



Office of Education  
and Data Management

Fall 2017  
Career Development

December

## Passive Fire Protection Features

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# *Passive Fire Protection Features*

*Based on the 2015 IBC*

*Connecticut Career  
Development Training  
November-December 2017*

Bruce E. Johnson  
*UL Codes and Advisory Services*



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November 2017

## Objectives

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- At the end of this presentation, you will:
  - Understand the intent and purpose behind *fire resistive construction*
  - Understand the 2015 IBC Chapter 7 code requirements, testing procedures, plan review requirements and inspection practices relating to ***fire resistive construction***



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## Objectives Cont.

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- Understand the code requirements, testing procedures, plan review requirements and inspection practices relating to the **protection of penetrations**
- Understand the 2015 IBC Chapter 7 requirements for protecting penetrations (firestop systems)



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## Objectives Cont.

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- Be able to navigate UL's Product Spec™ and Installation Code Link in order to identify *listed* products and assemblies which demonstrate compliance with the requirements of the 2015 *International Building Code*.
  - *Fire resistance-rated* Building Elements
  - *Fire protection-rated* Firestop Systems



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## Agenda

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- A brief IBC Basics Review
- Fire-Resistance-Rated Construction
  - Definitions
  - International Building Code Requirements
  - Establishing *Fire-Resistance* Ratings
  - Permitted Changes to UL Designs



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## Agenda Cont.

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- Through and Membrane-Penetration Firestop Systems
- Plan Review and Inspection Process
- Methods of Showing Code Compliance
- Engineering Judgments
- Navigating the UL Directories & UL's Online Resources for Code Compliance
- Summary and Closing



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## Questions / Comments



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## IBC Basics

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### Some Fundamentals



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## Use of the IBC

- *Definitions* – Chapter 2
- Occupancy Classification
- Use of Tables – Scoping Section
- Table Footnotes
- Code Exceptions
- Reference Standards
- Index and Glossary
- Identifying Changes in Code Text



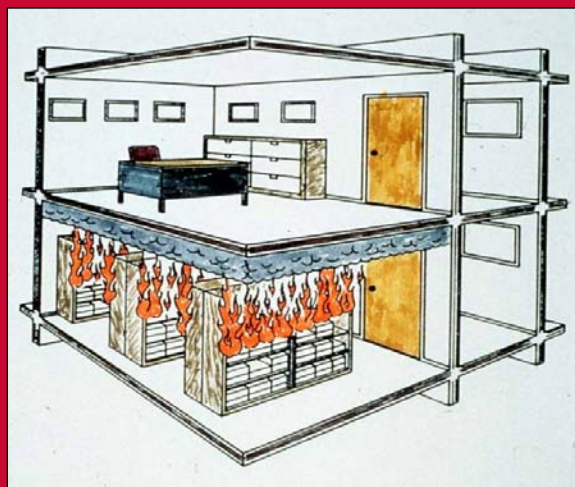
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## Questions / Comments



## Fire-Resistance-Rated Construction



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## Passive Fire Protection

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The IBC takes a systematic approach to building fire protection, including:

### 1. Passive Fire Protection

**Fire Area** = The aggregate floor area enclosed and bounded by *fire walls, fire barriers, exterior walls* or *horizontal assemblies* of a building.

### 2. Active Fire Protection

**Fire Protection System** = Approved devices, equipment and systems or combinations of systems used to detect a fire, activate an alarm, extinguish or control a fire, control or manage smoke and products of a fire or any combination thereof.

### 3. Reasonable level of redundancy; inspection, testing & maintenance



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## More Definitions

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- **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)



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## Definitions Cont.

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- *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)
  - Passage of Flames
  - Heat Transmission
  - Structural Integrity



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## Definitions Cont.

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- *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)
  - Passage of Flames
  - Structural Integrity



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## Standards Writing Organizations

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### American National Standards Institute (ANSI)

- ASTM International (ASTM)
- FM Global (FM)
- National Fire Protection Association (NFPA)
- Underwriters Laboratories (UL)



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## Questions / Comments



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## Fire-Resistance-Rated Construction

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



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## Code Requirements

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- Chapters 3, 4, 5, 6, 7 and 10 of the IBC
- Chapters 3 and 4 – Defines Occupancies
- Chapter 5 – General Building Heights and Areas
  - Permitted building area based on four factors:
    - Type of construction
    - Occupancy
    - Available frontage
    - Use of sprinklers



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## Code Requirements Cont.

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- Section 508 – Covers mixed use considerations
- Chapter 6 – Types of Construction
  - Table 601 – Establishes hourly rating required for building elements based on Type of Construction
- Chapter 7 – Fire and Smoke Protection Features



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## Code Requirements Cont.

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- 703.2 – Fire-resistance ratings shall be determined in accordance with ASTM E 119 or UL 263
- 703.2.1 – Nonsymmetrical walls shall be tested from both faces
- 703.2.3 – Assemblies considered **unrestrained** unless registered design professional provides evidence satisfactory to AHJ that construction qualifies for restrained classification per ASTM E 119 or UL 263



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## Code Requirements Cont.

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- 703.3 – Methods for determining *fire resistance* shall be based on fire exposure and acceptance criteria of ASTM E 119 or UL 263



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## Code Requirements Cont.

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- 703.3 Cont. – Required *fire resistance* permitted to be established based on any of the following:
  1. Designs documented from *approved* sources
  2. Prescriptive requirements from Section 721
  3. Calculations in accordance with Section 722
  4. **Engineering analysis based on ASTM E 119 or UL 263**
  5. Alternative protection methods as allowed in Section 104.11
  6. **Fire-resistance designs certified by an approved agency.**



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## Code Requirements Cont.

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- Breaches of assemblies shall be protected in accordance with Sections 712, 713, 714, 715 and 716
- Chapter 10 – Means of Egress
  - Table 1020.1– Establishes hourly rating required for corridors based on Occupancy Group



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## 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 (horizontal and vertical compartmentalization)



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## Questions / Comments



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## Fire-Resistance-Rated Construction

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Establishing  
Fire-Resistance  
Ratings



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## Standards

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- ANSI / UL 263
- ASTM E 119
- NFPA 251 (Withdrawn)



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## Building Components

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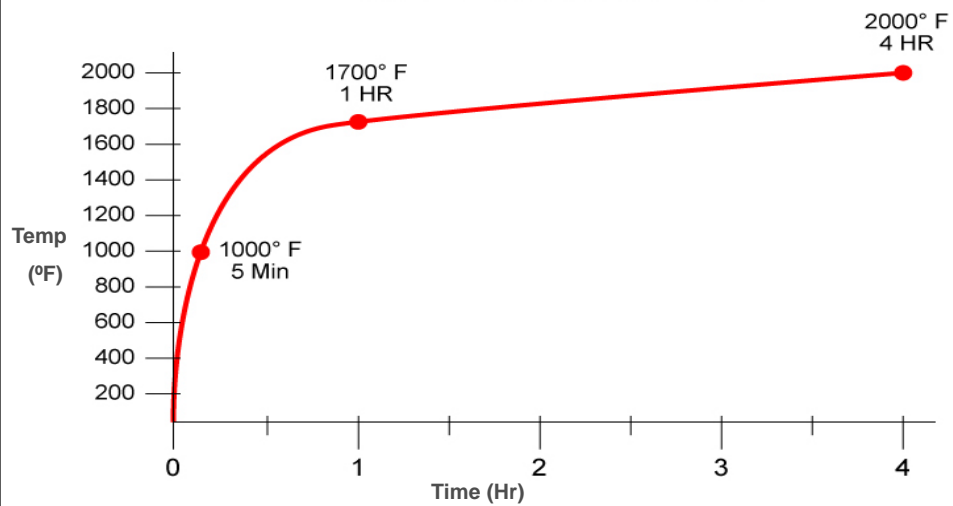
- Columns
- Beams
- Floor/Ceilings (F/C) or Roof/Ceilings (R/C)
- Walls



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## Time - Temperature Curve



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## Columns

- 
- Sample size – Minimum 9 ft
  - Tested unloaded



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## Conditions of Acceptance – Columns

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- 1000°F / 1200°F



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## Beams

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- Sample size – Minimum 12 ft
- Load applied – Per design



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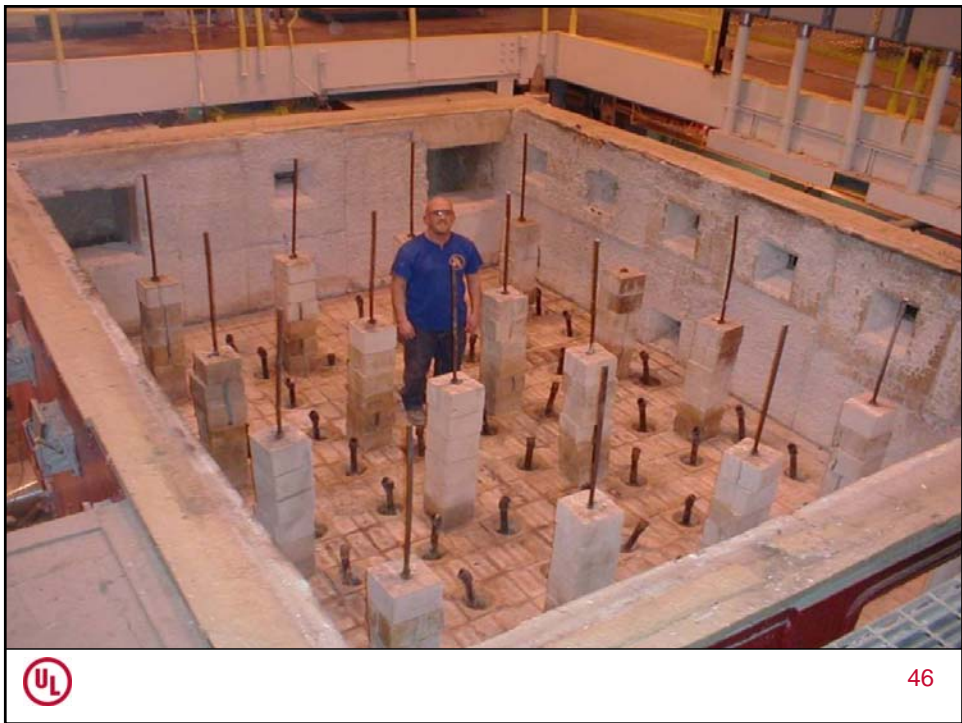
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## Conditions of Acceptance – Beams

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- Support load
- 1100°F / 1300°F



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## Floor/Ceiling or Roof/Ceilings

