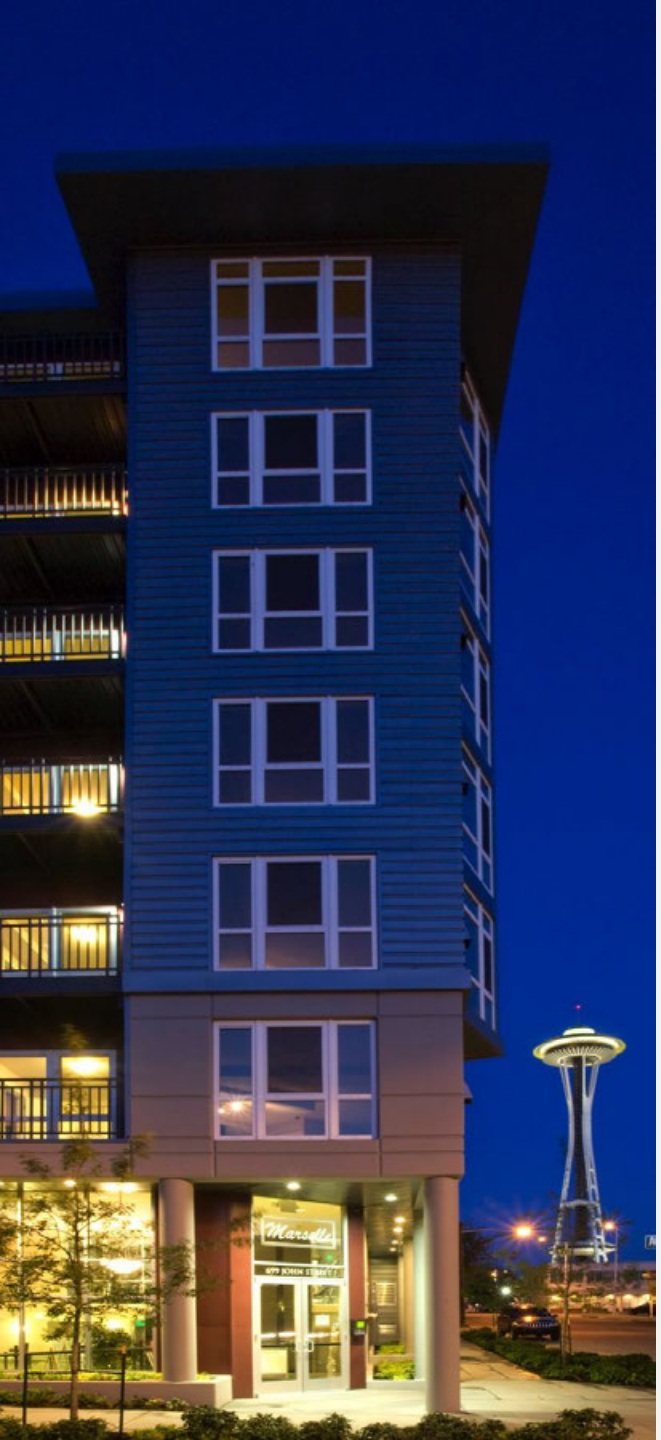

Fire Resistant Design and Detailing

For Light-Frame Wood Construction

EXTERIOR WALLS, INTERSECTIONS & BALCONIES

SPEAKER NAME

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This course is registered with AIA CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

AIA Approved Continuing Education

Course Description

With an increase in mid-rise wood-frame buildings, more designers are seeking information on code-compliant and constructible detailing. Many are unsure of the code's requirements for details, specifically at the intersection of rated assemblies and where structure and fire protection meet. This presentation will focus on common detailing issues and areas of misunderstanding of exterior walls and their intersection with rated floor assemblies. Mid-rise wood-frame opportunities and code-specified building sizes will also be reviewed, followed by discussion of detailing code requirements, code compliance, and rationale for approval with an emphasis on constructability and practicality.

Learning Objectives

1. Compare Type II to Type III construction with regard to cost, building size and fire resistance per the International Building Code.

2. Review requirements for exterior walls and questions commonly encountered including asymmetric assemblies, the allowance of wood structural panel, and bearing vs. non-bearing requirements.

3. Examine a variety of floor-to-exterior wall details for use in wood-frame, Type III construction and discuss code compliance paths and approval rationale for each.

4. Explore detailing requirements for balconies.

Outline

- Context for Type III Construction
- Fire Rating Requirements for Exterior Walls
  - Assembly Asymmetry
  - Addition of Wood Structural Panel
  - Bearing vs. Non-bearing
  - Vertical offsets
- Exterior Wall to Floor Intersection
  - Fire Resistant Continuity
  - Fire Retardant Continuity
- Parapets & Balconies

Landing Apartments, Russell Scott Steedle & Capione Architects, photo Gregory Folkins

Outline

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

Seattle, WA

Photo: Matt Todd/PB Architects

College Park , MD

Photo: Matt Church

Normal, IL

Image: OKW Architects

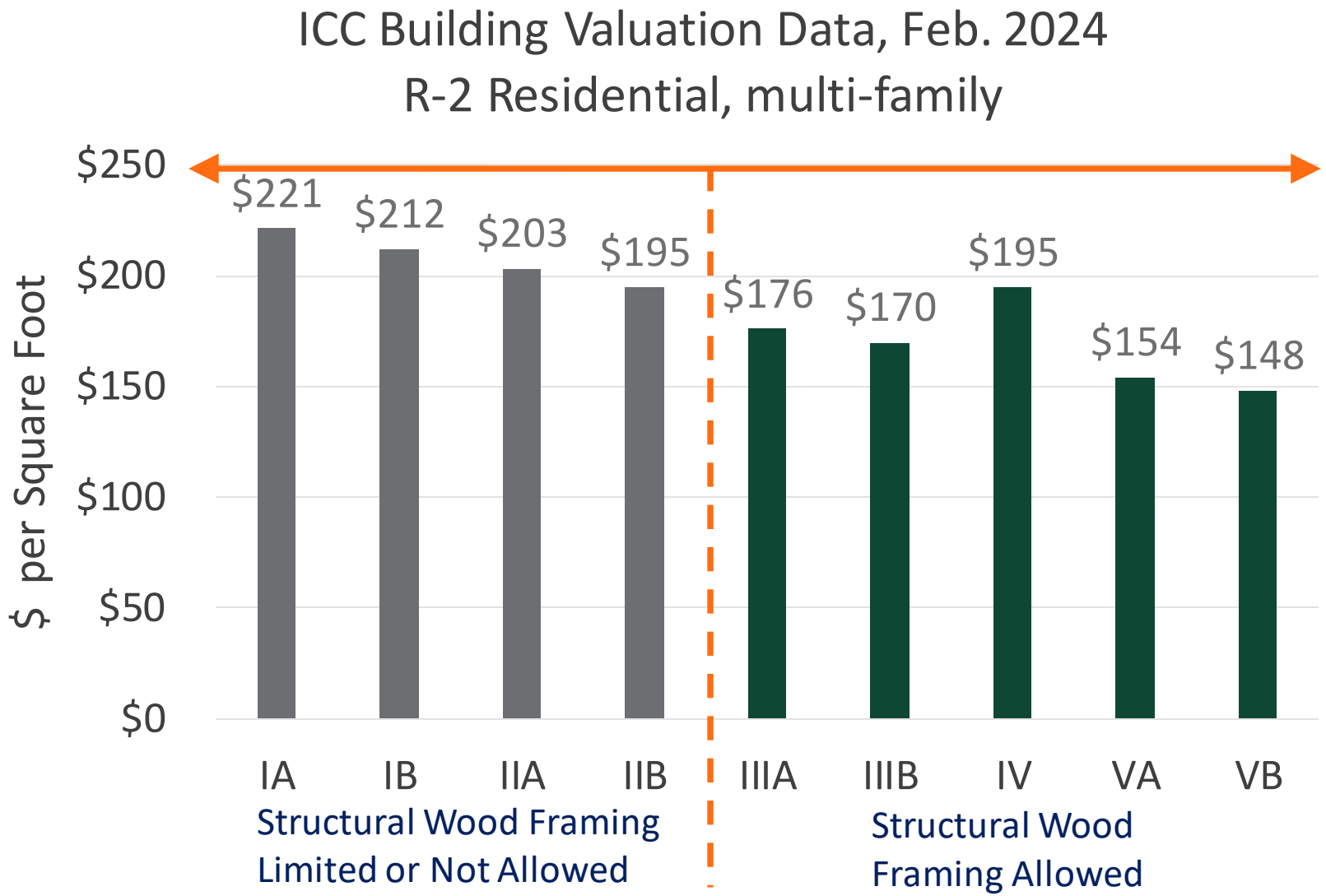
Los Angeles, CA

Photo: Lawrence Anderson/Esto

Atlanta, GA

Image: Lord Aeck Sargent

ICC Building Valuation Data (BVD)



Designers accustomed to steel and concrete often design buildings of Type IIA or IIB construction.

However,

nearly identical height and areas can be achieved with wood framing in Type IIIA or IIIB.

Type II (Non-Wood) vs. Type III (Wood Construction) Fire Resistant Requirements

Fire Rating of Structural Elements	IIA	IIB		IIIA	IIIB
IBC Table 601					
Exterior bearing walls (hrs)	1	0		2	2
Interior bearing walls (hrs)	1	0		1	0
All other elements (hrs)	1	0		1	0
IBC Table 602 (705.12 IBC 2021 & 2024) (Exterior Nonbearing Walls)					
X < 10 ft	1	1		1	1
10 ft ≤ X < 30 ft	1	0		1	0
X ≥ 30 ft	0	0		0	0

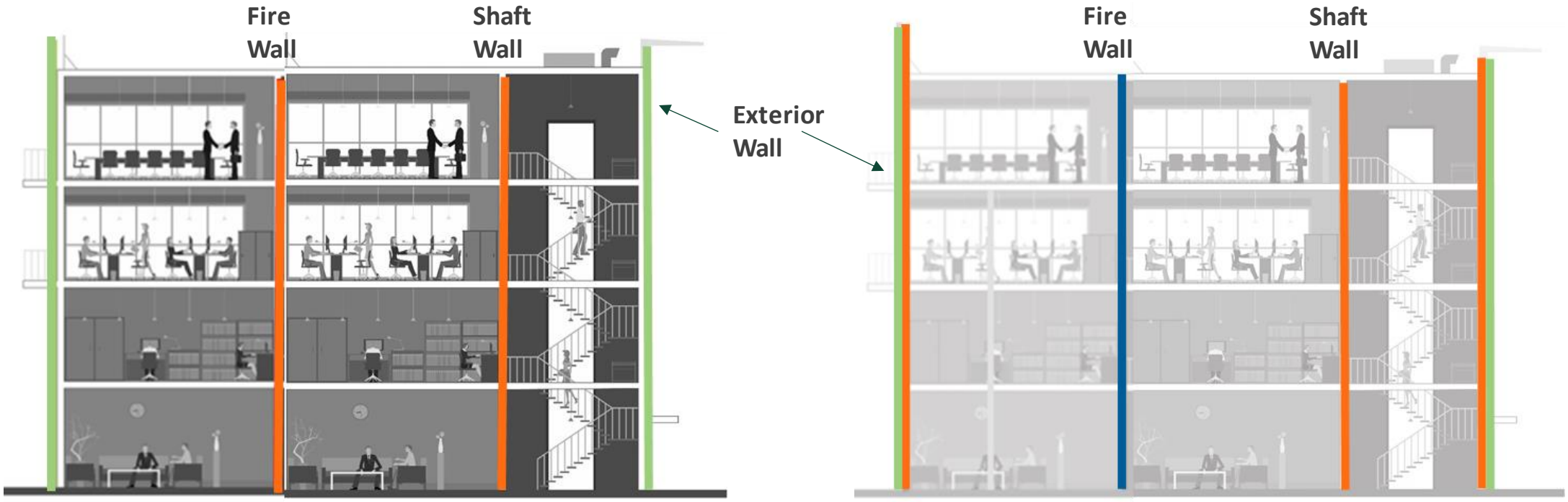
IBC Chapter 7	IIA	IIB		IIIA	IIIB
Shaft Walls (IBC 713.4)[1]	2 max	2 max		2 max	2 max
Fire Walls (706.4) – R Occupancy	2	2		3	3

[1] Shaft Walls are constructed as Fire Barriers (707.3.1). Shaft enclosures require a 2-hr rating when connecting 4 stories or more (1-hr for less than 4 stories).

By comparison, Fire-Resistant rating requirements are very similar between Type II and Type III with few exceptions

- Exterior walls on Type III require 2 hour fire-resistance ratings for both IIIA and IIIB
- Fire Walls (R occupancy) require 3 hour fire-resistance rating

Type II vs. Type III Fire Resistant Requirements



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^2)	24k	24k	96k	72k	90k
Total Building Area* (ft^2)	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

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

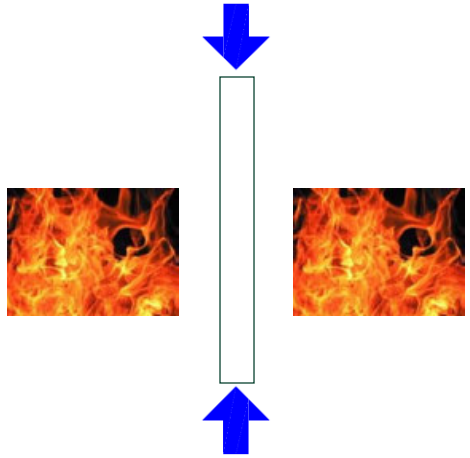
Fire Resistance-Rated Wall Assemblies

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.

Tested under a standardized test fire exposure for a given duration to:

1. Prevent the passage of flame and temperature rise from one side to the other
2. Continue to provide vertical structural support when exposed to fire and elevated temperatures

Fire Confinement



Structural Performance

Fire-Resistance Ratings

IBC Tables 601 & 602* (2018 IBC)

***Table 705.5 (2021 & 2024 IBC)**

Note: FRT = Fire Retardant Treated

Key Differences in Fire Ratings for Construction Types				
	IIIA	IIIB	VA	VB
Exterior wall framing	FRT	FRT	non-FRT	Non-FRT
Exterior bearing wall fire rating	2 hr	2 hr	1 hr	0 hr
Interior bearing wall fire rating	1 hr	0 hr	1 hr	0 hr
Interior non-bearing wall fire rating	0 hr	0 hr	0 hr	0 hr
Floor assembly fire rating	1 hr	0 hr	1 hr	0 hr
Fire wall rating	3 hr	3 hr	2 hr	2 hr

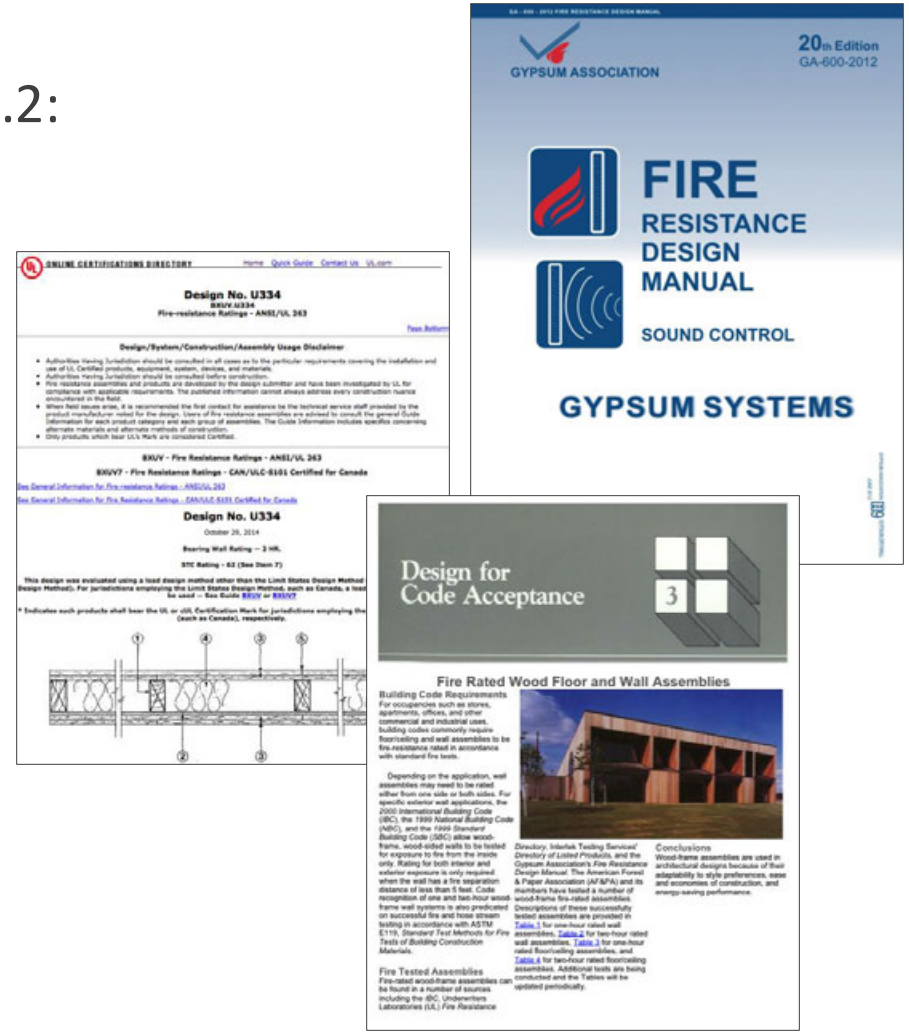
Choosing Fire Rated Assemblies

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



Unique to Exterior Walls

Exterior walls differ from other light frame fire assemblies in three basic ways:

