



# Exterior Wall Fire-Resistance: Ratings, Assemblies & Components

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# Outline

- Fire Rating Requirements for Exterior Walls
  - » Rating Requirements
  - » Assembly Options & Asymmetry
  - » Addition of Wood Structural Panel
  - » Addition of Cavity Insulation
  - » Use of FRTW
  - » Openings



1430 Q, The HR Group Architects, Buehler Engineering, Greg Folkins Photography

# IBC Building Size Limits with Sprinkler

## Residential (R1, R2, and R4) Occupancies

Type IIIA Construction Allowable Limit	NS	S13R	S1	SM	Max Frontage
Stories	4	4	5	5	5
Height (ft)	65	60	85	85	85
Building Area/Story (ft <sup>2</sup> )	24k	24k	96k	72k	90k
Total Building Area* (ft <sup>2</sup> )	72k	96k	96k	216k	270k

\* Assuming max stories built per IBC 506.4

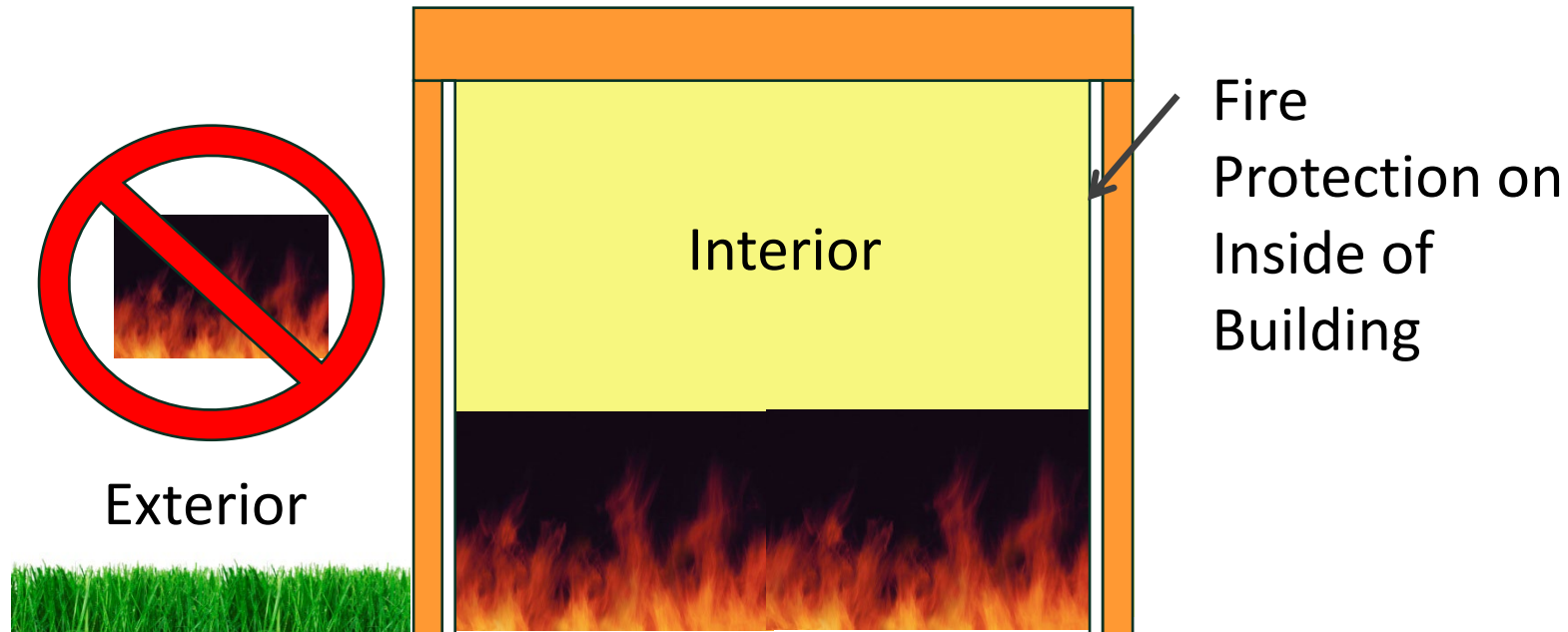
\*\* Maximum frontage increase possible

### 903.2.8 Group R

*An automatic sprinkler systems installed in accordance with Section 903.3 shall be provided throughout all buildings with a Group R fire area*

# Exterior Walls – IBC 705

Basic assumption is that fires begin at the interior and rated wall assemblies are not required *from* the exterior unless close to another structure.



# Exterior Walls – Fire Separation Distance

**705.5 Fire Resistance Ratings:** Exterior walls shall be fire-resistance rated in accordance with Tables 601 and 602 and this section. The required fire-resistance rating of exterior walls with a fire separation distance of greater than 10 feet shall be rated for exposure to fire from the inside. The required fire-resistance rating of exterior walls with a fire separation distance of less than or equal to 10 feet shall be rated for exposure to fire from both sides.

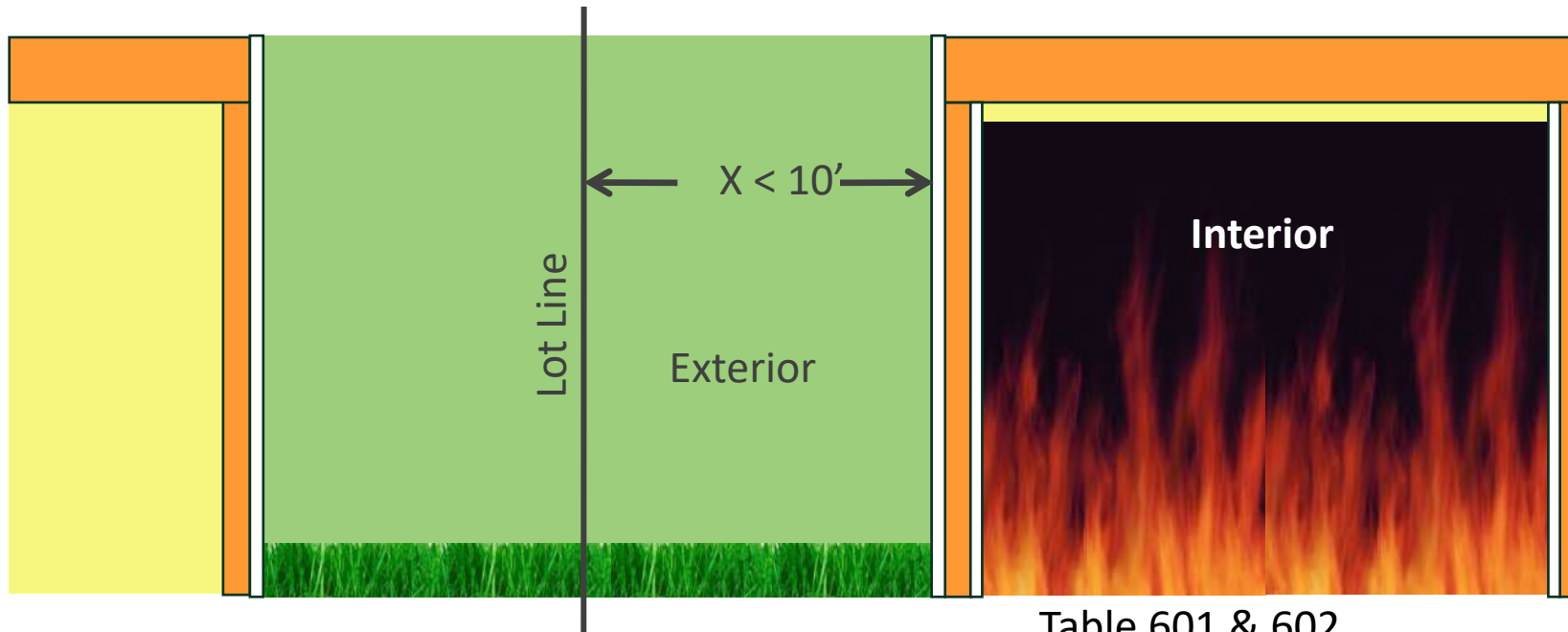


Table 601 & 602

# Exterior Wall Fire Resistance

**TABLE 601**  
**FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (HOURS)**

BUILDING ELEMENT	TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
	A	B	A	B	A	B	HT	A	B
Primary structural frame <sup>f</sup> (see Section 202)	3 <sup>a, b</sup>	2 <sup>a, b</sup>	1 <sup>b</sup>	0	1 <sup>b</sup>	0	HT	1 <sup>b</sup>	0
Bearing walls									
Exterior <sup>c, f</sup>	3	2	1	0	2	2	2	1	0
Interior	3 <sup>a</sup>	2 <sup>a</sup>	1	0	1	0	1/HT	1	0
Nonbearing walls and partitions	See Table 602								
Exterior									
Nonbearing walls and partitions							See		
Interior <sup>d</sup>	0	0	0	0	0	0	Section	0	0
							2304.11.2		
Floor construction and associated secondary members (see Section 202)	2	2	1	0	1	0	HT	1	0
Roof construction and associated secondary members (see Section 202)	1 <sup>1/2</sup> <sup>b</sup>	1 <sup>b, c</sup>	1 <sup>b, c</sup>	0 <sup>c</sup>	1 <sup>b, c</sup>	0	HT	1 <sup>b, c</sup>	0

**TABLE 602**  
**FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE<sup>a, d, g</sup>**

FIRE SEPARATION DISTANCE = X (feet)	TYPE OF CONSTRUCTION	OCCUPANCY GROUP H <sup>e</sup>	OCCUPANCY GROUP F-1, M, S-1 <sup>f</sup>	OCCUPANCY GROUP A, B, E, F-2, I, R, S-2, U <sup>h</sup>
X < 5 <sup>b</sup>	All	3	2	1
5 ≤ X < 10	IA	3	2	1
	Others	2	1	1
10 ≤ X < 30	IA, IB	2	1	1 <sup>c</sup>
	IIB, VB	1	0	0
	Others	1	1	1 <sup>c</sup>
X ≥ 30	All	0	0	0