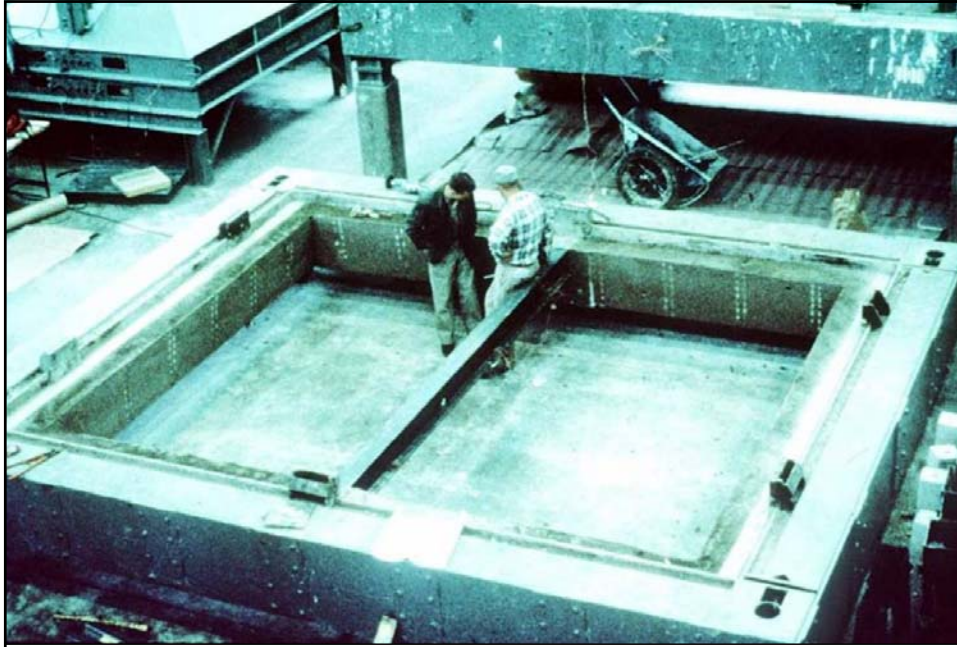
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- Sample size – 180 sq ft / 12 ft
- Load applied – Per design



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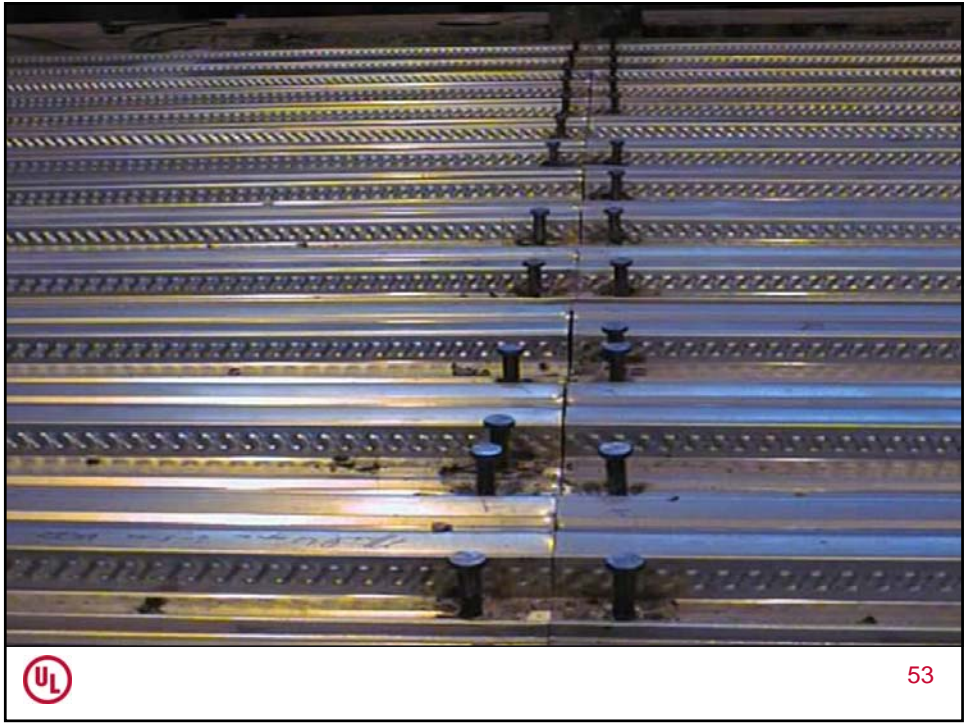


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## Conditions of Acceptance Floor/Ceilings or Roof/Ceilings

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- Support load
- Flame passage
- 250°F / 325°F
- Support temperatures (beams) 1100°F / 1300°F



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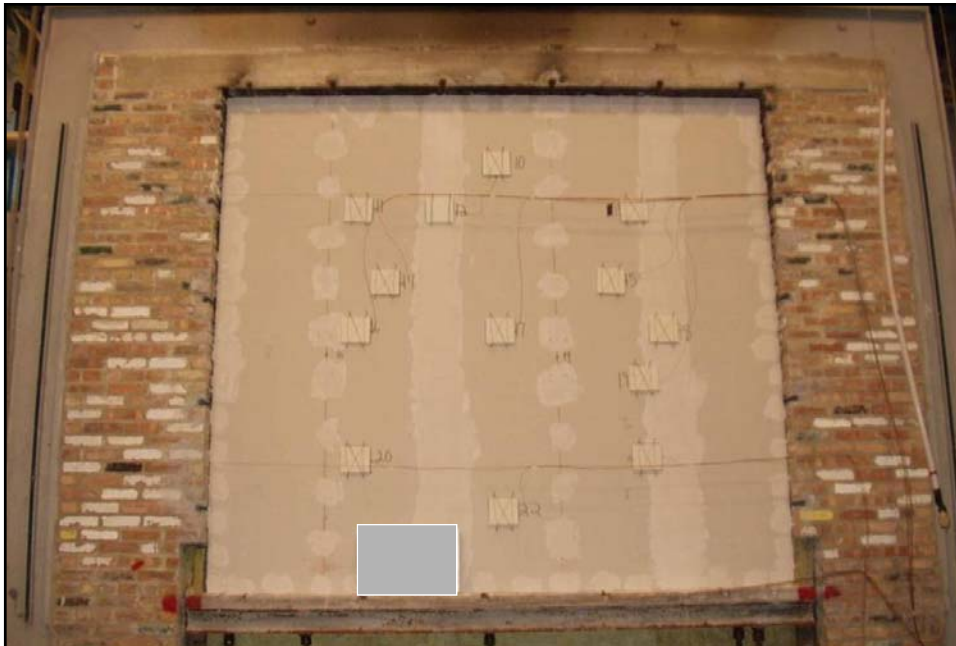
## Walls

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



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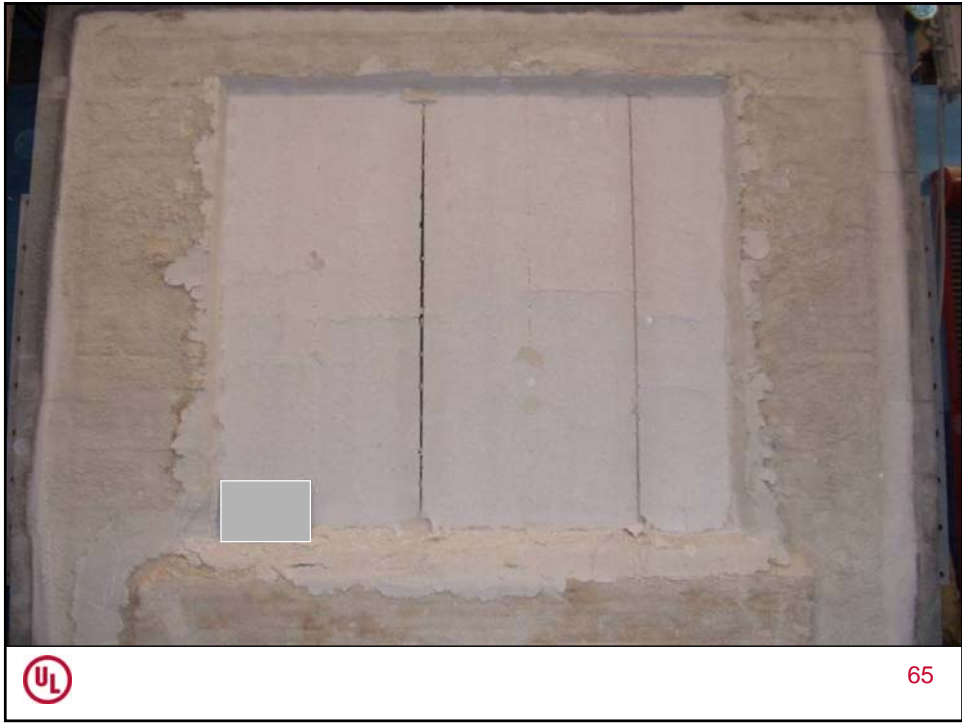


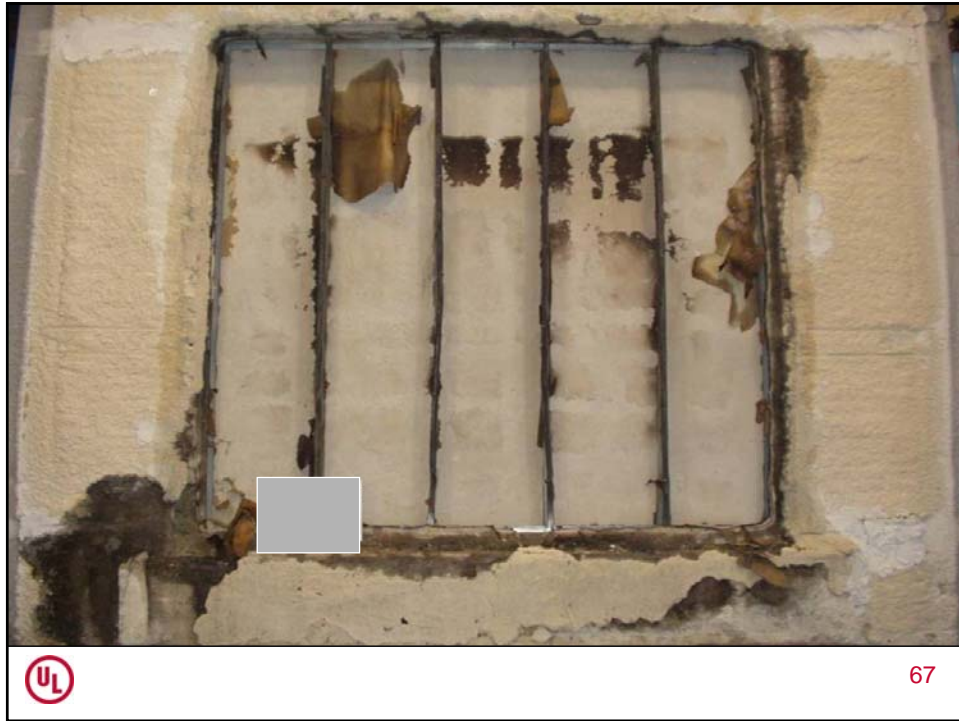
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## Conditions of Acceptance – Walls

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- Flame passage
- 250°F / 325°F
- Support load
- Hose stream (2 ½ minutes at 30 psi)



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## Questions / Comments



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## Fire-Resistance-Rated Construction

### Methods of Showing Code Compliance



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## Methods of Showing Compliance with the Fire Resistance Requirements of the IBC

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- 703.2 – *Fire-resistance* ratings shall be determined in accordance with ASTM E 119 or UL 263
- 703.3 – Methods for determining *fire resistance* shall be based on fire exposure and acceptance criteria of ASTM E 119 or UL 263



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## Methods of Showing Compliance with the Fire Resistance Requirements of the IBC

---

- 703.3 Cont. – Required fire resistance permitted to be established based on any of the following:
  - Designs documented from approved sources
  - Prescriptive requirements from Section 721
  - Calculations in accordance with Section 722
  - Engineering analysis based on ASTM E 119 or UL 263
  - Alternative protection methods as allowed in Section 104.11
  - Fire-resistance designs certified by an approved agency



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## Designs Documented From Approved Sources

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- Product Directories of Nationally Recognized Testing Laboratories
  - UL - *Fire Resistance Directory, Fire Resistance Directory on CD-ROM and Online Certifications Directory*
  - Intertek – *Intertek Directories of Certified Products*
  - FM Global - *Factory Mutual Approval Guide*



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## Designs Documented From Approved Sources Cont.