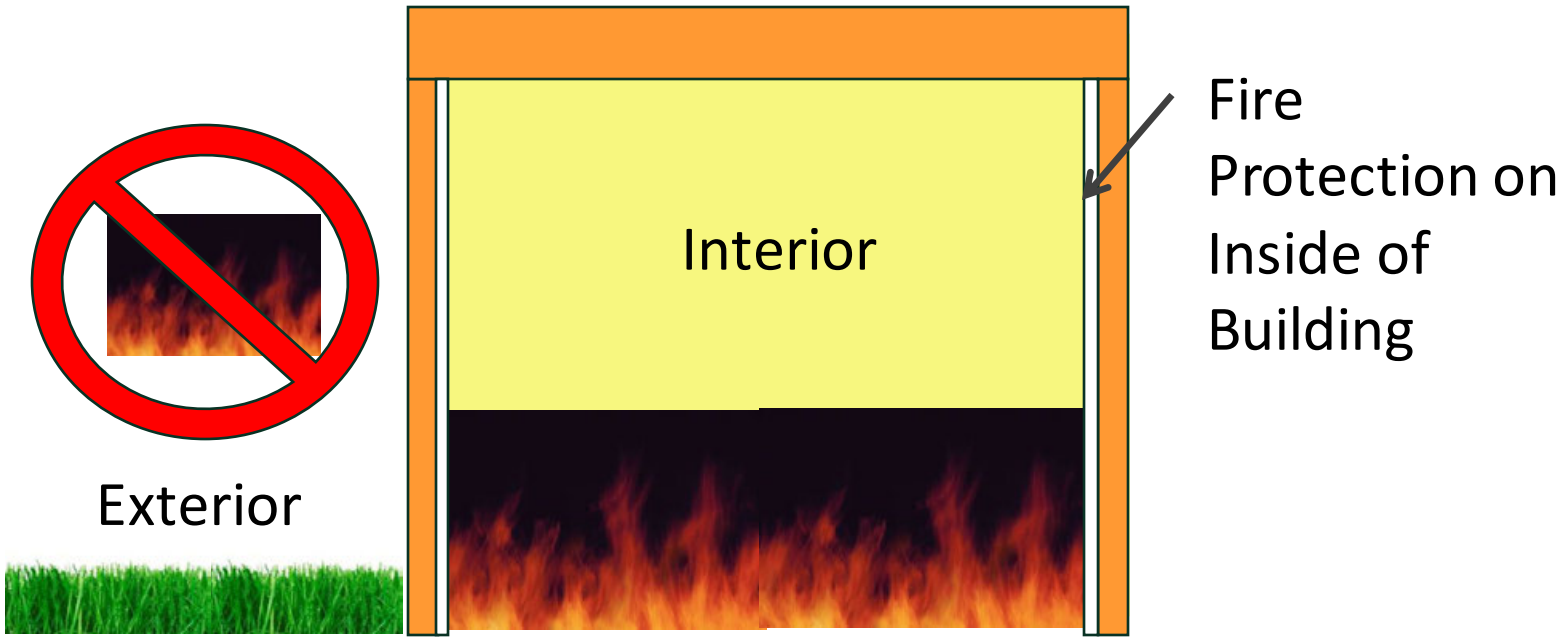
1. Minimum hourly Fire-Resistance rating requirements per 2018 IBC Tables 601 and 602*

   *Table 705.5 (2021 & 2024 IBC)

2. Structural stability requirements
3. Non-combustible exception

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.

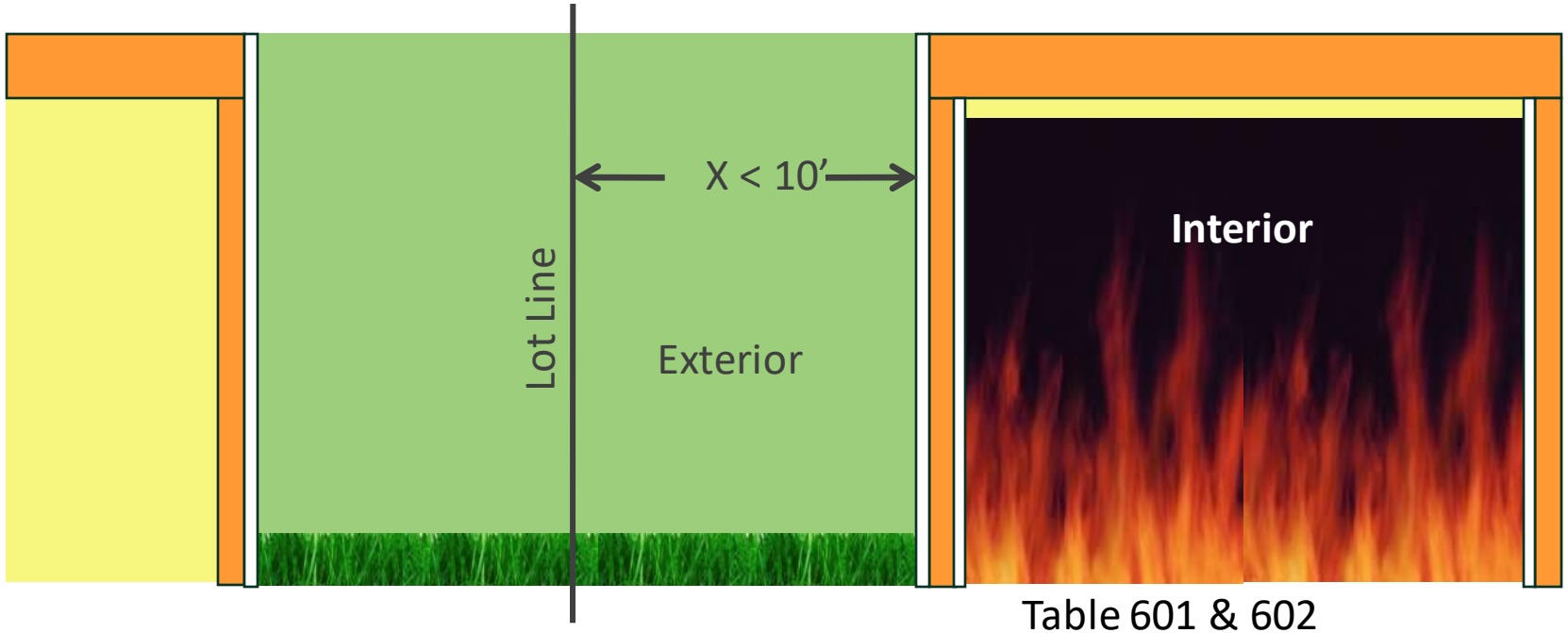


Table 601 & 602

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	A	B	C	HT	A	B
Primary structural frame[f] (see Section 202)	3[a, b]	2[a, b, c]	1[b, c]	0[c]	1[b, c]	0	3[a]	2[a]	2[a]	HT	1[b, c]	0
Bearing walls												
Exterior[e, f]	3	2	1	0	2	2	3	2	2	2	1	0
Interior	3[a]	2[a]	1	0	1	0	3	2	2	1/HT[g]	1	0
Nonbearing walls and partitions Exterior	See Table 705.5											
Nonbearing walls and partitions Interior[d]	0	0	0	0	0	0	0	0	0	See Section 2304.11.2	0	0
Floor construction and associated secondary structural members (see Section 202)	2	2	1	0	1	0	2	2	2	HT	1	0
Roof construction and associated secondary structural members (see Section 202)	1 1/2[b]	1[b,c]	1[b,c]	0[c]	1[b,c]	0	1 1/2	1	1	HT	1[b,c]	0

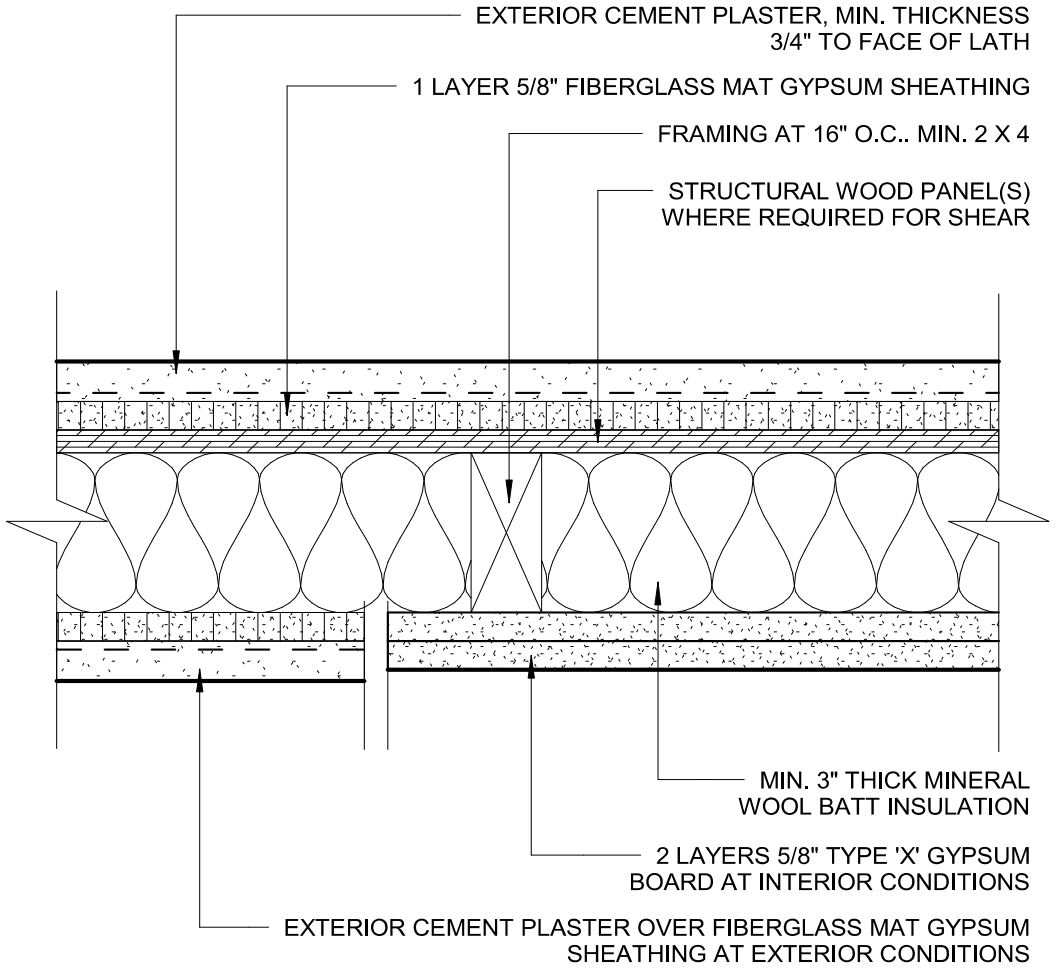
TABLE 705.5
FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE[a, d, g]

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

Exterior Wall Fire Ratings

- Using the provisions of Fire Separation Distance (705.5), Tables 601 and 705.5 could result in requiring a 1-hour or 2-hour rating on the inside face of exterior walls, while no rating is required on the exterior face of exterior walls.
- How do we specify such an asymmetric assembly?
- This is where prescriptive code methodology begins to break down; procedural data does not align with requirements. Most building jurisdictions understand that this is a deficiency of the system and will recognize one tested assembly for the outside and a second for the inside.

Exterior Walls – Asymmetry



2-HOUR RATING PER UL DESIGN NO. U371

2-HOUR EXTERIOR WALL

Common issues with tested assemblies:

- Assembly asymmetry: separate assemblies for each side

Common Assembly – Type V Construction
Exterior Walls – 1-hr Int; 0-hr Ext

IBC Table 721.1(2)

16. Exterior walls rated for fire resistance from the inside only in accordance with Section 705.5.	16-1.1[q]	2″ × 4″ wood studs at 16″ centers with double top plates, single bottom plate; interior side covered with $^5/_8$″ Type X gypsum wallboard, 4″ wide, applied horizontally unblocked, and fastened with $2^1/_4$″ 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 $^3/_8$″ 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 $3^1/_2$″ mineral wool insulation. Rating established for exposure from interior side only.	—	—	—	$4^1/_2$
	16-1.2[q]	2″ × 6″ wood studs at 16″ centers with double top plates, single bottom plate; interior side covered with $^5/_8$″ Type X gypsum wallboard, 4″ wide, applied horizontally or vertically with vertical joints over studs and fastened with $2^1/_4$″ 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 $^7/_{16}$″ 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 $5^1/_2$″ mineral wool insulation. Rating established from the gypsum-covered side only.	—	—	—	$6^9/_{16}$
	16-1.3[q]	2″ × 6″ wood studs at 16″ centers with double top plates, single bottom plates; interior side covered with $^5/_8$″ Type X gypsum wallboard, 4″ wide, applied vertically with all joints over framing or blocking and fastened with $2^1/_4$″ Type S drywall screws spaced 7″ on center. Joints to be covered with tape and joint compound. Exterior covered with $^3/_8$″ 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. Rating established from the gypsum-covered side only.	—	—	—	$6^1/_2$

Common Assembly – Type III Construction
Exterior Walls – 2-hr Int; 0-hr Ext

Design No. **U349**

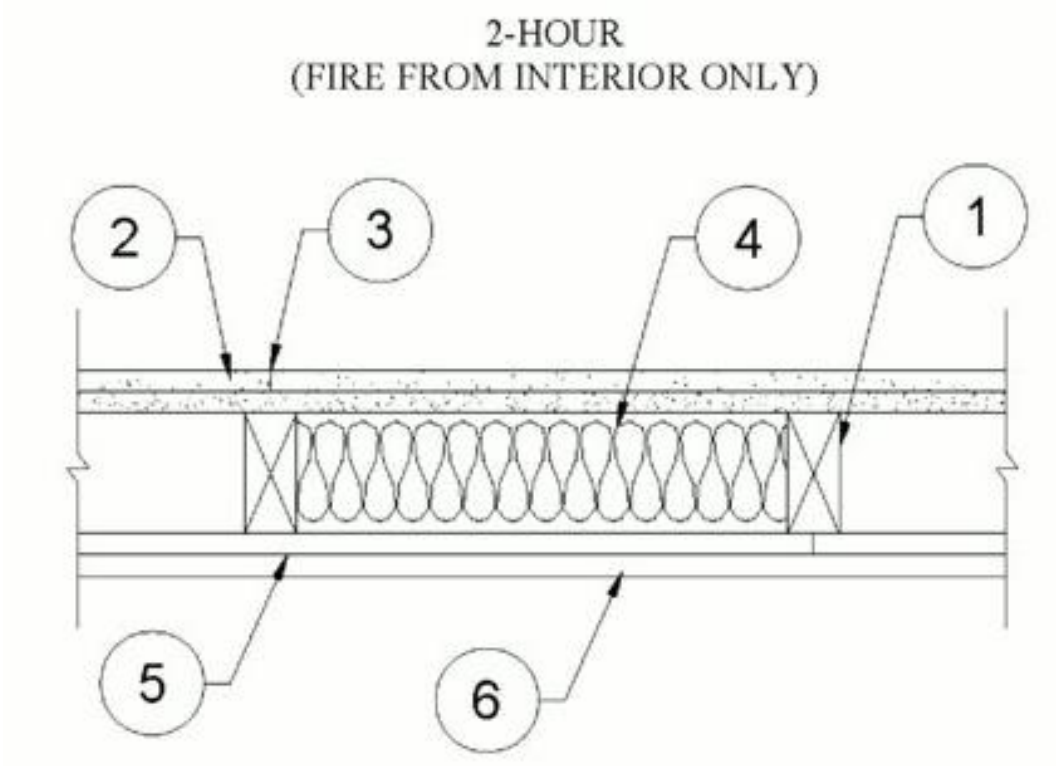
August 4, 2023

Bearing Wall Rating - 2 Hr Rating Exposed to Fire on Interior Face Only (See Item 6)