# Type III Exterior Walls: Fire Rating Requirements

Fire Rating of Structural Elements	IIIA		IIIB	
	Int. face of wall	Ext. face of wall	Int. face of wall	Ext. face of wall
FSD ≥ 30 ft				
Exterior bearing walls (hrs)	2	0	2	0
Exterior Nonbearing walls (hrs)	0	0	0	0
10 ft < FSD < 30 ft				
Exterior bearing walls (hrs)	2	0	2	0
Exterior Nonbearing walls (hrs)	1	0	0	0
FSD ≤ 10 ft				
Exterior bearing walls (hrs)	2	2	2	2
Exterior Nonbearing walls (hrs)	1	1	1	1

# Type V Exterior Walls: Fire Rating Requirements

Fire Rating of Structural Elements	VA		VB	
	Int. face of wall	Ext. face of wall	Int. face of wall	Ext. face of wall
FSD ≥ 30 ft				
Exterior bearing walls (hrs)	1	0	0	0
Exterior Nonbearing walls (hrs)	0	0	0	0
10 ft < FSD < 30 ft				
Exterior bearing walls (hrs)	1	0	0	0
Exterior Nonbearing walls (hrs)	1	0	0	0
FSD ≤ 10 ft				
Exterior bearing walls (hrs)	1	1	1	1
Exterior Nonbearing walls (hrs)	1	1	1	1



# Type III & V Exterior Walls: Fire Rating Requirements

Fire Rating of Structural Elements	IIIA		IIIB	
	Int. face of wall	Ext. face of wall	Int. face of wall	Ext. face of wall
FSD ≥ 30 ft				
Exterior bearing walls (hrs)	2	0	2	0
Exterior Nonbearing walls (hrs)	1	0	0	0
FSD ≤ 10 ft				
Exterior bearing walls (hrs)	2	2	2	2
Exterior Nonbearing walls (hrs)	1	1	1	1

Most instances result in an asymmetric exterior wall rating (rating on interior face of wall is greater than rating on exterior face of wall)

# Asymmetric Exterior Wall Fire Ratings

- » How do we specify such an asymmetric assembly?
- » Some building jurisdictions will recognize one tested assembly for the outside and a second for the inside.
- » Some tested, asymmetric wall assemblies are available

# Outline

- Fire Rating Requirements for Exterior Walls
  - » Rating Requirements
  - » Assembly Options & Asymmetry
  - » Addition of Wood Structural Panel
  - » Addition of Cavity Insulation
  - » Use of FRTW
  - » Openings



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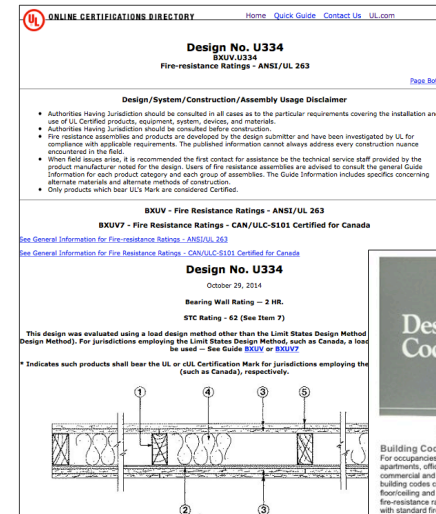
# Choosing Fire Rated Assemblies

Common tested assemblies (ASTM E119) per IBC 703.2:

- » UL Listings
- » Gypsum Catalog
- » Proprietary Manufacturer Tests
- » Industry Documents: such as AWC's DCA3

Alternate Methods per IBC 703.3

- » Prescriptive designs per IBC 721.1
- » Calculated Fire Resistance per IBC 722
- » Fire-resistance designs documented in sources
- » Engineering analysis based on a comparison
- » Fire-resistance designs certified by an approved agency





# Exterior Walls – 1-hr Int; 0-hr Ext

## Design No. U348

April 01, 2013

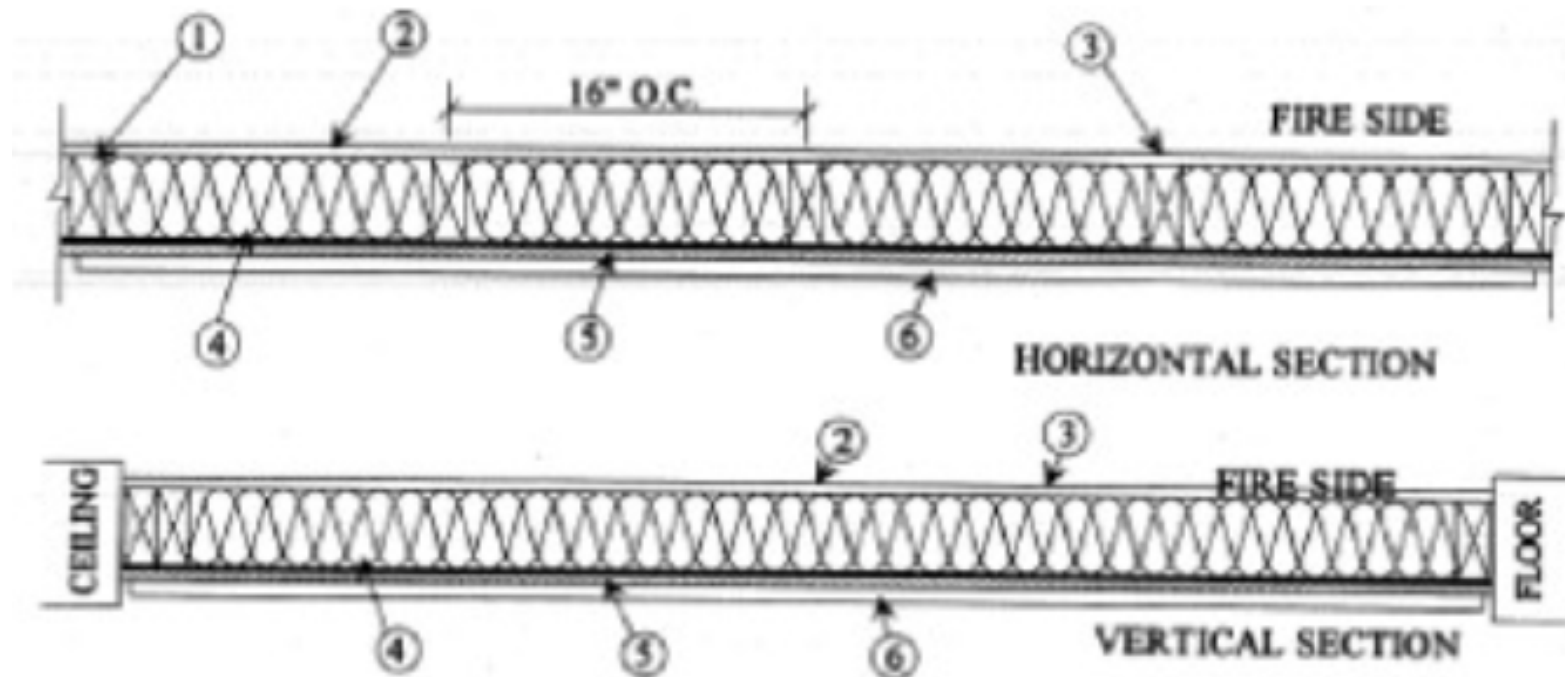
**Bearing Wall Rating — 1 Hr**

**(EXPOSED TO FIRE ON INTERIOR FACE ONLY)**

**Finish Rating — 23 min**

Potential Use For:

- IIIA non-bearing
- VB bearing
- VA non-bearing



# Exterior Walls – 1-hr Int; 0-hr Ext

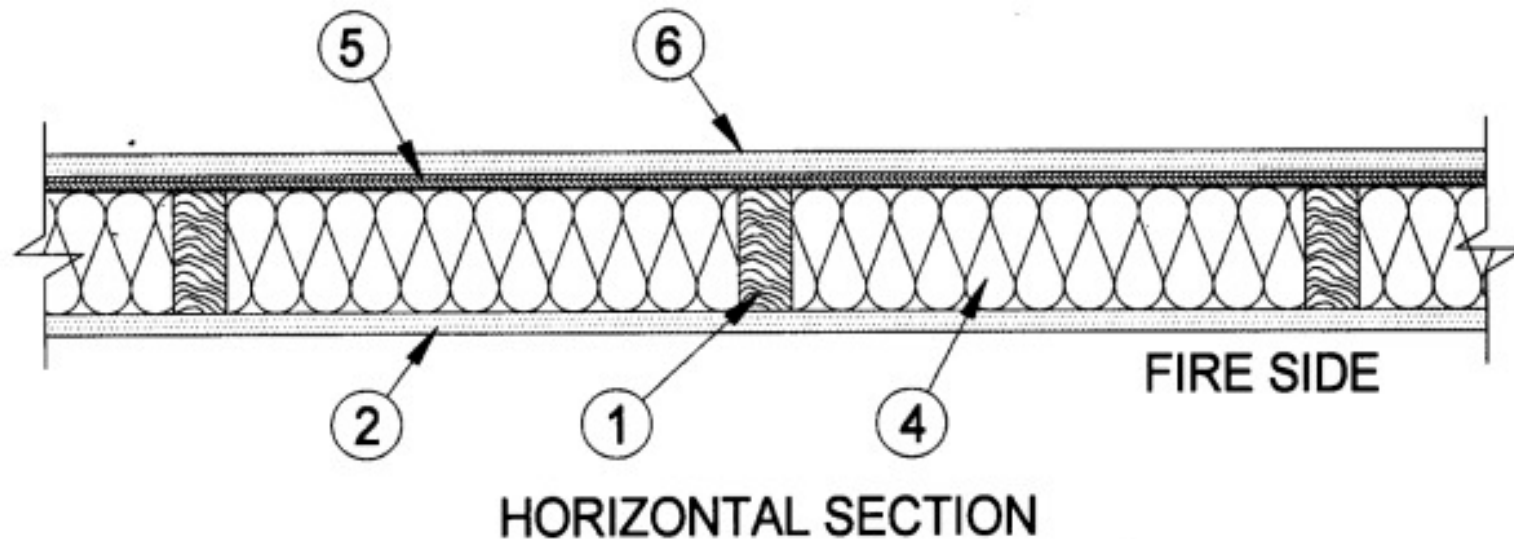
## Design No. U356

September 21, 2015

(Exposed to Fire on Interior Face Only)