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- Gypsum Association - *Fire Resistance Design Manual*
- American Insurance Services Group, Inc.  
(210) 469 – 3922 - *Fire Resistance Ratings*
- BOCA - *Guidelines for Determining Fire Resistance Ratings of Building Elements*



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## Designs Documented From Approved Sources Cont.

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- ASCE / SFPE 29 – *Standard Calculation Methods for Structural Fireproofing*
- ACI 261.1 / TMS 0216.1 – *Standard Method for Determining Fire Resistance of Concrete and Masonry Construction Assemblies*



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## Fire-Resistance Rating of Structural Members

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Covered in IBC Section 704

- Comply with IBC 601 based on Construction Type
- Column and primary structural frame protection
- Secondary structural member protection (new)
  - Light-frame construction
  - Horizontal assemblies
- Truss protection



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## Fire-Resistance Rating of Structural Members

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### Continuation of IBC Section 704 Requirements

- Attachments to structural members
- Connections (CT addition 704.6.1)
- Impact protection
- Exterior load-bearing structural members
- Seismic isolation systems



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## Fire-Resistance Rating of Structural Members

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### Continuation of IBC Section 704 Requirements

- Sprayed fire-resistant materials (SFRM)
  - Application and manufacturer's instructions
  - Surface conditions
  - Primers, paints and encapsulants
  - Temperature
  - Finished condition



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## Engineering Analysis Based on ASTM E 119 or UL 263

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- Engineering judgments
  - Product manufacturer
  - Testing laboratory
  - Fire protection engineer
  - Professional engineer



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## Alternate Materials, Design and Methods of Construction and Equipment

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- Allows authority having jurisdiction to accept other information to show compliance
  - Evaluation Services Reports
    - IAPMO Evaluation Services
    - ICC Evaluation Services
    - UL Evaluation Services



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## Questions / Comments



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## Organization Under Each Product Area

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- Guide Information
- Designs, Systems or Assemblies
- Product Categories (indexed by manufacturer's names)



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## Guide Information

- Equipment, materials or systems included in the Category
- Intended use, restrictions or supplemental information that apply
- Standard(s) used to evaluate products under the Category
- Listing or Classification Mark information for the Category



**NUMBERING SYSTEM FOR FIRE-RATED ASSEMBLIES**

Groups of Construction	TYPES OF PROTECTION								
	Membrane Protection						Direct-applied Protection		Unprotected
	000-099	100-199	200-299	300-399	400-499	500-599	600-699	700-899	
Floors-Ceilings: A or B* Concrete and Cellular Steel Floor	Concealed Grid System	(Reserved)	Exposed Grid System	(Reserved)	Metal Lath	Gypsum Board	Misc.	Spray-applied Fire-resistant Material	Unprotected
C - Glazing Systems	(Reserved)	(Reserved)	(Reserved)	(Reserved)	(Reserved)	(Reserved)	(Reserved)	(Reserved)	Unprotected
D, E* or F* Concrete and Steel Floor Units	Concealed Grid System	(Reserved)	Exposed Grid System	Mineral and Fiber Boards	Metal Lath	Gypsum Board	Mastic and Intumescent Coatings	Spray-applied Fire-resistant Material	Unprotected
G or H* Concrete and Steel Joists	Concealed Grid System	(Reserved)	Exposed Grid System	Mineral and Fiber Boards	Metal Lath	Gypsum Board	Misc.	Spray-applied Fire-resistant Material	Unprotected
I Non-load-bearing Horizontal Barrier	(Reserved)	(Reserved)	(Reserved)	(Reserved)	(Reserved)	Gypsum Board	(Reserved)	(Reserved)	(Reserved)
J or K Concrete	Concealed Grid System	(Reserved)	Exposed Grid System	Mineral and Fiber Boards	Metal Lath	Gypsum Board	Misc.	Spray-applied Fire-resistant Material	Unprotected
L or M Wood Joist or Combination Wood and Steel	Concealed Grid System	(Reserved)	Exposed Grid System	(Reserved)	Metal Lath	Gypsum Board	Misc.	Spray-applied Fire-resistant Material	Unprotected



## Designs

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- Each design contains specific construction features
- Many designs contain various options and various ratings
- Must be followed exactly for rating to apply



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## Questions / Comments



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## Fire Resistance-Rated Construction

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### Permitted Changes to Designs



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## Guide Information

---

- Equipment, materials or systems included in the Category
- Intended use, restrictions or supplemental information that apply
- Standard(s) used to evaluate products under the Category
- Listing or Classification Mark information for the Category



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## 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)
6. Exposed Interior Finishes	17. Penetrations
7. Radiant Heating Cable and Panels	18. Curtain Wall/Floor Protection Systems
8. Coating Materials	19. Fire-resistant Joint Systems
9. Gypsum Board	20. Fire Doors, Frames and Hardware
10. Gypsum Board Joint Treatment (Taping)	21. Glazing, Wired Glass and Glass Blocks
11. Plaster	22. Exterior Wall Systems

#### III. FLOOR-CEILINGS AND ROOF-CEILINGS

1. Concrete	12. Enclosures for Fluorescent Recessed Luminaires (Traffic)
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## Fasteners

- Cement coated box or cooler nails shall be used for securing gypsum board, unless otherwise specified in design
- Screws meeting ASTM C 1002 or C 954 may be substituted for nails providing head diameter and length are equal or larger than specified nail



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## Primers with SFRM

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- May be applied to primed structural elements providing:
  - Beam flange width shall not exceed 12 inch
  - Column flange width shall not exceed 16 inch
  - Web depth shall not exceed 16 inch
  - Pipe diameter or tube width shall not exceed 12 inch
  - Bond tests conducted to ASTM E 736
    - Average > 80% of uncoated steel and individual > 50% of uncoated steel, or
    - Wrap member with metal lath



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## Concrete in Horizontal Assemblies

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- Compressive strength specified may be reduced 500 psi
- Unit weight tolerance 3 pcf
- Do not substitute lightweight concrete if normal weight specified
- Do not substitute normal weight concrete if lightweight specified



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## Outlet Boxes in Ceilings

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- Metallic boxes may be installed in F/C and R/C assemblies incorporating gypsum board protection providing:
  - Clearance not to exceed 1/8 in.
  - Area of each box not to exceed 16 sq in.
  - Total area of boxes not to exceed 100 sq in. per 100 sq ft of ceiling area
- Nonmetallic boxes tested and listed (CEYY)



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## Steel Joists

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- Specified joist is minimum depth
- Specified joist is minimum weight/foot
- K-Series Joist may often substitute for older series joists specified
- Spacing between joists may be increased to 4 ft OC providing:
  - Structural integrity of floor is maintained
  - Hanger wire spacing is not increased
- Bridging bar size is minimum



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## Gypsum Board on Horizontal Assemblies

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- Thickness may be increased providing fastener length is also increased
- Additional layers may be added



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## Gypsum Ceiling Control Joints

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- Ceiling suspended below floor assembly
- Guide describes control joints when gypsum board is parallel to wood joists
- Guide describes control joints when gypsum board is perpendicular to wood joists



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## Recessed (Can) Lighting

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- Generic recessed luminaires not permitted unless covered in design
- Luminaires specifically tested and Listed for use in fire resistive construction covered in “Luminaires and Luminaire Assemblies Classified for Fire Resistance Category” (CDHW)

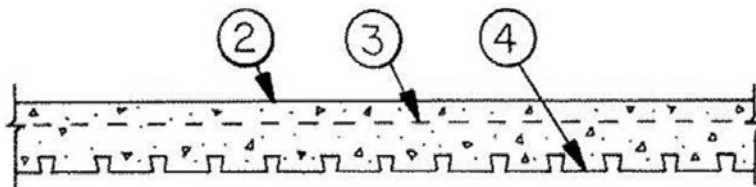


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## Restrained & Unrestrained

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- Designer & AHJ must determine
- Unrestrained ratings may be used for either condition



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## Restrained & Unrestrained Cont.

- I. Wall Bearing:
- A. Single span and simply supported end spans of multiple bays:<sup>9</sup>
1. Open-web steel joists or steel beams supporting concrete slab, precast units, or metal decking. . . . . Unrestrained
  2. Concrete slabs, precast units, or metal decking. . . . . Unrestrained
- B. Interior spans of multiple bays.
1. Open-web steel joists, steel beams, or metal decking supporting continuous concrete slab. . . . . Restrained
  2. Open-web steel joists or steel beams, supporting precast units or metal decking. . . . . Unrestrained
  3. Cast-in-place concrete slab systems . . . . . Restrained
  4. Precast concrete where the potential thermal expansion is resisted by adjacent construction<sup>9</sup>. . . . . Restrained
- II. Steel Framing:
- A. Steel beams welded, riveted, or bolted to the framing members . . . . . Restrained
- B. All types of cast-in-place floor and roof systems (such as beam-and-slabs, flat slabs, pan joists, and waffle slabs) where the floor or roof system is secured to the framing members . . . . . Restrained
- C. All types of prefabricated floor or roof systems where the structural members are secured to the framing members and the potential thermal expansion of the floor or roof system is resisted by the framing system or the adjoining floor or roof construction<sup>9</sup>. . . . . Restrained



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## HVAC Openings in Ceilings

- Most acoustical ceilings are tested with generic hinged blade damper
- UL Classified Ceiling Damper, Ceiling Air Diffuser or Air Terminal Unit may be substituted for generic hinged blade damper
- Duct Protection Systems A and B may also be substituted per Guide Info
- Some assemblies with gypsum board ceilings have been test with specific UL Classified Ceiling Dampers
- In assemblies with gypsum board ceilings, damper may not be utilized if not specified in design



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## Blanket Insulation in Horizontal Assemblies

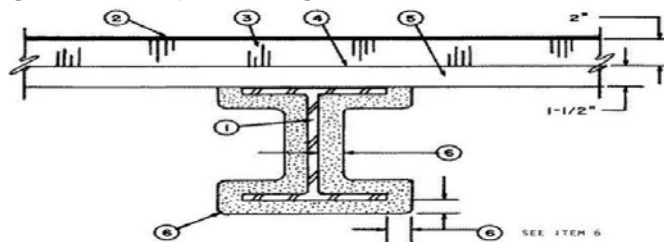
- May cause premature disruption of ceiling membrane
- For certain assemblies, fiberglass insulation can be used with additional layer of gypsum board
- Otherwise, only permitted as specified



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## Beam Size

- Larger beams may be substituted without restriction
- Larger is based on W/D ratio
  - W/D = weight of unit measure divided by heated perimeter (exposed surface except top flange)
- Larger W/D yields greater fire resistance

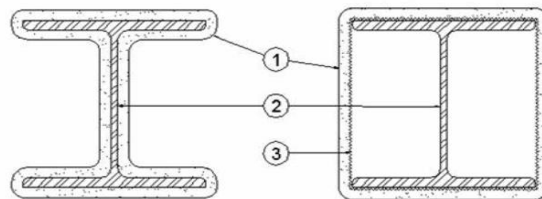


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## Column Size

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- Larger columns may be substituted without restriction
- Based on W/D ratio
- Larger W/D yields greater fire resistance



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## Walls & Partitions

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- Rating applies when either face exposed to fire, unless otherwise noted
- Unsymmetrical walls tested from both sides
- Exterior walls may only require rating from inside face
- Load bearing rating applies to non load bearing applications



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## Walls & Partitions Cont.