Bearing Wall Rating - 1 Hr Rating Exposed to Fire on Exterior Face (See Item 7)

Bearing Wall Rating - 2 Hr Rating Exposed to Fire on Exterior Face (See Item 5C or 8)

For Wood Studs, Finish Rating — 55 min (Exposed to Fire on Interior Face)



1) Wood Studs
2) 5/8” Gypsum Board
3) Joints covered with tape and joint compound
4) Batts and Blankets
5) Proprietary Building Units
6) Exterior Facings

Common Assembly – Type III Construction
Exterior Walls – 2-hr Int; 0-hr Ext

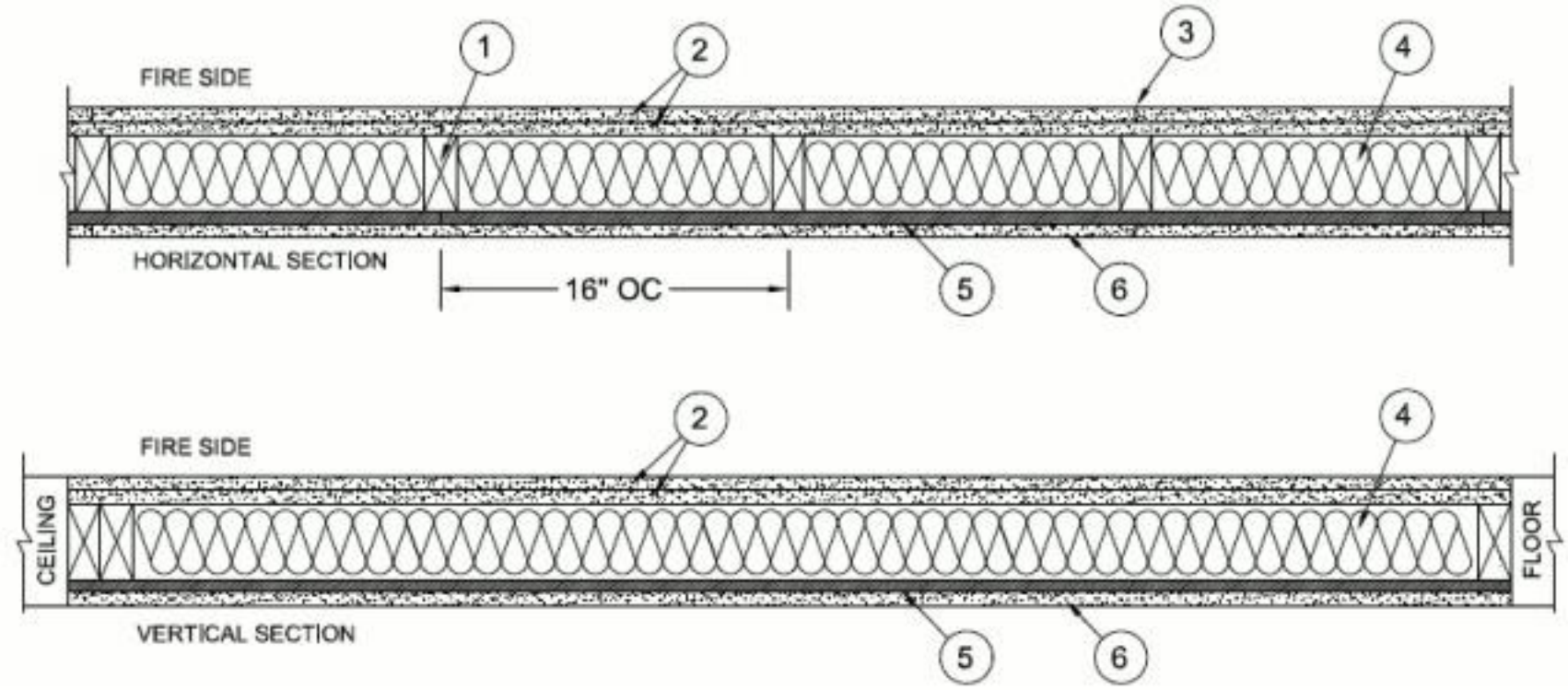
Design No. **V314**

May 25, 2022

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

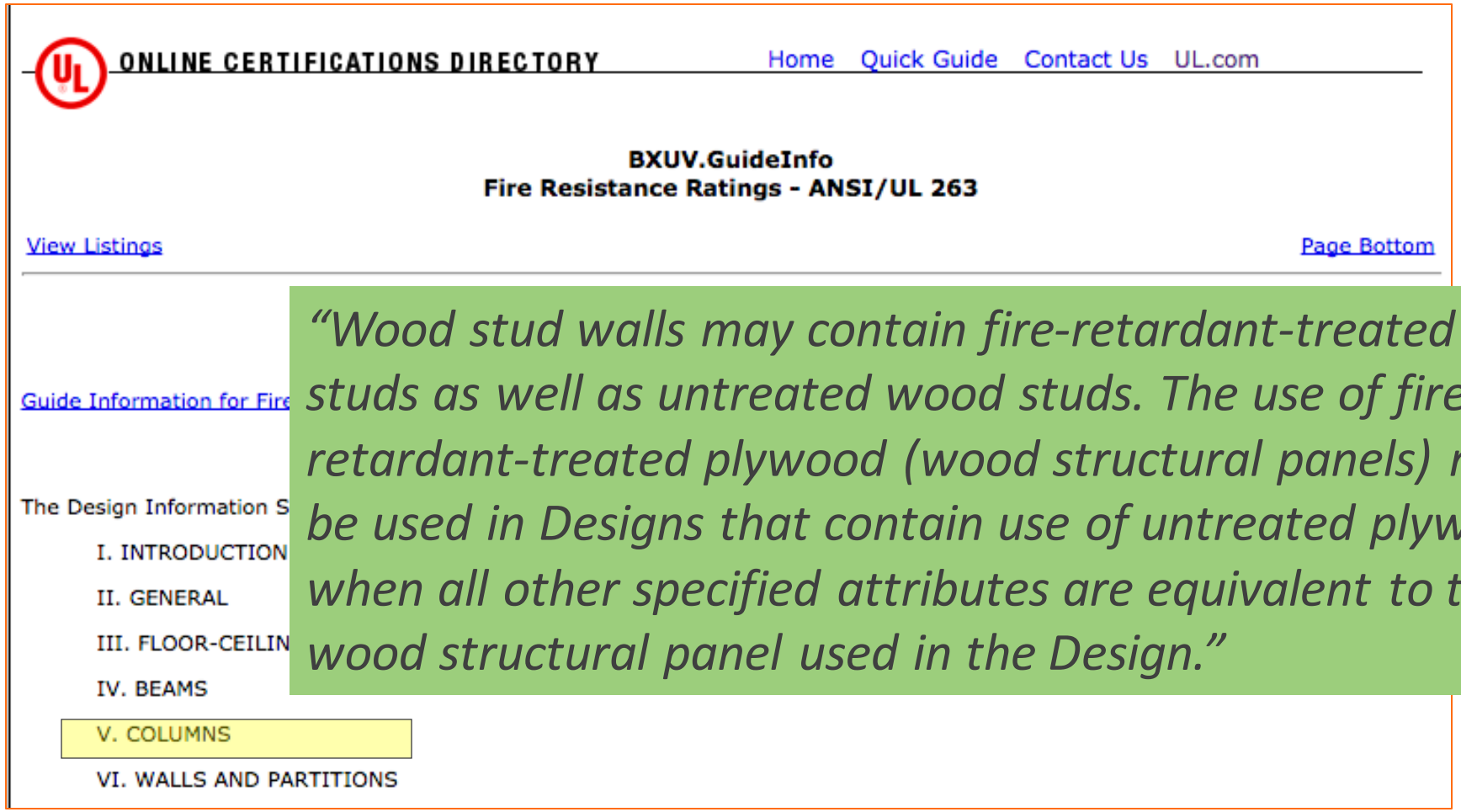
Bearing Wall Rating - 2 Hr Rating Exposed to Fire on Interior Face

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



1) Wood Studs
2) Two Layers -5/8” Gypsum Board
3) Joints covered with tape and joint compound
4) Batts and Blankets
5) FRT Plywood
6) Exterior Facings

Exterior Walls – Using FRT Studs



ONLINE CERTIFICATIONS DIRECTORY

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BXUV.GuideInfo
Fire Resistance Ratings - ANSI/UL 263

View Listings Page Bottom

Guide Information for Fire

The Design Information S

I. INTRODUCTION

II. GENERAL

III. FLOOR-CEILIN

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."

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 – Bearing vs. Nonbearing

Non loading-bearing exterior walls may have lower fire resistance rating requirements than bearing walls in certain situations. IBC Chapter 2 defines load bearing walls as:

[BS] WALL, LOAD-BEARING. Any wall meeting either of the following classifications:

1. Any metal or wood stud wall that supports more than 100 pounds per linear foot (1459 N/m) of vertical load in addition to its own weight.

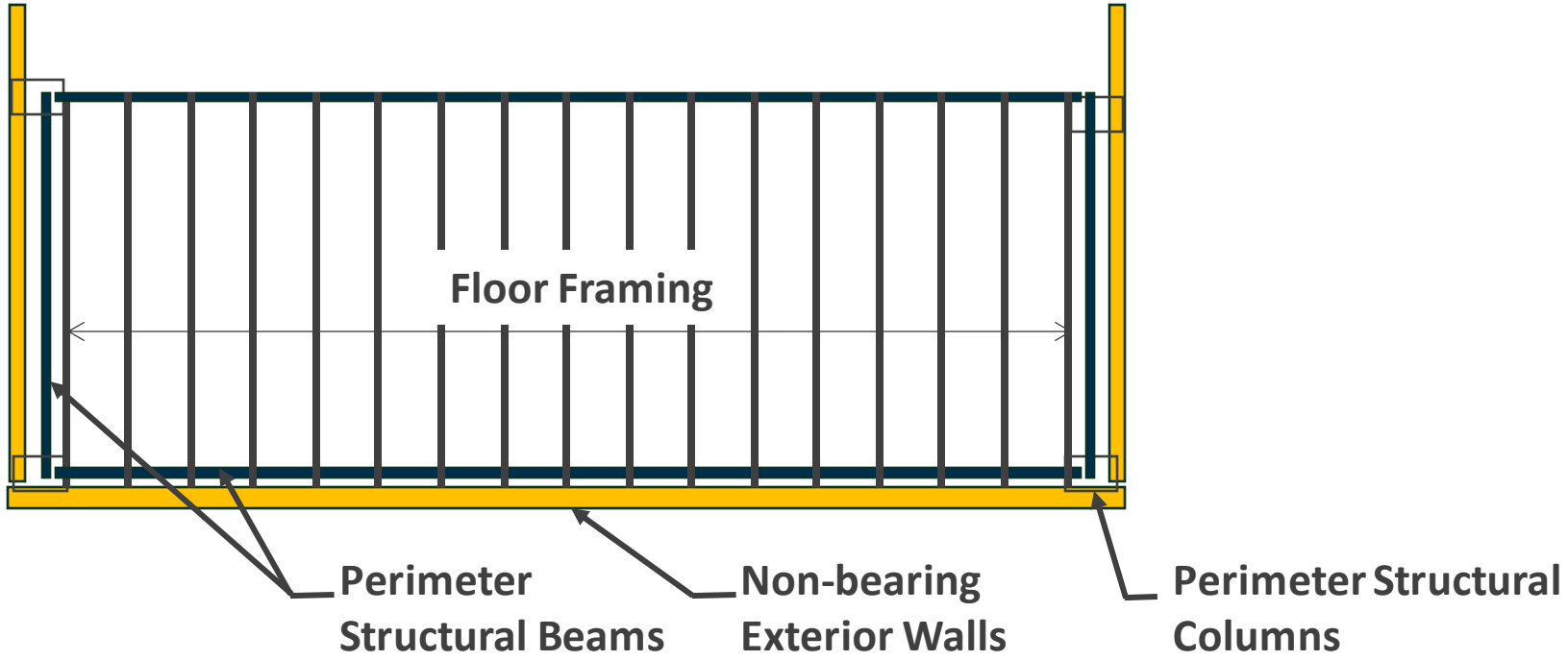
[BS] **WALL, NONLOAD-BEARING.** Any wall that is not a *load-bearing wall*.

Note that 2x6 exterior wall weighs an average of 12 lbs. pers square foot (vertically) based upon ASCE 7, table C-3.1-1A recommendations. At 8' in height, the dead load of the wall will be 96 lbs per lineal foot. Additional height or any floor/roof loading limits the ability to define an exterior wall as *nonload-bearing.*

Exterior Walls – Bearing vs. Non-Bearing

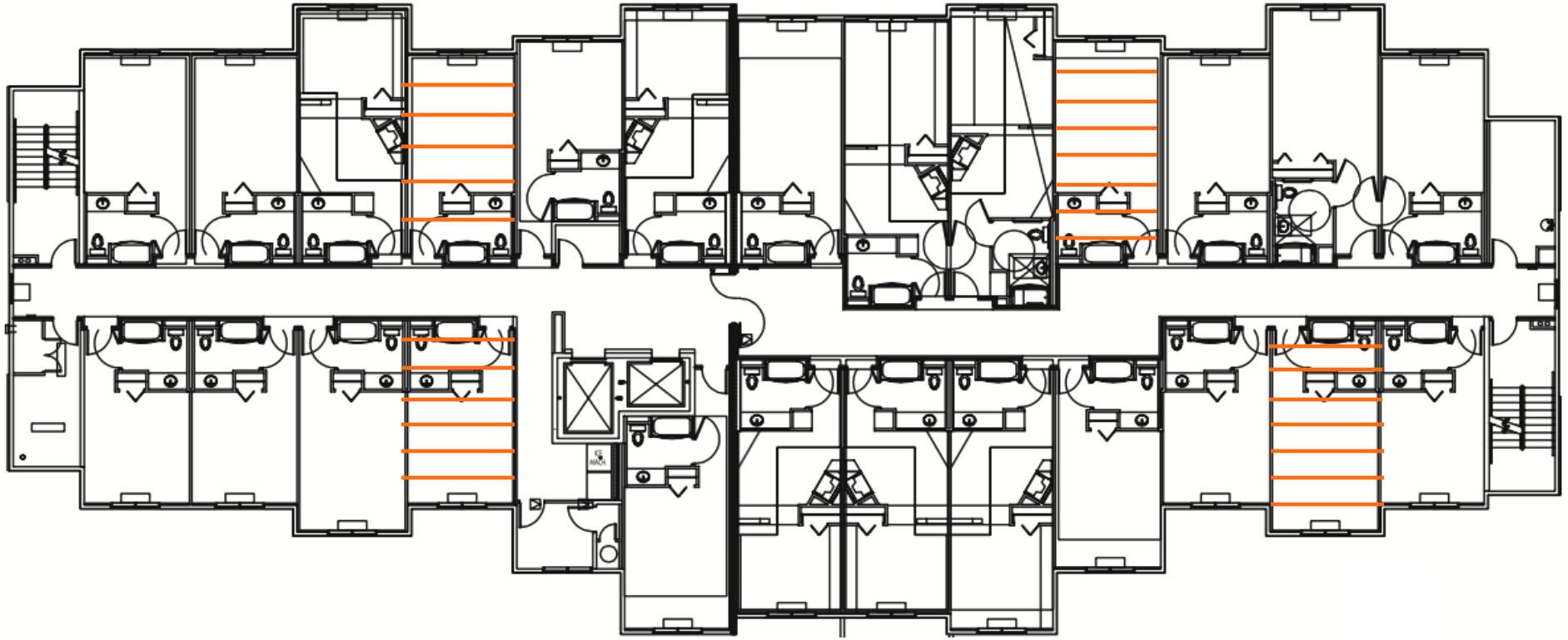
Utilization of structural beams in-board or directly over exterior walls can make walls non-bearing and reduce required fire resistance rating to 1-hr or 0-hr (IBC Table 602)

Note: Beams & Columns will most likely be considered “Primary Structural Frame” & require individual encasement per IBC 704