Bearing Wall Rating — 1 Hr

Finish Rating — 23 Min or 25 Min (See Item 2C)



# Exterior Walls – 1-hr Int; 0-hr Ext

Potential Use For:

- IIIA non-bearing
- VB bearing
- VA non-bearing

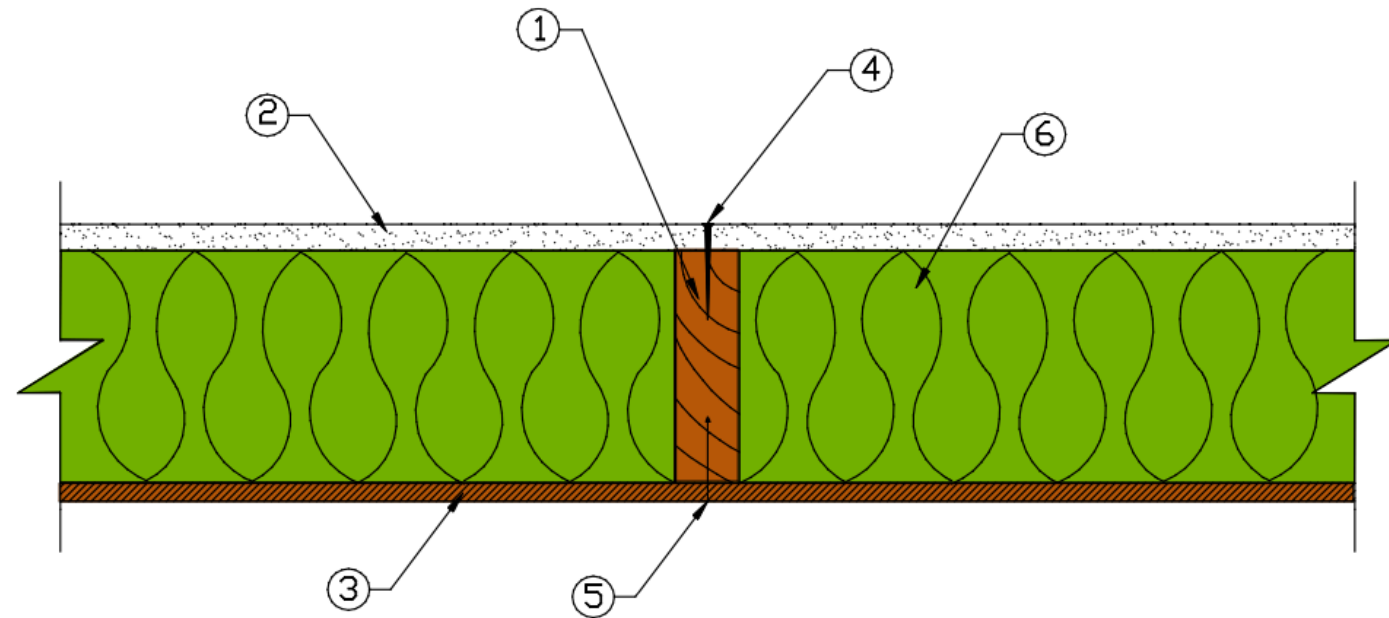
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**WS6-1.3 One-Hour Fire-Resistance-Rated Wood-Frame Wall Assembly**  
**(Rated from gypsum wallboard side)**

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2x6 Wood Stud Wall – 100% Design Load – ASTM E 119/NFPA 251

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1. Framing - Nominal 2x6 wood studs, spaced 16 in. o.c., double top plates, single bottom plate
2. Interior Sheathing - 5/8 in. Type X gypsum wallboard, 4 ft. wide, applied horizontally. Horizontal joints are unblocked. Horizontal application of wallboard represents the direction of least fire resistance as opposed to vertical application.
3. Exterior Sheathing - Minimum 7/16 in. wood structural panels (oriented strand board), applied vertically, horizontal joints blocked



# Exterior Walls – 1-hr Int; 0-hr Ext

IBC Table 721.1(2)

Potential Use For:

- IIIA non-bearing
- VB bearing
- VA non-bearing

16. Exterior walls rated for fire resistance from the inside only in accordance with Section 705.5.	16-1.1 <sup>a</sup>	2" × 4" wood studs at 16" centers with double top plates, single bottom plate; interior side covered with $\frac{5}{8}$ " Type X gypsum wallboard, 4" wide, applied horizontally unblocked, and fastened with $2\frac{1}{4}$ " Type S drywall screws, spaced 12" on center, wallboard joints covered with paper tape and joint compound, fastener heads covered with joint compound. Exterior covered with $\frac{3}{8}$ " wood structural panels, applied vertically, horizontal joints blocked and fastened with 6d common nails (bright) — 12" on center in the field, and 6" on center panel edges. Cavity to be filled with $3\frac{1}{2}$ " mineral wool insulation. <u>Rating established for exposure from interior side only.</u>	—	—	—	$4\frac{1}{2}$
	16-1.2 <sup>a</sup>	2" × 6" wood studs at 16" centers with double top plates, single bottom plate; interior side covered with $\frac{5}{8}$ " Type X gypsum wallboard, 4" wide, applied horizontally or vertically with vertical joints over studs and fastened with $2\frac{1}{4}$ " Type S drywall screws, spaced 12" on center, wallboard joints covered with paper tape and joint compound, fastener heads covered with joint compound, exterior side covered with $\frac{7}{16}$ " wood structural panels fastened with 6d common nails (bright) spaced 12" on center in the field and 6" on center along the panel edges. Cavity to be filled with $5\frac{1}{2}$ " mineral wool insulation. <u>Rating established from the gypsum-covered side only.</u>	—	—	—	$6\frac{9}{16}$
	16-1.3 <sup>a</sup>	2" × 6" wood studs at 16" centers with double top plates, single bottom plates; interior side covered with $\frac{5}{8}$ " Type X gypsum wallboard, 4" wide, applied vertically with all joints over framing or blocking and fastened with $2\frac{1}{4}$ " Type S drywall screws spaced 7" on center. Joints to be covered with tape and joint compound. Exterior covered with $\frac{3}{8}$ " wood structural panels, applied vertically with edges over framing or blocking and fastened with 6d common nails (bright) at 12" on center in the field and 6" on center on panel edges. R-19 mineral fiber insulation installed in stud cavity. <u>Rating established from the gypsum-covered side only.</u>	—	—	—	$6\frac{1}{2}$

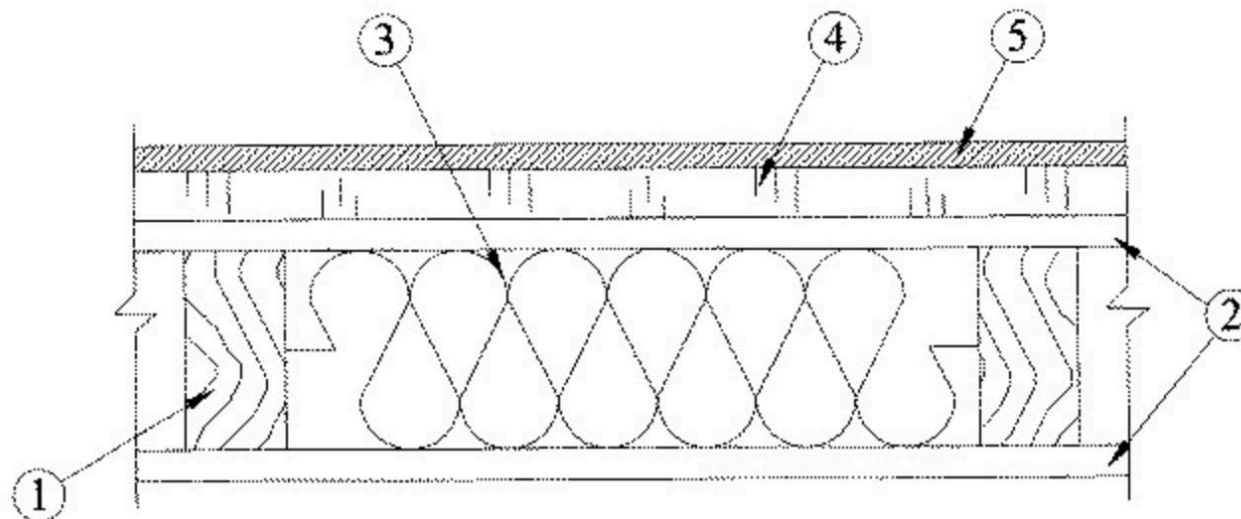
# Exterior Walls – 1-hr Int; 1-hr Ext

Design No. U364

Bearing Wall Rating — 1 Hr.