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- Size of studs specified is minimum
- Stud spacing specified is maximum
- Board orientation as specified in design



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## Walls & Partitions Cont.

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- Metallic boxes may be installed in wall assemblies incorporating gypsum board protection providing:
  - Max 2 hr rated assemblies
  - Clearance not to exceed 1/8 in.
  - Area of each box not to exceed 16 sq in.



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## Walls & Partitions Cont.

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- Total area of boxes not to exceed 100 sq in. per 100 sq ft of wall surface
- Boxes on opposite sides of wall separated by min 24 in. or provided with protection (CLIV)
- Nonmetallic boxes tested and listed (CEYY)



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## Permitted Changes – Summary

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

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### Self Service Tools and Resources

Resources to help architects quickly and easily locate code compliant fire-resistance and smoke protection solutions.



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# Permitted Changes – Summary

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

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## DESIGN CRITERIA AND ALLOWABLE VARIANCES

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Product category guide information can clarify construction and application requirements for the certifications and view acceptable variances allowed for the designs and systems. Click below for details.

[Walls, floors, beams and columns](#)

[Firestop systems](#)

[Joint systems](#)

[Perimeter fire containment systems](#)

[Architectural services FAQs](#)



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## Questions / Comments



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**FIRESTOP**  
INSTALLATIONS



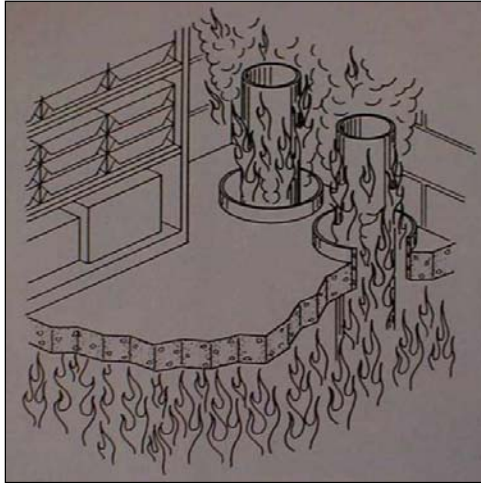
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Through- and Membrane-Penetration  
Firestop Systems



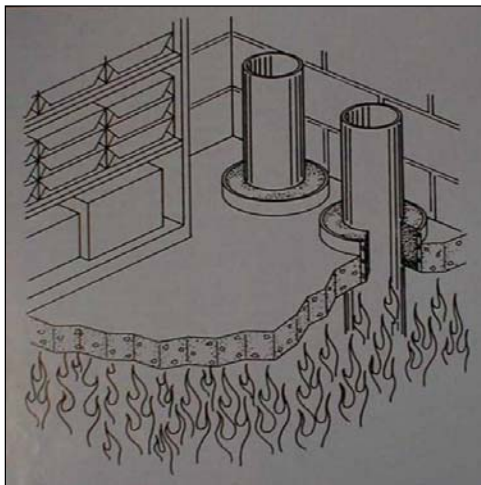
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## No Firestopping



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## Proper Firestopping



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## Some Definitions

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- What is Firestopping?
  - Firestopping (v) is the process of restoring the integrity of a fire-resistance-rated assembly at a penetration of the assembly through the use of a properly designed, installed, inspected and maintained firestop system
  - Firestopping (n) is a material or device installed to resist the passage of flame and heat through penetrations (i.e. a firestop)



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## Definitions Cont.

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- *Membrane Penetration* – A breach in one side of a floor-ceiling, roof-ceiling or wall assembly to accommodate an item installed into or passing through the breach. (IBC)
- *Through Penetration* – A breach in both sides of a floor, floor-ceiling or wall assembly to accommodate an item passing through the breaches. (IBC)



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## Definitions Cont.

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- *Membrane-Penetration Firestop* – A material, device or construction installed to resist for a prescribed time period the passage of flame and heat through openings in a protective membrane in order to accommodate cables, cable trays, conduit, tubing, pipes or similar items. (IBC)



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## Definitions Cont.

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- *Through-Penetration Firestop System* – An assemblage consisting of a fire-resistance-rated floor, floor-ceiling, or wall assembly, one or more penetrating items passing through the breaches on both sides of the assembly and the materials or devices, or both, installed to resist the spread of fire through the assembly for a prescribed period of time. (IBC)



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## Definitions Cont.

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- *Firestop System* – Membrane or through-penetration firestop system. (BEJ)

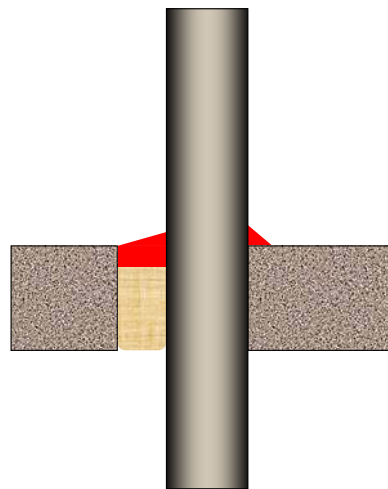


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## Three Elements of a Firestop System

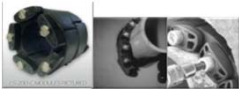
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- Floor or Wall Assembly
- Penetrating Item
- Firestopping Products



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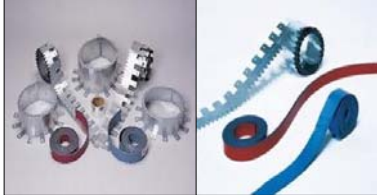
# The Right Product for the Right Application



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# Steel Collars and Intumescent Wrap Strips

- Intumescent sealant expands and fills the void
- The collar expands to crush pipe



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## Enclosures: Valves, Controls, Speaker, Lighting

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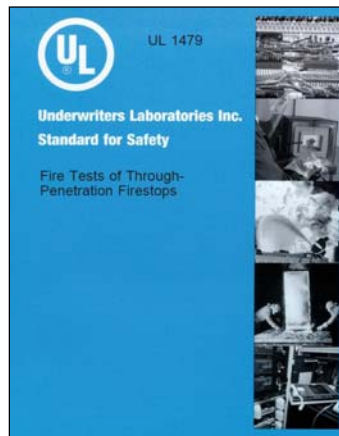


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## Firestop Systems

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Standards



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## Standards

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- ANSI / UL 1479
- ASTM E814



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## Ratings

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- F - Flame Occurrence
- T - Heat Transmission
- L - Leakage (Optional)
- W - Water Leakage (Optional)



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## Conditions of Acceptance F Rating

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- Passage of Flame
- Hose Stream
- *IBC Definition:*

**F RATING.** The time period that the *through-penetration firestop system* limits the spread of fire through the penetration when tested in accordance with ASTM E 814 or UL 1479.



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## Conditions of Acceptance T Rating

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- Passage of Flame
- 325°F Temperature Rise
- Hose Stream
- *IBC Definition:*

**T RATING.** The time period that the *penetration firestop system*, including the penetrating item, limits the maximum temperature rise to 325°F (163°C) above its initial temperature through the penetration on the nonfire side when tested in accordance with ASTM E 814 or UL 1479.



130

## L Rating

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- Air Leakage Rate at Ambient Temperature
- Air Leakage Rate at 400°F
- *IBC Definition:*

**L RATING.** The air leakage rating of a *through penetration firestop system* or a fire-resistant *joint system* when tested in accordance with UL 1479 or UL 2079, respectively.



131

## W Rating

---

- **Optional program\***, applicable to incidental water
- 3 Ft WC Pressure Head / 72 Hr Exposure
- Firestop subjected to water exposure, followed by standard fire and hose stream tests
- Firestop systems assigned a W Rating

\* *No IBC definition or requirements*



132

## Questions / Comments



133

## Firestop Systems

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International  
Building Code  
Requirements



134

## Code Requirements General

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- Section 714 of the 2015 IBC
  - 714.3 – Penetrations into or through *fire walls, fire barriers, smoke barrier walls* and *fire partitions* shall comply with 714.3.1 through 714.3.3. Penetrations in *smoke barrier walls* shall also comply with 714.4
  - 714.4 – Penetrations of horizontal assemblies not required to be protected by shaft enclosure shall be protected per Section 714.4.1 through 714.4.4



135

## Code Requirements Wall Assemblies

---

- Section 714.3 of the 2015 IBC
  - 714.3.1 – Through penetrations shall be protected by one of the following:
    - As tested as part of the entire wall assembly
    - As tested to ANSI/UL 1479 / ASTM E814
    - Exceptions
      - Concrete, grout or mortar (full thickness of the wall)
      - Annular space protection material



136

## Code Requirements Wall Assemblies Cont.

---

- 714.3.1.2 – When tested to ANSI/UL 1479 / ASTM E814, through penetrations shall have an F Rating of not less than the required rating of wall penetrated



137

## Code Requirements Wall Assemblies Cont.

---

- 714.3.2 – Membrane penetration shall be protected as follows:
  - As specified in 714.3.1 (i.e. through penetrations)
  - Recessed fixtures shall be installed so as not to reduce the required fire resistance



138

## Code Requirements Wall Assemblies Cont.

---

- Exceptions
  - Steel electrical boxes installed per prescriptive requirements
  - Listed electrical boxes of any material installed per listing
  - Electrical boxes of any size or type installed with tested and listed protection
  - Boxes other than electrical boxes tested and listed for such use
  - Annular space created by fire sprinklers (covered by metal escutcheon plate)
  - Steel electrical boxes exceeding 16 sq. in in area or any size exceeding prescriptive requirements protected by listed putty pads or other listed material and method installed per its listing.