Exterior Walls – Bearing vs. Non-Bearing

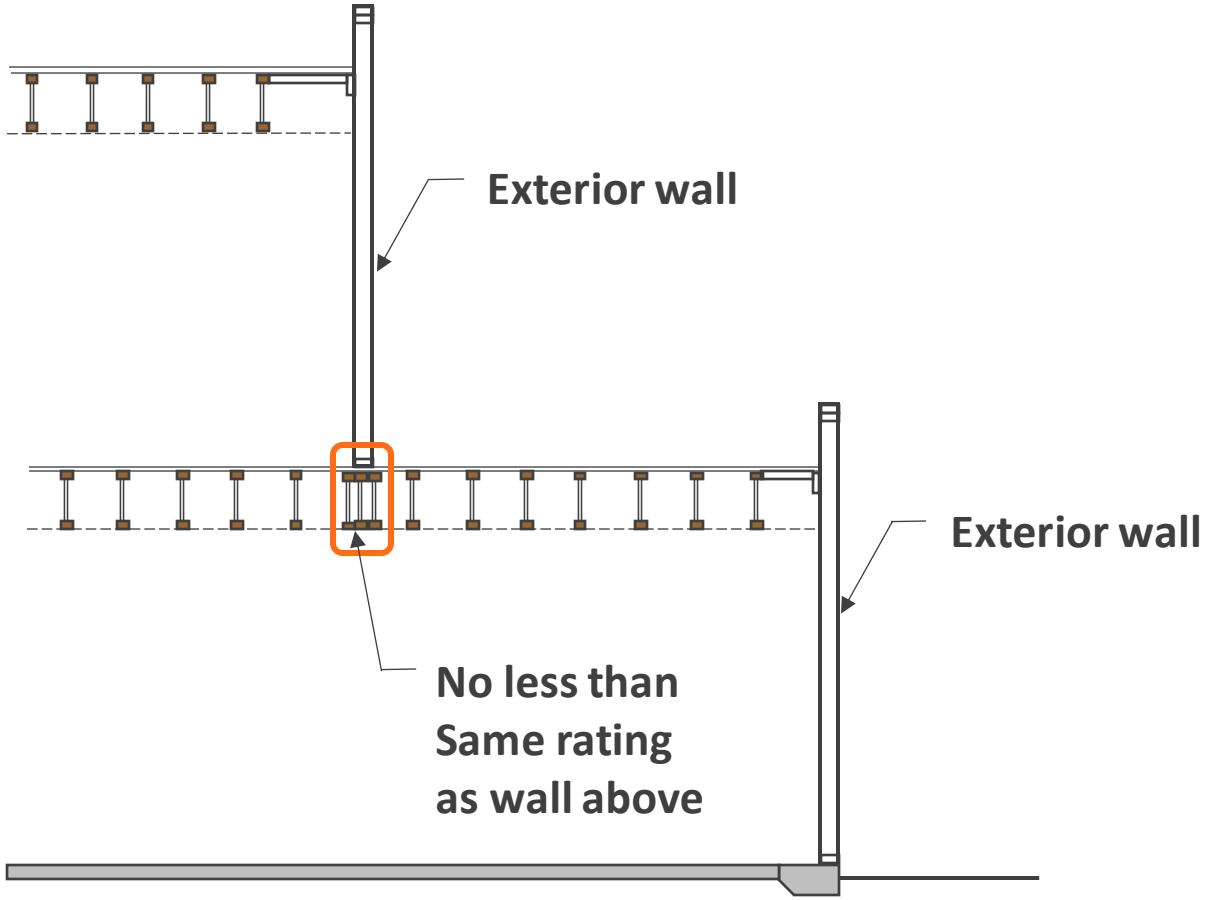
If framing parallel to long exterior walls is possible, minimizes area of load bearing exterior walls



Exterior Walls – Vertical Offsets

There is no requirement for an exterior wall to extend to the foundation in a stepped building.

Posts, beams or walls, that support a rated exterior wall must be fire-resistance rated not less than the rating of the supported wall (IBC 704.1)



Outline

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- **Exterior Wall to Floor Intersection**
  - Fire Resistant Continuity
  - Fire Retardant Continuity
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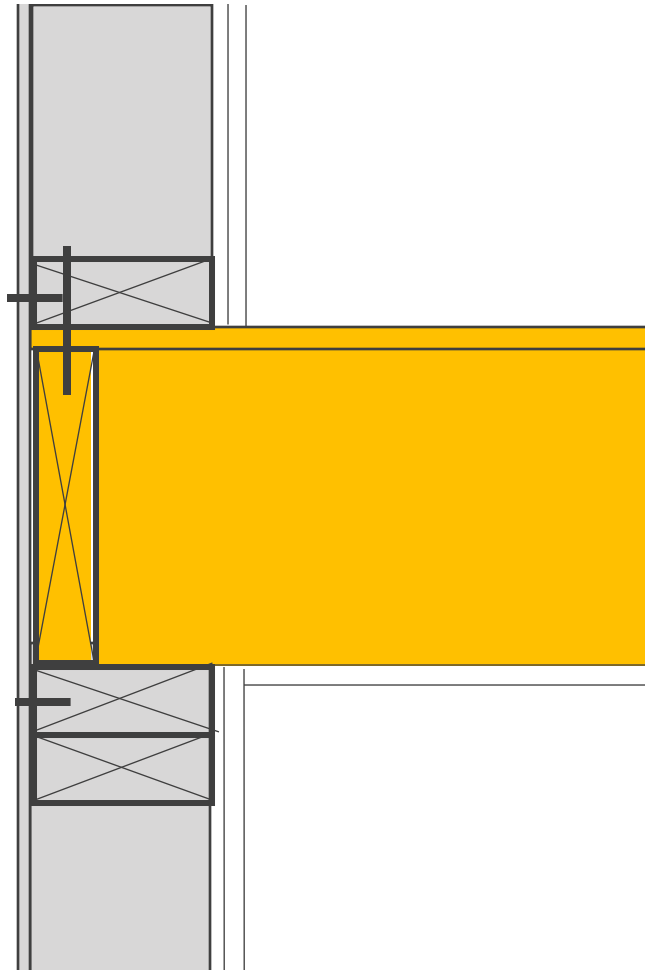
1430 Q, The HR Group Architects, Buehler Engineering, Greg Folkins Photography

Platform Framing



Structural

» Direct bearing/no add'l hardware

» May require load transfer blocking for concentrated loads from above

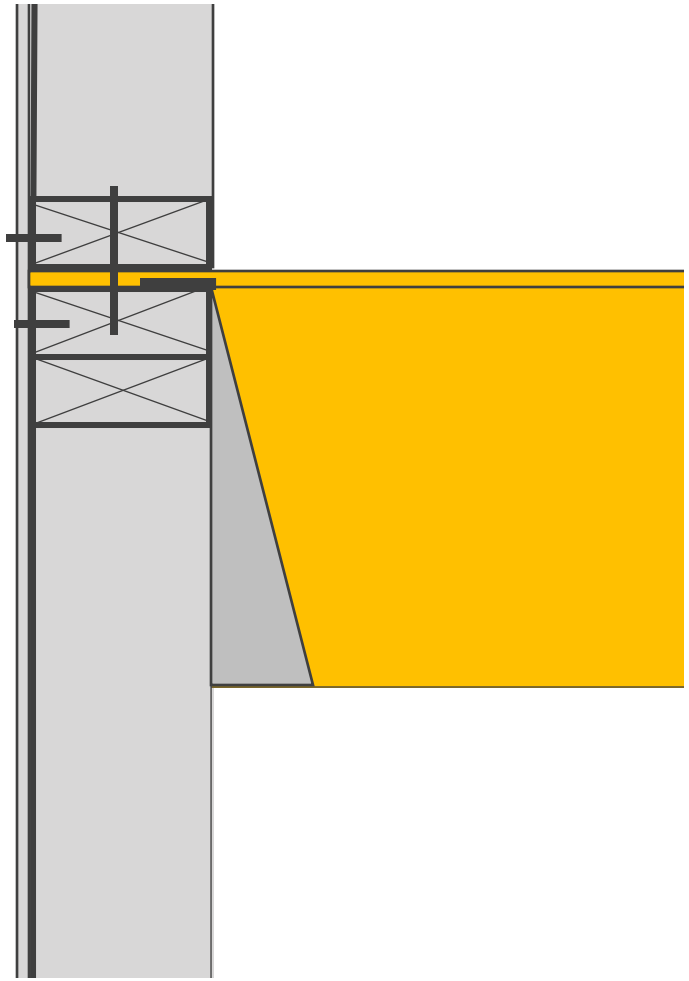
» Wall sole plate and floor sheathing crushing may need to be considered

Constructability

» Framing can be completed before drywall and insulation are installed

» Common length studs

Semi-balloon Framing



Structural

» Additional hardware/no direct bearing

» No load transfer blocking req'd

Rated Assemblies

» May accommodate continuity in exterior walls in type III construction

Constructability

» Framing can be completed before drywall and insulation are installed

» Custom length studs

» Can help minimize building shrinkage

Intersection of Assemblies – Ratings

Key Differences in Fire Ratings for Construction Types			
	IIIA	IIIB	VA
Exterior wall framing	FRT	FRT	non-FRT
Exterior bearing wall fire rating	**2 hr**	**2 hr**	1 hr
Floor assembly fire rating	1 hr	0 hr	1 hr

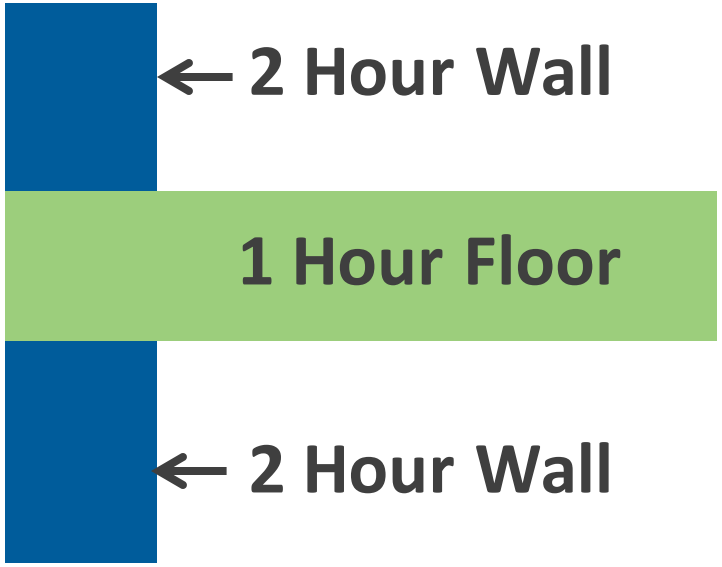
Referencing IBC Tables 601 & 602* (2018 IBC)

***Table 705.5 (2021 & 2024 IBC)**

Note: FRT = Fire Retardant Treated

Intersection of Tested Assemblies

- Many options are available for fire resistance tested floor assemblies and wall assemblies
- No tested intersection details exist
- We must understand the intent of the code, provide a rationale that meets the code's intent, and utilize available information and testing results



Intersection of Tested Assemblies

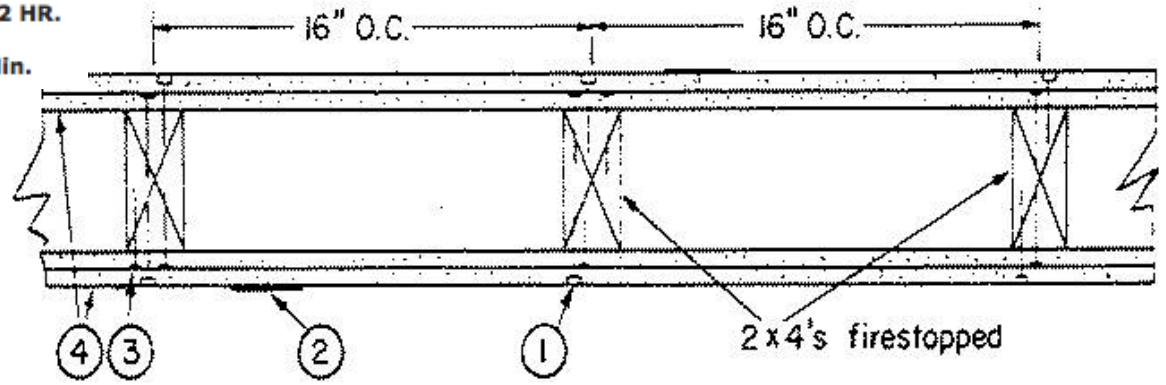
2 Hour Wall

Design No. U301

May 20, 2015

Bearing Wall Rating — 2 HR.

Finish Rating — 66 Min.

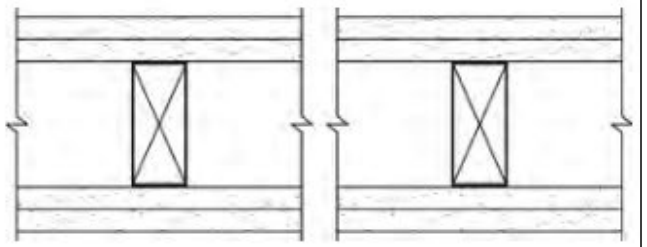


GA FILE NO. WP 4135	GENERIC	2 HOUR FIRE	40 to 44 STC SOUND

GYPSUM WALLBOARD, WOOD STUDS

Base layer 5/8" type X gypsum wallboard or gypsum veneer base applied at right angles to each side of 2 x 4 wood studs 24" o.c. with 6d coated nails, 1 7/8" long, 0.085" shank, 1/4" heads, 24" o.c. **Face** layer 5/8" type X gypsum wallboard or gypsum veneer base applied at right angles to each side with 8d coated nails, 2 3/8" long, 0.100" shank, 1/4" heads, 8" o.c.

Joints staggered 24" each layer and side. Sound tested with studs 16" o.c. and with nails for **base** layer spaced 6" o.c. **(LOAD-BEARING)**



Thickness:	6 1/8"
Approx. Weight:	12 psf
Fire Test:	FM WP 360, 9-27-74
Sound Test:	NGC 2363, 4-1-70

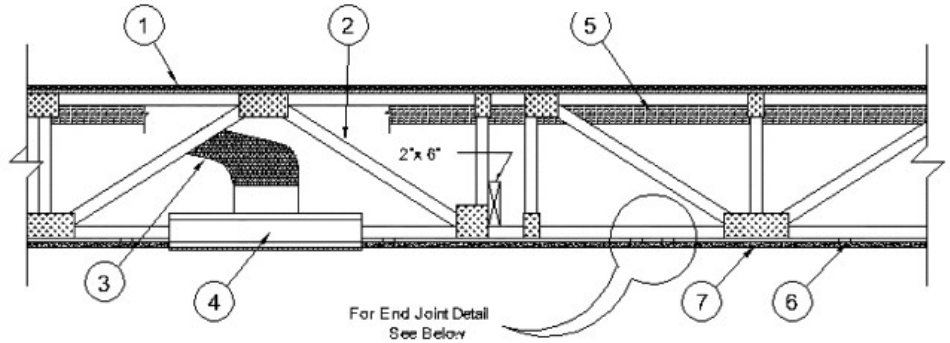
Intersection of Tested Assemblies

1 Hour Floor

Design No. L550

August 27, 2015

Unrestrained Assembly Rating — 1 Hr.



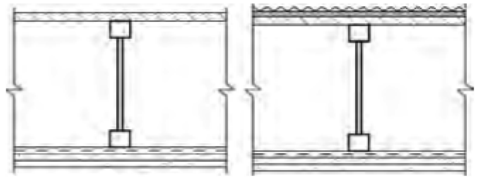
FLOOR-CEILING SYSTEMS, WOOD FRAMED

GA FILE NO. FC 5111	GENERIC	1 HOUR FIRE	50 to 54 STC SOUND

WOOD I-JOISTS, GYPSUM WALLBOARD, RESILIENT CHANNELS

Base layer 1/2" type X gypsum wallboard applied at right angles to resilient channels 16" o.c. with 1 1/4" Type S drywall screws 12" o.c. Resilient channels applied at right angles to minimum 9 1/2" deep wood I-joists, with minimum 1 1/4" deep x 1 1/2" wide flanges and minimum 3/8" webs, 24" o.c. with 1 1/4" Type W drywall screws. **Face** layer 1/2" type X gypsum wallboard applied at right angles to channels with 1 5/8" Type S drywall screws 12" o.c. Face layer end joints located midway between channels and attached to base layer with 1 1/2" Type G screws 12" o.c. Edge joints offset 24" from base layer edge joints. Wood I-joists supporting 5/8" oriented strand board applied at right angles to I-joists with 8d common nails 12" o.c.

STC and IIC tested with 40 oz carpet over 1/4" foam pad.