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.



Potential Use For:

- IIIA non-bearing
- IIIB non-bearing
- VA bearing
- VA non-bearing
- VB bearing
- VB non-bearing

# Exterior Walls – 2-hr Int; 0-hr Ext

Potential Use For:

- IIIA bearing
- IIIB bearing

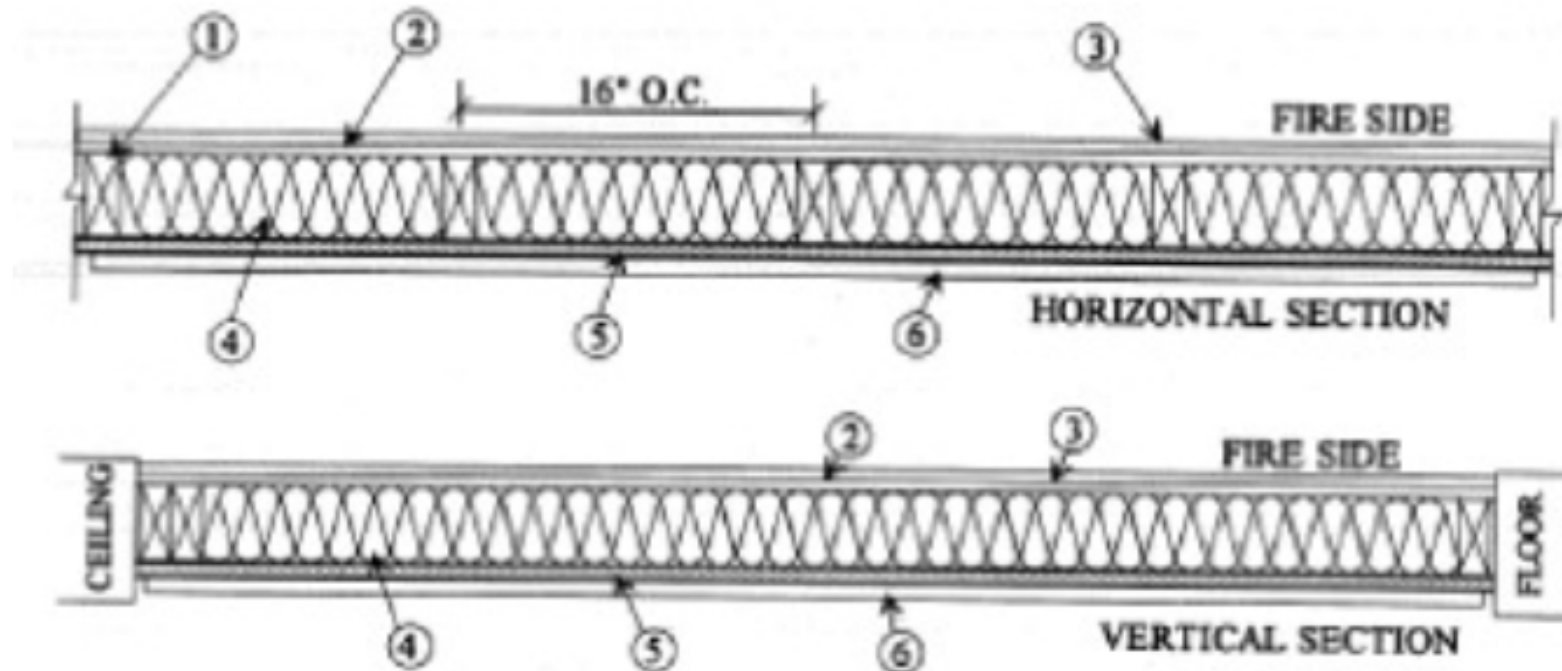
## Design No. U349

August 21, 2013

Bearing Wall Rating — 2 Hr

(EXPOSED TO FIRE ON INTERIOR FACE ONLY)

For Wood Studs, Finish Rating — 55 min



# Exterior Walls – 2-hr Int; 0-hr Ext

**Design No. V314**

March 13, 2020

Potential Use For:

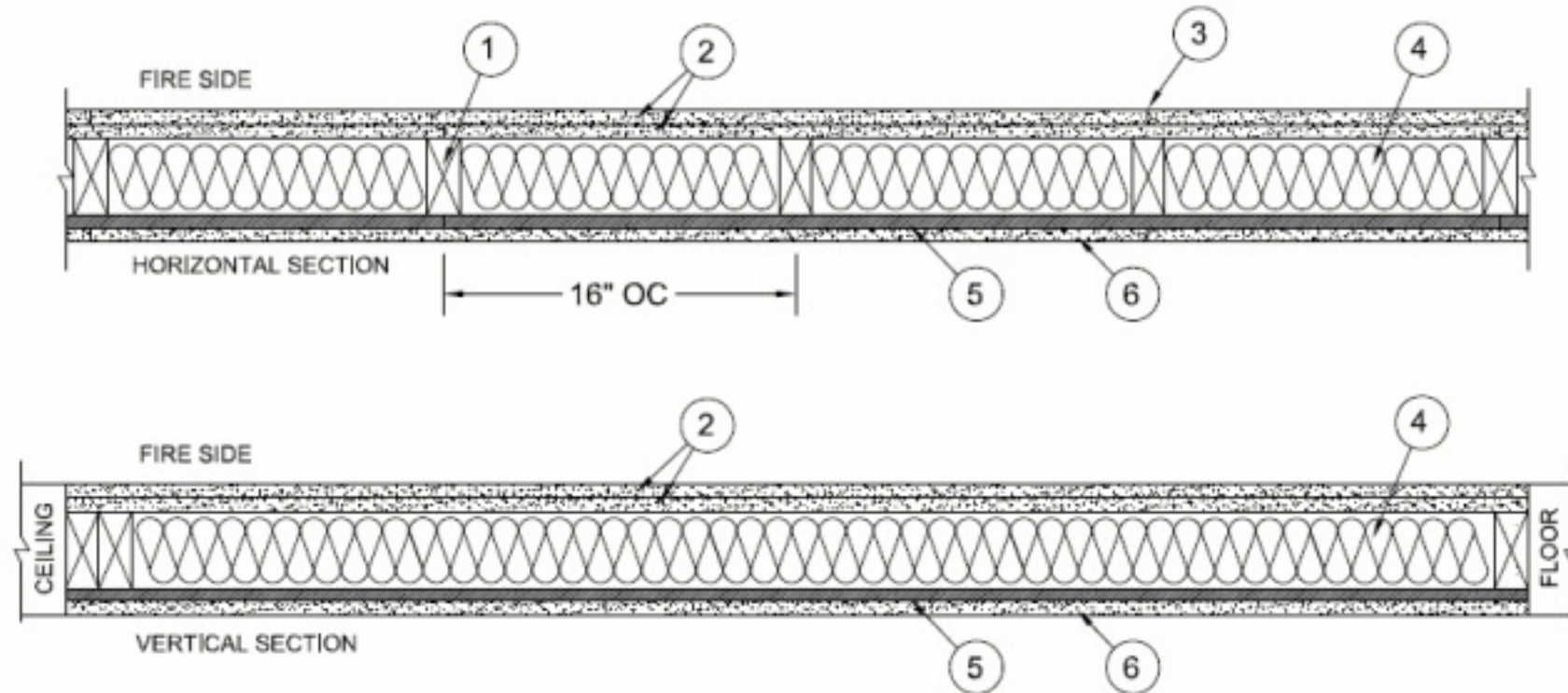
- IIIA bearing
- IIIB bearing

**Bearing Wall Rating - 1 Hr Rating Exposed to Fire on Exterior Face (See Item 8)**

**Bearing Wall Rating - 2 Hr Rating Exposed to Fire on Interior Face**

**Finish Rating — 42 min (Exposed to Fire on Interior Face)**

**Loaded Per 2012 NDS Supplement, ASD Method, Wall Braced Mid-Height**





# Exterior Walls – 2-hr Int; 0-hr Ext

## Design No. W408

April 01, 2013

Potential Use For:

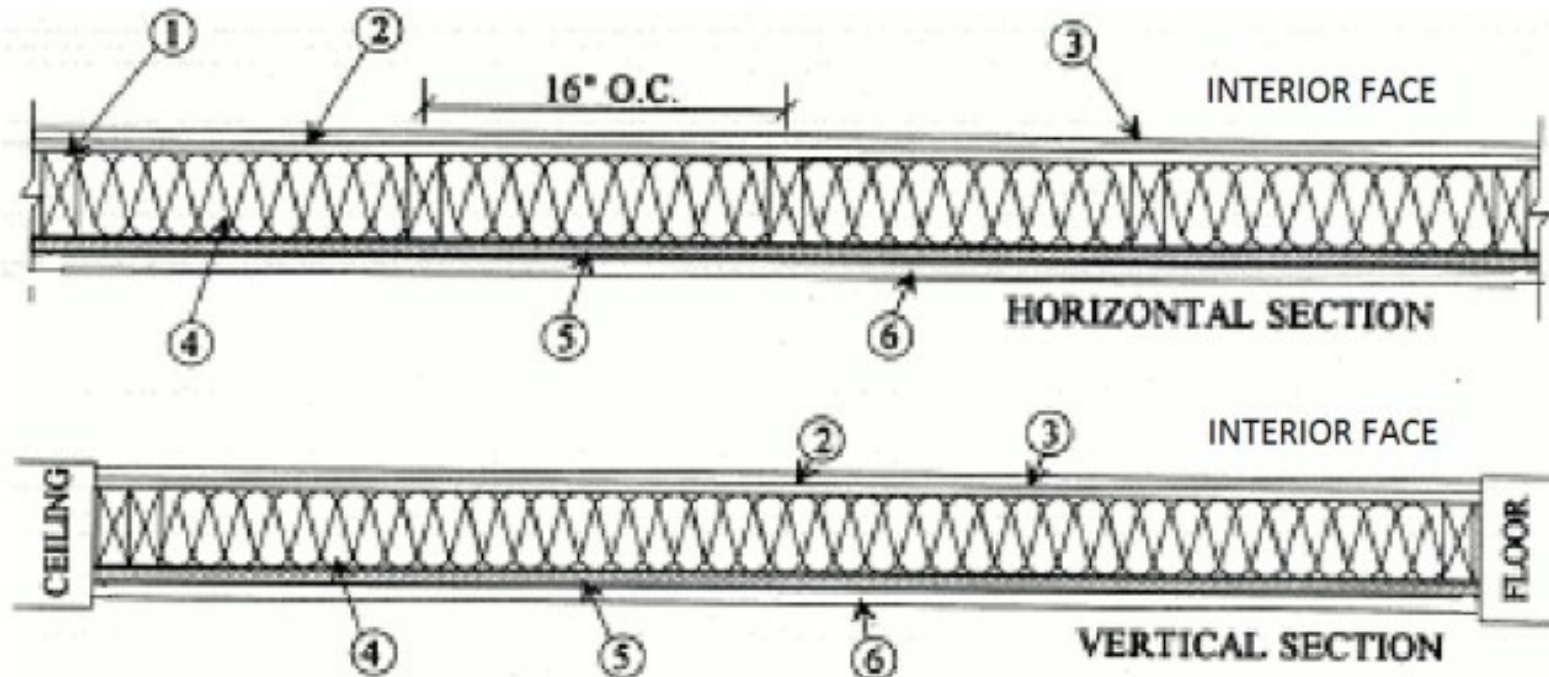
- IIIA bearing
- IIIB bearing

**Bearing Wall Rating — 2 Hr when EXPOSED TO FIRE ON INTERIOR FACE ONLY**

**Bearing Wall Rating — 1 Hr when EXPOSED TO FIRE ON EXTERIOR FACE ONLY, see Item 4 and 6**

**For Wood Studs, Finish Rating — 50 min when EXPOSED TO FIRE ON INTERIOR FACE.**

**For Wood Studs, Finish Rating — 17 min when EXPOSED TO FIRE ON EXTERIOR FACE.**



# Exterior Walls – 2-hr Int; 2-hr Ext

Potential Use For:

- IIIA bearing
- IIIB bearing

**Design No. U302**

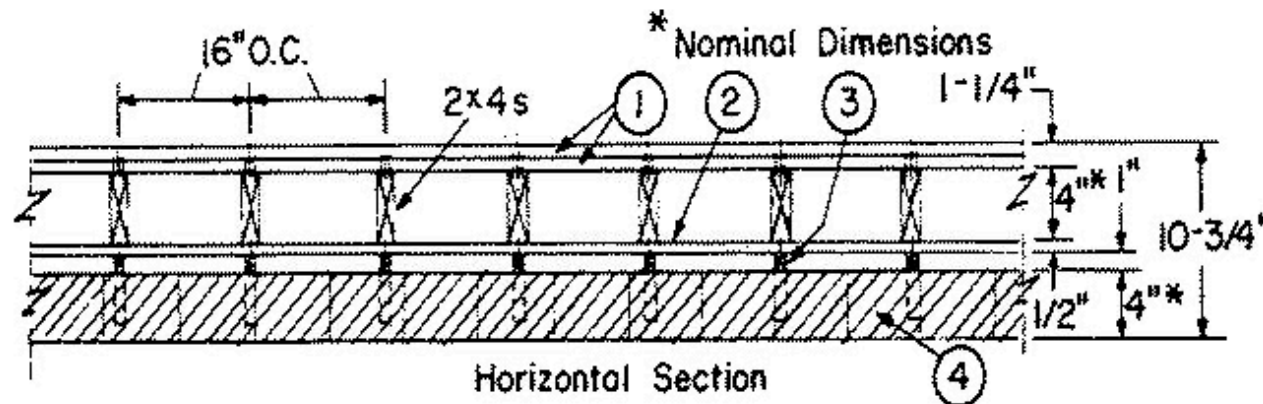
October 06, 2020

**Bearing Wall Rating — 2 Hr.**

**Finish Rating — (When Exposed to Fire on Interior Face) 59 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.



# Exterior Walls – 2-hr Int; 2-hr Ext

Potential Use For:

- IIIA bearing
- IIIB bearing

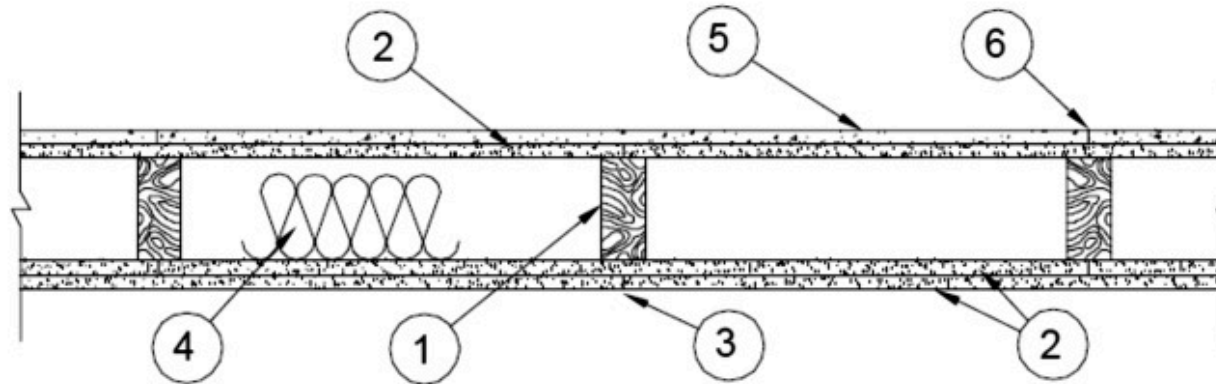
**Design No. U308**

November 19, 2019

## Bearing Wall Rating — 2 Hr

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.





# Exterior Walls – 2-hr Int; 2-hr Ext

Potential Use For:

- IIIA bearing
- IIIB bearing

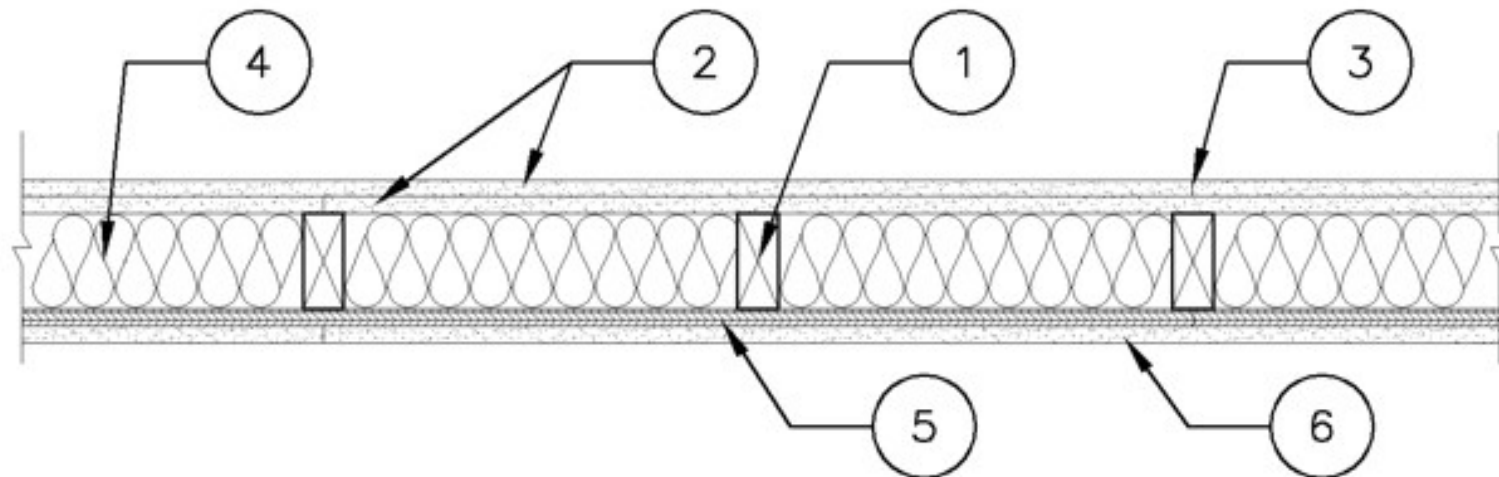
**Design No. V337**

September 10, 2021

**Bearing Wall Rating — 2 Hr**

**For Wood Studs, Finish Rating — 42 min**

**Loaded Per 2012 NDS Supplement, ASD Method, Wall Braced by Sheathing, 73% of Design Load Applied to Wall**



# Outline

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# Exterior Walls – Addition of Wood Structural Panel

Can include WSP in assemblies which were tested without them:

- » ESR 2586
- » AWC's DCA4
- » Gypsum Association Manual

ESR 2586:

## 4.7 Fire-resistive Construction:

Structural-use panels may be installed between the fire protection and the wood studs on either the interior or exterior side of fire-resistance-rated wood frame wall and partition assemblies described in the applicable code, provided the length of fasteners is adjusted for the added thickness of the panel.