139

## Code Requirements Horizontal Assemblies

---

- Section 714.4 of the 2015 IBC
  - 714.4.1.1 – Through penetration shall be protected by one of the following:
    - As tested as part of the entire horizontal assembly
    - As tested to ANSI/UL 1479 / ASTM E814
  - Exceptions
    - Annular space protection material
    - Concrete, grout or mortar
    - Listed electrical boxes of any material installed per listing



140

## Code Requirements Horizontal Assemblies Cont.

---

- 714.4.1.2 – When tested to ANSI/UL 1479 / ASTM E814, through penetrations shall have F and T Ratings of not less than 1 hour but not less than required rating of assembly penetrated
  - Exceptions
    - Penetrations contained and located within the cavity of a wall above or below the floor do not require a T Rating
    - Penetrations by floor, tub or shower drains contained and located within the concealed space of a horizontal assembly do not require a T Rating
    - Penetrations a maximum of 4" in diameter penetrating directly into metal-enclosed electrical power switchgear do not require a T Rating



141

## Code Requirements Horizontal Assemblies Cont.

---

- 714.4.2 – Membrane penetration shall be protected as follows:
  - As specified in 714.4.1.1 or 714.4.1.2 (i.e. through penetrations)
  - Recessed fixtures in floor/ceiling assemblies shall be installed so as not to reduce the required fire resistance



142

## Code Requirements Horizontal Assemblies Cont.

---

- Exceptions
  - If less than 100 sq in. per 100 sq ft, metallic penetrants may be either firestopped or fireblocked
  - Steel electrical boxes installed per prescriptive requirements
  - Electrical boxes of any size or type installed with tested and listed protection
  - Listed electrical boxes of any material installed per listing
  - Annular space created by fire sprinklers (covered by metal escutcheon plate)
  - Interruption by a double wood top plate of a wall assembly sheathed with X-Rated gypsum; provided all penetrating items through the double top plates are protected and the ceiling membrane is tight to the top plates.



143

## Code Requirements Miscellaneous

---

- 714.4.3 – Noncombustible penetrants shall not be connected to combustible penetrants beyond point of firestop system
- 714.4.4 – Penetrations in smoke barriers shall have an L Rating at ambient and 400°F
  - Max 5.0 CFM / sq ft of opening
  - Aggregate 50 CFM / 100 sq ft of barrier



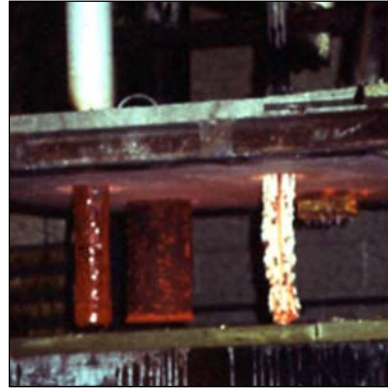
144



## Firestop Systems

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Establishing  
F and T Ratings



145

## Full-Scale Wall Assembly

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146

## Small-Scale Wood Floor Assembly



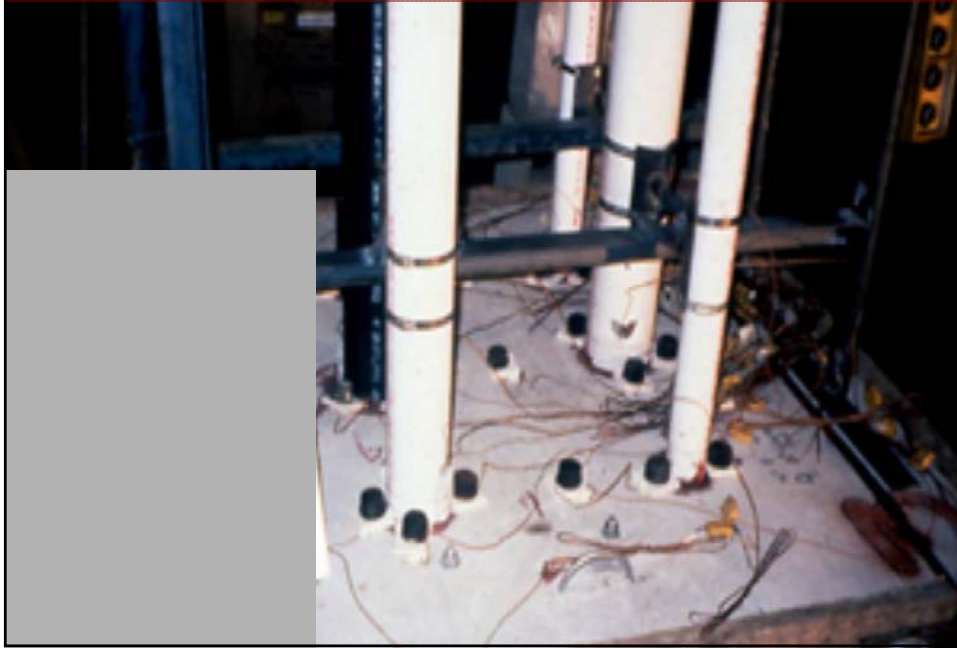
147

## Cables Through Wood Floor

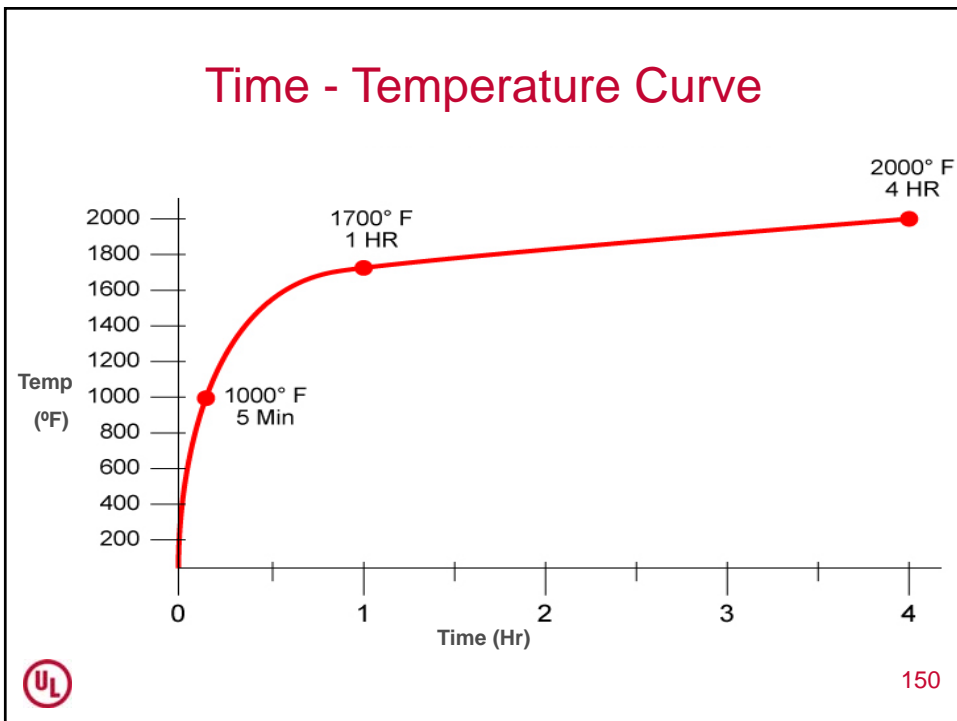


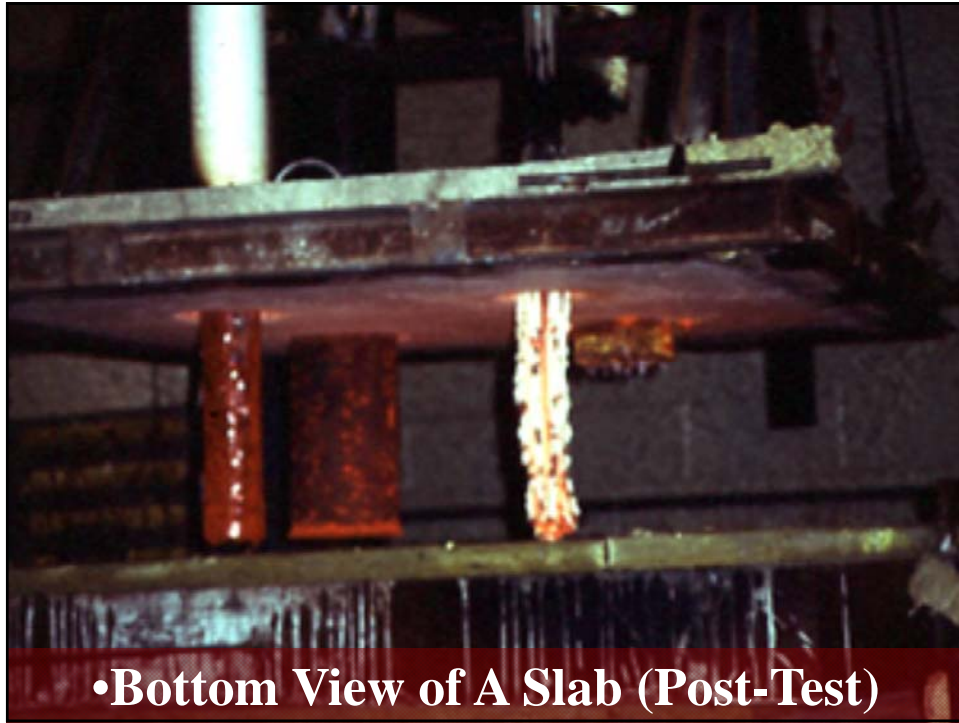
148

## Top View of A Slab (Pre-Test)



## Time - Temperature Curve





## Hose Stream Test



152

## Questions / Comments



153

## Fire-Resistance-Rated Construction

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Plan  
Review

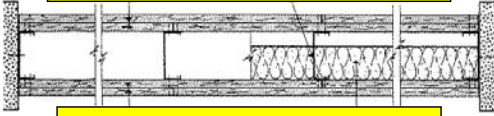


154

## For the Architect / Contractor

Design No. U411  
May 29, 2012  
Nonbearing Wall Rating – 2 HR.

**UL Designs serve two roles:**



**1) Evidence of compliance**

1. Floor and Ceiling Runner – (Not Shown) – Min. 25 MSG galv steel, 1 in. return legs, 2-1/2 in. deep (min), attached to floor and ceiling with fasteners 24 in. OC max.

**2) A set of build-instructions**

1A  
US  
OC  
in 1 - For  
24 in.

ALLSTEEL & GYPSUM PRODUCTS INC – Type SUPREME Framing System

CALIFORNIA EXPANDED METAL PRODUCTS CO – Viper20™ Track

CONSOLIDATED FABRICATORS CORP, BUILDING PRODUCTS DIV – Type SUPREME Framing System

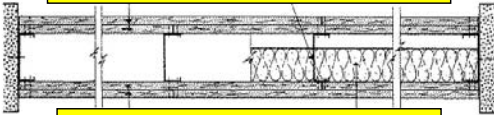


155

## For the Building Official

Design No. U411  
May 29, 2012  
Nonbearing Wall Rating – 2 HR.

**UL Designs serve two roles:**



**1) Evidence of compliance**

1. Floor and Ceiling Runner – (Not Shown) – Min. 25 MSG galv steel, 1 in. return legs, 2-1/2 in. deep (min), attached to floor and ceiling with fasteners 24 in. OC max.

