



•State of Connecticut  
 •Department of Administrative Services  
 •Division of Construction Services  
 •Office of Education and Data Management

## Fire Resistant Construction and UL Resources for Code Officials

*Presented by*  
**Bruce E. Johnson, UL, LLC**  
*for the*

*Office of Education and Data Management*  
*Fall 2015 Career Development Series*



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## Fire Resistive Construction

*Based on the 2012 IBC*



**Bruce E. Johnson**  
*UL Codes and Advisory Services*

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January 22, 2015

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### Objective

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



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## Objective Cont.

- Be able to navigate UL's Fire Resistance Directory, Online Certifications Directory and Product Spec in order to identify listed products and assemblies which demonstrate compliance with the requirements of the 2012 *International Building Code (IBC)*.
- Understand the *proposed* Connecticut modifications to the IBC model code.



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## Agenda

- A brief IBC Basics Review
- Fire-Resistance-Rated Construction
  - *Definitions*
  - International Building Code Requirements
  - Establishing *Fire-Resistance* Ratings
  - Methods of Showing Code Compliance



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## Agenda Cont.

- Permitted Changes to Designs
- Plan Review Process
- Inspection Process
- Navigating the UL Directories & on-line resources
- Summary and Closing



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Questions / Comments



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IBC Basics

Some Fundamentals – A refresher!



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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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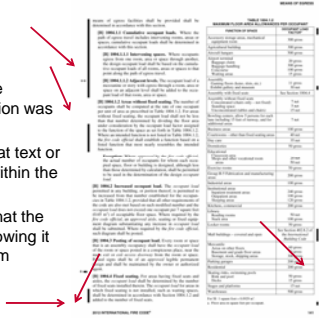
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## Identifying Changes in Code Text

### Margin markings:

- Vertical lines indicate new or revised text
- Arrows indicate that an entire sentence, paragraph or Section was deleted
- \* A single asterisk indicates that text or a table has been relocated within the code
- \*\* A double asterisk indicates that the text or table immediately following it has been relocated there from elsewhere in the code



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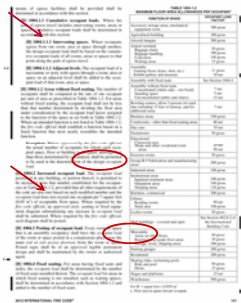
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## Identifying Changes and the Responsibility of Code Development

### Margin markings:

- Letters in brackets indicate the Section is maintained by another code development committee  
[B] is the Building Code Development Committee  
[M] is Mechanical Code
- Terms set forth in Chapter 2 – Definitions are italicized
- If not italicized, then the definition in Chapter 2 does not impart the intended meaning



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## Scope of the IFC and IBC

IBC	Provision	IFC
Duplicated	Sprinkler Installation	Maintained
Maintained	Groups A, B, E, F, I, M, R, S and U Occupancy Classifications	Duplicated
Duplicated	Group H Occupancy Classification	Maintained
Duplicated	Decorations and Trim	Maintained
Duplicated	Standpipe and Hose Systems	Maintained
Duplicated	Fire Alarm and Detection	Maintained
Duplicated	Emergency Alarm	Maintained



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## Scope of the IFC and IBC

IBC	Provision	IFC
Duplicated	Smoke Control Operation	Maintained
Duplicated	Smoke Control Systems	Maintained
Duplicated	Smoke and Heat Vents	Maintained
Maintained	Means of Egress Design	Duplicated
Reference to IFC	Means of Egress Maintenance	Maintained
No Text	Retroactive Means of Egress Requirements	Maintained
Duplicated	Elevator Emergency Operation	Maintained



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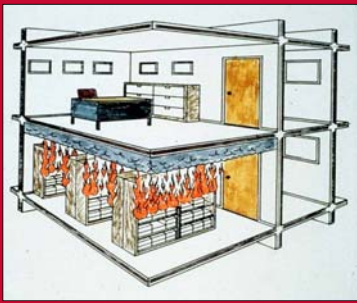
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## Fire-Resistance-Rated Construction



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## Passive Fire Protection

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. (more)

### 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 (ITM)*



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## 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)



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## Definitions Cont.

- *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. (IBC)
  - Passage of Flames
  - Heat Transmission
  - Structural Integrity



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## Definitions Cont.

- *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

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

International Building Code Requirements for Fire-Resistance-Rated Construction



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## Code Requirements

- 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.

- 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.

- 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 the *building official* that construction qualifies for restrained classification per ASTM E 119 or UL 263



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### Code Requirements Cont.

- 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.

- 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



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### Code Requirements Cont.

- Breaches of assemblies shall be protected in accordance with Sections:
  - 713 Shaft Enclosures
  - 714 Penetrations
  - 715 Fire-Resistant Joint Systems
  - 716 Opening Protectives
- Chapter 10 – Means of Egress
  - Table 1018.1– Establishes hourly rating required for corridors based on Occupancy Group



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## Fire Resistance

- Expressed as an Hourly Time Period
- Ratings range from 1/2 to 4 hours
- Containment of fire to room or floor of origin (horizontal and vertical compartmentalization)



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## Questions / Comments



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## Fire-Resistance-Rated Construction

Establishing  
Fire-Resistance  
Ratings



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## Standards

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



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## Building Components

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



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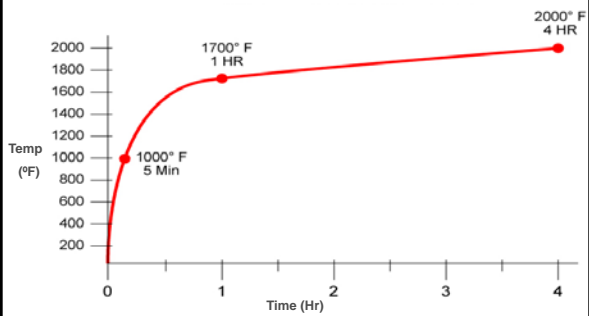
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## Time - Temperature Curve



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## Columns

- Sample size – Minimum 9 ft
- Tested unloaded



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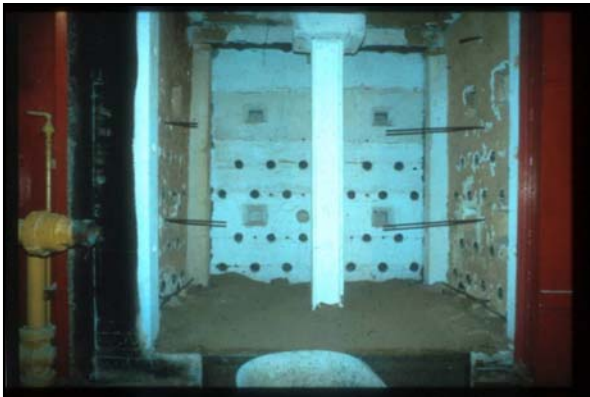
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## Conditions of Acceptance – Columns

- 1000°F / 1200°F



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## Beams

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



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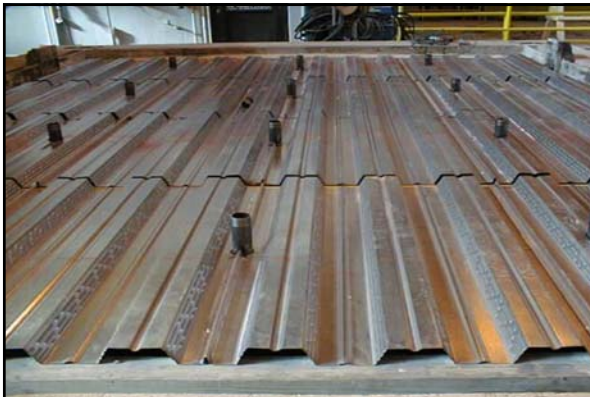
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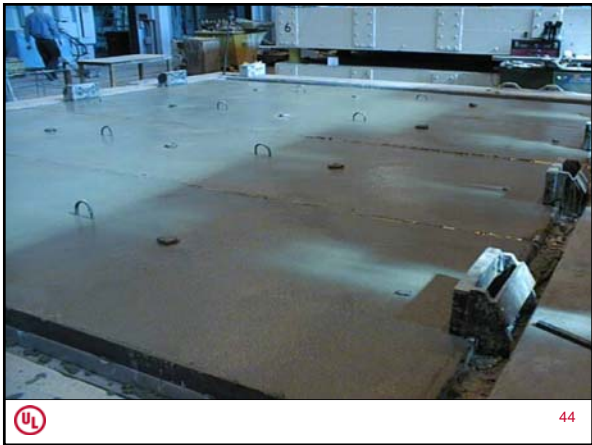
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**Conditions of Acceptance – Beams**

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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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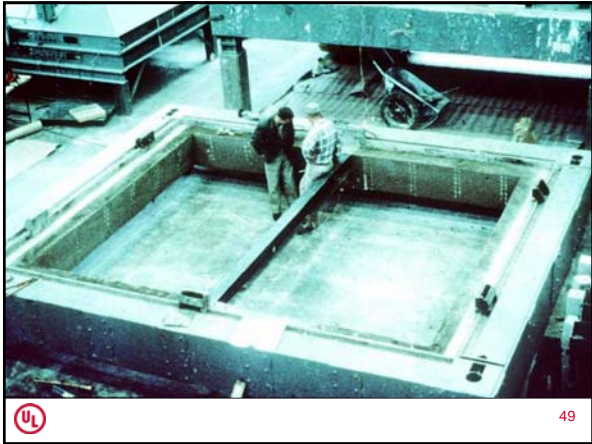
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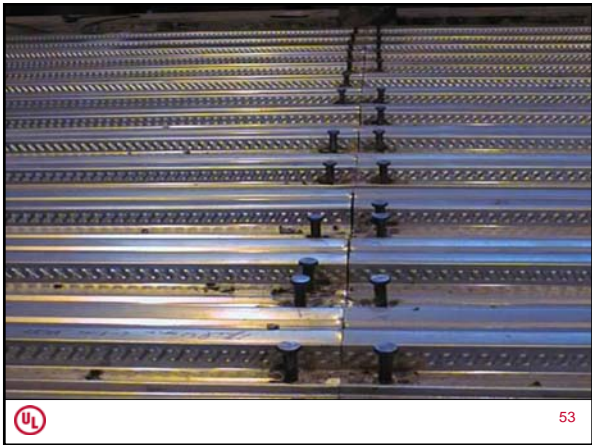
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U<sub>L</sub>