GA Fire Resistance Design Manual  
Item 23, Section 1 of the General  
Explanatory Notes:

*“When not specified as a component of a fire- resistance rated wall or partition system, wood structural panels shall be permitted to be added to one or both sides.”*



**Component Additive Method (CAM) for Calculating and Demonstrating Assembly Fire Resistance**



# Exterior Walls – Addition of Wood Structural Panel

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## Adding Wood Structural Panels to a Fire-Tested Wall Assembly

Q: Can I add wood structural panels to a fire-tested wall assembly that doesn't already include them? I need the exterior walls on a project to be shear walls but the UL assembly I'm specifying doesn't show sheathing panels.

A: Yes, wood structural panels can be added to a fire resistance-rated wall assembly that was tested without them. Several references permit this, as outlined below:

The Underwriter Labs' [General Information for Fire-resistance Ratings – ANSI/UL 263, Section VI item 6](#), allows the addition of wood structural panels in fire-rated gypsum board wall assemblies and provides relevant construction details.

The [Gypsum Association's Fire Resistance Design Manual](#) permits this per Item 23 in Section 1 of the General Explanatory Notes. This is shown in the following text:

*"When not specified as a component of a fire resistance-rated wall or partition system, wood structural panels shall be permitted to be added to one or both sides. Such panels shall be permitted to be applied either as a base layer directly to the framing (under the gypsum board), as a face layer (over the face layer of gypsum board), or between layers of gypsum board in multi-layer systems. When such panels are applied under the gypsum board or between layers of gypsum board the length of the fasteners specified for the attachment of the gypsum board applied over the wood structural panels shall be increased by not less than the thickness of the wood structural panels. Fastener spacing for the gypsum board and the number of layers of gypsum board shall be as specified in the system description."*

Additionally, ESR 2586, [Performance Standards and Qualification Policy for Structural-Use Panels, and Performance Standard for 303 Siding](#), states the following in section 4.7 Fire-Resistive Construction:

*"Structural-use panels may be installed between the fire protection and the wood studs on either the interior or exterior side of fire resistance-rated wood-frame wall and partition assemblies described in the applicable code, provided the length of fasteners is adjusted for the added thickness of the panel."*

# Outline

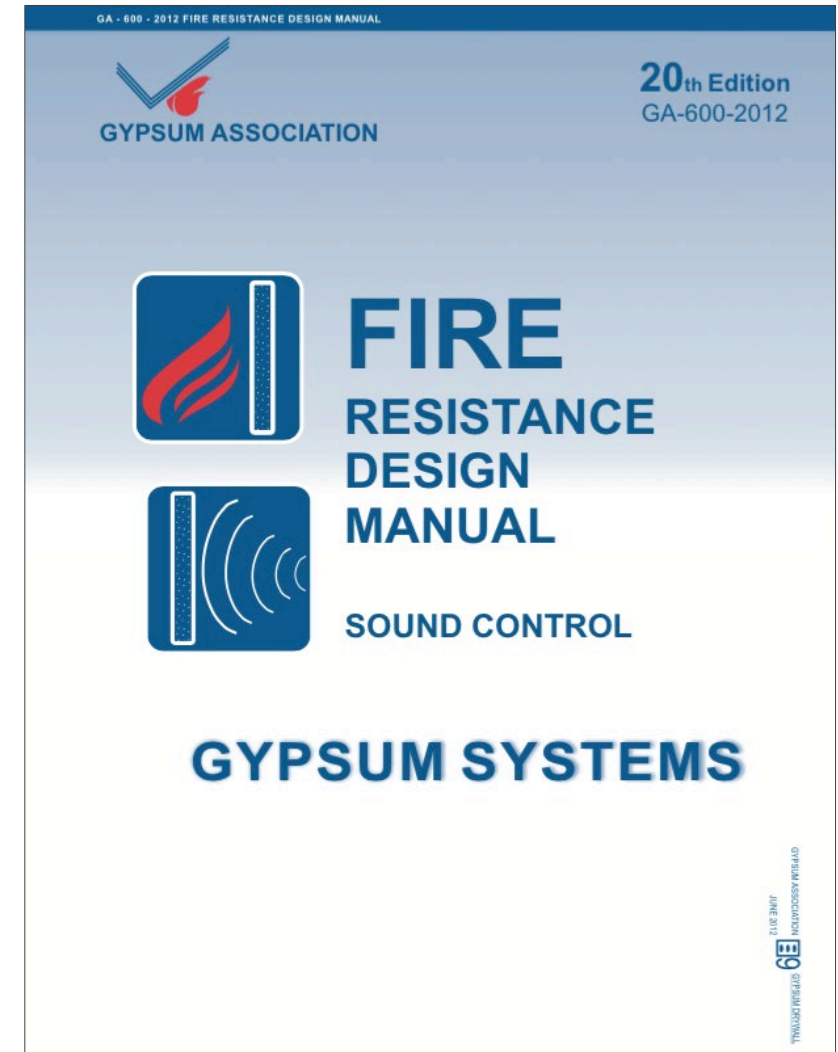
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## Fire Resistance – Insulation Effects

“When not specified as a component of a fire tested wall or partition system, mineral fiber, glass fiber, or cellulose fiber insulation of a thickness not exceeding that of the stud depth shall be permitted to be added within the stud cavity.”





# Outline

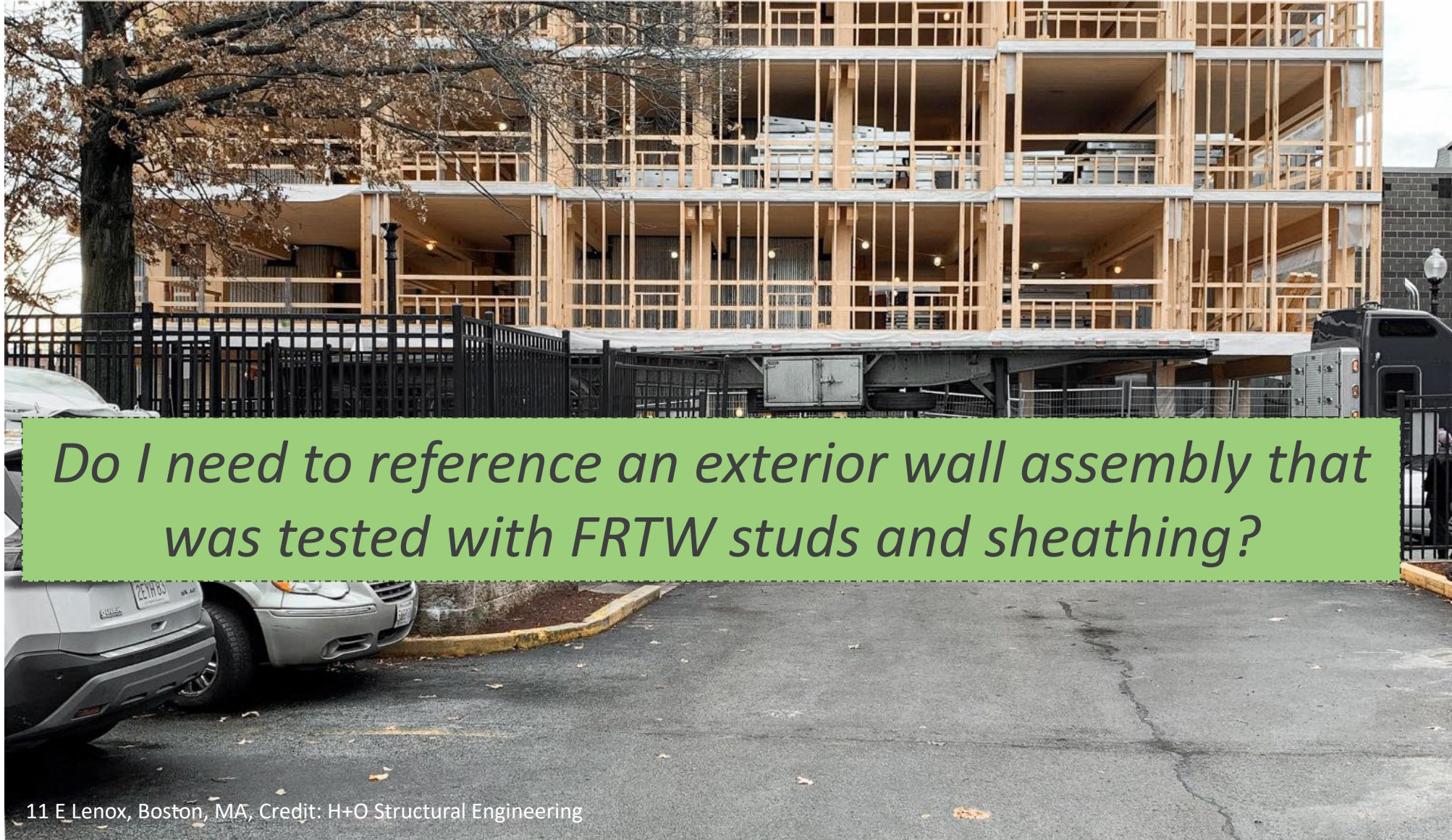
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# Exterior Walls – Using FRT Studs



*Do I need to reference an exterior wall assembly that was tested with FRTW studs and sheathing?*



# Exterior Walls – FRTW

**602.3 Type III.** Type III construction is that type of construction in which the exterior walls are of noncombustible materials and the interior building elements are of any material permitted by this code. *Fire-retardant-treated wood* framing and sheathing complying with Section 2303.2 shall be permitted within *exterior wall* assemblies of a 2-hour rating or less.

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For a Type III or Type IV building, can non-treated studs and sheathing in a fire-tested assembly for exterior walls be replaced with fire retardant-treated studs and sheathing?

Yes, wall assemblies that were tested with untreated wood studs may instead use fire retardant-treated wood studs. The [UL Fire Design Information Section](#), Part VI: Walls and Partitions, Sub-section 1: Wood Stud Walls, states the following:

"Wood stud walls may contain fire retardant-treated studs as well as untreated wood studs. The use of fire retardant-treated plywood (wood structural panels) may be used in designs that contain use of untreated plywood when all other specified attributes are equivalent to the wood structural panel used in the design."