Approx. Ceiling Weight:	5 psf
Fire Test:	NRCC A-4440.1 (Revised), 6-24-97
Sound Test:	NRCC B-3150.2, 6-30-00
IIC & Test:	(68 C & P) NRCC B-3150.2, 6-30-00

Type III Exterior Walls – Fire Retardant Treated Wood (FRTW)

Type III and IV-HT Construction - IBC Section 602.3 & 602.4:

Fire-retardant-treated wood framing complying with Section 2303.2 shall be permitted within exterior wall assemblies of a 2-hour rating or less

What does this FRTW requirement include?

- Wall Framing (Studs & Plates) – **Yes**
- Wall Sheathing – **Yes**
- Floor sheathing – **No, based upon 2024 (consult AHJ for prior IBC)**
- Rim Joist- **No, based upon 2024 IBC (consult AHJ for prior IBC)**
- Floor Joists- **No, based upon 2024 IBC (consult AHJ for prior IBC)**

Exterior Walls – Intersecting Floors

Some have interpreted the allowance of FRT framing in exterior walls of type III construction as not including FRT wall sheathing. The inclusion of wall sheathing is intended in the allowance of FRT framing.

Changes to the 2018 IBC clarified this and remains in 2021 and 2024 IBC

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.

602.4 Type IV.

Type IV construction is that type of construction in which the exterior walls are of noncombustible materials and the interior building elements are of solid wood, laminated wood, heavy timber (HT) or structural composite lumber (SCL) without concealed spaces. The minimum dimensions for permitted materials including solid timber, glued-laminated timber, structural composite lumber (SCL), and cross-laminated timber and details of Type IV construction shall comply with the provisions of this section and Section 2304.11. Exterior walls complying with Section 602.4.1 or 602.4.2 shall be permitted. Interior walls and partitions not less than 1-hour fire-resistance rating or heavy timber complying with Section 2304.11.2.2 shall be permitted.

Relocated

602.4.1 Fire-retardant-treated wood in exterior walls.

Fire-retardant-treated wood framing and sheathing complying with Section 2303.2 shall be permitted within exterior wall assemblies not less than 6 inches (152 mm) in thickness with a 2-hour rating or less.

Exterior Walls – Structural Stability

IBC 705.6 (2018 & 2021 IBC) / IBC 705.7 (2024 IBC)

Structural Stability:

Exterior walls shall extend to the height required by 705.11. Interior structural elements that brace the exterior wall but that are not located within the plane of the exterior wall shall have the minimum fire resistance rating required in Table 601 for that structural element. Structural elements that brace the exterior wall but are located outside of the exterior wall or within the plane of the exterior wall shall have the minimum fire resistance rating required in Tables 601 or 602 (705.5 in 2021 & 2024 IBC) for the exterior wall.

Code Commentary – Fire Rating

2018 & 2021 IBC 705.6

- Structural stability of fire-resistance-rated construction is an important concern. Section 705.6 requires elements providing bracing support to be fi
tance rated for the same duration of time as t
rior wall. In light-frame platform construction,
require that the band joist or beam suppor
floor and the wall above to also be of fire-
construction. Although the floor constructi
may not be required to be of fire-resistan
construction in Type IIB and VB constructio
effort must be made to ensure that the floor
least at the exterior wall, are of fire-resista
construction. Although the floor framing acts
eral support for the exterior wall, this section
require that the entire floor system be of fi
tance-rated construction. To state otherwise would prohibit Type IIB and VB buildings with an FSD of less than 10 feet (3048 mm). Only the structural element within the floor system that supports the vertical load of the wall must be of fire-resistance-rated construction.

"In light-frame platform construction, this will require that the **band joist or beam supporting the floor and the wall above to also be of fire-resistant construction**… Although the floor framing acts as a lateral support for the exterior wall, **this section does not require that the entire floor system be of fire-resistance rated construction**."

This commentary is specific to the fire-resistant construction and should not be implied to indicate that the member should be FRT

IBC 2024 Changes:
Exterior Floor to Wall Intersections

Two key additions to the code language were included in the 2024 IBC to help clarify platform framed floor-to-exterior wall details, particularly Type III construction.

705.6 CONTINUITY:

The addition of code language specifically addressing continuity of the fire-resistance rating of exterior walls was added as section 705.6

705.7.1 FLOOR ASSEMBLIES IN TYPE III CONSTRUCTION:

The addition of code language specifically addressing fire-resistance ratings for portions of floor assemblies intersecting exterior walls in Type III construction and the material allowed for intersecting structure.

IBC 2024 Addition: Continuity

705.6 Continuity. The *fire-resistance rating* of *exterior walls* shall extend from the top of the foundation or floor/ceiling assembly below to one of the following:

1. The underside of the floor sheathing, roof sheathing, deck or slab above.
2. The underside of a floor/ceiling or roof/ceiling assembly having a *fire-resistance rating* equal to or greater than the *exterior wall* and the *fire separation distance* is greater than 10 feet.

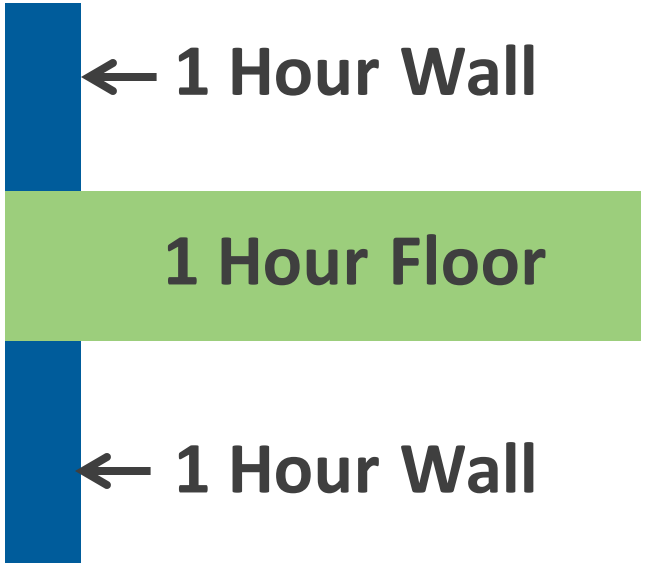
Parapets shall be provided as required by Section 705.12.

Example 1:

Type VA Construction, Group R-2

1 hour FRR exterior wall, supported by 1 hour FRR floor.

If the FRR rating of the floor is equal or greater than the FRR supported exterior wall, then the wall is only required to extend to the underside of the rated floor/ceiling assembly



IBC 2024 Addition: Continuity

705.6 Continuity. The *fire-resistance rating* of *exterior walls* shall extend from the top of the foundation or floor/ceiling assembly below to one of the following:

1. The underside of the floor sheathing, roof sheathing, deck or slab above.
2. The underside of a floor/ceiling or roof/ceiling assembly having a *fire-resistance rating* equal to or greater than the *exterior wall* and the *fire separation distance* is greater than 10 feet.

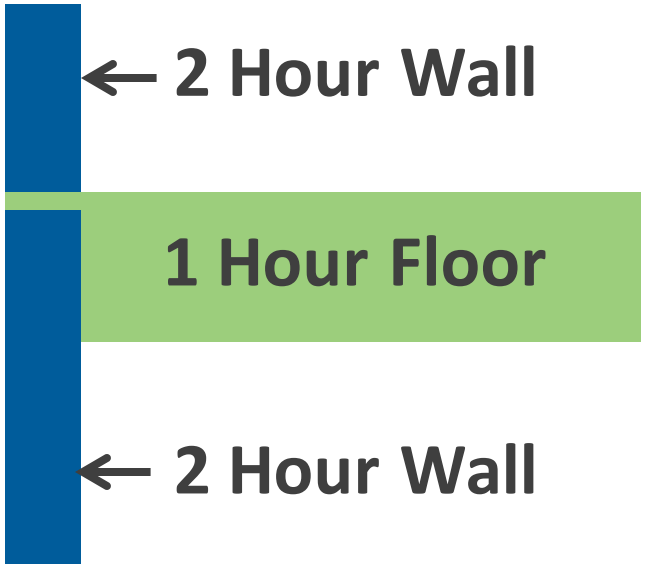
Parapets shall be provided as required by Section 705.12.

Example 2:

Type IIIA Construction, Group R-2

2 hour FRR exterior wall, supported by 1 hour FRR floor

If the FRR of the floor assembly is less than the FRR rating of the exterior wall assembly, then the fire resistance rating of the wall must continue to the underside of the floor/ceiling assembly



IBC 2024 Additions: Continuity

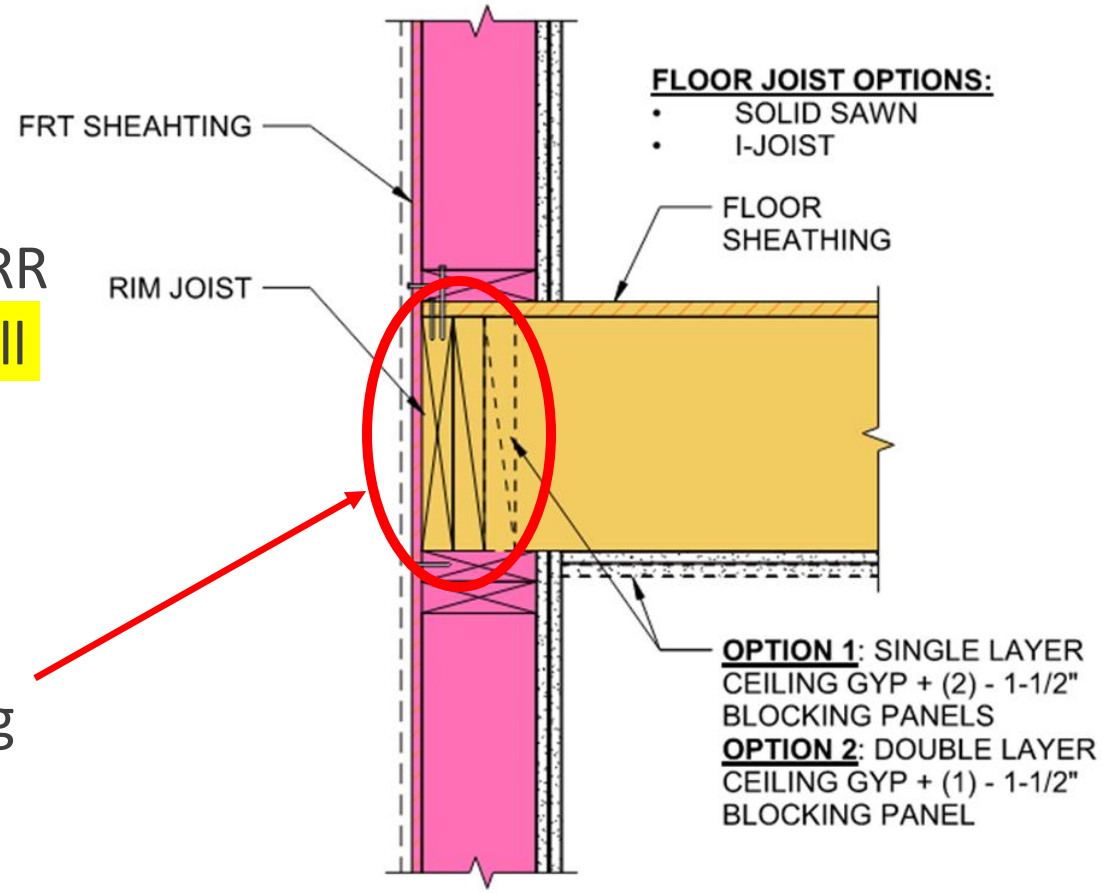
Continuity of Fire Resistance Without Membrane

Type IIIA Construction, Group R-2

2 hour FRR exterior wall, 1 hour FRR floor

Since FRR of the exterior wall is greater than FRR of the floor, the fire resistance rating of the wall must be continuous to the underside of the floor/roof sheathing.

The *membrane* (typically gypsum) need not be continuous to the underside of the floor/ceiling sheathing as long as the FRR of the wall /floor meets or exceeds the FRR of the exterior wall.



IBC 2024 Addition:
Floor Assemblies in Type III Construction

The addition of new code language specifically addressing fire-resistance ratings for portions of floor assemblies intersecting exterior walls in Type III construction.

705.7.1 Floor assemblies in Type III construction. In Type III construction where a floor assembly supports gravity loads from an *exterior wall*, the *fire-resistance rating* of the portion of the floor assembly that supports the *exterior wall* shall be not less than the *fire-resistance rating* required for the *exterior wall* in Table 601. The *fire-resistance rating* provided by the portion of the floor assembly supporting and within the plane of the *exterior wall* shall be permitted to include the contribution of the ceiling membrane when considering exposure to fire from the inside. Where a floor assembly supports gravity loads from an *exterior wall*, the *building elements* of the floor construction within the plane of the *exterior wall*, including but not limited to rim joists, rim boards and blocking, shall be in accordance with the requirements for interior *building elements* of Type III construction.

The highlighted text states that the fire resistance of the floor assembly elements supporting, and within the plane of the exterior wall, shall be permitted to include the contribution of the ceiling membrane (typically gypsum) within the calculated fire resistance.

IBC 2024 Addition:
Floor Assemblies in Type III Construction

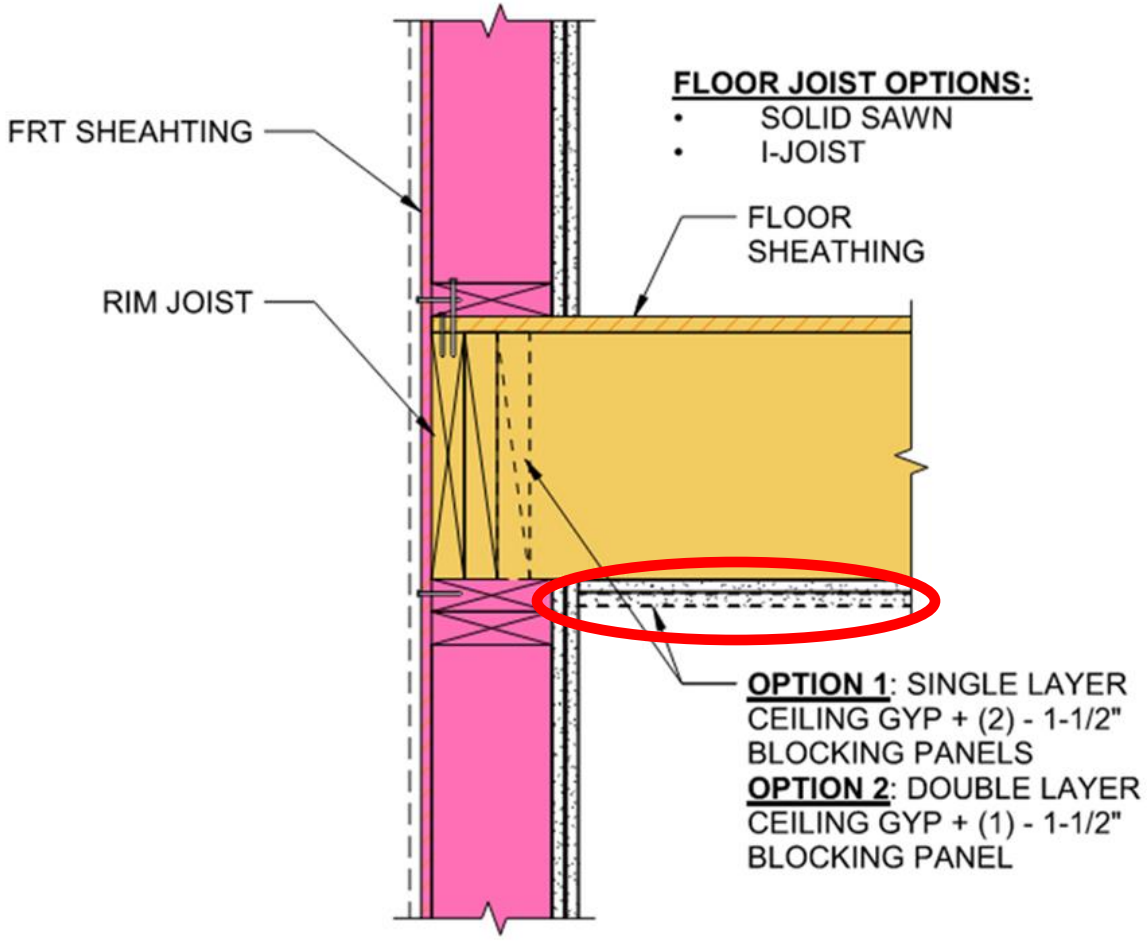


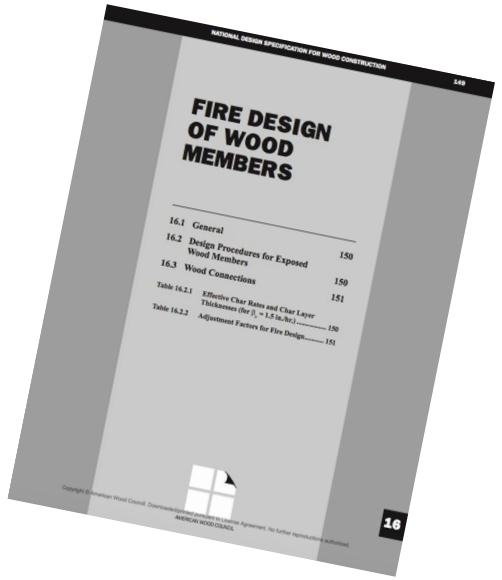
Table 722.2.1.4(2) [excerpt]

TIME ASSIGNED TO FINISH MATERIALS ON FIRE-EXPOSED SIDE OF WALL

3/8” Gypsum Wallboard	10 min.
1/2” Gypsum Wallboard	15 min.
5/8” Gypsum Wallboard	20 min.
2 layers of 3/8” Wallboard	25 min.
2 layers of ½” Wallboard	40 min.
1/2” Type X Gypsum Wallboard	25 min.
5/8” Type X Gypsum Wallboard	40 min.