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U<sub>L</sub>

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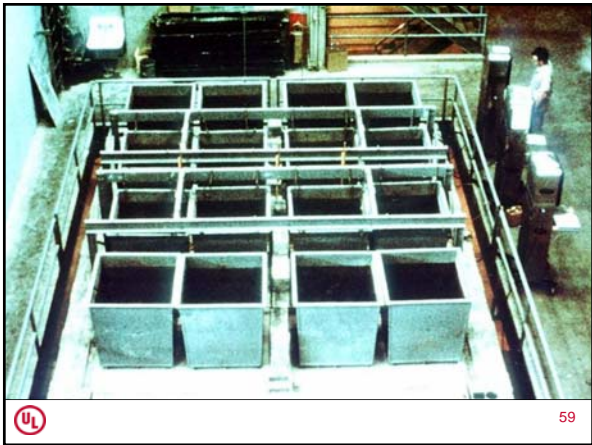
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**Conditions of Acceptance**  
**Floor/Ceilings or Roof/Ceilings**

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

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U<sub>L</sub>

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**Walls**

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

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U<sub>L</sub>

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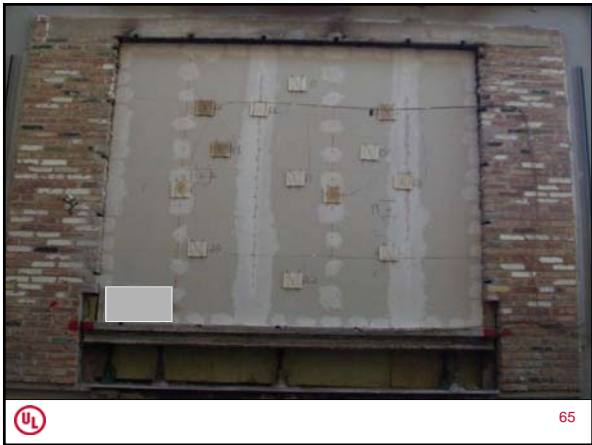
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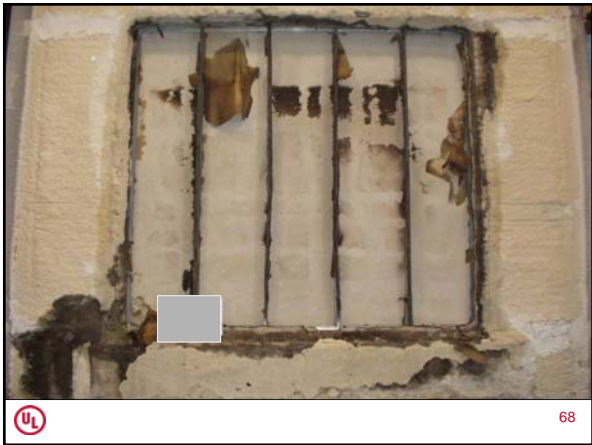
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**Conditions of Acceptance – Walls**

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



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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

- 703.2 – Fire-resistance ratings shall be determined in accordance with ASTM E 119 or UL 263
- 703.3 – Alternative 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



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**Designs Documented From Approved Sources**

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



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**Designs Documented From Approved Sources Cont.**

- 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.

- 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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## Prescriptive Fire Resistance Section 720 of the IBC



3. Bonded prestensioned reinforcement in prestressed concrete <sup>a</sup>	3-1.1	Carbonate, lightweight, sand-lightweight and siliceous <sup>a</sup> aggregate concrete Beams or girders	4h	3h	2 1/2	1 1/2
			Solid slabs <sup>b</sup>		2	1 1/2



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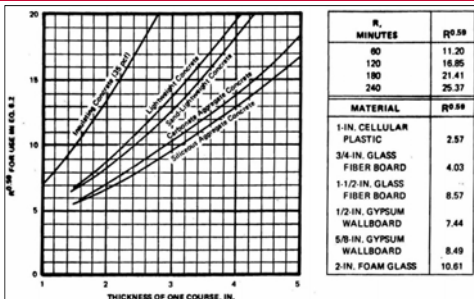
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## Calculated Fire Resistance Section 721 of the IBC



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

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



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

- 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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## Fire-Resistance-Rated Construction

### Navigating the UL Directories



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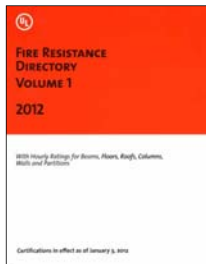
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## Navigating the UL Directories

Hard Copy



CD-ROM



Online



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## Fire Resistance Directory



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### Fire Resistance Directory

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- Volume 1 – Columns, Beams, Floor/Ceilings, Roof/Ceilings and Walls
- Volumes 2A & 2B – Joint Systems, Perimeter Fire Containment Systems, and Through-Penetration Firestop Systems
- Volume 3 – Dampers, Fire Doors, Door Frames and Glazing



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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

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- 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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NUMBERING SYSTEM FOR FIRE RATED ASSEMBLIES										
Groups of Construction	TYPES OF PROTECTION									
	Membrane Protection			Direct Applied Protection						
	000-099	100-199	200-299	300-399	400-499	500-599	600-699	700-799	800-899	900-999
Roof Ceilings A, B*, or C*	Concrete Grid Sys.	(Reserved)	Exposed Grid System	(Reserved)	Metal Lath Gypsum Board	Gypsum Board	Miscellaneous	SFRM*	Unprotected	
Concrete and Cellular Steel Floor D, E*, or F*	Concrete Grid Sys.	(Reserved)	Exposed Grid System	(Reserved)	Metal Lath Gypsum Board	Gypsum Board	Mastic Coating	SFRM*	Unprotected	
Concrete and Steel Joists D, H*, or I*	Concrete Grid Sys.	(Reserved)	Exposed Grid System	(Reserved)	Metal Lath Gypsum Board	Gypsum Board	Miscellaneous	SFRM*	Unprotected	
Concrete T, or K	Concrete Grid Sys.	(Reserved)	Exposed Grid System	(Reserved)	Metal Lath Gypsum Board	Gypsum Board	Miscellaneous	SFRM*	Unprotected	
L or M Wood Joist or Composite Wood and Steel Assemblies	Concrete Grid Sys.	(Reserved)	Exposed Grid System	(Reserved)	Metal Lath Gypsum Board	Gypsum Board	Miscellaneous	SFRM*	Unprotected	
Beams N or O* for Floor Ceiling	Concrete Grid Sys.	(Reserved)	Exposed Grid System	Batts and Blankets or Mineral and Fibre Boards	Metal Lath Gypsum Board	Gypsum Board	Mastic Coating	SFRM*	Unprotected	
Roof Ceiling P, Q* or R*	Concrete Grid Sys.	(Reserved)	Exposed Grid System	(Reserved)	Metal Lath Gypsum Board	Gypsum Board	Miscellaneous	SFRM*	Unprotected	
Beams S or T*	Building Units	(Reserved)	Exposed Grid System	(Reserved)	Metal Lath Gypsum Board	Gypsum Board	Mastic Coating	SFRM*	Unprotected	
Wall & Partition U, V, or W*	Slab or Partition Panel Units	(Reserved)	Insulating Concrete	Wood Stud Gypsum Bl Lath &or Plaster	Metal Stud Gypsum Bl Lath &or Plaster	Misc.	Metal Panels Gypsum Bl Lath &or Plaster	SFRM*	Masonry	
Columns X, Y or Z*	Building Units	Profile- casted	(Reserved)	Batts and Blankets or Mineral and Fibre Boards	Metal Lath & Plaster	Gypsum Board	Mastic Coating	SFRM*	(Reserved)	

The prefix numbers with an asterisk (\*) and the design numbers indicated as "Reserved" in the above table are for future expansion and to cater to new types of systems developed in the future.

+ SFRM denotes Spray-Applied Fire Resistive Materials



## Designs

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



## Product Categories

- Located near end of Volume 1 of Fire Resistance Directory
- Each Product Category describes some generic family of products (e.g. Acoustical Materials)
- Each Product Category contains the manufacturers and designations of products tested and specified in the designs



## Product Categories Cont.

- Manufacturers arranged alphabetically within Product Category



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## Questions / Comments



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## Fire Resistance-Rated Construction

Permitted  
Changes to  
Designs



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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

- 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

- 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

- Metallic boxes may be installed in Floor/Ceiling and Roof/Ceiling 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)



97

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### Steel Joists

- Specified joist is minimum depth
- Specified joist is minimum weight/foot
- K-Series Joist may often substitute
- 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

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



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### Gypsum Ceiling Control Joints

- 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

- 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)



101

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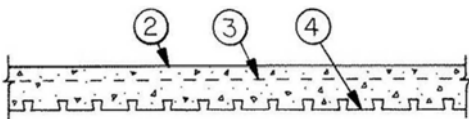
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### Restrained & Unrestrained

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



102

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## Restrained & Unrestrained Cont.

- I. Wall Bearing
- A. Single span and simply supported end spans of multiple bays:<sup>8</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



103

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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



104

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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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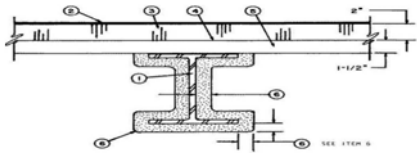
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### Beam Size

- Larger beams may be substituted without restriction
- Larger is based on W/D ratio
- Larger W/D yields greater fire resistance



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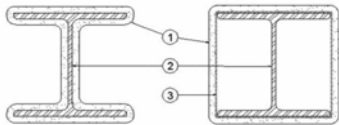
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### Column Size

- 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

- 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.**

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



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**Walls & Partitions Cont.**

- 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.**

- 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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## Questions / Comments



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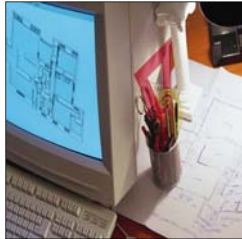
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## Fire-Resistance-Rated Construction

Plan  
Review



113

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## For the Architect / Contractor

Design No. U411  
May 26, 2012  
Nonbearing Wall Rating - 2 HR.

**UL Designs serve two roles:**

**1) Evidence of compliance**

1. Floor and Ceiling Member - One (1) layer of 1/2" (12.7 mm) galv steel, 1 in. (25.4 mm) deep (2x12), attached to floor and ceiling with fasteners 24 in. (609.6 mm) o.c.

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

ALLSTEEL & SUPPLY PRODUCTS INC. - Type SUPREME Framing System  
CALIFORNIA EXPANDED METAL PRODUCTS CO. - Viper2™ Truss  
CONSOLIDATED FABRICATORS CORP. BUILDING PRODUCTS DIV. - Type SUPREME Framing System



114

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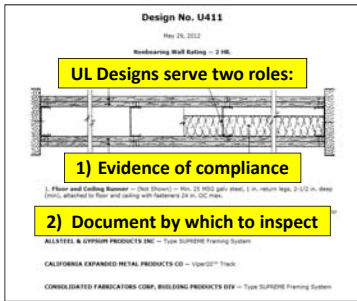
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## For the Building Official



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## Plan Review

- 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 ...