# Exterior Walls – Using FRT Studs

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- I. INTRODUCTION
- II. GENERAL
- III. FLOOR-CEILING
- IV. BEAMS
- V. COLUMNS**
- VI. WALLS AND PARTITIONS

*“Wood stud walls may contain fire-retardant-treated studs as well as untreated wood studs. The use of fire-retardant-treated plywood (wood structural panels) may be used in Designs that contain use of untreated plywood when all other specified attributes are equivalent to the wood structural panel used in the Design.”*

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# Exterior Walls: Openings

How do exterior wall FRR requirements apply to openings (windows & doors)?





# Exterior Walls: Openings

IBC Section 705.8 provides requirements for opening protection

Function of:

- FSD
- Sprinklers

Not a Function of:

- Construction type
- Bearing or non
- Wall framing materials

TABLE 705.8  
MAXIMUM AREA OF EXTERIOR WALL OPENINGS BASED ON  
FIRE SEPARATION DISTANCE AND DEGREE OF OPENING PROTECTION

FIRE SEPARATION DISTANCE (feet)	DEGREE OF OPENING PROTECTION	ALLOWABLE AREA <sup>a</sup>
0 to less than 3 <sup>b, c, k</sup>	Unprotected, Nonsprinklered (UP, NS)	Not Permitted <sup>k</sup>
	Unprotected, Sprinklered (UP, S) <sup>i</sup>	Not Permitted <sup>k</sup>
	Protected (P)	Not Permitted <sup>k</sup>
3 to less than 5 <sup>d, e</sup>	Unprotected, Nonsprinklered (UP, NS)	Not Permitted
	Unprotected, Sprinklered (UP, S) <sup>i</sup>	15%
	Protected (P)	15%
5 to less than 10 <sup>e, f, j</sup>	Unprotected, Nonsprinklered (UP, NS)	10% <sup>h</sup>
	Unprotected, Sprinklered (UP, S) <sup>i</sup>	25%
	Protected (P)	25%
10 to less than 15 <sup>e, f, g, j</sup>	Unprotected, Nonsprinklered (UP, NS)	15% <sup>h</sup>
	Unprotected, Sprinklered (UP, S) <sup>i</sup>	45%
	Protected (P)	45%
15 to less than 20 <sup>f, g, j</sup>	Unprotected, Nonsprinklered (UP, NS)	25%
	Unprotected, Sprinklered (UP, S) <sup>i</sup>	75%
	Protected (P)	75%
20 to less than 25 <sup>f, g, j</sup>	Unprotected, Nonsprinklered (UP, NS)	45%
	Unprotected, Sprinklered (UP, S) <sup>i</sup>	No Limit
	Protected (P)	No Limit
	Unprotected, Nonsprinklered (UP, NS)	70%

## Exterior Walls: Openings

3 Options for Protection of Openings in Exterior Walls:


- Unprotected in a non-sprinklered building (UP, NS)
- Unprotected in a sprinklered building (UP, S)
- Protected (P)

Note that a building with an NFPA 13R sprinkler system is considered non-sprinklered for the purposes of opening protection. Only an NFPA 13 system is considered sprinklered in this context





**TABLE 705.8**  
**MAXIMUM AREA OF EXTERIOR WALL OPENINGS BASED ON**  
**FIRE SEPARATION DISTANCE AND DEGREE OF OPENING PROTECTION**



<b>FIRE SEPARATION DISTANCE (feet)</b>	<b>DEGREE OF OPENING PROTECTION</b>	<b>ALLOWABLE AREA<sup>a</sup></b>
0 to less than 3 <sup>b, c, k</sup>	Unprotected, Nonsprinklered (UP, NS)	Not Permitted <sup>k</sup>
	Unprotected, Sprinklered (UP, S) <sup>i</sup>	Not Permitted <sup>k</sup>
	Protected (P)	Not Permitted <sup>k</sup>
3 to less than 5 <sup>d, e</sup>	Unprotected, Nonsprinklered (UP, NS)	Not Permitted
	Unprotected, Sprinklered (UP, S) <sup>i</sup>	15%
	Protected (P)	15%
5 to less than 10 <sup>e, f, j</sup>	Unprotected, Nonsprinklered (UP, NS)	10% <sup>h</sup>
	Unprotected, Sprinklered (UP, S) <sup>i</sup>	25%
	Protected (P)	25%
10 to less than 15 <sup>e, f, g, j</sup>	Unprotected, Nonsprinklered (UP, NS)	15% <sup>h</sup>
	Unprotected, Sprinklered (UP, S) <sup>i</sup>	45%
	Protected (P)	45%
15 to less than 20 <sup>f, g, j</sup>	Unprotected, Nonsprinklered (UP, NS)	25%
	Unprotected, Sprinklered (UP, S) <sup>i</sup>	75%
	Protected (P)	75%
20 to less than 25 <sup>f, g, j</sup>	Unprotected, Nonsprinklered (UP, NS)	45%
	Unprotected, Sprinklered (UP, S) <sup>i</sup>	No Limit
	Protected (P)	No Limit
25 to less than 30 <sup>f, g, j</sup>	Unprotected, Nonsprinklered (UP, NS)	70%
	Unprotected, Sprinklered (UP, S) <sup>i</sup>	No Limit
	Protected (P)	No Limit
30 or greater	Unprotected, Nonsprinklered (UP, NS)	No Limit
	Unprotected, Sprinklered (UP, S) <sup>i</sup>	No Limit
	Protected (P)	No Limit

# Exterior Walls: Openings

## Design Example:

- 5 story hotel
- Type IIIA
- NFPA 13 sprinklers
- Exterior bearing walls
- 2-hour fire-resistance rating



# Exterior Walls: Openings

Design Example Continued:

FSD	Unprotected Openings Permitted*	Protected Openings Permitted*	Ext Wall FRR (interior face/exterior face)
0 to 3 ft	Not permitted	Not permitted	2/2
3 to 5 ft	15%	15%	2/2
5 to 10	25%	25%	2/2
10 to 15	45%	45%	2/0
15 to 20	75%	75%	2/0
20 to 25	No limit	No limit	2/0
25 to 30	No limit	No limit	2/0
Greater than 30	No limit	No limit	2/0

\* Percentages indicated are based on the area of the exterior wall, per story.



# Exterior Walls: Openings

Design Example Continued:

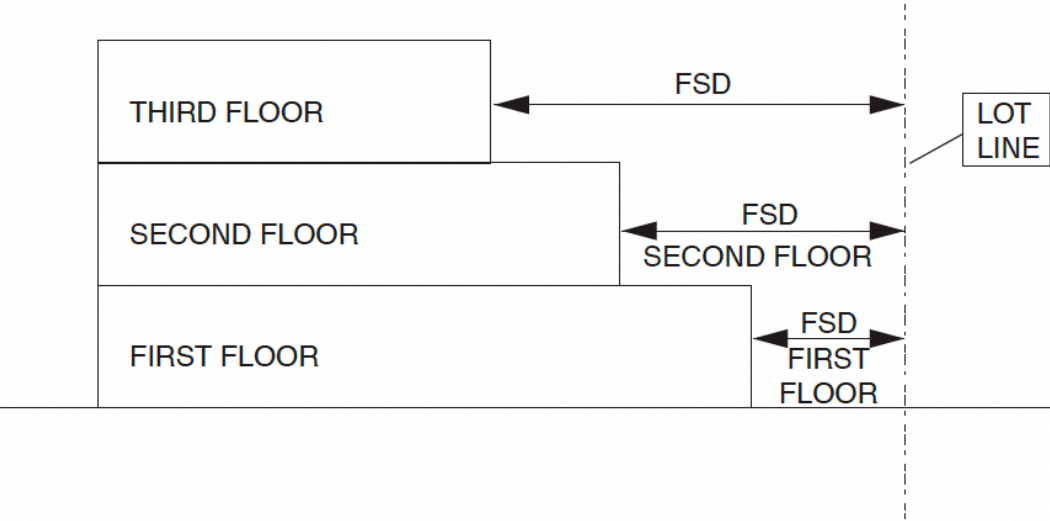
FSD	Unprotected Openings Permitted*	Protected Openings Permitted*	Ext Wall FRR (interior face/exterior face)
0 to 3 ft	Not permitted	Not permitted	2/2
3 to 5 ft	15%	15%	2/2
<i>When a building is equipped with an NFPA 13 sprinkler system, allowances for openings are usually the same for protected and unprotected conditions. Therefore, it is common to have unprotected openings in exterior walls.</i>			
15 to 20	75%	75%	2/0
20 to 25	No limit	No limit	2/0
25 to 30	No limit	No limit	2/0
Greater than 30	No limit	No limit	2/0
* Percentages indicated are based on the area of the exterior wall, per story			