Contribution of the Ceiling Membrane

To establish the req'd minimum fire resistance rating for the building elements supporting or within the plane of the exterior wall, the IBC designates the use of Chapter 16 of the National Design Standard for calculation of fire resistance for wood building elements in section 722.



SECTION 722—CALCULATED FIRE RESISTANCE

722.1 General. The provisions of this section contain procedures by which the *fire resistance* of specific materials or combinations of materials is established by calculations. These procedures apply only to the information contained in this section and shall not be otherwise used. The calculated *fire resistance* of specific materials or combinations of materials shall be established by one of the following:

1. *Concrete,* concrete *masonry* and clay *masonry* assemblies shall be permitted in accordance with ACI 216.1/TMS 0216.
2. Precast and precast, prestressed *concrete* assemblies shall be permitted in accordance with PCI 124.
3. Steel assemblies shall be permitted in accordance with Chapter 5 of ASCE 29.
4. Exposed wood members and wood decking shall be permitted in accordance with Chapter 16 of ANSI/AWC NDS.

Calculating FRR of Floor Elements

Chapter 16 of the 2024 NDS references the Fire Design Specification for Wood Construction

2024 NDS - 16.1 General

Where determinations of thermal separation and burn-through resistance are required, calculations shall be in accordance with the *Fire Design Specification for Wood Construction*

Calculating the FRR of Floor Elements

The 2021 FDS provides guidance for calculating the contribution of the ceiling membrane toward the fire resistance rating of the building elements supporting or within the plane of the exterior wall.

3.8.1 Calculating the Structural Fire Resistance Time

The structural fire resistance time of a wood assembly shall be equal to the sum of the structural fire resistance times assigned to the wood members in 3.8.1.1 and the protection times assigned protective membrane on the fire-exposed side in accordance with 3.8.1.2. The membrane on the unexposed side shall not be included in determining the structural fire resistance time of the assembly.

Contribution of the Ceiling Membrane

The 2021 FDS provides guidance for calculating the contribution of the ceiling membrane toward the fire resistance rating of the building elements supporting or within the plane of the exterior wall.

Table 3.3.2.1 Fire Resistance Time for Type X Gypsum Panel Products

Protection Description [1]	Gypsum Panel Cover of Members [2, 3]	Gypsum Panel Membrane Protection of Members & Assemblies [4, 5, 6, 7]		Protection Time, t_p
	Maximum Fastener Spacing (inches)	Maximum Framing Spacing (inches)	Maximum Fastener Spacing (inches)	(minutes)
1/2-inch Type X Gypsum Panel Product	12	16 24	12 8	30 [8]
5/8-inch Type X Gypsum Panel Product	12	16 24	12 8	40 [9]

Contribution of the Ceiling Membrane

The 2021 FDS provides guidance for calculating the contribution of the ceiling membrane which can also include the insulation within the floor/ceiling system as part of the membrane contribution.

3.3.3.2 *Insulation as part of a membrane*: Where mineral wool or fiberglass insulation batts are used as part of a membrane to protect the entire wood member or wood assembly, the protection time calculated in 3.3.3.1 shall be the added protection time. Protection times specified in Table 3.3.3.1 shall not be additive with each other and shall not be increased for additional insulation thickness, density, or R-value.

Table 3.3.3.1 Fire Resistance Time for Protected Wood Surfaces

Insulation Description	Minimum Thickness (inches)	Protection Time, t_p, (minutes)
Mineral wool batts (minimum nominal density: 2.5 pcf)	3.5	19
	1.5	17
Fiberglass batts (minimum R-13)	3.5	3

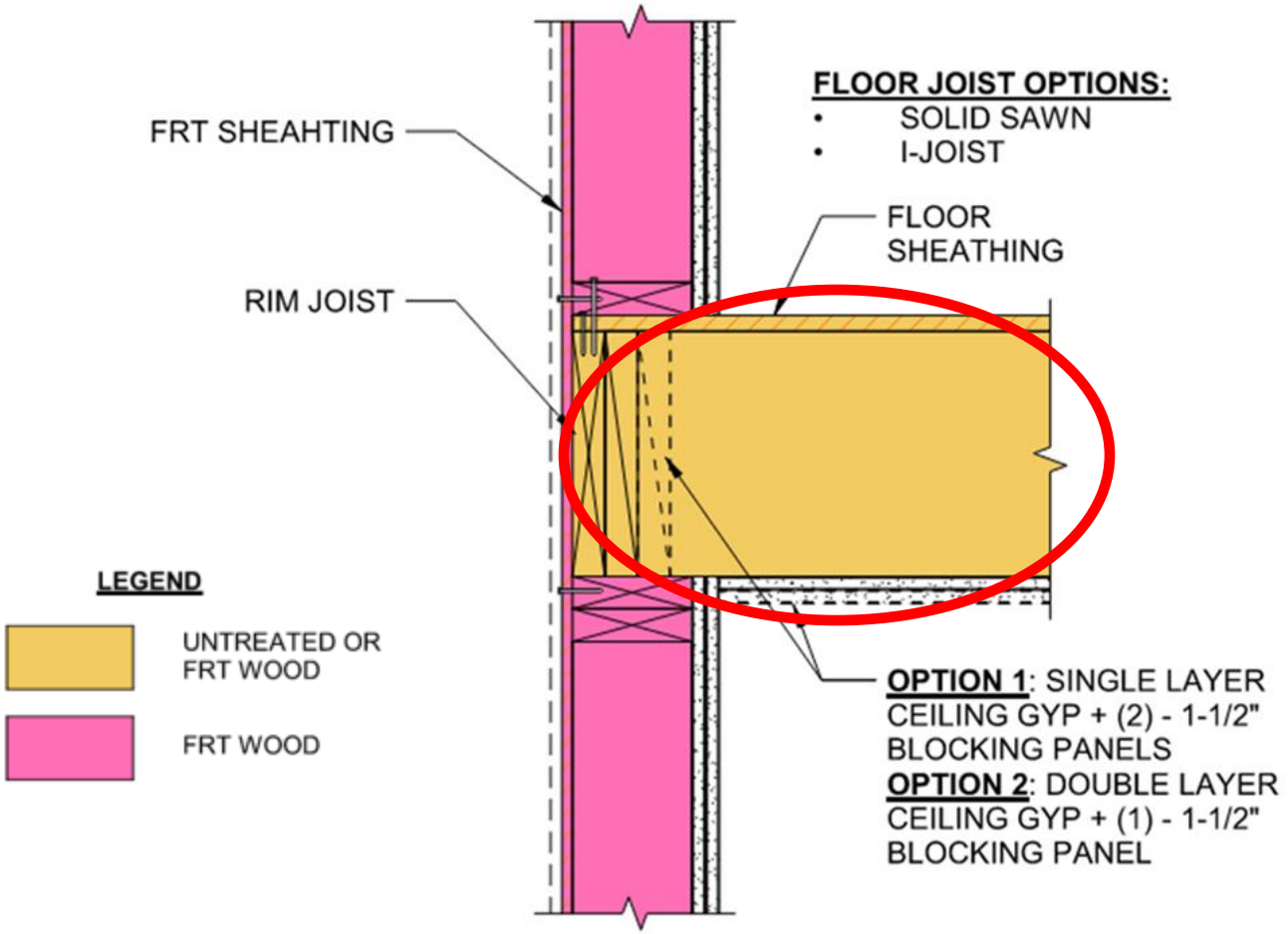
IBC 2024 Addition:
Floor Assemblies in Type III Construction

The addition of new code language specifically addressing fire-resistance ratings for portions of floor assemblies intersecting exterior walls in Type III construction.

705.7.1 Floor assemblies in Type III construction. In Type III construction where a floor assembly supports gravity loads from an *exterior wall*, the *fire-resistance rating* of the portion of the floor assembly that supports the *exterior wall* shall be not less than the *fire-resistance rating* required for the *exterior wall* in Table 601. The *fire-resistance rating* provided by the portion of the floor assembly supporting and within the plane of the *exterior wall* shall be permitted to include the contribution of the ceiling membrane when considering exposure to fire from the inside. Where a floor assembly supports gravity loads from an *exterior wall*, the *building elements* of the floor construction within the plane of the *exterior wall*, including but not limited to rim joists, rim boards and blocking, shall be in accordance with the requirements for interior *building elements* of Type III construction.

The highlighted text states that the building elements of the floor construction within the plane of the exterior wall shall be in accordance with the requirements for interior elements of type III construction. Rim joists, rim boards, and blocking (including, but not limited to) need not be constructed of fire-retardant-treated material.

IBC 2024 Addition:
Floor Assemblies in Type III Construction



The 2024 language of 705.7.1 clarifies that the building elements of the floor construction, supporting and within the plane of the exterior wall, shall be in accordance with the requirements for interior building elements. Accordingly, those building elements do not typically require the use of Fire-Retardant Treated materials in Type III Construction.

Structural Wood Panels on the exterior are required to be Fire-Retardant Treated as they are not considered part of the floor assembly.

Exterior Walls – Intersecting Floors – AWC DCA3

AWC's DCA3 provides floor to wall intersection detailing options

Addresses both continuity provisions and requirements for FRT elements in exterior wall plane

Fire-Resistance-Rated Wood-Frame Wall and Floor/Ceiling Assemblies

Building Code Requirements

For occupancies such as stores, apartments, offices, and other commercial and industrial uses, building codes commonly require floor/ceiling and wall assemblies to be fire-resistance rated in accordance with standard fire tests. This document is intended to aid in the design of various wood-frame walls and wood-frame floor/ceiling assemblies, where such assemblies are required by code to be fire-resistance-rated.

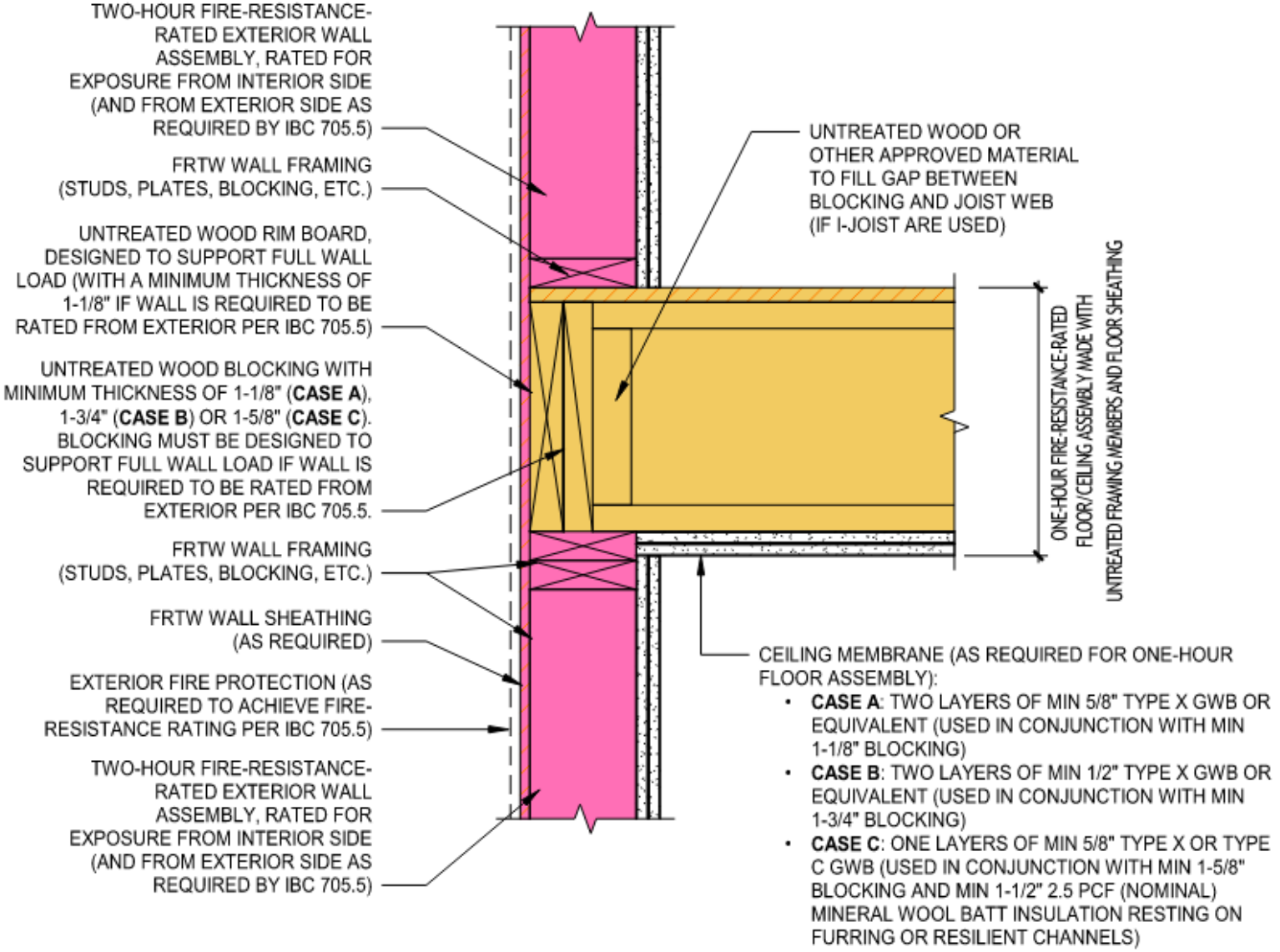
Depending on the application, wall assemblies may need to be fire-resistance-rated for exposure from either one side or both sides. Exterior walls are required to be rated for both interior and exterior fire exposure where the wall has a fire separation distance of 10 feet or less. For exterior walls with a fire separation distance of greater than 10 feet, the required fire-resistance-rating applies only to exposure from the interior. The designer should note that some state and local building code amendments may require fire resistance rating for exposure from both sides of exterior walls, regardless of fire separation distance; however, the solutions and example details provided in this doc-

Fire Tested Assemblies

Fire-resistance-rated wood-frame assemblies can be found in a number of sources including the *International Building Code (IBC)*, Underwriters Laboratories (UL) *Fire Resistance Directory*, Intertek Testing Services' *Directory of Listed Products*, and the Gypsum Association's *Fire Resistance Design Manual* (GA 600). The American Wood Council (AWC) and its members have tested a number of wood-frame fire-resistance-rated assemblies (see photos). Descriptions of successfully tested lumber wall assemblies are provided in Table 1 for one-hour fire-resistance-rated wall assemblies and Table 2 for two-hour fire-resistance-rated wall assemblies. Lumber shall be identified by the grade mark of a lumber grading or inspection agency that has been approved by an accreditation body that complies with the *American Softwood Lumber Standard* (*PS 20*). The fire-resistance-rated assemblies described in this document, as well as those listed in other sources are not species- or grade-specific unless specifically noted as such.

Descriptions of successfully tested I-joist floor as-

Exterior Walls – Intersecting Floors




Design for Code Acceptance 3

Fire-Resistance-Rated Wood-Frame Wall and Floor/Ceiling Assemblies

Building Code Requirements

For occupancies such as stores, apartments, offices, and other commercial and industrial uses, building codes commonly require floor/ceiling and wall assemblies to be fire-resistance rated in accordance with standard fire tests. This document is intended to aid in the design of various wood-frame walls and wood-frame floor/ceiling assemblies, where such assemblies are required by code to be fire-resistance-rated.