116

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## Plan Review Cont.

- Details showing compliance with the fire-resistant requirements of the IBC should be included on the plans and in the specifications
- Recommended that the UL designs (or others) be imported into the plans
- Importing designs into plans does NOT violate UL copyright requirements



117

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### Plan Review Cont.

- 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



118

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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



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### Questions / Comments



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## Fire-Resistance-Rated Construction

### Inspection Process



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## Inspection of Fire-Resistance-Rated Assemblies

- Inspections typically done by code official, but may be inspected by an approved agency or individual
- Verifies approved design is being used
- Verifies assembly is being constructed in accordance with the approved design



122

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## For the Architect / Contractor

Design No. U411  
Rev 26, 2012  
Nonbearing Wall Rating - 2 HR.

**UL Designs serve two roles:**

**1) Evidence of compliance**

1. Floor and Ceiling Member - One (1) layer of 5/8" (16.0) galv steel, 1 in. rebar top, 2-1/2 in. deep (2x4), attached to floor and ceiling with fasteners 24 in. OC max.

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

ALLSTEEL & SUPPLY PRODUCTS INC. - Type SUPREME Framing System  
CALIFORNIA EXPANDED METAL PRODUCTS CO. - Viper2™ Truss  
CONSOLIDATED FABRICATORS CORP. BUILDING PRODUCTS DIV. - Type SUPREME Framing System



123

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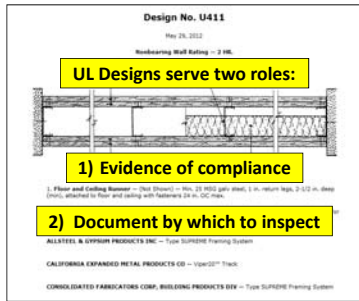
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## For the Building Official



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## Pre-Construction Meeting

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



125

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## Pre-Inspection

- 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



126

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### At the Inspection Site

- 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



127

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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



128

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### At the Inspection Site Cont.

- 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



129

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### Reference Materials

- 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”



130

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### Reference Materials Cont.

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



131

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### Available Resources

- 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)



132

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Questions / Comments



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Fire Resistive Construction

UL's Online Search Tools



134

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UL's Online Search Tools

- Product Spec™
- Code Link
- Online Certifications Directory



135

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## Online Certifications Directory or *OCD*

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



136

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## www.ul.com



137

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138

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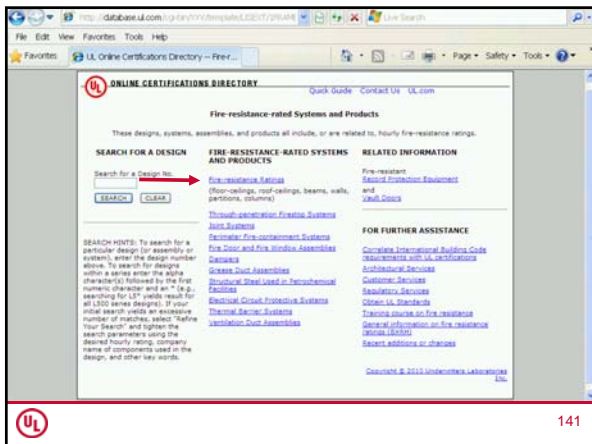
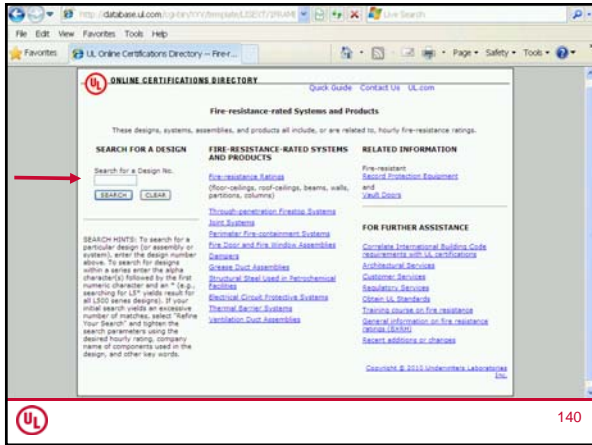
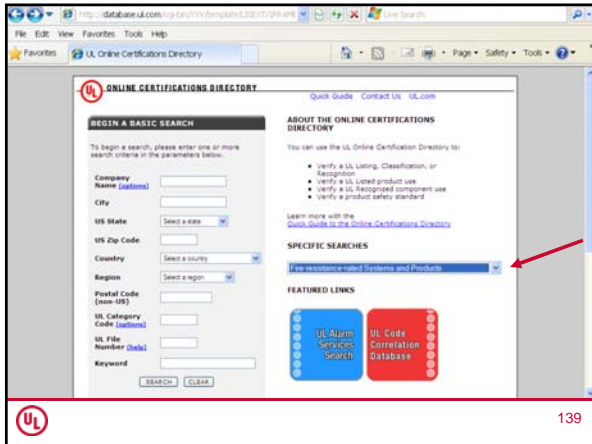
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U.L. ONLINE CERTIFICATIONS DIRECTORY

Fire-resistance Ratings

SEARCH FOR DESIGNS

RELATED INFORMATION

FOR FURTHER ASSISTANCE

142

U.L. ONLINE CERTIFICATIONS DIRECTORY

Fire Rated Assemblies (RNOV)

NUMBERING SYSTEM FOR FIRE RATED ASSEMBLIES

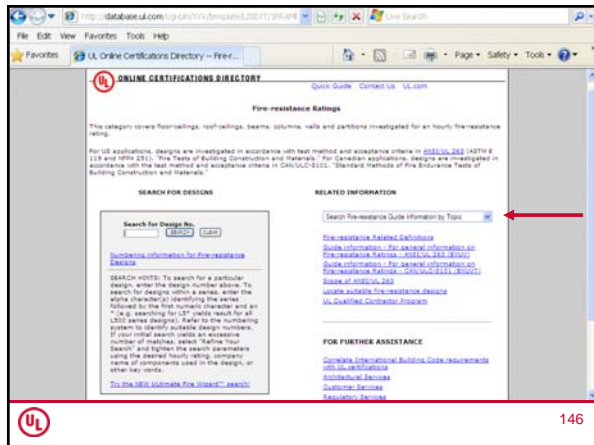
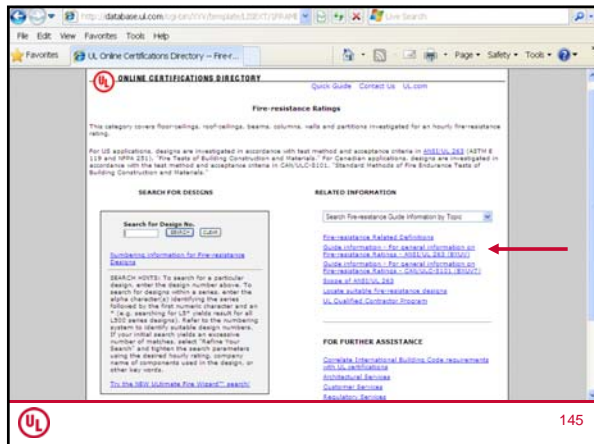
Type of Construction	Membrane Protection					Direct Applied Protection		Unprotected
	100-199	200-299	300-399	400-499	500-599	600-699	700-799	
Floors, Ceilings, and Columns and Columns Over Floor	Completed Steel Joist	(Reserved)	Exposed Steel Joist	(Reserved)	Steel Joist Metal Lath	Concrete Board	Yes	SP111
5, 8", 10" Concrete and Steel Floor Joists	Completed Steel Joist	(Reserved)	Exposed Steel Joist	Steel Joist Metal Lath	Steel Joist Metal Lath	Concrete Board	Yes	SP111
5, 8", or 10" Concrete and Steel Joists	Completed Steel Joist	(Reserved)	Exposed Steel Joist	Steel Joist Metal Lath	Steel Joist Metal Lath	Concrete Board	Yes	SP111
5, 8", or 10" Concrete and Steel Joists	Completed Steel Joist	(Reserved)	Exposed Steel Joist	Steel Joist Metal Lath	Steel Joist Metal Lath	Concrete Board	Yes	SP111
5, 8", or 10" Concrete and Steel Joists	Completed Steel Joist	(Reserved)	Exposed Steel Joist	Steel Joist Metal Lath	Steel Joist Metal Lath	Concrete Board	Yes	SP111
5, 8", or 10" Concrete and Steel Joists	Completed Steel Joist	(Reserved)	Exposed Steel Joist	Steel Joist Metal Lath	Steel Joist Metal Lath	Concrete Board	Yes	SP111

143

Roof Ceiling, 5" or 6"	Completed Steel Joist	(Reserved)	Exposed Steel Joist	Steel Joist Metal Lath	Steel Joist Metal Lath	Concrete Board	Yes	SP111
Roof Ceiling, 5" or 6" for Roof-Ceiling	Building Units	(Reserved)	Exposed Steel Joist	Steel Joist Metal Lath	Steel Joist Metal Lath	Concrete Board	Yes	SP111
Wall and Partition, 5" or 6"	Building Units	(Reserved)	Exposed Steel Joist	Steel Joist Metal Lath	Steel Joist Metal Lath	Concrete Board	Yes	SP111
Columns, 5" or 6"	Building Units	(Reserved)	Exposed Steel Joist	Steel Joist Metal Lath	Steel Joist Metal Lath	Concrete Board	Yes	SP111