**2) Document by which to inspect**

ALLSTEEL & GYPSUM PRODUCTS INC – Type SUPREME Framing System

CALIFORNIA EXPANDED METAL PRODUCTS CO – Viper20™ Track

CONSOLIDATED FABRICATORS CORP, BUILDING PRODUCTS DIV – Type SUPREME Framing System



156

## Plan Review

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- 107.2.1 - Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that it will conform to the provisions of this code ...



157

## Plan Review Cont.

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- Details showing compliance with the fire-resistive requirements of the IBC shall be included on the plans and specifications
- (IPC/IMC) For buildings more than 2 stories, details showing materials and methods for protecting penetrations of pipes and mechanical systems to maintain required structural safety, fire resistance rating and fireblocking shall be included



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## Plan Review Cont

---

- Recommended that the UL designs (or others) be imported into the plans
- Importing designs into plans does NOT violate UL copyright requirements, provided:
  - ✓ Presented in their entirety in a non-misleading manner and without manipulation (data & drawings)
  - ✓ Include notation that they are reprinted from UL Online Certification Directory: "© 2017 UL LLC"



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## Plan Review Cont.

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- Review proposed fire-resistance-rated assemblies for compliance with code
- Hourly rating requirement
  - Type of Construction
  - Details of assemblies proposed relative to actual construction
  - Consider variations identified relative to permitted substitutions stated in the UL Fire Resistance Directory



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## Plan Review Cont.

- Consider need for engineering judgments if permitted by department policy
- Consider need for special inspections as required by code and/or by department policy
- IBC 1705.17 (new) Statement of Special Inspections required in high-rise or structural risk category III or IV by an *approved agency* for:
  - ✓ Penetration firestop systems
  - ✓ Fire-resistant joint systems



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## Questions / Comments



162

## Fire-Resistance-Rated Construction

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### Inspection Process



163

## Inspection of Fire-Resistance-Rated Assemblies

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- Inspections typically done by Code Official, but may be inspected by an *approved* agency or individual
- IBC 1703 requirements for *approved* agency:
  - ✓ Independence – 1703.1.1
  - ✓ Adequate equipment – 1703.1.2
  - ✓ Experienced personnel – 1703.1.3



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## Inspection of Fire-Resistance-Rated Assemblies

- Verifies approved design is being used
- Verifies assembly is being constructed in accordance with the approved design
- May require multiple and well-timed inspections
- May require selective “destructive” inspection

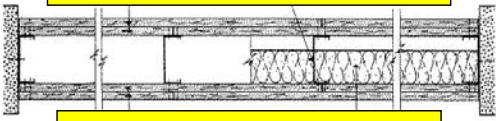


165

## For the Architect / Contractor

Design No. U411  
May 29, 2012  
Nonbearing Wall Rating – 2 HR.

**UL Designs serve two roles:**



**1) Evidence of compliance**

1. Floor and Ceiling Runner – (Not Shown) – Min. 25 MSG galv steel, 1 in. return legs, 2-1/2 in. deep (min), attached to floor and ceiling with fasteners 24 in. OC max.

**2) A set of build-instructions**

1.A  
24 in.  
OC

1.3 - For  
24 in.

ALLSTEEL & GYPSUM PRODUCTS INC – Type SUPREME Framing System

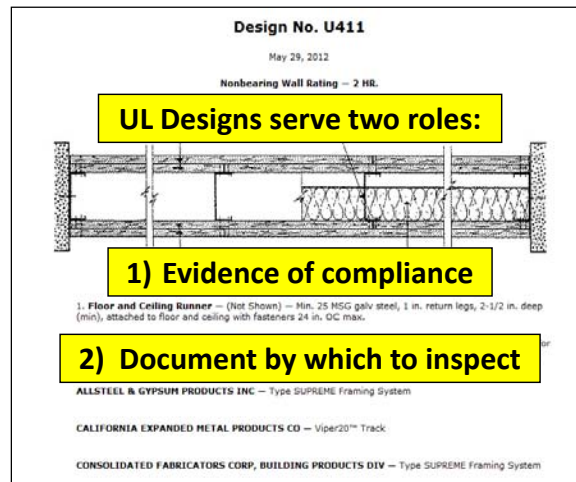
CALIFORNIA EXPANDED METAL PRODUCTS CO – Viper20™ Track

CONSOLIDATED FABRICATORS CORP, BUILDING PRODUCTS DIV – Type SUPREME Framing System



166

## For the Certified Code Official



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## Inspection of Firestop Systems

- Section 110.3.6 of the 2015 IBC:
  - Protection of joints and penetrations in *fire-resistance-rated* assemblies, *smoke barriers* and smoke partitions shall not be concealed from view until inspected and approved
- Section 1705.17 of the 2015 IBC:
  - **Special Inspections** are required for fire-resistant penetrations and joints in *high-rise buildings* and *Risk Category III or IV*

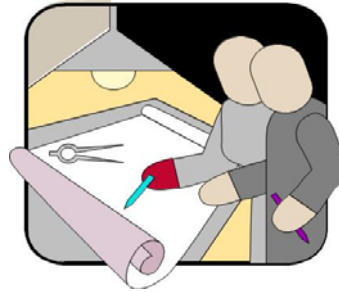


168

## Pre-Construction Meeting

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- Review selected designs
- Obtain engineering judgments as needed
- Establish inspection guidelines and expectations
- Establish work and inspection schedules
- Review qualifications /experience of contractors



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## Pre-Inspection

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- Require construction documents that detail all fire-resistance-rated assemblies
- Obtain copies of all fire-resistance-rated designs
- Develop a plan to inspect each assembly at the appropriate times during the construction process



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## At the Inspection Site

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- Have your inspection tools such as a flashlight, coring device, depth gauge, calipers, tape measure, etc.
- Review the general layout of the assembly
- Verify the building materials being utilized match those described in the approved design



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## At the Inspection Site Cont.

---

- For board products, verify the type, manufacturer, thickness and orientation match what is described in the approved design
- Verify fastener type, size and spacing for compliance with the approved design
- For insulation products, verify the type, manufacturer, thickness and density match what is described in the approved design



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## At the Inspection Site Cont.

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- Verify that the approved third party testing agency's labels are on the products, empty containers or boxes
- When necessary conduct destructive evaluations on the assemblies
- During the inspection have the contractor follow along to repair assemblies after destructive testing



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## Reference Materials

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- ASTM E 736 – “Standard Test Method for Cohesion / Adhesion of Sprayed Fire Resistive Materials Applied to Structural Members”
- ASTM E 605 – “Standard Test Methods for Thickness and Density of Sprayed Fire Resistive Material Applied to Structural Members”



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## Reference Materials Cont.

---

- Association of Wall and Ceiling Industry – *Technical Manuals 12, 12-A and 12-B*
- Gypsum Association – *Fire Resistance Design Manual*
- International Firestop Council Video – *Inspecting Firestop for Compliance*



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## Available Resources

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- Fire Safe North America (FSNA) – [www.firesafenorthamerica.org](http://www.firesafenorthamerica.org)
- Association of Wall and Ceilings Industry (AWCI) – [www.awci.org](http://www.awci.org)
- Gypsum Association (GA) – [www.gypsum.org](http://www.gypsum.org)



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## Questions / Comments



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## Building Elements & Firestop Systems

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Engineering  
Judgments



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## Engineering Judgments

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- An Engineering Judgment is a letter or report issued by some knowledgeable party which evaluates the construction of some site-specific application which deviates from a tested design, system or assembly and concludes with a judgment of the applicable rating of that assembly
- Referred to as “Engineering Analysis” in IBC Section 703.3



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## Engineering Judgments Cont.

---

- Typically, an Engineering Judgment is used when a tested design, systems or assembly is unavailable
- Most often applied to fire resistive construction



180

## Engineering Judgments Cont.

---

- Applications for an Engineering Judgment
  - Design and system concept where multiple components, some listed and some unlisted, are used to field construct the finished assembly (e.g. wall)
  - Typically products are not required to be listed by code
- Must be acceptable to the *Code Official*



181

## Who Issues Engineering Judgments?

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- Who issues Engineering Judgments?
  - Professional engineer
  - Fire protection engineer
  - Manufacturer
  - Testing laboratory
- Individual issuing judgment must be acceptable to the *Code Official*



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## 2015 IBC References Justifying Engineering Judgments

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- IBC 104.11 Alternative materials, design and methods of construction and equipment
- IBC 703.2 Fire-resistance ratings
- IBC 703.3 Alternative methods for determining fire resistance – six options are permitted



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## Important Points of an Engineering Judgment

---

- No guidance from the International Code Council or the various I-Codes
- No guidance from UL
- Best documents available are from the International Firestop Council (IFC) – [www.firestop.org](http://www.firestop.org)



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## IFC Guidelines

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- Four Documents – *International Firestop Council* (IFC) [www.firestop.org](http://www.firestop.org)
  - Recommended *IFC* Guidelines for Evaluating Firestop Systems in Engineering Judgments (EJs)
    - Covers firestops, joint systems and grease/air duct assemblies
  - Perimeter fire barrier systems
  - Fire resistant duct enclosure systems for commercial kitchen exhaust ducts
  - Fire resistant duct enclosure systems for ventilation ducts



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## Summary of Engineering Judgments

---

- Emphasizes importance of tested designs
- Not a substitute for existing designs
- Should be issued only by those who know the components
- Based on sound engineering practices and knowledge of performance of the designs
- Based on interpolation of previous testing
- Issued only for a specific jobsite
- Presented in clear detail



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## Questions / Comments



187

## Fire Resistive Construction

UL's Online  
Search Tools



188

## Fire-Resistance-Rated Construction

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### Navigating the UL Directories



189

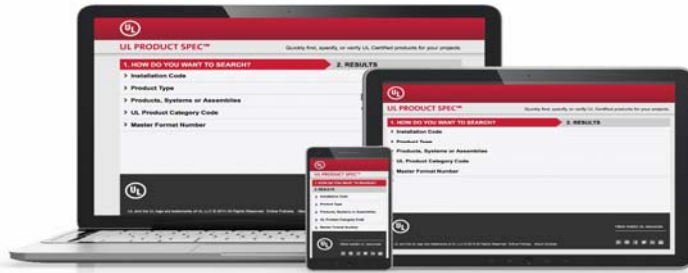
## UL's Online Search Tools

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- Product Spec™
- Installation Code - Code Link
- Online Certifications Directory



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### Introducing UL Product Spec™

- Responsive Web site-Right sizes to your screen size, smartphone, tablet or PC
- Works on all web connected devices regardless of platform or OS
- Includes Electrical Construction, Fire and Building Materials and Systems



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## UL Product Spec™

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- No charge to access
- Find, specify or verify UL certified building products, fire resistance designs, through-penetrations and more
- Updated daily
- Easy to use
  - <http://www.ul.com/productspec>

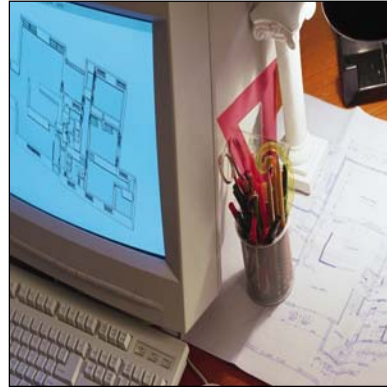


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# UL Product Spec™

Searching for  
Information on  
Fire-Resistance-  
Rated Construction



193

# UL Product Spec™

**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



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# UL Product Spec™

The screenshot shows the UL Product Spec™ search interface. At the top is the UL logo and the text "UL PRODUCT SPEC™" with the tagline "Quickly find, specify, or verify UL Certified products for your projects." Below this is a navigation bar with two tabs: "1. HOW DO YOU WANT TO SEARCH?" (active) and "2. RESULTS". Under the active tab, there is a section titled "Products, Systems or Assemblies" with a list of options: "Electrical", "Building or Fire Systems", and a "Back" button. A red arrow points to "Building or Fire Systems".