Depending on the application, wall assemblies may need to be fire-resistance-rated for exposure from either one side or both sides. Exterior walls are required to be rated for both interior and exterior fire exposure where the wall has a fire separation distance of 10 feet or less. For exterior walls with a fire separation distance of greater than 10 feet, the required fire-resistance-rating applies only to exposure from the interior. The designer should note that some state and local building code amendments may require fire resistance rating for exposure from both sides of exterior walls, regardless of fire separation distance; however, the solutions and example details provided in this document are based on compliance with national model building codes.

Code recognition of one and two-hour wood-frame wall systems is also predicated on successful fire and hose stream testing in accordance with ASTM E119, *Standard Test Methods for Fire Tests of Building Construction Materials*.

Fire Tested Assemblies

Fire-resistance-rated wood-frame assemblies can be found in a number of sources including the *International Building Code (IBC)*, Underwriters Laboratories (UL) *Fire Resistance Directory*; Intertek Testing Services' *Directory of Listed Products*, and the Gypsum Association's *Fire Resistance Design Manual* (GA 600). The American Wood Council (AWC) and its members have tested a number of wood-frame fire-resistance-rated assemblies (see photos). Descriptions of successfully tested lumber wall assemblies are provided in Table 1 for one-hour fire-resistance-rated wall assemblies and Table 2 for two-hour fire-resistance-rated wall assemblies. Lumber shall be identified by the grade mark of a lumber grading or inspection agency that has been approved by an accreditation body that complies with the *American Softwood Lumber Standard (PS 20)*. The fire-resistance-rated assemblies described in this document, as well as those listed in other sources are not species- or grade-specific unless specifically noted as such.

Descriptions of successfully tested I-joist floor assemblies are provided in Table 3 for one-hour fire-resistance-rated floor/ceiling assemblies and Table 4 for two-hour fire-resistance-rated floor/ceiling assemblies. I-joists are required to comply with ASTM D5055, *Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists*. Where resilient channels are specified, single-leg (RC-1) resilient channels shall be used. Alternatively, two-leg

American Wood Council

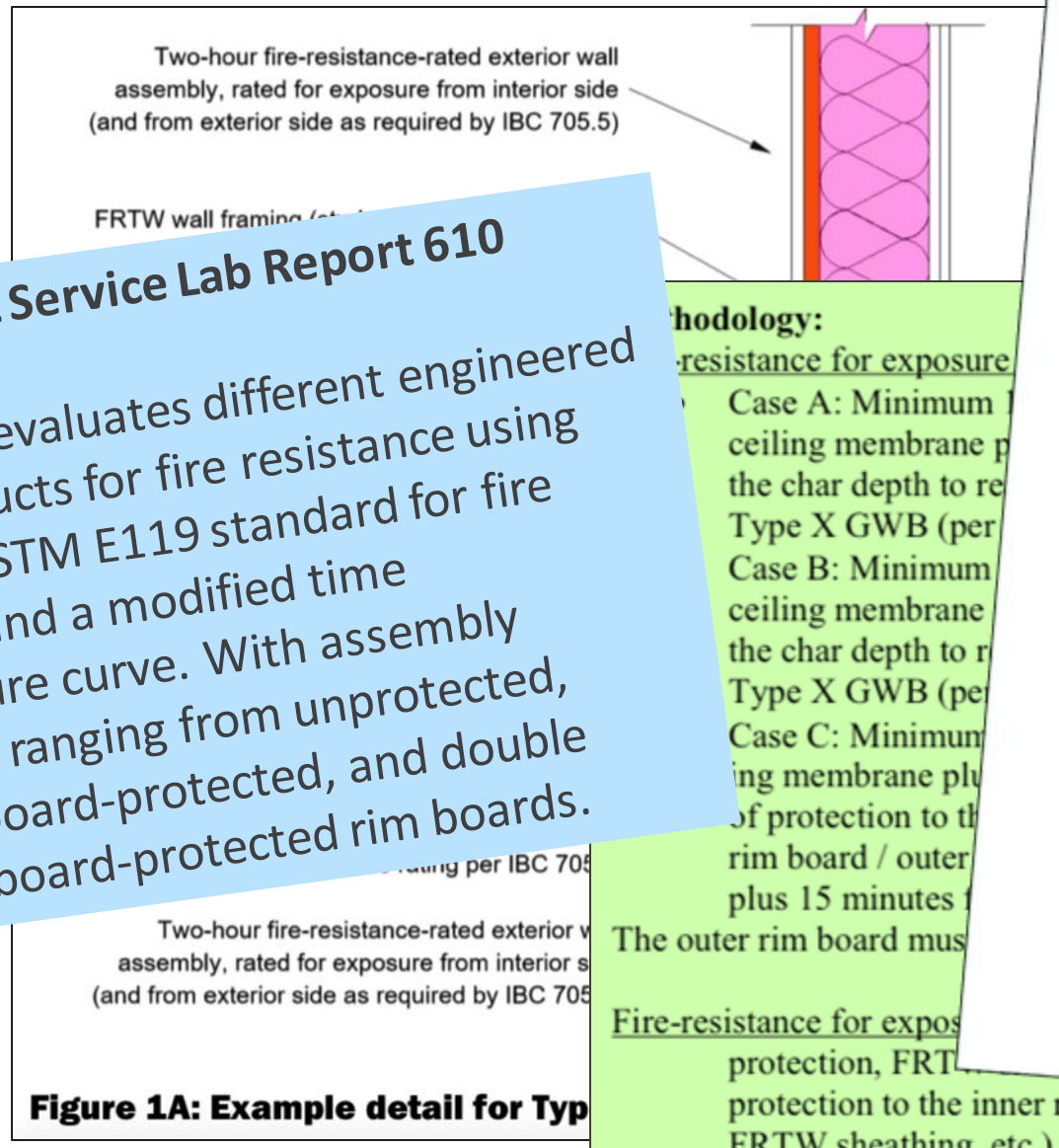
February 2021

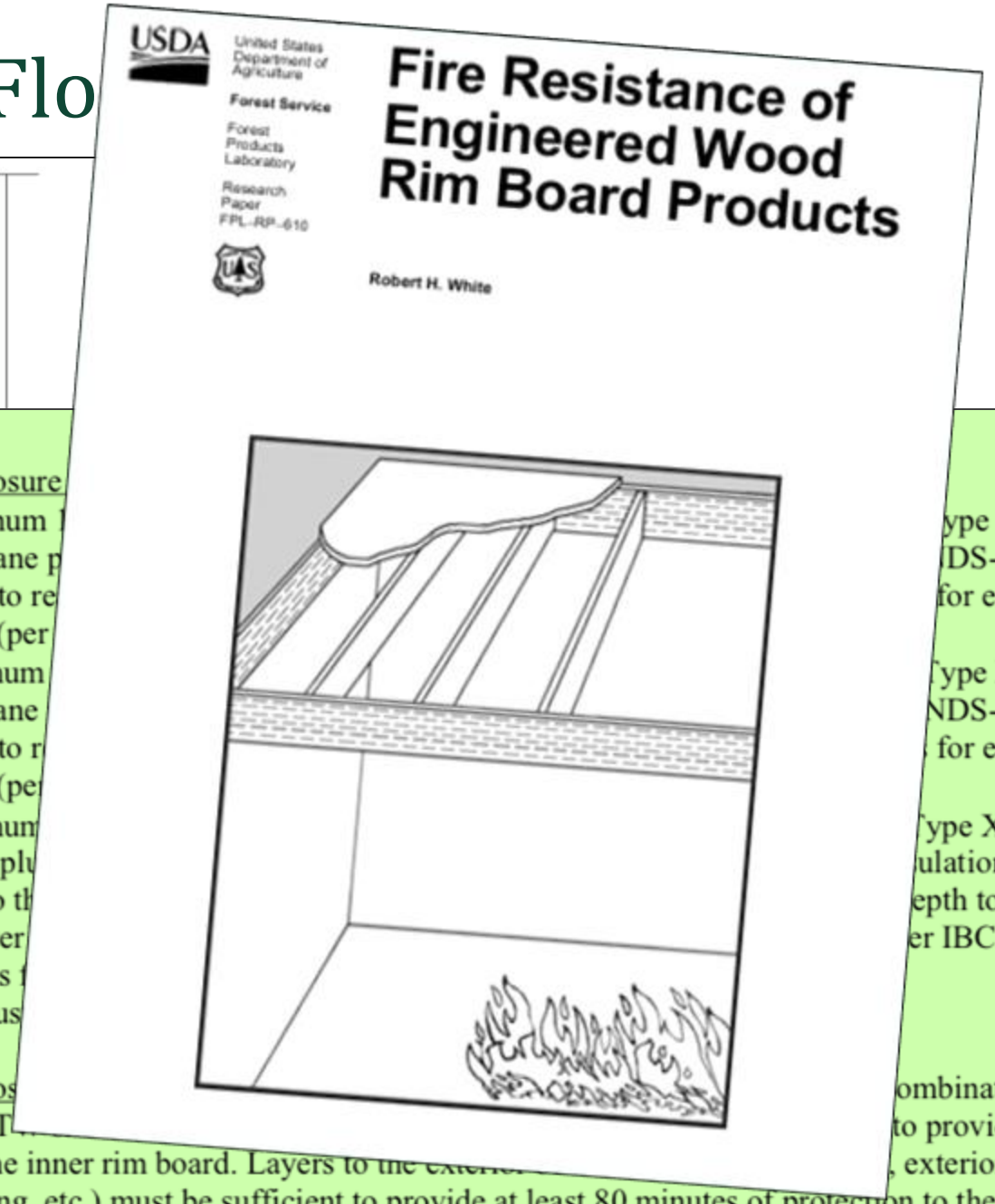
DCA3 Figure 1a: Example Detail for Type IIIA Exterior Wall-Floor Intersection with Rim Board and Blocking

Exterior Walls – Intersecting Flo

USDA Forest Service Lab Report 610

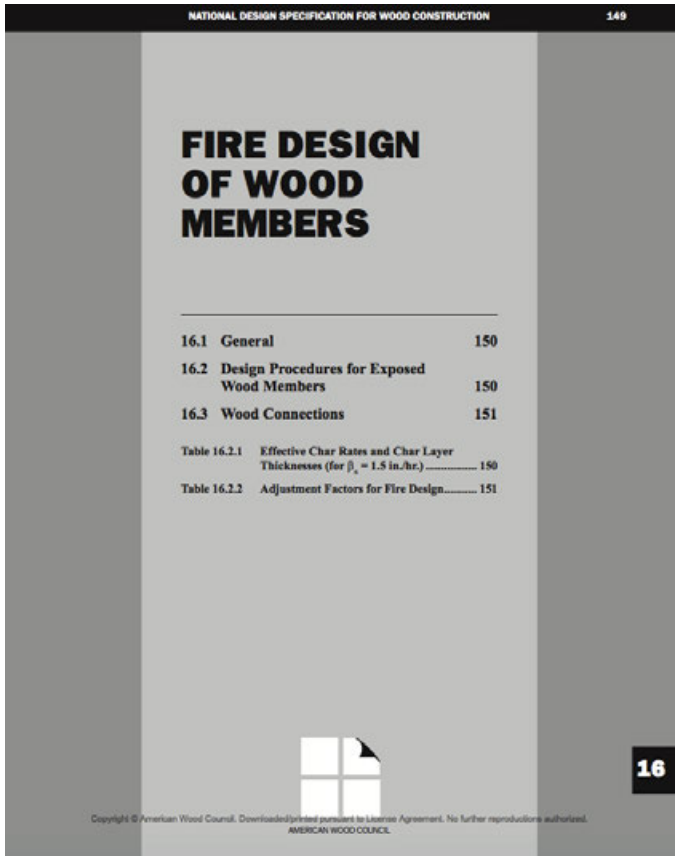
This report evaluates different engineered wood products for fire resistance using both the ASTM E119 standard for fire exposure and a modified time temperature curve. With assembly variations ranging from unprotected, gypsum board-protected, and double gypsum-board-protected rim boards.

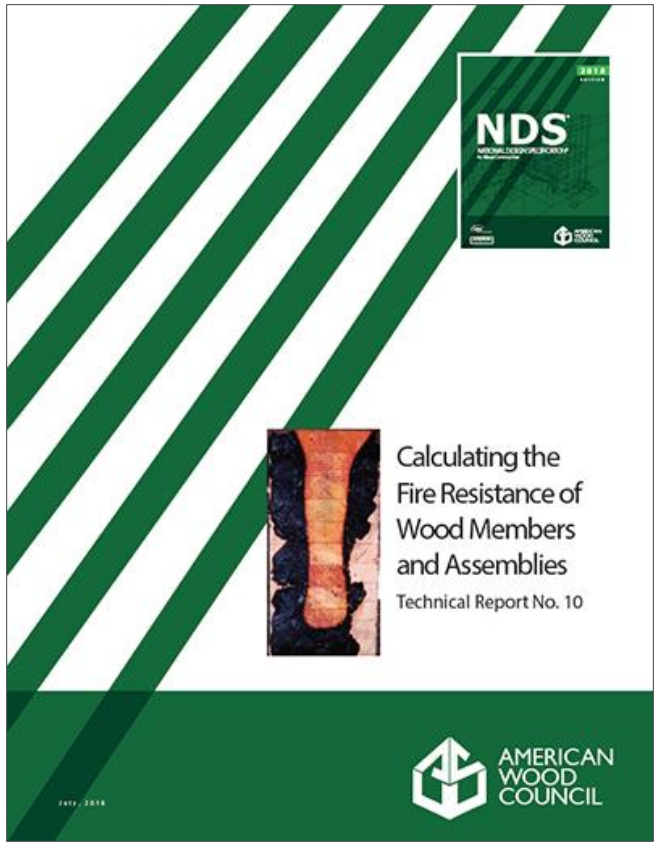




Calculated Fire Resistance of Wood

For Exposed Wood Members: IBC 722.1 References AWC's NDS Chapter 16 (AWC's TR 10 is a design aid to NDS Chapter 16)





Equations for Calculating Fire Endurance

Assumptions:

- Nominal assumed char rate = 1.5”/hr.
- Uses ultimate strength for design check

Structurally spanning members: reduced section checked for capacity vs. demand

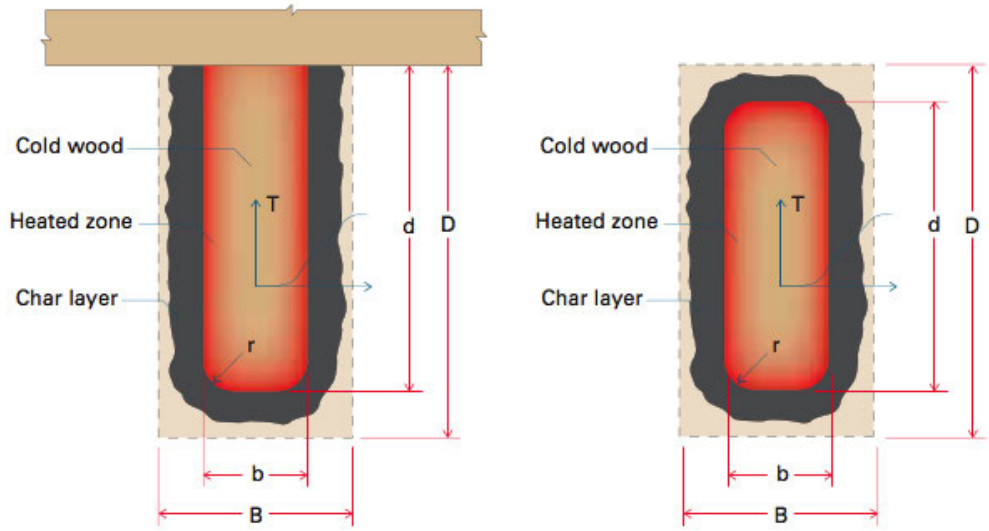


Figure 1-1 Reduction in member breadth and depth over time, t

Source: AWC’s TR 10

Equations for Calculating Fire Endurance

ACCOUNTS FOR NON-CHARRED STRENGTH RED'N

$$\beta_{eff} = \frac{1.2\beta_n}{t^{0.187}}$$

CHAR SLOWS WITH TIME: NONLINEAR

β_{eff} = Effective char rate (in/hr), adjusted for exposure time, t

β_n = Nominal char rate (in/hr), linear char rate based on a 1-hour exposure (1.5"/hr.)

t = Exposure time (hrs)