144

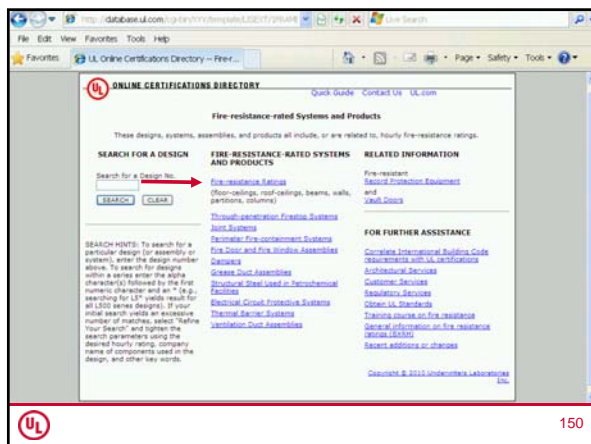
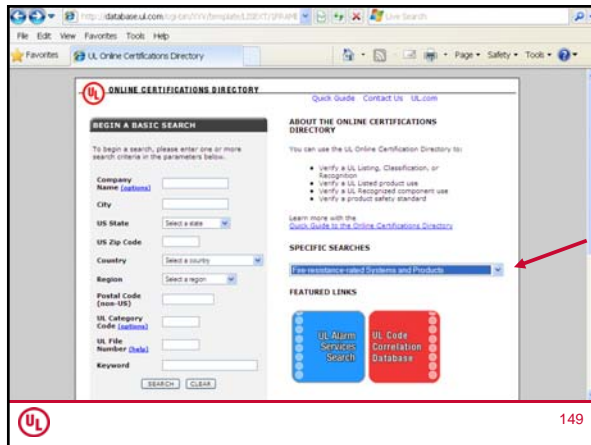
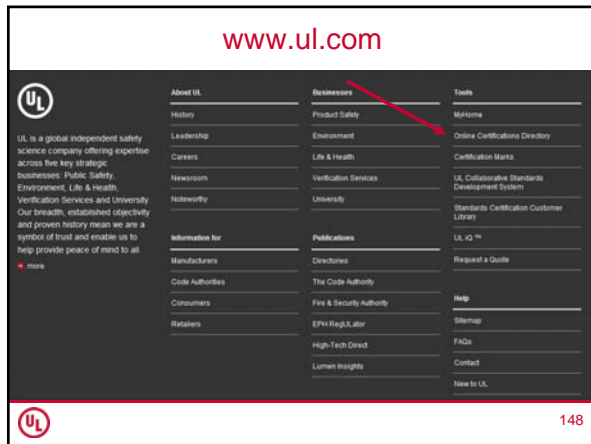


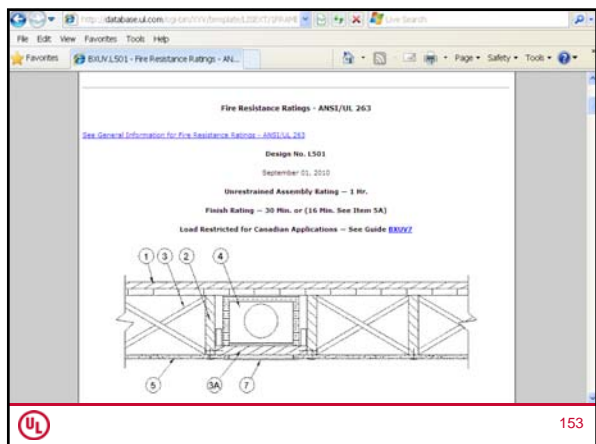
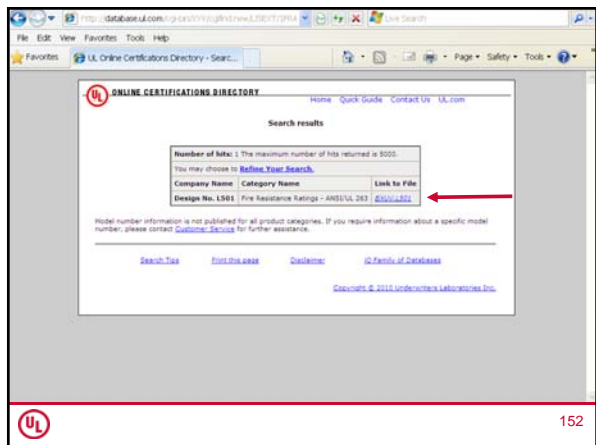
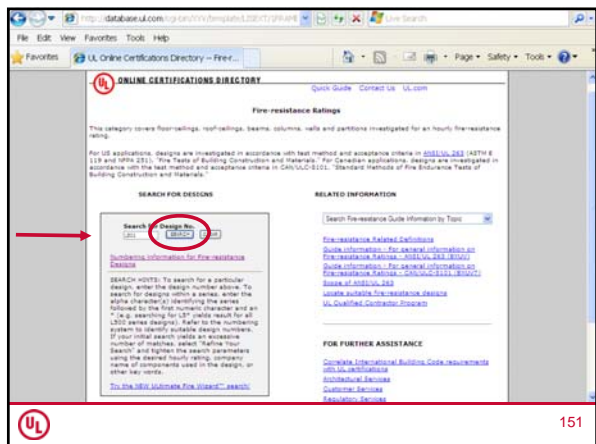


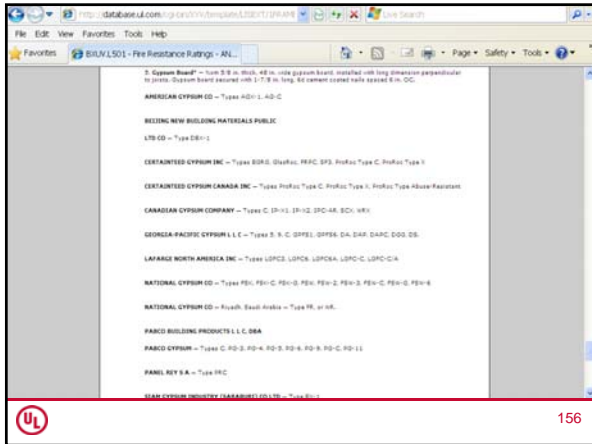
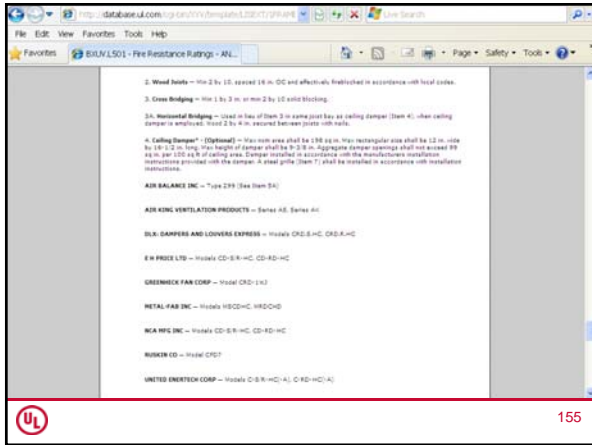
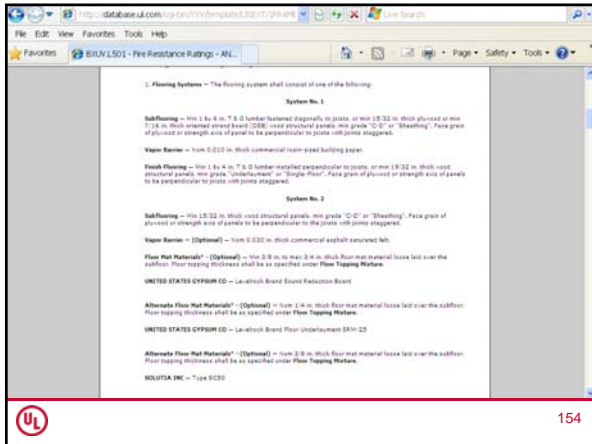
## Online Certifications Directory (OCD)

- Sample Search - Accessing a design if design number is known
  - Design No. L501
  - L = (L or M) Wood Joist or Combination Wood and Steel Assemblies
  - 501 (500-599) = Gypsum Board

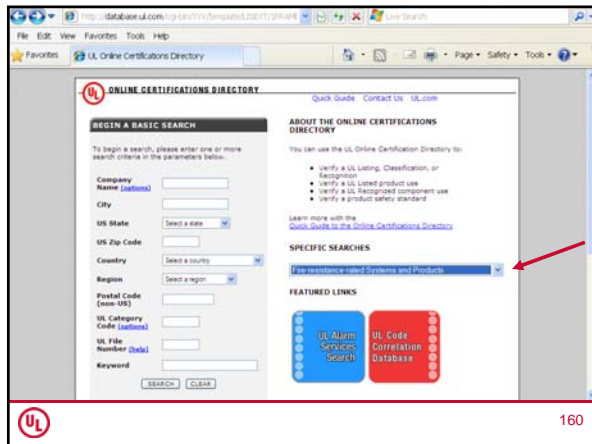
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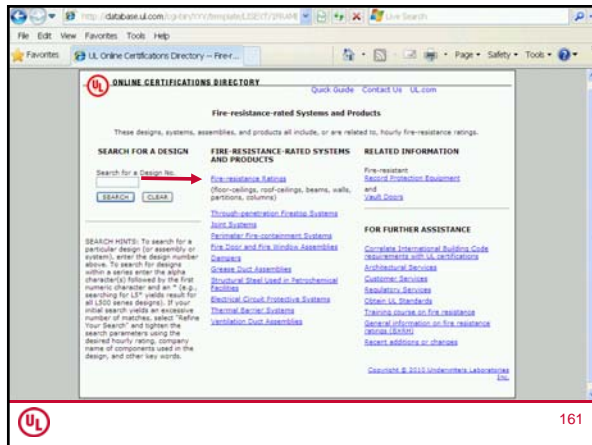