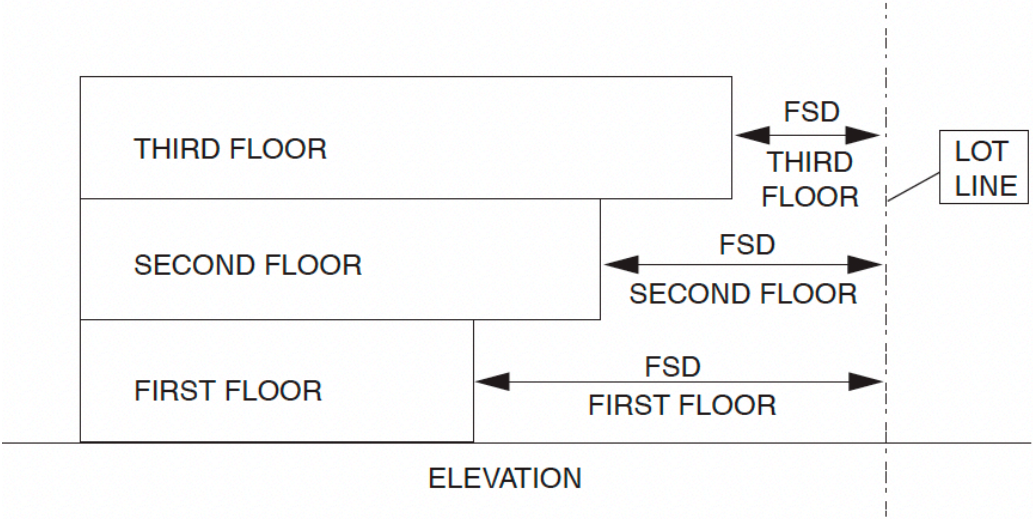
# Exterior Walls: Openings

There are a few exceptions for unlimited area openings in the first story above grade plane for certain projects and conditions (IBC 705.8.1 exceptions 1 & 2)

For the purposes of exterior wall openings, FSD is based on the conditions of each story (affects buildings with exterior offset walls):



Commentary Figure 705.8.1(1)  
EXAMPLE OF BUILDING WITH FLOOR OFFSETS



Commentary Figure 705.8.1(2)  
EXAMPLE OF BUILDING WITH FLOOR OFFSETS

# Exterior Walls: Openings

- Protected openings have fire doors, fire shutters or fire window assemblies that comply with IBC Sections 716.5 and 716.6.
- Exception is allowed when building is equipped with an NFPA 13 sprinkler system and exterior openings are protected by a water curtain.

TYPE OF ASSEMBLY	REQUIRED WALL ASSEMBLY RATING (HRS)	DOOR VIEW PANEL A 100 IN <sup>2</sup> OR LESS	DOOR VIEW PANEL A > 100 IN <sup>2</sup>	SIDELITE OR TRANSOM PANELS B & C	WINDOW ASSEMBLY D
Exterior walls <sup>d</sup>	3-hr	[D-H-90]	[D-H-W-90] <sup>c</sup>	W-180 <sup>b</sup>	[OH-90] or W-180 <sup>b</sup>
	2-hr	[D-H-90]	[D-H-W-90] <sup>c</sup>	W-120 <sup>b</sup>	[OH-90] or W-120 <sup>b</sup>
	1-hr	[D-H-45]	[D-H-45]	[D-H-45]	[OH-45] or W-60 <sup>b</sup>

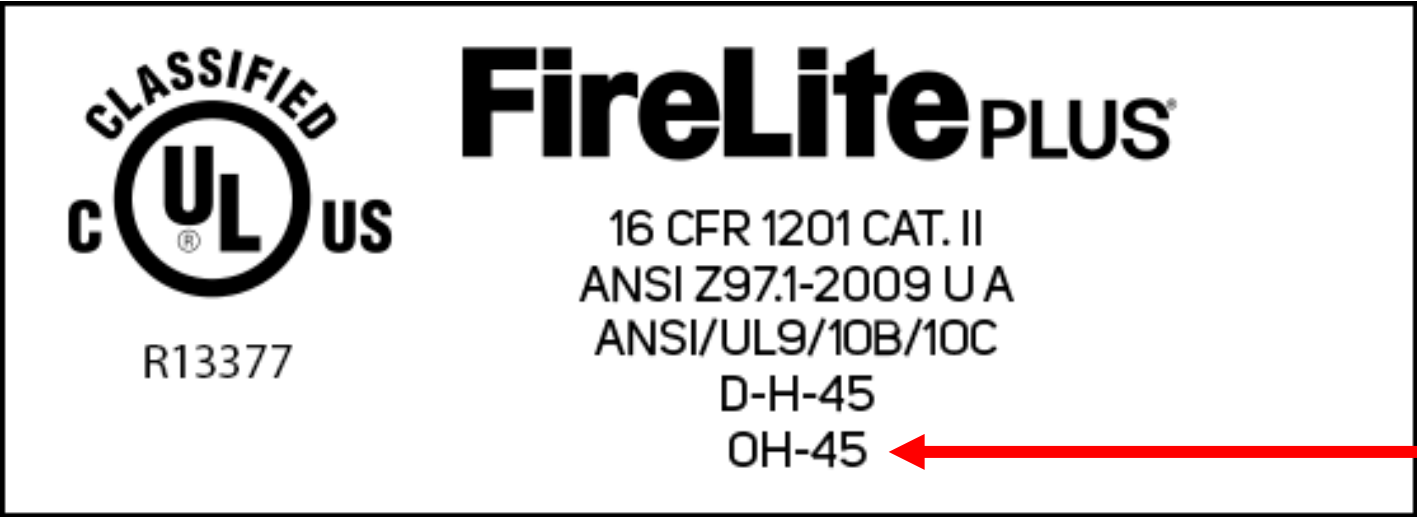


Glazing must be fire-resistance rated meeting ASTM E119 or UL 263

# Exterior Walls: Openings

TABLE 716.1(1)  
MARKING FIRE-RATED GLAZING ASSEMBLIES

FIRE TEST STANDARD	MARKING	DEFINITION OF MARKING
ASTM E119 or UL 263	W	Meets wall assembly criteria.
ASTM E119 or UL 263	FC	Meets floor/ceiling criteria <sup>a</sup>
NFPA 257 or UL 9	OH	Meets fire window assembly criteria including the hose stream test.
NFPA 252 or UL 10B or UL 10C	D	Meets fire door assembly criteria.
	H	Meets fire door assembly hose stream test.
	T	Meets 450°F temperature rise criteria for 30 minutes
—	XXX	The time in minutes of the fire resistance or fire protection rating of the glazing assembly.

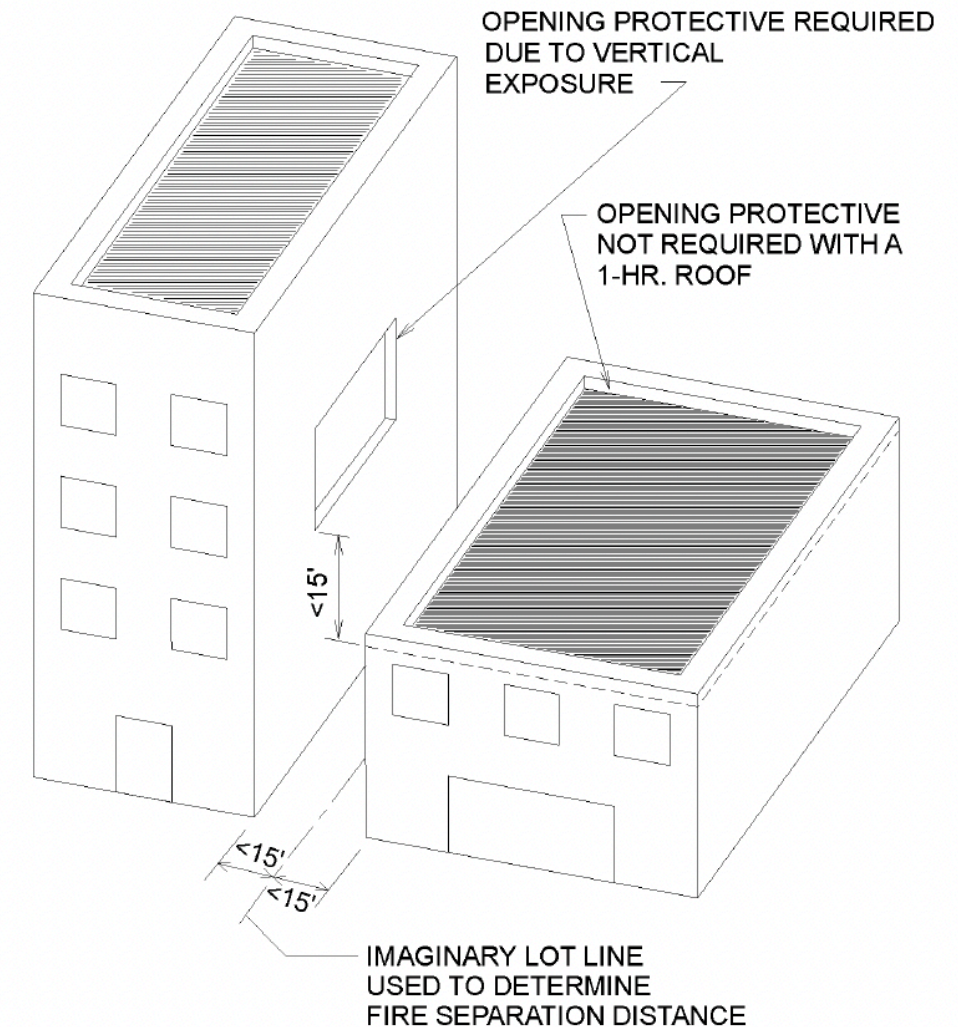


Example rated glazing  
label: meets opening  
protection requirement  
in 1 hour exterior wall



# Exterior Walls: Openings

Other requirements exist for vertical separation of openings on the same exterior wall and between an opening in a lower roof in an adjacent building on the same lot. See IBC 705.8.



Commentary Figure 705.8.6  
VERTICAL FIRE EXPOSURE OF ADJACENT BUILDING



## Exterior Walls: Openings

Where unprotected openings are permitted, windows and doors shall be constructed of any approved materials. Glazing shall conform to the requirements of Chapters 24 and 26. (IBC 705.8.3)



# ➤ QUESTIONS?

This concludes The American  
Institute of Architects Continuing  
Education Systems Course

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