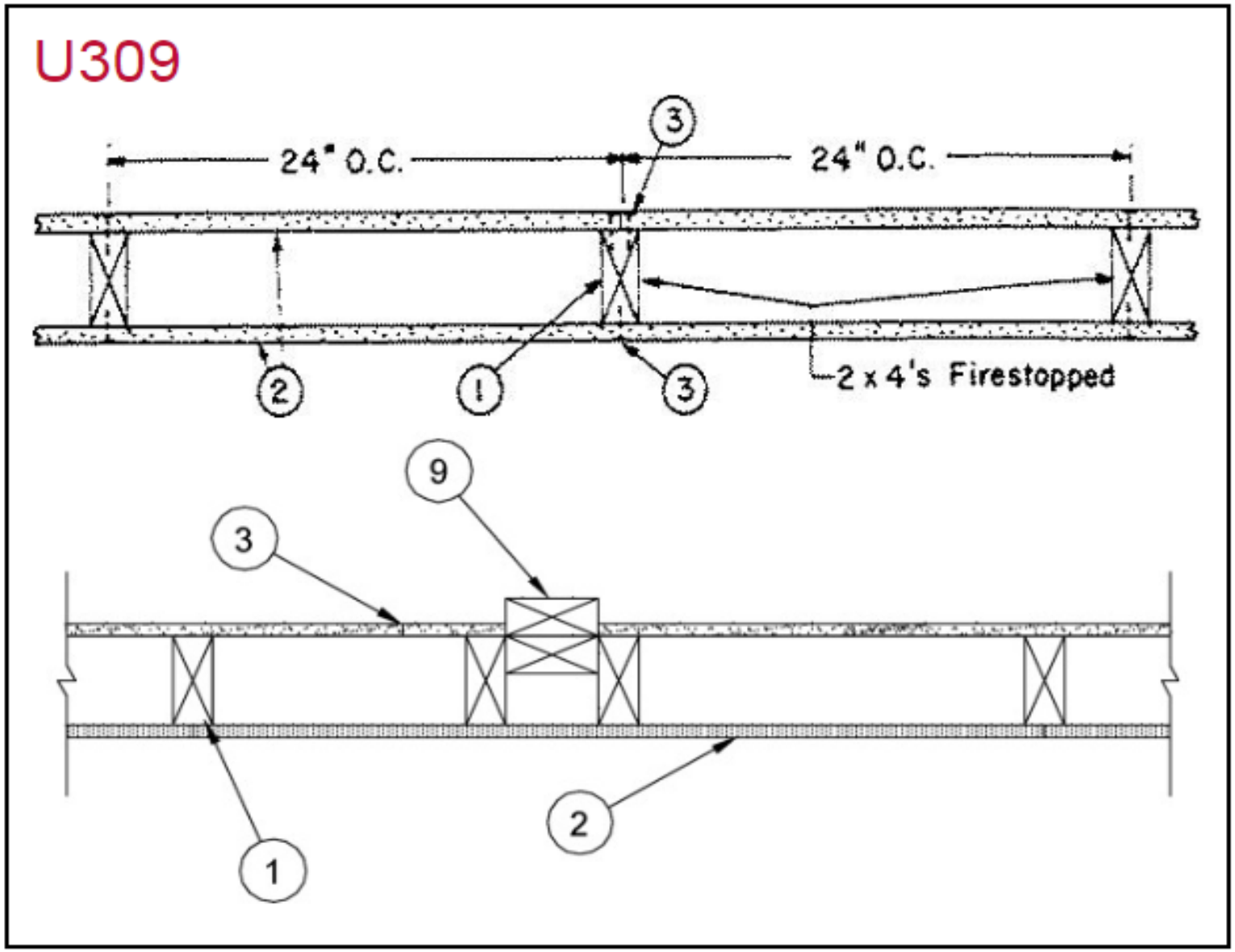
Assembly 1 – U309

Assembly 2 – U379

Assembly 3 – U305

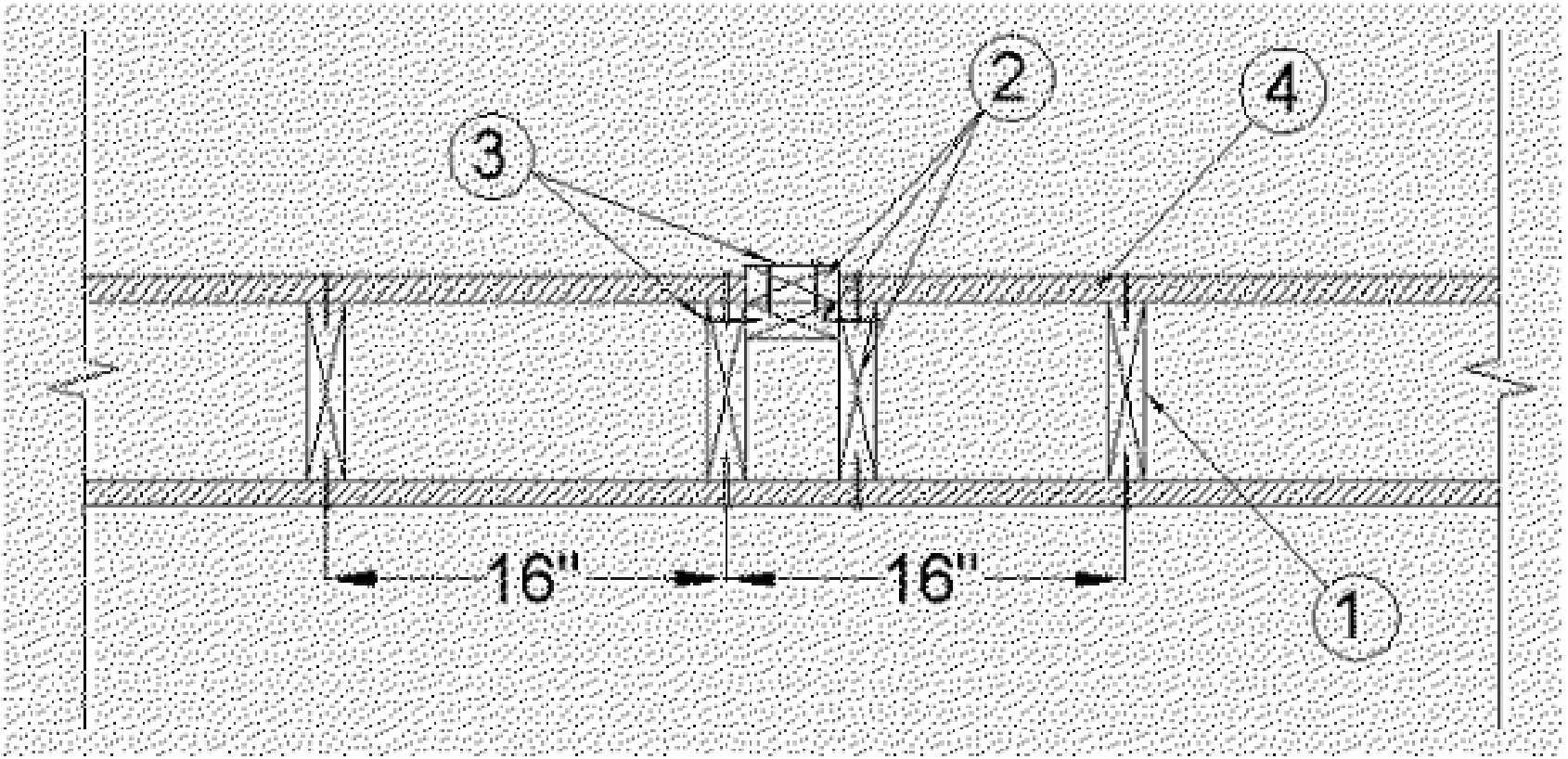
Assembly 4 – U328

Assembly 1 – U309