# UL Product Spec™

The screenshot shows the UL Product Spec™ search interface. At the top is the UL logo and the text "UL PRODUCT SPEC™" with the tagline "Quickly find, specify, or verify UL Certified products for your projects." Below this is a navigation bar with two tabs: "1. HOW DO YOU WANT TO SEARCH?" (active) and "2. RESULTS". Under the active tab, there is a section titled "Building or Fire Systems" with a list of options: "Fire Protection Systems", "Commercial Cooking", "Elevators", "Fire Rated Walls, Floors, Beams and Columns", "Firestop Systems", "Passive Systems", "Roofing", "Windstorm Rated Products", "Egress Equipment", and "Green Buildings". Red arrows point to "Firestop Systems" and "Fire Rated Walls, Floors, Beams and Columns".



# UL Product Spec™



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# UL Product Spec™

- Sample Search - Accessing a design if design number is known
  - Design No. L501



198

# UL Product Spec™

The screenshot shows the UL Product Spec™ search interface. At the top is the UL logo. Below it is the text "UL PRODUCT SPEC™" and "Quickly find, specify, or verify UL Certified products for your projects." The main content area is divided into two steps: "1. HOW DO YOU WANT TO SEARCH?" and "2. RESULTS". Under step 1, there are three options: "Fire Rated Walls, Floors, Beams and Columns", "Search by Assembly Number", and "Search with Specific Parameters". A red arrow points to "Search by Assembly Number". A "Back" button is located at the bottom left of the search options.



# UL Product Spec™

The screenshot shows the UL Product Spec™ search interface. At the top is the UL logo. Below it is the text "UL PRODUCT SPEC™" and "Quickly find, specify, or verify UL Certified products for your projects." The main content area is divided into two steps: "1. HOW DO YOU WANT TO SEARCH?" and "2. RESULTS". Under step 1, the "Search by Assembly Number" option is selected. Below this option is a search input field containing the text "L501" and a "Search" button. A "Back" button is located at the bottom left of the search options.



# UL Product Spec™

The screenshot shows the UL Product Spec search interface. At the top left is the UL logo. Below it, the text "UL PRODUCT SPEC™" is followed by the tagline "Quickly find, specify, or verify UL Certified products for your projects." The interface is divided into two main sections: "1. HOW DO YOU WANT TO SEARCH?" and "2. RESULTS". Under "1. HOW DO YOU WANT TO SEARCH?", the search criteria are "Search: Assembly number: L501" and "Results: viewing 1-1 of 1". A red arrow points to the "FIRE-RESISTANCE DESIGN" section, which lists "L501 - BXUV.L501" and "Results: viewing 1-1 of 1". At the bottom right of the results area, there are two buttons: "Print" and "New Search".



201

# UL Product Spec™

The screenshot shows the UL Product Spec product details page for the L501 assembly. At the top left is the UL logo. Below it, the text "UL PRODUCT SPEC™" is followed by the tagline "Quickly find, specify, or verify UL Certified products for your projects." The interface is divided into two main sections: "1. HOW DO YOU WANT TO SEARCH?" and "2. RESULTS". Under "2. RESULTS", the "FIRE-RESISTANCE DESIGN" section is expanded, showing the following information:  
Assembly Usage Disclaimer  
BXUV - Fire Resistance Ratings - ANSUL 203  
BXUV7 - Fire Resistance Ratings - CANULC-5101 Certified for Canada  
See General Information for Fire-resistance Ratings - ANSUL 203  
See General Information for Fire Resistance Ratings - CANULC-5101 Certified for Canada  
Design No. L501  
October 26, 2014  
Unrestrained Assembly Rating — 1 Hr.  
Finish Rating — (See Item 5 and 5A)  
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.  
Below the text is a technical drawing of a fire-resistance assembly, showing a cross-section of a wall or ceiling structure with various components labeled with numbers 1 through 7.



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http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME

File Edit View Favorites Tools Help

BXUV.L501 - Fire Resistance Ratings - AN...

1. **Flooring Systems** — The flooring system shall consist of one of the following:

**System No. 1**

**Subflooring** — Min 1 by 6 in. T & G lumber fastened diagonally to joists, or min 15/32 in. thick plywood or min 7/16 in. thick oriented strand board (OSB) wood structural panels, min grade "C-D" or "Sheathing". Face grain of plywood or strength axis of panel to be perpendicular to joists with joints staggered.

**Vapor Barrier** — Nom 0.010 in. thick commercial rosin-sized building paper.

**Finish Flooring** — Min 1 by 4 in. T & G lumber installed perpendicular to joists, or min 19/32 in. thick wood structural panels, min grade "Underlayment" or "Single-Floor". Face grain of plywood or strength axis of panels to be perpendicular to joists with joints staggered.

**System No. 2**

**Subflooring** — Min 15/32 in. thick wood structural panels, min grade "C-D" or "Sheathing". Face grain of plywood or strength axis of panels to be perpendicular to the joists with joints staggered.

**Vapor Barrier** — (Optional) — Nom 0.030 in. thick commercial asphalt saturated felt.

**Floor Mat Materials\* - (Optional)** — Min 3/8 in. to max 3/4 in. thick floor mat material loose laid over the subfloor. Floor topping thickness shall be as specified under **Floor Topping Mixture**.


**UNITED STATES GYPSUM CO** — Levelock Brand Sound Reduction Board

**Alternate Floor Mat Materials\* - (Optional)** — Nom 1/4 in. thick floor mat material loose laid over the subfloor. Floor topping thickness shall be as specified under **Floor Topping Mixture**.

**UNITED STATES GYPSUM CO** — Levelock Brand Floor Underlayment SRM-25

**Alternate Floor Mat Materials\* - (Optional)** — Nom 3/8 in. thick floor mat material loose laid over the subfloor. Floor topping thickness shall be as specified under **Floor Topping Mixture**.

**SOLUTIA INC** — Type SC50

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http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME

File Edit View Favorites Tools Help

BXUV.L501 - Fire Resistance Ratings - AN...

2. **Wood Joists** — Min 2 by 10, spaced 16 in. OC and effectively fireblocked in accordance with local codes.

3. **Cross Bridging** — Min 1 by 3 in. or min 2 by 10 solid blocking.

3A. **Horizontal Bridging** — Used in lieu of item 3 in same joist bay as ceiling damper (item 4), when ceiling damper is employed. Wood 2 by 4 in. secured between joists with nails.

4. **Ceiling Damper\* - (Optional)** — Max nom area shall be 198 sq in. Max rectangular size shall be 12 in. wide by 16-1/2 in. long. Max height of damper shall be 9-3/8 in. Aggregate damper openings shall not exceed 99 sq in. per 100 sq ft of ceiling area. Damper installed in accordance with the manufacturers installation instructions provided with the damper. A steel grille (item 7) shall be installed in accordance with installation instructions.

**AIR BALANCE INC** — Type 299 (See Item 5A)

**AIR KING VENTILATION PRODUCTS** — Series AS, Series AK

**DLX: DAMPERS AND LOUVERS EXPRESS** — Models CRD,S,HC, CRD,R,HC

**E H PRICE LTD** — Models CD-S/R-HC, CD-RD-HC


**GREENHECK FAN CORP** — Model CRD-1WJ

**METAL-FAB INC** — Models MSCDHC, MRDCHD

**NCA MFG INC** — Models CD-S/R-HC, CD-RD-HC

**RUSKIN CO** — Model CFP7

**UNITED ENERTECH CORP** — Models C-S/R-HC(-A), C-RD-HC(-A)

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http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME

File Edit View Favorites Tools Help

BXUV.L501 - Fire Resistance Ratings - AN...

5. **Gypsum Board\*** — Nom 5/8 in. thick, 48 in. wide gypsum board, installed with long dimension perpendicular to joists. Gypsum board secured with 1-7/8 in. long, 6d cement coated nails spaced 6 in. OC.

**AMERICAN GYPSUM CO** — Types AGX-1, AG-C

**BEIJING NEW BUILDING MATERIALS PUBLIC LTD CO** — Type DBX-1

**CERTAINTEEED GYPSUM INC** — Types EGRG, GlasRoc, FRPC, SF3, ProRoc Type C, ProRoc Type X

**CERTAINTEEED GYPSUM CANADA INC** — Types ProRoc Type C, ProRoc Type X, ProRoc Type Abuse-Resistant

**CANADIAN GYPSUM COMPANY** — Types C, IP-X1, IP-X2, IPC-AR, SCX, WRX

**GEORGIA-PACIFIC GYPSUM L L C** — Types S, 9, C, GPFS1, GPFS6, DA, DAP, DAPC, DGG, DS.

**LAFARGE NORTH AMERICA INC** — Types LGFC3, LGFC6, LGFC6A, LGFC-C, LGFC-C/A


**NATIONAL GYPSUM CO** — Types FSK, FSK-C, FSK-G, FSW, FSW-2, FSW-3, FSW-C, FSW-G, FSW-6

**NATIONAL GYPSUM CO** — Riyadh, Saudi Arabia — Type FR, or WR.

**PABCO BUILDING PRODUCTS L L C, DBA PABCO GYPSUM** — Types C, PG-3, PG-4, PG-5, PG-6, PG-9, PG-C, PG-11

**PANEL REY S A** — Type PRC

**SIAM GYPSUM INDUSTRY (SARABURI) CO LTD** — Type EX-1

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http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME

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BXUV.L501 - Fire Resistance Ratings - AN...

**TEMPLE-INLAND** — Type X, Veneer Plaster Base-Type X, Water Rated-Type X, Sheathing Type-X, Soffit-Type X, TC-C, GreenGlass Type X.

**UNITED STATES GYPSUM CO** — Types C, IP-X1, IP-X2, IPC-AR, SCX, WRX

**USG MEXICO S A DE C V** — Types C, IP-X1, IP-X2, IPC-AR, SCX, WRX

5A. **Gypsum Board\*** — (Finish Rating - 15 min.) Required when Air Balance Inc. Type 299 ceiling damper (Item 4) is installed. Nom 5/8 in. thick, 48 in. wide gypsum board, installed with long dimension perpendicular to joists. Gypsum board secured with 1-7/8 in. long, 6d cement coated nails spaced 6 in. OC with the first nails located 1/2 in. and 3 in. from the board edges.

**UNITED STATES GYPSUM CO** — Type C

**USG MEXICO S A DE C V** — Type C


6. **Finishing System - (Not shown)** — Vinyl, dry or premixed joint compound, applied in two coats to joints and screw-heads; Nom 2 in. wide paper tape embedded in first layer of compound over all joints. As an alternate, nom 3/32 in. thick veneer plaster may be applied to the entire surface of gypsum board.