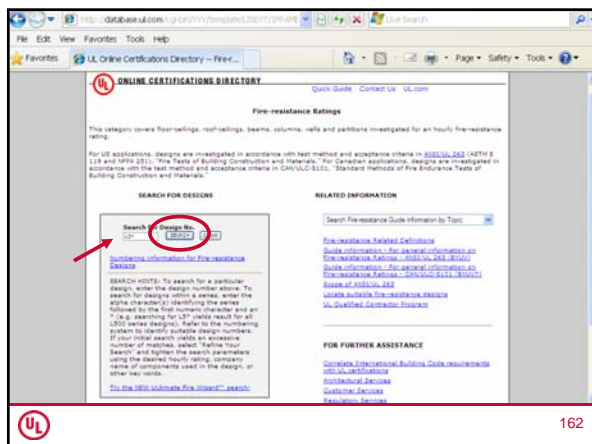




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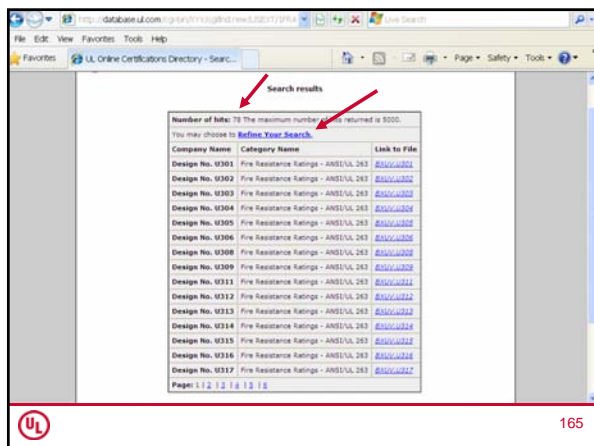
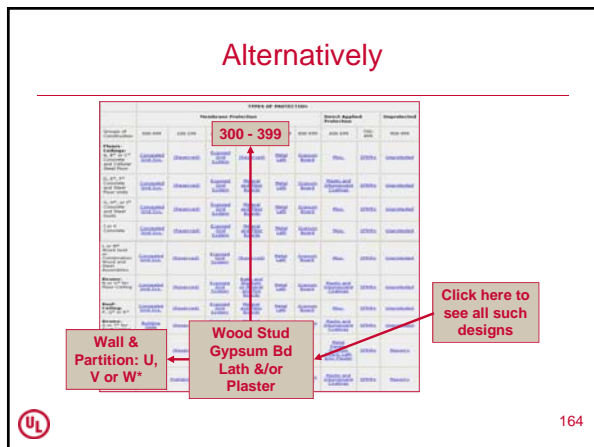
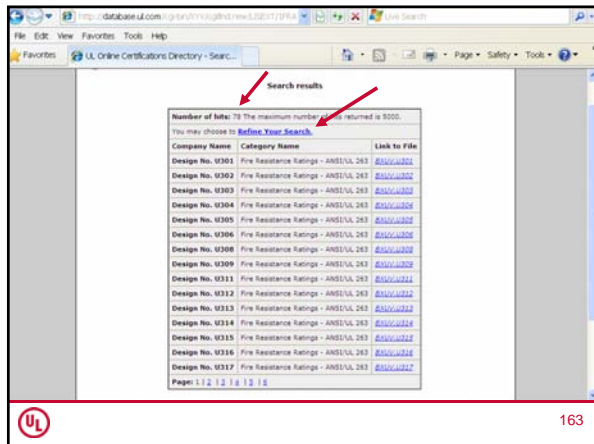


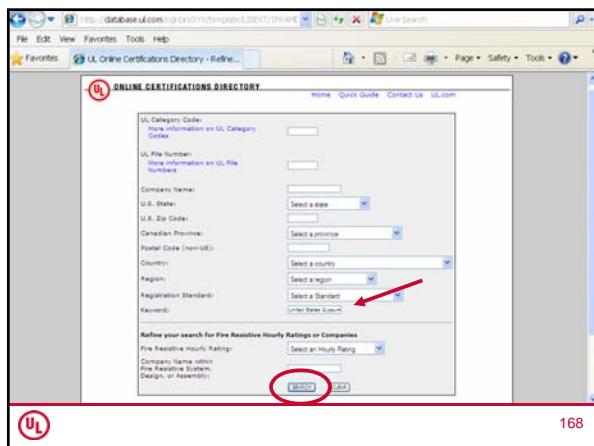
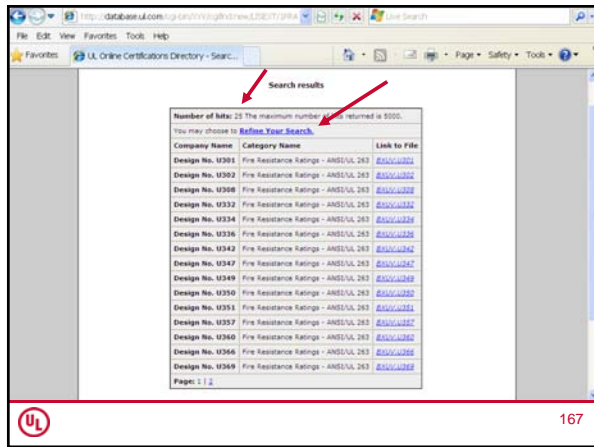
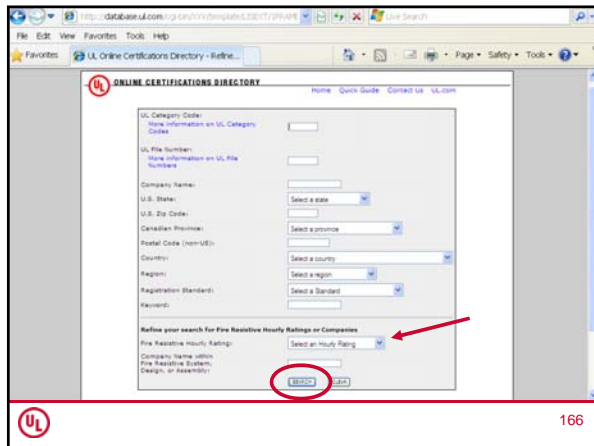
161



162









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U.L. Online Certifications Directory - Search

ONLINE CERTIFICATIONS DIRECTORY

Search results

Number of hits: 10 The maximum number of hits returned is 5000.  
You may choose to [Refine Your Search](#).

Company Name	Category Name	Link to File
Design No. U301	Fire Resistance Ratings - ANSI/UL 263	<a href="#">BULUJ301</a>
Design No. U302	Fire Resistance Ratings - ANSI/UL 263	<a href="#">BULUJ302</a>
Design No. U308	Fire Resistance Ratings - ANSI/UL 263	<a href="#">BULUJ308</a>
Design No. U334	Fire Resistance Ratings - ANSI/UL 263	<a href="#">BULUJ334</a>
Design No. U336	Fire Resistance Ratings - ANSI/UL 263	<a href="#">BULUJ336</a>
Design No. U342	Fire Resistance Ratings - ANSI/UL 263	<a href="#">BULUJ342</a>
Design No. U370	Fire Resistance Ratings - ANSI/UL 263	<a href="#">BULUJ370</a>
Design No. U378	Fire Resistance Ratings - ANSI/UL 263	<a href="#">BULUJ378</a>
Design No. U382	Fire Resistance Ratings - ANSI/UL 263	<a href="#">BULUJ382</a>
Design No. U395	Fire Resistance Ratings - ANSI/UL 263	<a href="#">BULUJ395</a>

Model number information is not published for all product categories. If you require information about a specific model number, please contact [Customer Service](#) for further assistance.

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U.L. 169



http://database.ul.com/cgi-bin/379/gh/nd/news/LSDET7/PRA

BULUJ301 - Fire Resistance Ratings - A...

Fire Resistance Ratings - ANSI/UL 263

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

Design No. U301  
November 17, 2010

Bearing Wall Rating - 2 HR.  
Finish Rating - 66 Min.

Load Restricted for Canadian Applications - See Guide [B8002](#)

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

2. **Joints** - Exposed joints covered with joint compound and paper tape. Joint compound and paper tape may be limited when square edge boards are used. As an alternate, non 3/32 in. thick gypsum veneer plaster may be applied to the entire surface of Classified veneer baseboard with the joints reinforced with steel tape.

3. **Nails** - 6d cement coated nails 1-7/8 in. long, 0.2913 in. shank diam, 1/4 in. diam heads, and 8d cement coated nails 2-3/8 in. long, 0.113 in. shank diam, 9/32 in. diam heads.

4. **Gypsum Board** - 5/8 in. thick, two layers applied either horizontally or vertically. Inner layer attached to studs with the 1-7/8 in. nails spaced 8 in. OC. Outer layer attached to studs over inner layer with the 2-3/8 in. long nails spaced 8 in. OC, vertical joints located over studs. All joints in face layers staggered with joints in base layers. Joints of each base layer offset with joints of base layer on opposite side.

When used in widths other than 48 in., gypsum board to be installed horizontally.

When Steel Framing Members® (Item 6) are used, base layer attached to furring channels with 1 in. long Type S double-head steel screws spaced max 24 in. OC, face layer attached with 1-5/8 in. long Type S double-head steel screws spaced max 12 in. OC.

**AMERICAN GYPSUM CO** - Types ADX-L, AD-C, ADX-11.

**BEIJING NEW BUILDING MATERIALS PUBLIC LTD CO** - Type DEX-L.

**CERTAINTED GYPSUM INC** - Types 1, FHC, EDAG, Glastac, ProFloc Type C or ProFloc Type X.

**CERTAINTED GYPSUM CANADA INC** - ProFloc Type C, ProFloc Type X, ProFloc Type Abuse-Resistant.

**CANADIAN GYPSUM COMPANY** - Types AR, C, D-AR, D-X1, D-X2, DPC-AR, SCK, SKN, WRC, WXX.

U.L. 170



http://database.ul.com/cgi-bin/379/gh/nd/news/LSDET7/PRA

BULUJ301 - Fire Resistance Ratings - A...

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

2. **Joints** - Exposed joints covered with joint compound and paper tape. Joint compound and paper tape may be limited when square edge boards are used. As an alternate, non 3/32 in. thick gypsum veneer plaster may be applied to the entire surface of Classified veneer baseboard with the joints reinforced with steel tape.

3. **Nails** - 6d cement coated nails 1-7/8 in. long, 0.2913 in. shank diam, 1/4 in. diam heads, and 8d cement coated nails 2-3/8 in. long, 0.113 in. shank diam, 9/32 in. diam heads.

4. **Gypsum Board** - 5/8 in. thick, two layers applied either horizontally or vertically. Inner layer attached to studs with the 1-7/8 in. nails spaced 8 in. OC. Outer layer attached to studs over inner layer with the 2-3/8 in. long nails spaced 8 in. OC, vertical joints located over studs. All joints in face layers staggered with joints in base layers. Joints of each base layer offset with joints of base layer on opposite side.

When used in widths other than 48 in., gypsum board to be installed horizontally.

When Steel Framing Members® (Item 6) are used, base layer attached to furring channels with 1 in. long Type S double-head steel screws spaced max 24 in. OC, face layer attached with 1-5/8 in. long Type S double-head steel screws spaced max 12 in. OC.

**AMERICAN GYPSUM CO** - Types ADX-L, AD-C, ADX-11.

**BEIJING NEW BUILDING MATERIALS PUBLIC LTD CO** - Type DEX-L.

**CERTAINTED GYPSUM INC** - Types 1, FHC, EDAG, Glastac, ProFloc Type C or ProFloc Type X.

**CERTAINTED GYPSUM CANADA INC** - ProFloc Type C, ProFloc Type X, ProFloc Type Abuse-Resistant.

**CANADIAN GYPSUM COMPANY** - Types AR, C, D-AR, D-X1, D-X2, DPC-AR, SCK, SKN, WRC, WXX.

U.L. 171



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GEORGIA PACIFIC GYPSUM L L C — Types S, E, S, C, DAF, DD, DA, DAPC, DGG, DS, GPFSC.

LAFARGE NORTH AMERICA INC — Types LGPC-C, LGPC2, LGPC3A, LGPC4, LGPC5A, LGPC6A, LGPC7A, LGPC8.