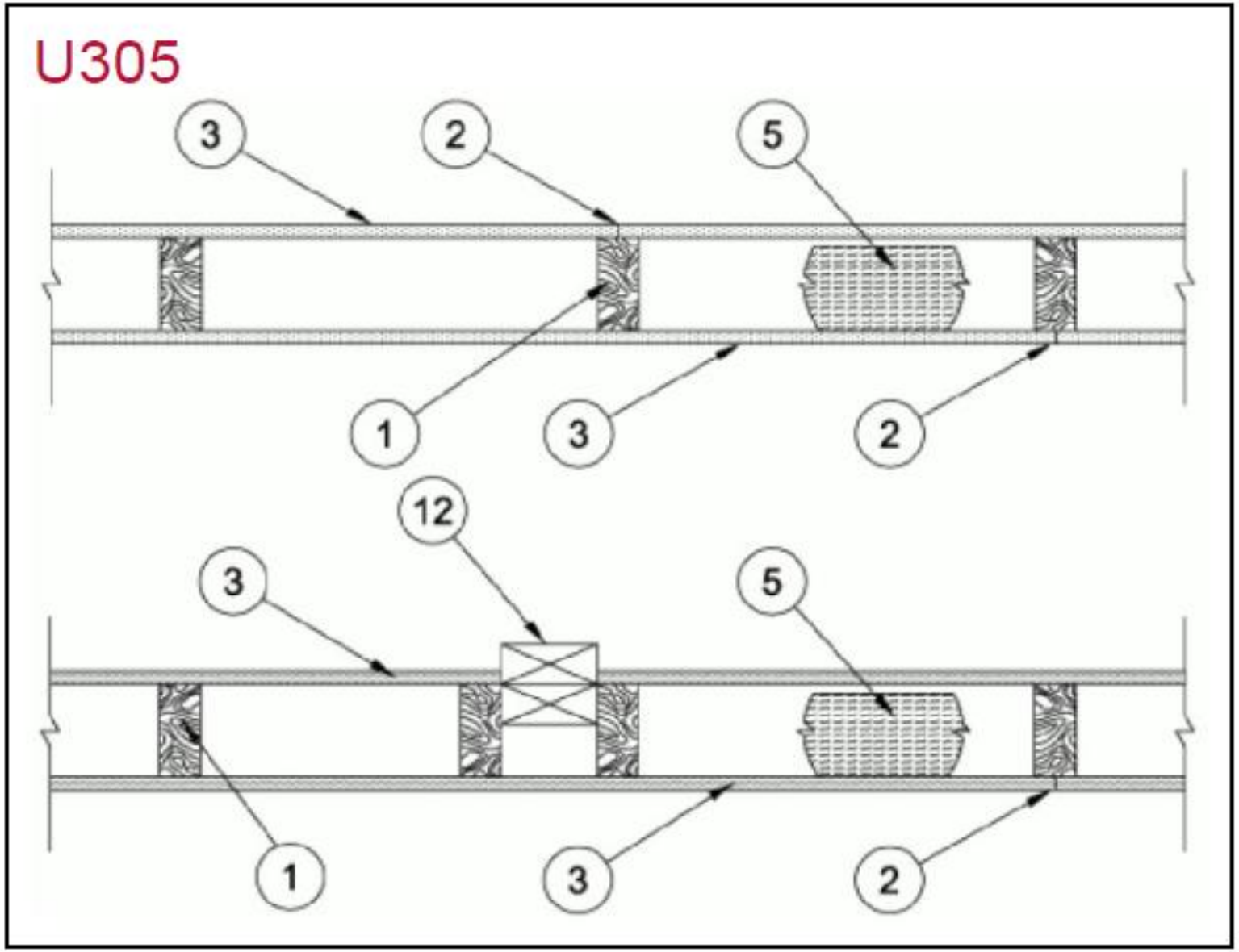


Assembly 2 – U379

U379

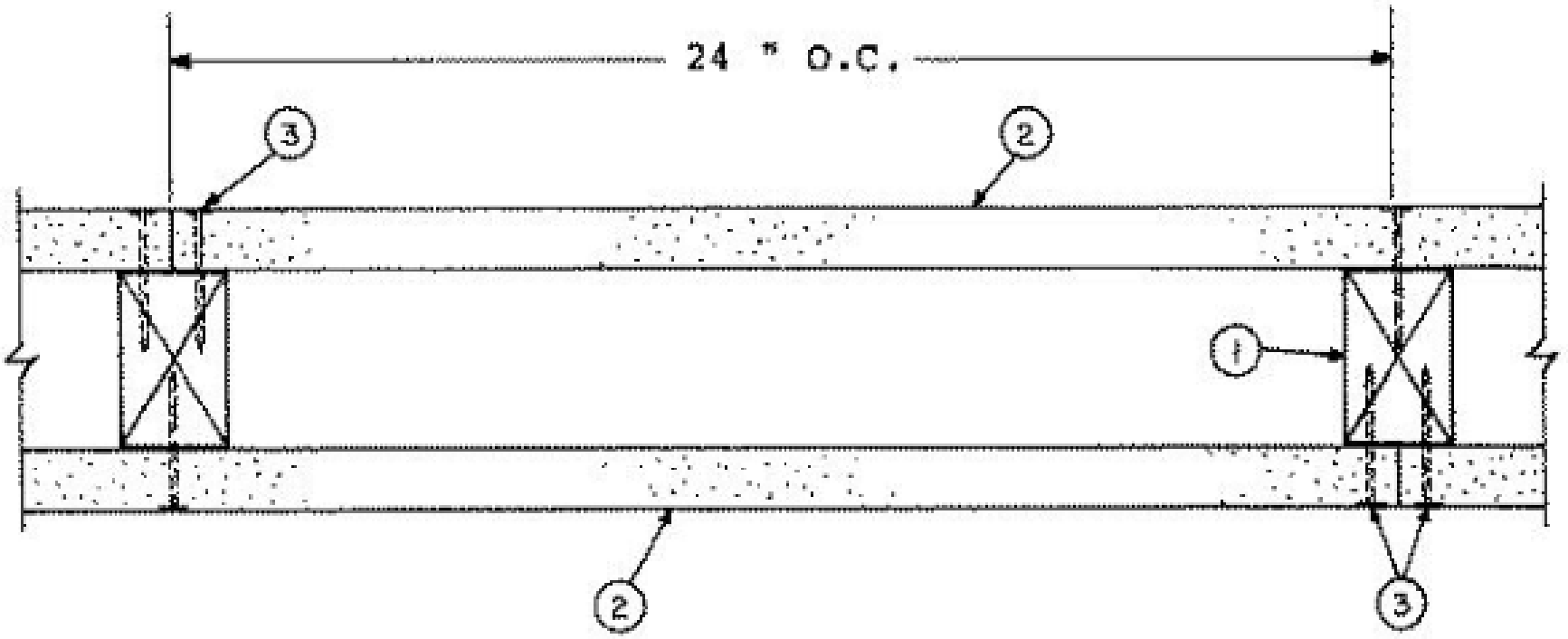


Assembly 3 – U305



Assembly 4 – U328

U328




PROTECTING
PEOPLE,
PRODUCTS
AND PLACES

Questions / Comments

Underwriters Laboratories

Jon Roberts

Codes and Advisory Services

Jonathan.Roberts@ul.com

405-760-6724

Underwriters Laboratories

Jon Roberts

Codes and Advisory Services

Jonathan.Roberts@ul.com

405-760-6724

RICHMOND ICC
INTERNATIONAL CODE COUNCIL 2018

Thank You For Attending

Sponsored by ORACLE