7. **Grille** — Steel grille, installed in accordance with the installation instructions provided with the ceiling damper.

8. **Steel Corner Fasteners** — (Optional-not shown) - Used to attach ends of gypsum board at wall intersection where joists run parallel to wall. Channel shaped, 2 in. long by 1 in. high on the back side with two 1/8 in. wide cleats protruding into the 5/8 in. wide channel, fabricated from 24 gauge galvanized steel. Fasteners nailed to face of wall bearing plate through fastener tab with one No. 6d cement coated nail, spaced not greater than 16 in. OC and 2 in. from edge of gypsum board. Fasteners covered with gypsum board facing applied to intersecting wall.

\*Bearing the UL Classification Mark.

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## UL Product Spec™

- Sample Search - Searching for a design based on specific parameters
  - Wood stud/gypsum board wall assembly
  - 2 hour rating
  - Gypsum board supplied by the United States Gypsum Company



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## UL Product Spec™

UL

**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



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# UL Product Spec™

**UL**  
**UL PRODUCT SPEC™** Quickly find, specify, or verify UL Certified products for your projects.

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

**Search with Specific Parameters**

Select from the following menus, then click Search.

Assembly type: Walls and Partitions	Construct group: 	Protection type: Wood Stud, Gypsum Board, Lath &/or Plaster
Hourly ratings: Rating ≥ 2 hr and < 3 hr	Manufacturer (optional): United States Gypsum	Keyword (optional): Example: "plastic"

**Search**

**Back**



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# UL Product Spec™

**UL**  
**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: Walls and Partitions; Protection type: Wood Stud, Gypsum Board, Lath &/or Plaster; Rating: Rating ≥ 2 hr and < 3 hr; Manufacturer: United States Gypsum

Results viewing 1-25 of 26 1 | 2 | »

**FIRE-RESISTANCE DESIGN**

- U301 - BXUV.U301
- U302 - BXUV.U302
- U308 - BXUV.U308
- U309 - BXUV.U309
- U332 - BXUV.U332
- U334 - BXUV.U334
- U336 - BXUV.U336



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# UL Product Spec™

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**

Assembly Usage Dictionary

**BXUV - Fire Resistance Ratings - ANSUL 263**

**BXUV7 - Fire Resistance Ratings - CANULC-S101 Certified for Canada**

See General Information for Fire-Resistance Ratings - ANSUL 263

See General Information for Fire-Resistance Ratings - CANULC-S101 Certified for Canada

**Design No. U301**  
October 29, 2014

Bearing Wall Rating — 2 HR.  
Finish Rating — 66 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.



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## Guide Information

- Equipment, materials or systems included in the Category
- Intended use, restrictions or supplemental information that apply
- Standard(s) used to evaluate products under the Category
- Listing or Classification Mark information for the Category



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## Examples of Guide Information for Firestop Systems

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- General Description of a Firestop System
- Standard
- Description of Ratings
- Permitted Substitutions
- Specifications of Penetrating Items
- Support of Penetrating Items
- Angle of Penetration
- Description of Numbering System



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## C-A J-1000 First Alpha Character

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- C - Either Floor or Wall being Penetrated
- F - Floor being Penetrated
- W - Wall being Penetrated



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## C-AJ-1000 Second and Third Alpha Characters

Letter	Description
A	Concrete floors with a minimum thickness less than or equal to 5 in.
B	Concrete floors with a minimum thickness greater than 5 in.
C	Framed floors
D	Steel decks in marine vessels
E	Floor-ceiling assemblies consisting of concrete with membrane protection
F - I	Not used a present time
J	Concrete or masonry walls with a minimum thickness less than or equal to 8 in.
K	Concrete or masonry walls with a minimum thickness greater than 8 in.
L	Framed wall
M	Bulkheads in marine vessels
N	Composite panel walls
O-Z	Not used at present time



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## C-AJ-1000 Numeric Characters

Numeric Range	Description
0000 - 0999	No penetrating items
1000 - 1999	Metallic pipe, conduit or tubing
2000 - 2999	Nonmetallic pipe, conduit or tubing
3000 - 3999	Electrical cables
4000 - 4999	Cable trays with electrical
5000 - 5999	Insulated pipes
6000 - 6999	Misc. electrical penetrants such as busducts
7000 - 7999	Misc. mechanical penetrants such as air ducts
8000 - 8999	Groupings of penetrations including any combination of items listed above
9000 - 9999	Not used at present time



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## Firestop Systems

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- Each firestop system contains specific construction features
- Many firestop systems contain various options and various ratings
- Must be followed exactly for rating to apply



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## Questions / Comments



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## Search by Installation Code

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



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## Product Spec™ Installation Code

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

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

National Electrical Code	2017	2014
International Fire Code	2015	2012
NFPA 1: Fire Code	2015	2012
NFPA 101: Life Safety Code	2015	2012
International Building Code	2015	2012
International Residential Code	2015	2012
ASHRAE 189.1	2011	



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# Product Spec™ Installation Code

**UL PRODUCT SPEC™** Quickly find, specify, or verify UL Certified products for your projects.

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

National Electrical Code	2017	2014
International Fire Code	2015	2012
NFPA 1: Fire Code	2015	2012
NFPA 101: Life Safety Code	2015	2012
International Building Code	2015	2012

Enter one of the following search parameters:

Code Section Number:

UL Product Category Code:

**Search**

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# Product Spec™ Installation Code

**UL PRODUCT SPEC™** Quickly find, specify, or verify UL Certified products for your projects.

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

Search Code name: International Building Code; Edition: 2015; Section number: 716.3  
Results 1-7 of 7

INSTALLATION CODE	UL PRODUCT CATEGORY & CODE
IBC 2015: 716.3	Fire-resistance-rated Glazing Materials: CCET
IBC 2015: 716.3	Glazing Materials: KCMZ
IBC 2015: 716.3.1	Fire-resistance-rated Glazing Materials: CCET
IBC 2015: 716.3.1	Glazing Materials: KCMZ
IBC 2015: 716.3.2	Glazing Materials: KCMZ
IBC 2015: 716.3.3	Fire-resistance-rated Glazing Materials: CCET
IBC 2015: 716.3.3	Glazing Materials: KCMZ

Results 1-7 of 7

# Product Spec™ Installation Code

## UL PRODUCT CATEGORY

### Fire-resistance-rated Glazing Materials, CCET

[Guide Information for Fire-resistance Ratings](#)

#### USE

This category covers fire-resistance-rated glazing materials investigated for use in fire-resistance designs as detailed in Fire-resistance Ratings - ANSI/UL 263 (BXUV). The glazing materials have been investigated for use in specified fire-resistive floor-ceiling, wall and/or partition constructions with respect to (1) construction details, (2) maximum size of individual glazing panels, and (3) for wall or partition constructions, the maximum aggregate area of glazing panels per 100 sq ft of wall area as described in the individual design illustrations. The glazing material provides the insulation properties for compliance with the temperature rise requirement of the Standard Test Method.

[> Show additional information...](#)

## VIEW UL CERTIFIED PRODUCTS

[View list](#)

## UL PUBLICATIONS

[Door & Window Application Guide](#)

## UL STANDARDS

[UL 263 Scope](#)



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[New Search](#)

# Product Spec™ Installation Code

Search Listings: CCET  
Results viewing 1-13 of 13

COMPANY NAME AND FILE	CATEGORY NAME
AGC GLASS EUROPE SA - SENEFFE [R26570], CCET	Fire-resistance-rated Glazing Materials
GENERAL GLASS INTERNATIONAL [R25120], CCET	Fire-resistance-rated Glazing Materials
GLAS TROSCH AG FIRESWISS [R27170], CCET	Fire-resistance-rated Glazing Materials
GLASSOPOLIS [R27613], CCET	Fire-resistance-rated Glazing Materials
GREENLITE GLASS SYSTEMS INC [R38768], CCET	Fire-resistance-rated Glazing Materials
PILKINGTON DEUTSCHLAND AG [R18372], CCET	Fire-resistance-rated Glazing Materials
SAFTIFIRST [R14212], CCET	Fire-resistance-rated Glazing Materials
SCHOTT TECHNICAL GLASS SOLUTIONS GMBH [R38979], CCET	Fire-resistance-rated Glazing Materials
TECHNICAL GLASS PRODUCTS [R16132], CCET	Fire-resistance-rated Glazing Materials
TECHNICAL GLASS PRODUCTS [R38725], CCET	Fire-resistance-rated Glazing Materials
TRULITE GLASS & ALUMINUM SOLUTIONS L L C [R26885], CCET	Fire-resistance-rated Glazing Materials
TRULITE GLASS & ALUMINUM SOLUTIONS L L C [R38774], CCET	Fire-resistance-rated Glazing Materials
VETROTECH SAINT-GOBAIN NORTH AMERICA INC [R22066], CCET	Fire-resistance-rated Glazing Materials



Results viewing 1-13 of 13

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**UL PRODUCT CATEGORY**

**Fire-resistance-rated Glazing Materials**

See General Information for Fire-resistance-rated Glazing Materials

**AGC GLASS EUROPE SA - SENEFFE**  
PARC INDUSTRIEL ZONE C  
7180 SENEFFE, BELGIUM

R26570

**Fire-resistance-rated glazing material**, Pyrobel 60, Pyrobel 60 EG, Pyrobel 60 IGU, Pyrobel 120, Pyrobel 120 EG, Pyrobel 120 IGU for use in Wall and Partition Design Nos. **U550** and **U553**.

Trademark and/or Tradename: "PYROBEL"

Last Updated on 2011-06-23

The appearance of a company's name or product in this database does not in itself assure that products so identified have been manufactured under UL's Follow-Up Service. Only those products bearing the UL Mark should be considered to be Certified and covered under UL's Follow-Up Service. Always look for the Mark on the product.

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New Search

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## Questions / Comments



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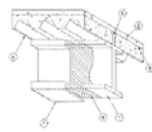
## Additional Resources

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

### Architectural Services

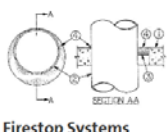
Resources to help you quickly and easily locate code compliant fire-resistance and smoke protection solutions.

#### LOCATE SPECIFIC DESIGNS AND SYSTEMS



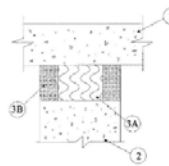
Walls, Floors, Roofs,  
Beams and Columns

[Find Designs >](#)



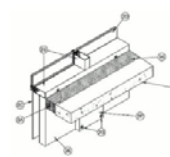
Firestop Systems

[Find Systems >](#)



Joint Systems

[Find Systems >](#)



Perimeter Fire  
Containment Systems

[Find Systems >](#)



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## Additional Resources

- Firestop Contractors International Association [www.FCIA.org](http://www.FCIA.org)
- National Fireproofing Contractors Association [www.NFCA-online.org](http://www.NFCA-online.org)
- UL – Code Authorities Technical Library [www.ul.com/codeauthorities](http://www.ul.com/codeauthorities)



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Thank You for Attending!!!

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