NATIONAL GYPSUM CO — Types FSH, FSH-C, FSH-G, FSH-I, FSH-2, FSH-3, FSH-4, FSH-C, FSH-G, FSH-I, FSH-C.

NATIONAL GYPSUM CO — Riyadh, Saudi Arabia — Type PL or WL.

FARCO BUILDING PRODUCTS L L C, DBA

FARCO GYPSUM — Type C, PG-2, PG-3, PG-3H, PG-4, PG-5, PG-5H, PG-6, PG-6H, PG-7 or PG-8.

PANEL REV S A — Types FR, FRX, HX, HXK, ETK.

SEAM GYPSUM INDUSTRY (SABABIR) CO LTD — Type E1-1.

TEMPLE-INLAND — Type TD-C, Type K, Veneer Plaster Base-Type X, Water-Rated-Type X, Sheathing Type X, Soft-Type X, Green-Glass Type X.

UNITED STATES GYPSUM CO — Types AR, C, FR-G, FR-X1, FR-X2, FR-X3, FR-X4, SCX, SHX, WXC, WXX, USGA.

USG MEXICO S A DE C V — Types AR, C, FR-AR, FR-X1, FR-X2, FR-X3, FR-X4, SCX, SHX, WXC, WXX.

UL

172



UL

3. Molded Plastic\* — Not shown, Optional — Solid vinyl siding mechanically secured over the outer layer to framing members in accordance with manufacturer's recommended installation details.

ALSIDO, DIV OF ASSOCIATED MATERIALS

INC

GENTEX BUILDING PRODUCTS LTD

VYTEC CORP

NEBRASKA PLASTICS INC

5. Steel Framing Members\* — (Optional, Not Shown)\* — Furring channels and resilient sound isolation clip as described below:

A. Furring Channels — Formed of No. 25 HSD galv-steel, 2-3/8 in. wide by 7/8 in. deep, spaced 24 in. OC perpendicular to studs. Channels secured to studs as described in Item 3. Ends of adjoining channels are overlapped 8 in. and fast together with double strand of No. 25 HSD galv-steel wire near each end of overlap. An alternate ends of adjoining channels may be fast together 8 in. and secured together with two self-tapping wd. furring screws, min. 7/16 in. long at the midpoint of the overlap, with one screw on each flange of the channel. Channels attached to furring channels as described in Item 4.

B. Steel Framing Members\* — Resilient sound isolation clip used to attach furring channels to studs. Clips spaced 48 in. OC, and secured to studs with No. 8 x 2-1/2 in. coarse dry-wall screw through the center grommet. Furring channels are friction fitted into clips.

PAC INTERNATIONAL INC — Type RSDC-1.

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173



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7. Wall and Partition Facings and Accessories\* — (Optional, Not Shown) — Nominal 1/2 in. thick, 4 ft wide panels, for optional use as an additional layer on one or both sides of the assembly. Panels attached in accordance with manufacturer's recommendations. When the QI-012 panel is installed between the wood framing and the UL Classified gypsum board, the required UL Classified gypsum board layer(s) shall be installed as indicated as to fastener type and spacing, except that the required fastener length shall be increased by a minimum of 1/2 in. Not evaluated or intended as a substitute for the required layer(s) of UL Classified Gypsum Board.

SERIOUS MATERIALS INC — Type QuietRock QI-012.

8. Cementitious Backer Units\* — (Optional Item Not Shown) — For Use On Face Of 2 Air Systems With All Standard Items Required) — 1/2 in., 5/8 in., 3/4 in. or 1 in. thick, min. 32 in. wide — Applied vertically with vertical joints centered over studs. Face layer fastened over gypsum board to studs and runners with cement board screws of adequate length to penetrate stud by a minimum of 3/8 in. for steel framing members, and a minimum of 3/4 in. for wood framing members spaced a max. of 8 in. OC.

NATIONAL GYPSUM CO — Type PermaBase

\*Bearing the UL Classification Mark

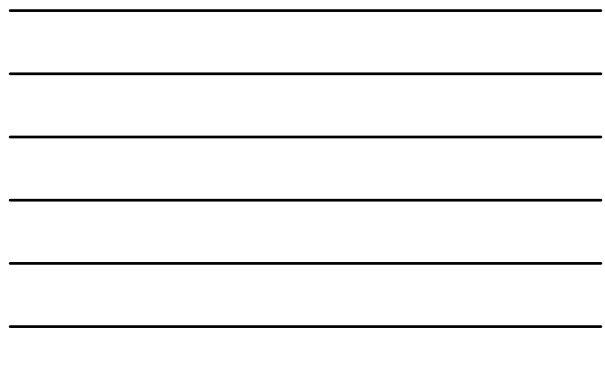
Last Updated on 2010-11-17

Questions? [Print this page](#) [Notice of Discontinuation](#) [Page Top](#)

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UL

174



## Questions / Comments



175

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## UL Product Spec™

- Supplements Online Certification Directory
- Replaces Code Correlation Database
- Needs no password
- Is free – no charge for use
- [www.ul.com/productspec](http://www.ul.com/productspec)



176

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## UL Product Spec™

Searching for  
Information on  
Fire-Resistance-  
Rated Construction



177

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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

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

UL 178

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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

Products, Systems or Assemblies

- Electrical
- Building or Fire Systems ←

Back

UL 179

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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

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
- Green Buildings

UL 180

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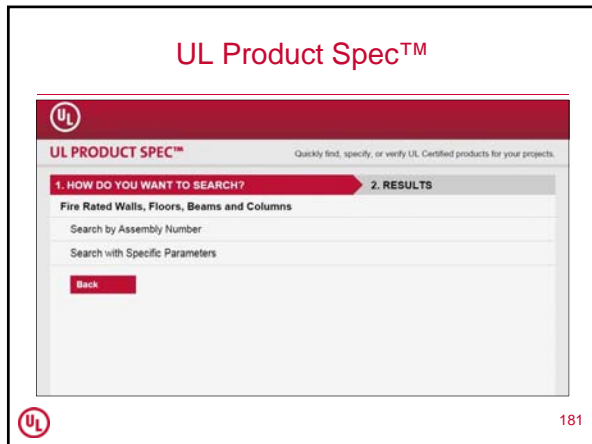
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## UL Product Spec™



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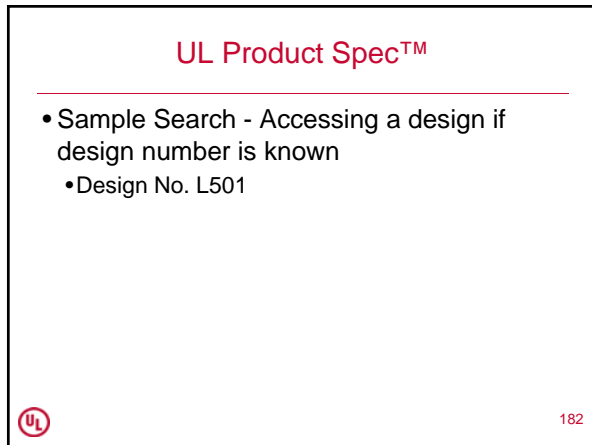
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## UL Product Spec™

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



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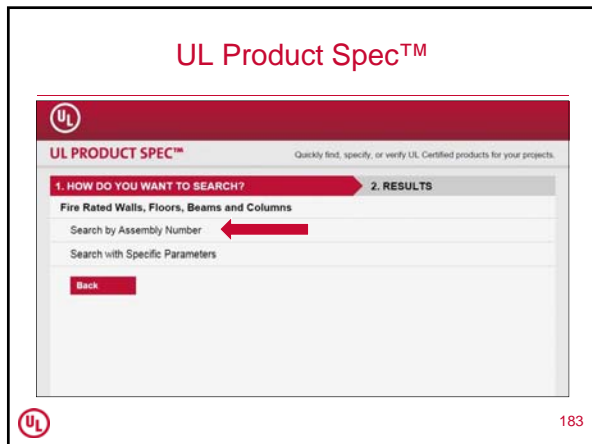
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## UL Product Spec™



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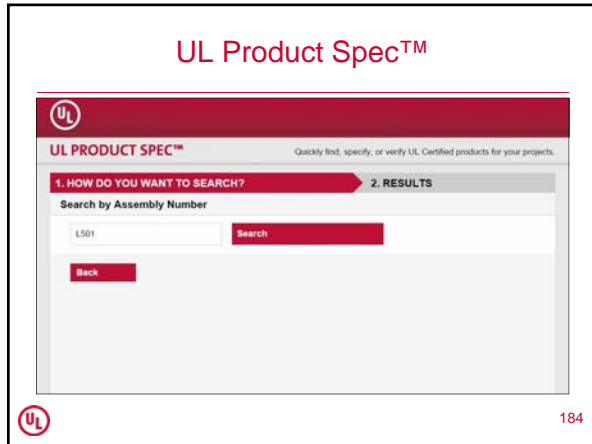
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# UL Product Spec™



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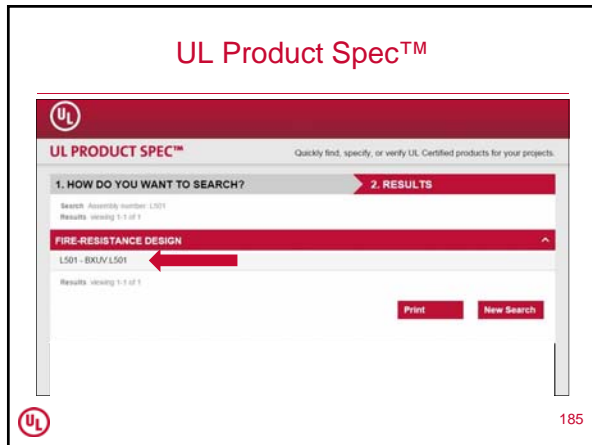
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# UL Product Spec™



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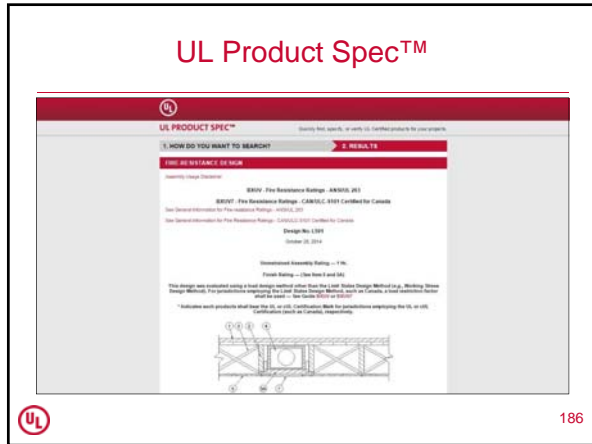
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# UL Product Spec™



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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



187

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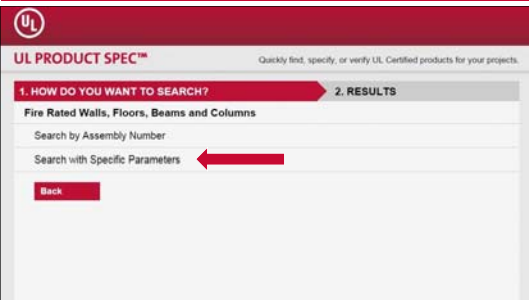
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## UL Product Spec™



188

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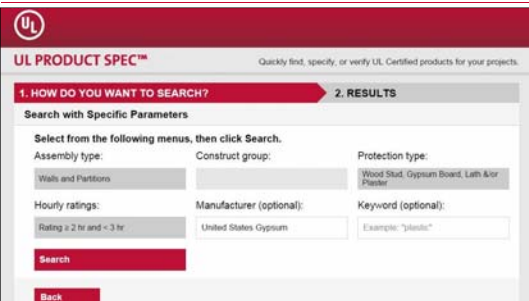
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## UL Product Spec™



189

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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

Search: Assembly type: Walls and Partitions, Protection type: Wood Stud, Opposed Board, Lath and Plaster, Rating Rating: 2 hr and > 3 hr, Manufacturer: United States Equipment  
Results: viewing 1/25 of 26

**FIRE-RESISTANCE DESIGN**

- U301 - BKJ/V U301
- U302 - BKJ/V U302
- U308 - BKJ/V U308
- U309 - BKJ/V U309
- U332 - BKJ/V U332
- U334 - BKJ/V U334
- U336 - BKJ/V U336

UL 190

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## UL Product Spec™

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

3. HOW DO YOU WANT TO SEARCH? 4. RESULTS

**FIRE-RESISTANCE DESIGN**

Assembly Design Overview

BRV7 - Fire Resistance Rating - CANULC 8001 Certified to Canada

See General Information for Fire-Resistance Rating - CANULC 8001

See General Information for Fire-Resistance Rating - CANULC 8001 Certified to Canada

Design No. 6198  
Issued 20 2014

Rating: 2 hr

Product Rating - 2 hr

This design was published using a model design method other than the Joint Design Method (e.g., Working Stress Design Method). For jurisdictions requiring the Joint Design Method, such as Canada, a Joint Design Method (JDM) is used - see Design BRV7 or U301.

\*Indicates each product should bear the UL or eUL Certification Mark for jurisdictions requiring the UL or eUL Certification Mark and Canada, respectively.

UL 191

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## Code Link feature of Product Spec™

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

UL 192

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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

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

UL 193

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## Code Link

UL CODE LINK  
Quickly find the correlations between building codes and UL Certified products.

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

National Electrical Code	2014	2011
International Fire Code	2012	2008
NFPA 1, Fire Code	2011	
International Building Code	2012	2008
International Residential Code	2012	2008
Canadian Electrical Code, Part 1	2012	2008
ASHRAE 189.1	2011	
CAL Green	2013	
ICC 700	2012	
International Fuel Gas Code	2012	2008
International Green Construction Code	2012	
International Mechanical Code	2012	2008
International Plumbing Code	2012	2008
International Swimming Pool & Spa Code	2012	

UL 194

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## Code Link

UL CODE LINK  
Quickly find the correlations between building codes and UL Certified products.

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

Enter one of the following search parameters:

Code Section Number: ICC 700

UL Product Category Code: 2012

Search

International Residential Code	2012	2008
Canadian Electrical Code, Part 1	2012	2008
ASHRAE 189.1	2011	
CAL Green	2013	
ICC 700	2012	
International Fuel Gas Code	2012	2008

UL 195

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## Code Link

The screenshot shows the UL Code Link search interface. At the top, it says "UL CODE LINK" and "Quickly find the correlations between building codes and UL Certified products." Below this, there are two tabs: "1. HOW DO YOU WANT TO SEARCH?" and "2. RESULTS". The "RESULTS" tab is active. A table lists various damper applications with columns for "INSTALLATION CODE" and "UL PRODUCT CATEGORY & CODE". A red arrow points to the "UL PRODUCT CATEGORY & CODE" column. The table includes entries for Air-Terminal Units (ASTU), Ceiling-Dampers (CAD), and Damper for Fire Barrier and Smoke Applications (EMME).

INSTALLATION CODE	UL PRODUCT CATEGORY & CODE
BC 2008 710.3	Air-Terminal Units (ASTU)
BC 2008 710.3	Ceiling-Dampers (CAD)
BC 2008 710.3	Dampers for Fire Barrier and Smoke Applications (EMME)
BC 2008 710.3	Exhaust-Type Fire Dampers (EFD)
BC 2008 710.3.1	Air-Terminal Units (ASTU)
BC 2008 710.3.1	Ceiling-Dampers (CAD)
BC 2008 710.3.1	Dampers for Fire Barrier and Smoke Applications (EMME)
BC 2008 710.3.1	Exhaust-Type Fire Dampers (EFD)
BC 2008 710.3.2	Dampers for Fire Barrier and Smoke Applications (EMME)
BC 2008 710.3.2.1	Exhaust-Type Fire Dampers (EFD)
BC 2008 710.3.2.2	Dampers for Fire Barrier and Smoke Applications (EMME)
BC 2008 710.3.2.3	Dampers for Fire Barrier and Smoke Applications (EMME)
BC 2008 710.3.2.4	Exhaust-Type Fire Dampers (EFD)



196

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## Code Link

The screenshot shows the UL Code Link search interface. At the top, it says "UL CODE LINK" and "Quickly find the correlations between building codes and UL Certified products." Below this, there are two tabs: "1. HOW DO YOU WANT TO SEARCH?" and "2. RESULTS". The "RESULTS" tab is active. A table lists various damper applications with columns for "INSTALLATION CODE" and "UL PRODUCT CATEGORY & CODE". A red arrow points to the "UL PRODUCT CATEGORY & CODE" column. The table includes entries for Air-Terminal Units (ASTU), Ceiling-Dampers (CAD), and Damper for Fire Barrier and Smoke Applications (EMME).

INSTALLATION CODE	UL PRODUCT CATEGORY & CODE
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BC 2008 710.3	Ceiling-Dampers (CAD)
BC 2008 710.3	Dampers for Fire Barrier and Smoke Applications (EMME)
BC 2008 710.3	Exhaust-Type Fire Dampers (EFD)
BC 2008 710.3.1	Air-Terminal Units (ASTU)
BC 2008 710.3.1	Ceiling-Dampers (CAD)
BC 2008 710.3.1	Dampers for Fire Barrier and Smoke Applications (EMME)
BC 2008 710.3.1	Exhaust-Type Fire Dampers (EFD)
BC 2008 710.3.2	Dampers for Fire Barrier and Smoke Applications (EMME)
BC 2008 710.3.2.1	Exhaust-Type Fire Dampers (EFD)
BC 2008 710.3.2.2	Dampers for Fire Barrier and Smoke Applications (EMME)
BC 2008 710.3.2.3	Dampers for Fire Barrier and Smoke Applications (EMME)
BC 2008 710.3.2.4	Exhaust-Type Fire Dampers (EFD)



197

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## Code Link

The screenshot shows the UL Online Certifications Directory page for "EMME GuideInfo Dampers for Fire Barrier and Smoke Applications". The page includes a navigation bar with "Home", "Quick Guide", and "Contact Us - UL.com". Below the navigation bar, there are links for "View Listings" and "Back Button". The main content area is titled "Dampers for Fire Barrier and Smoke Applications" and includes a "GENERAL" section. The text in the "GENERAL" section states: "This category covers fire dampers, smoke dampers (leakage-rated dampers), combination fire and smoke dampers (fire and leakage-rated dampers), and corridor dampers." Below this, there is an "Installation" section that reads: "All dampers covered under this category are intended to be installed in accordance with the installation instructions provided with the dampers. Authorities Having Jurisdiction should be consulted before installation. Unless otherwise indicated in the installation instructions, the annular space between the sleeves of fire dampers, combination fire and smoke dampers, or corridor dampers and the wall opening should not be filled with fire-rated materials such as fire, void or cavity materials." Finally, there is an "Air-Flow and Pressure Ratings" section that reads: "Fire dampers for use in dynamic systems, smoke dampers, combination fire and smoke dampers, and corridor dampers are marked with the maximum air flow and static pressure HVAC system conditions for which the damper has been investigated. The air-flow (velocity) ratings are established in increments of 1500 CFM<sup>2</sup> of damper area (FPM), with the minimum being 2000 CFM<sup>2</sup>. The air-flow ratings are established based on test conditions with the damper in the full open position. The static pressure ratings are established in increments of 2 in. WC, with the minimum being 4 in. WC. The static pressure ratings are established based on test conditions with the damper in the full closed position."



198

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## Code Link

UL

UL CODE LINK

Quickly find the correlations between building codes and UL Certified products

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

UL PRODUCT CATEGORY

DAMPERS

Dampers for Fire Barrier and Smoke Applications

3 View certification and installation parameters...

VIEW UL CERTIFIED PRODUCTS

View all

UL PUBLICATIONS

Damper Installation Guide

UL STANDARDS

UL 555 Single

UL 555B Single

Find New Search

UL

199

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## Code Link

UL

ONLINE CERTIFICATIONS DIRECTORY

Home Quick Guide Contact Us Us.com

Search results

You may choose to [Refine Your Search](#).

Company Name	Category Name	Link to File
AIR BALANCE INC	Dampers for Fire Barrier and Smoke Applications	<a href="#">#00P_#4700</a>
AIR MANAGEMENT INC	Dampers for Fire Barrier and Smoke Applications	<a href="#">#00P_#47221</a>
AIR MASTER EQUIPMENTS EMIRATES L.L.C	Dampers for Fire Barrier and Smoke Applications	<a href="#">#00P_#47221</a>
AIRE TECHNOLOGIES INC	Dampers for Fire Barrier and Smoke Applications	<a href="#">#00P_#47001</a>
ALDES MIDDLE EAST	Dampers for Fire Barrier and Smoke Applications	<a href="#">#00P_#47001</a>
ALUMAVENT INC	Dampers for Fire Barrier and Smoke Applications	<a href="#">#00P_#47001</a>
AMERICAN WARMING & VENTILATING	Dampers for Fire Barrier and Smoke Applications	<a href="#">#00P_#48301</a>
ARABIAN THERMAL AIRE INDUSTRIES CO LTD	Dampers for Fire Barrier and Smoke Applications	<a href="#">#00P_#48301</a>
ARLAN DAMPER CORP	Dampers for Fire Barrier and Smoke Applications	<a href="#">#00P_#48301</a>
ARROW UNITED INDUSTRIES, DIV OF MESTEK	Dampers for Fire Barrier and Smoke Applications	<a href="#">#00P_#48301</a>

Page: 1 2 12 13 14 15 16 17 18 19

Model number information is not published for all product categories. If you require information about a specific model number, please contact [Customer Service](#) for further assistance.

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200

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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)

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201

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Questions / Comments



202

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Thank You for Attending!!!

**Bruce E. Johnson**  
Codes and Advisory Services Department  
Underwriters Laboratories

Bruce.Johnson@UL.com  
(631) 680-5174

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



203

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# Restrained and Unrestrained Assemblies – What Designers and AHJs Need to Know

By **Richard N. Walke** / Senior Regulatory Engineer

*Section 703.2.3 of the International Building Code (IBC) specifies that fire-resistance-rated assemblies tested in accordance with ASTM E119 or UL 263 are not to be considered to be restrained unless evidence satisfactory to the building official is furnished by the registered design professional showing that the construction qualifies for a restrained classification in accordance with ASTM E119 or UL 263. It also specifies that restrained construction shall be identified on the construction documents.*

Knowing that a rated assembly qualifies as restrained construction in some cases reduces the amount of protection required to achieve a given rating. This article describes two sources of information that can be used to demonstrate if an assembly can be considered restrained.

The two tests standards used to determine fire-resistance ratings, ASTM E119 and UL 263, the Standard for Fire Tests of Building Construction and Materials, both define restraint in buildings. UL 263 states, “Floor-ceiling and roof-ceiling assemblies and individual beams in buildings should be considered restrained

when the surrounding or supporting structure is capable of resisting substantial thermal expansion throughout the range of anticipated elevated temperatures. Constructions not complying with this definition are assumed to be free to rotate and expand and should be therefore considered as unrestrained.”

Both test standards contain Conditions of Acceptance for determining restrained and unrestrained ratings of horizontal assemblies based on the data generated during fire testing. The resulting published certifications provide both restrained and unrestrained ratings, along with

descriptions of the protection needed to achieve each rating. The decision on which of the published rating to use is dependent on whether the construction in question is restrained or unrestrained based on the above definition of restraint. The requirements for unrestrained ratings are more conservative, often requiring more fire protection. And since they are more conservative, they can always be used in conditions where the assembly is judged to be restrained.

## Determining restrained conditions

One source of information that can be used to help determine if a rated assembly is being installed in a restrained application (as referenced in IBC Section 703.2.3) is included in Appendix C of UL 263. The other is information included in the UL Guide Information for Fire Resistance Ratings – UL 263 (BXUV). Once the restrained versus unrestrained determination has been made and approved by the building official, the designer and involved contractors follow the published certification to determine the required fire protection to achieve the required rating.

### Table C1.1 of UL 263

Appendix C1.1 of UL 263 provides general information with respect to the use of



the restrained and unrestrained ratings published in the various certifications of horizontal assemblies.

The definition of restraint in buildings specified in Table C1.1 requires the exercise of engineering judgment to determine what constitutes restraint to “substantial thermal expansion.” Restraint may be provided by the lateral stiffness of supports for floor and roof assemblies and intermediate beams forming part of the assembly. In order to develop restraint, connections must adequately transfer thermal thrusts to such supports. The rigidity of adjoining panels or structures should be considered in assessing the capability of a structure to resist thermal expansion. Continuity, such as that occurring in beams acting continuously over more than two supports, will induce rotational restraint, which will usually add to the fire resistance of structural members. Table C1.1 of UL 263 (shown below) addresses common types of constructions and specifies whether that construction is considered as restrained or unrestrained. Having these examples in mind, the user should be able to rationalize the less common types of construction.

The foregoing methods of determining the presence or absence of restraint, according to the type and detail of construction, represent only one procedure for establishing fire-resistance ratings. This procedure alone does not represent all restrained and unrestrained construction conditions.

## UL Guide Information for Fire Resistance Ratings – UL 263 (BXUV)

Since the information shown in Table C1.1 of UL 263 may not be appropriate for all conditions of restraint in actual structures, the UL Guide Information for Fire Resistance Ratings – UL 263 provides additional guidance. It also recognizes the exercise of engineering judgment is required to determine what constitutes “substantial

### UL 263, Table C1.1: Considerations of restraint for common construction

I. Wall Bearing:	
<b>A. Single Span and simply supported end spans of multiple bays.a</b>	
1. Open-web steel joist or steel beams supporting concrete slab, precast units or metal decking	<b>Unrestrained</b>
2. Concrete slabs, precast units, or metal decking	<b>Unrestrained</b>
<b>B. Interior spans of multiple bays.</b>	
1. Open-web steel joists, steel beams, or metal decking supporting continuous concrete slab	<b>Restrained</b>
2. Open-web steel joists or steel beams, supporting precast units or metal decking	<b>Unrestrained</b>
3. Cast-in-place concrete slab systems	<b>Restrained</b>
4. Precast concrete where the potential thermal expansion is restricted by adjacent construction <sup>b</sup>	<b>Restrained</b>
II. Steel Framing:	
<b>A. Steel beams welded, riveted, or bolted to the framing members</b>	<b>Restrained</b>
<b>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</b>	<b>Restrained</b>
<b>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 members or the adjoining floor or roof construction<sup>b</sup></b>	<b>Restrained</b>
III. Concrete Framing:	
<b>A. Beams securely fastened to the framing members</b>	<b>Restrained</b>
<b>B. All types of cast-in-place floor or roof systems, such as beam-and-slabs, flat slabs, pan joists, and waffle slabs, where the floor systems is cast with the framing members</b>	<b>Restrained</b>
<b>C. Interior and exterior spans of precast systems with cast-in-place joints resulting in restraint equivalent to that which would exist in Condition III, item <sup>A</sup></b>	<b>Restrained</b>
<b>D. All types of prefabricated floor or roof systems where the structural members are secured to such systems 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>b</sup></b>	<b>Restrained</b>
IV. Wood Construction:	
<b>A. All types</b>	<b>Unrestrained</b>

<sup>a</sup> Floor and roof systems can be considered restrained if they are tied into walls with or without tie beams, and the walls are designed and detailed to resist thermal thrust for the floor or roof system.

<sup>b</sup> For example, resistance to potential thermal expansion is considered to be achieved if:

1. Continuous structural concrete topping is used.
2. The space between the ends of precast units or between the ends of units and the vertical face of supports is filled with concrete or mortar.
3. The space between the ends of precast units and the vertical faces of supports or between the ends of solid or hollow core slab units does not exceed 0.25% of the length for normal-weight concrete members or 0.1% of the length for structural light-weight concrete members.

continued on page 6

## Restrained and Unrestrained Assemblies (continued from page 5)

thermal expansion” when determining the conditions under which the restrained or unrestrained ratings should be used.

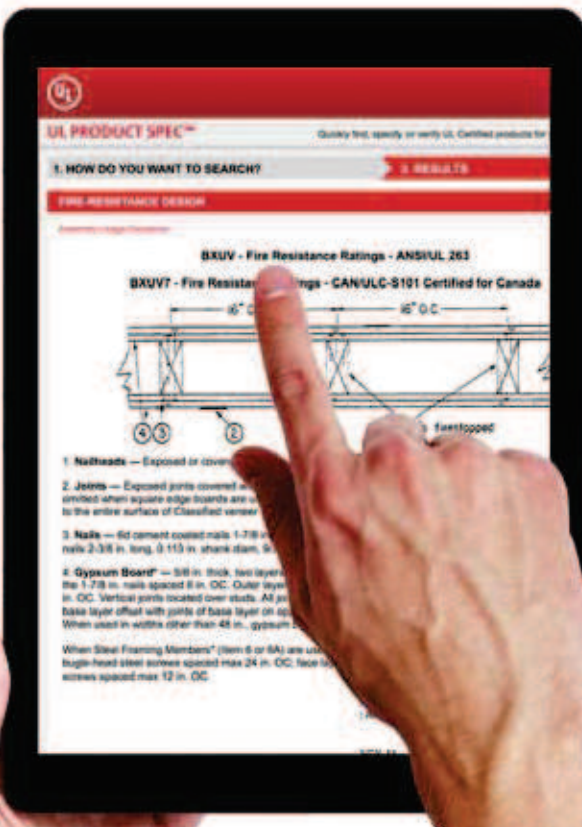
Restrained conditions for the fire-test assemblies are provided by constructing floor, roof and beam test assemblies within nominal 14-foot by 17-foot frames of composite steel/concrete cross sections having an approximate stiffness (EI/L) of 850,000 kip-in. and 700,000 kip-in. along the 14 foot and 17 foot sides, respectively. The frame stiffness remains constant throughout the fire test because the test frame is insulated from the fire environment.

When applying the published restrained ratings, it is recognized that the individual responsible for the design of the fire-resistance-rated construction may ascertain that a different degree of restraint may be provided to the building assembly during a fire condition than was provided to the test sample during the fire test. Under these conditions, the designer may review the Conditions of Acceptance for restrained and unrestrained assemblies and beams in UL 263 for additional guidance in determining whether restrained or unrestrained ratings should be specified.

### Summary

As can be seen in the information included in UL 263, Appendix C reproduced above, and in the UL Guide Information for Fire Resistance Ratings – UL 263, can be utilized by the design professional to demonstrate that a given construction qualifies for a restrained classification in accordance with UL 263.

For more information on restrained and unrestrained ratings, please contact Rich Walke in Northbrook, Ill., at [Richard.N.Walke@ul.com](mailto:Richard.N.Walke@ul.com), or at +1.847.664.3084.



## Web Compliance Tool Updated

*Al Ramirez / Regulatory Services Regional Manager*

UL Product Spec™, UL's newest web database, now contains correlations to the most popular 2015 International Code Council Installation codes. Specifically, Product Spec now includes 2015 editions of the International Building Code (IBC), International Fire Code, International Residential Code and International Mechanical Code. The update provides links to more than 10,000 UL Certified Products to code sections and retains 2012 editions to access for municipalities still basing their installation regulations on previously published codes. Overall, Product Spec contains over 20 of the most common model installation codes enforced in the United States and Canada. Besides correlations to installation codes, UL Product Spec contains multiple UL Certified product search options and correlation to MasterFormat specifications. UL Product Spec can be accessed at [ul.com/productspec](http://ul.com/productspec).