Exterior Walls – Intersecting Floors

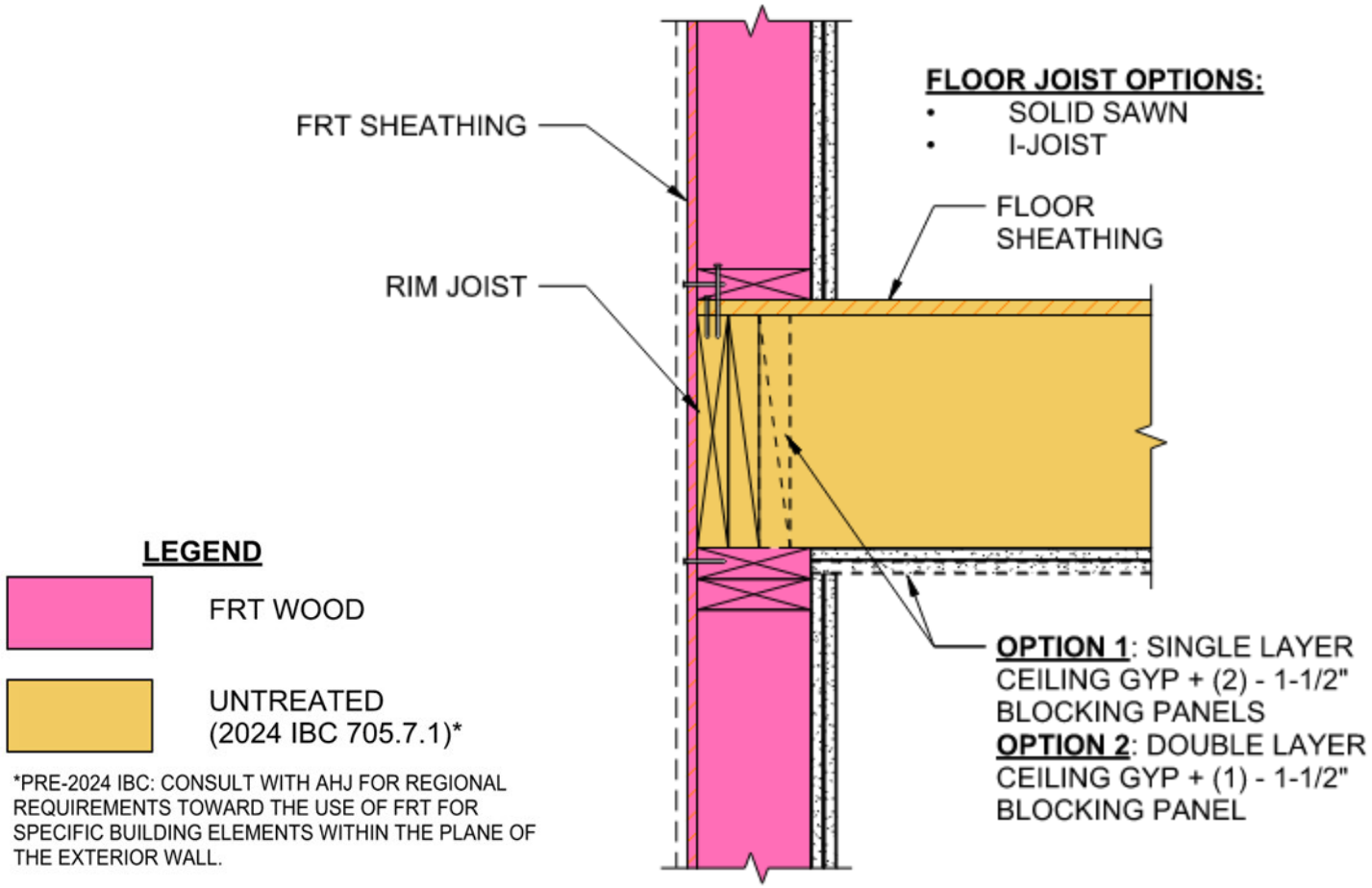
Please note that the following details are examples of what we have seen used on projects and do not necessarily represent details that will be accepted and applicable in all jurisdictions and to all projects.

These details are not intended as recommendations for universally accepted details. Local product availability and manufacturer specifications should also be considered for each project.

The Architect of Record and Engineer of Record should verify acceptance of the details used on their project with all provisions of the building code, including local amendments, with the local Authority Having Jurisdiction.

Exterior Walls – Intersecting Floors

Type III Construction: 2-hr Wall, 1-hr Floor
Typical Platform Framing



Considerations:

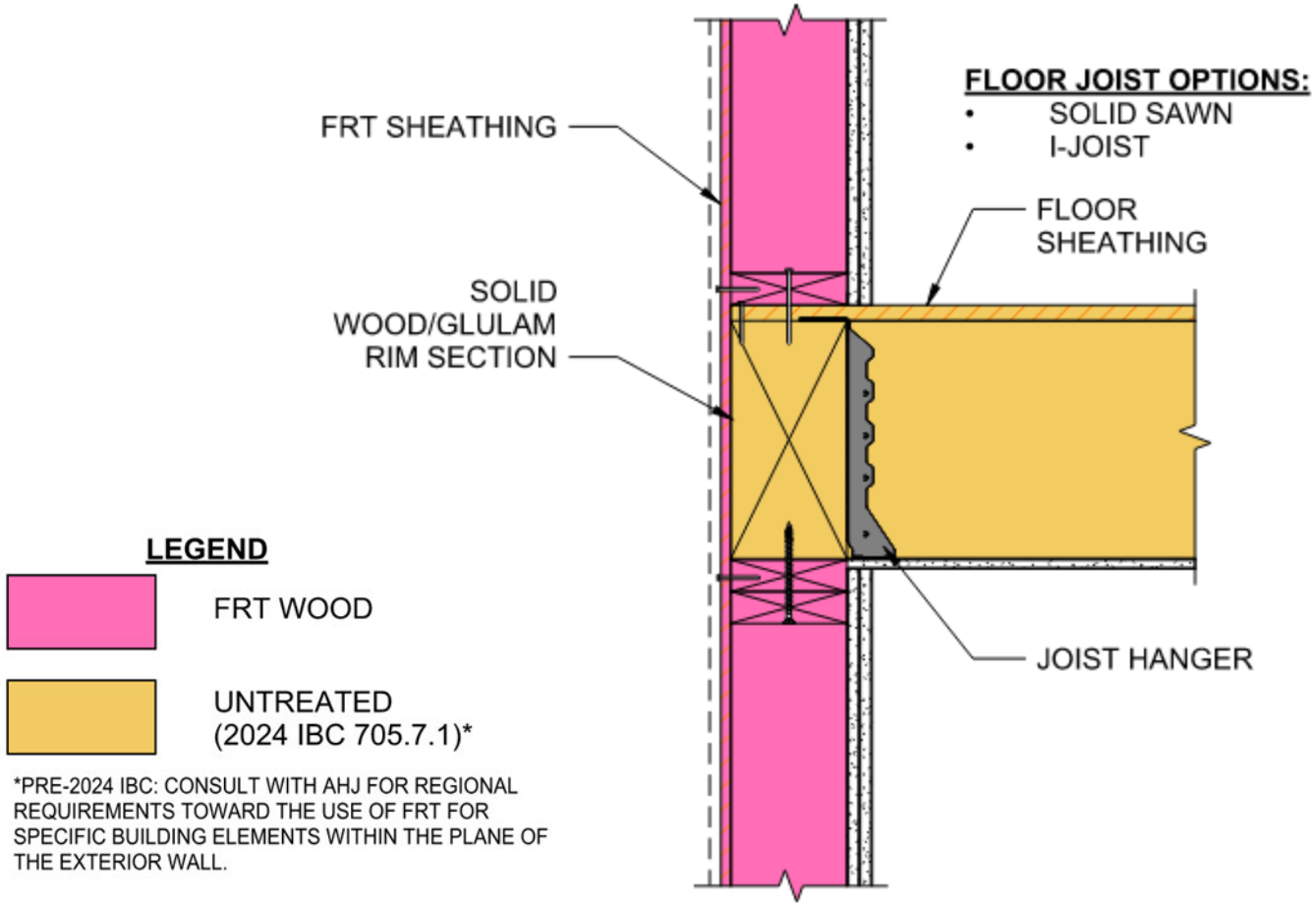
- Shrinkage of rim, plates, joists

Rationale for detail approval:

- Membranes on both side of wall provide fire resistance via their approved assembly
- At floor cavity, ceiling provides 1 hour
- 1 layer of blocking provides 2nd hr through char calculations

Exterior Walls – Intersecting Floors

Type III Construction: 2-hr Wall, 1-hr Floor
Modified Platform Framing



Considerations:

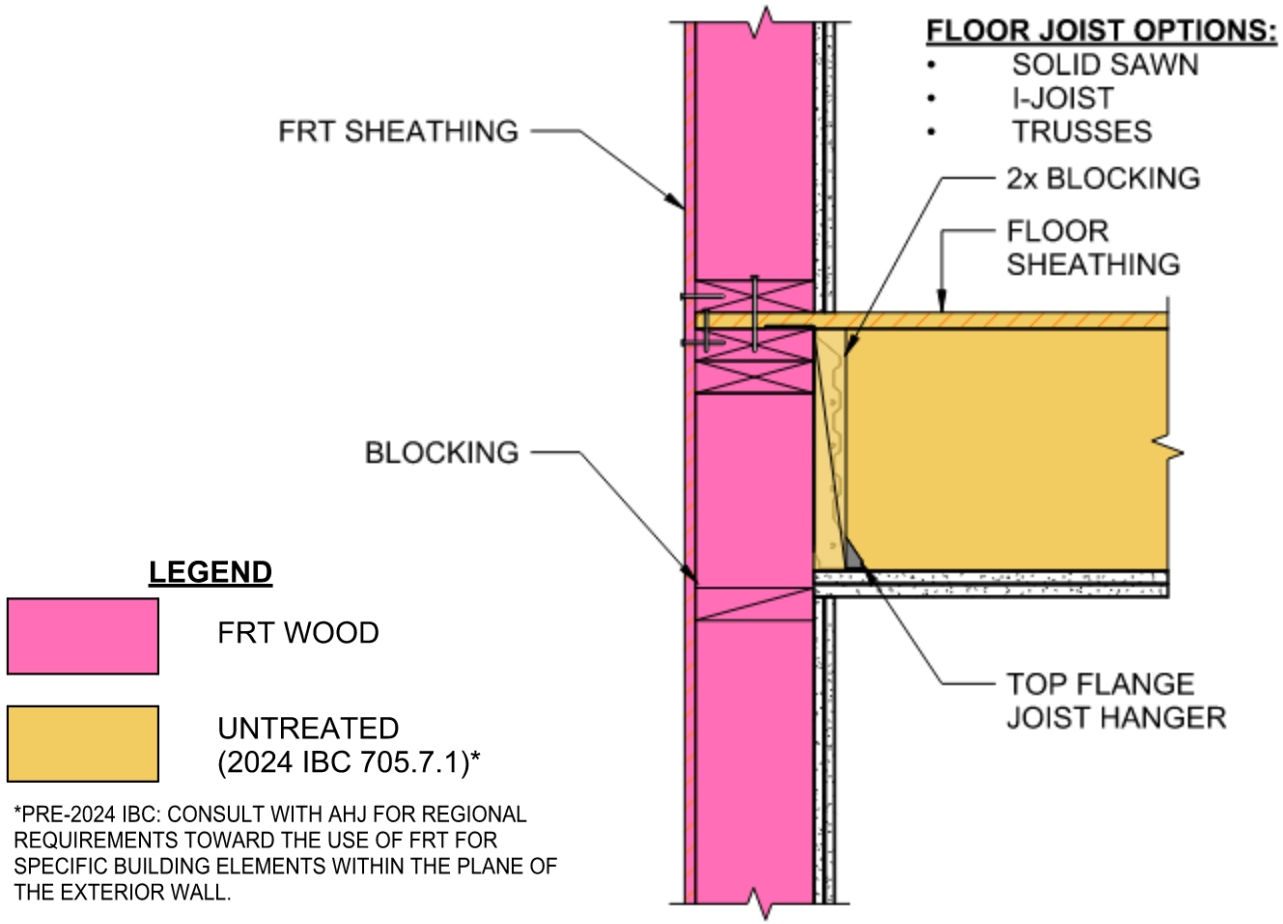
- Shrinkage of rim, plates, joists

Rationale for detail approval:

- Membranes on both side of wall provide fire resistance via their approved assembly
- At floor cavity, 4x rim provides 2-hr protection through char calculations

Exterior Walls – Intersecting Floors

Type III Construction: 2-hr Wall, 1-hr Floor
Semi-Balloon Framing

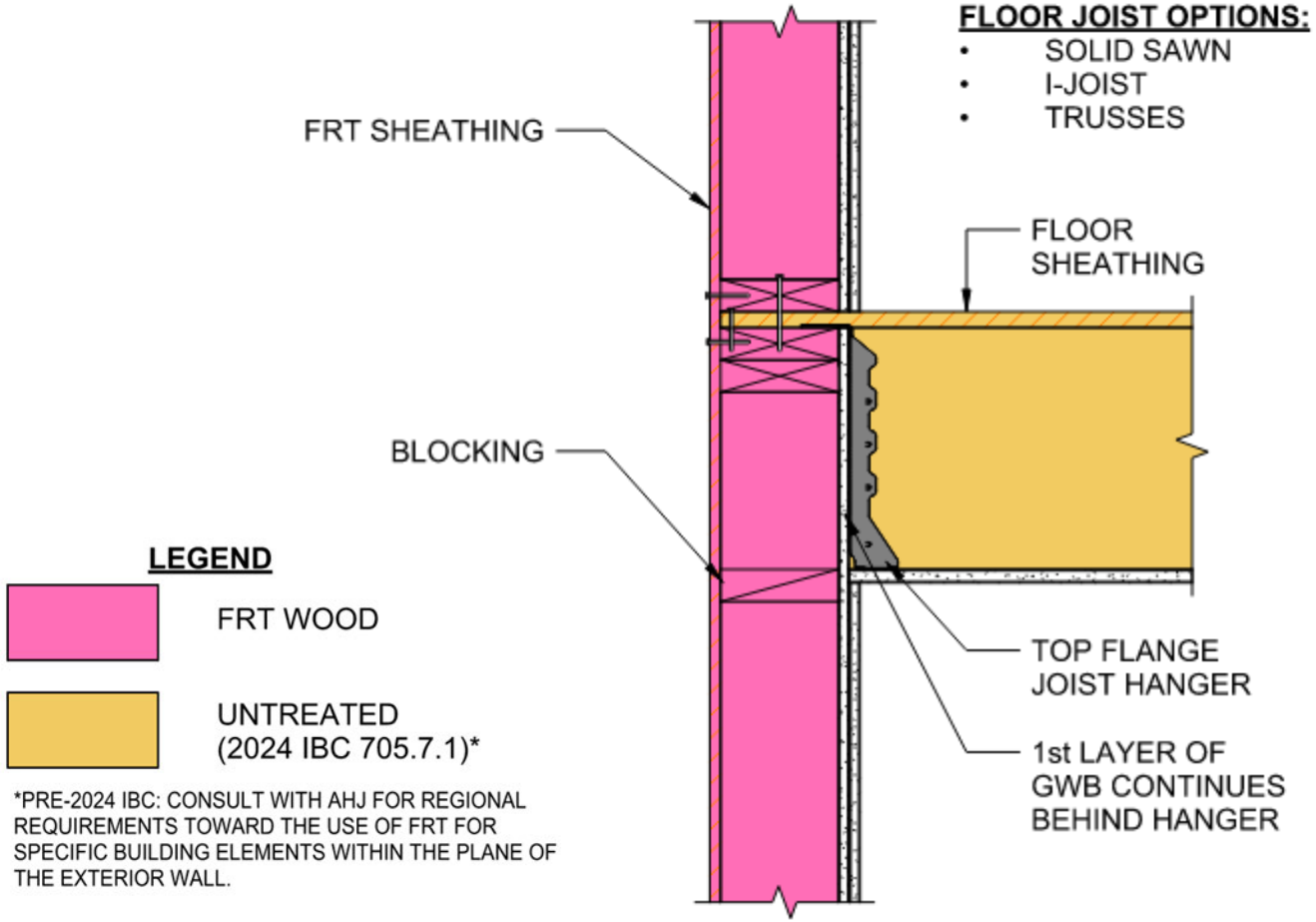


Rationale for detail approval:

- Ceiling membrane provides 1-hr protection
- Blocking between joists provides 2nd hr through char calculations

Exterior Walls – Intersecting Floors

Type III Construction: 2-hr Wall, 1-hr Floor
Semi-Balloon Framing

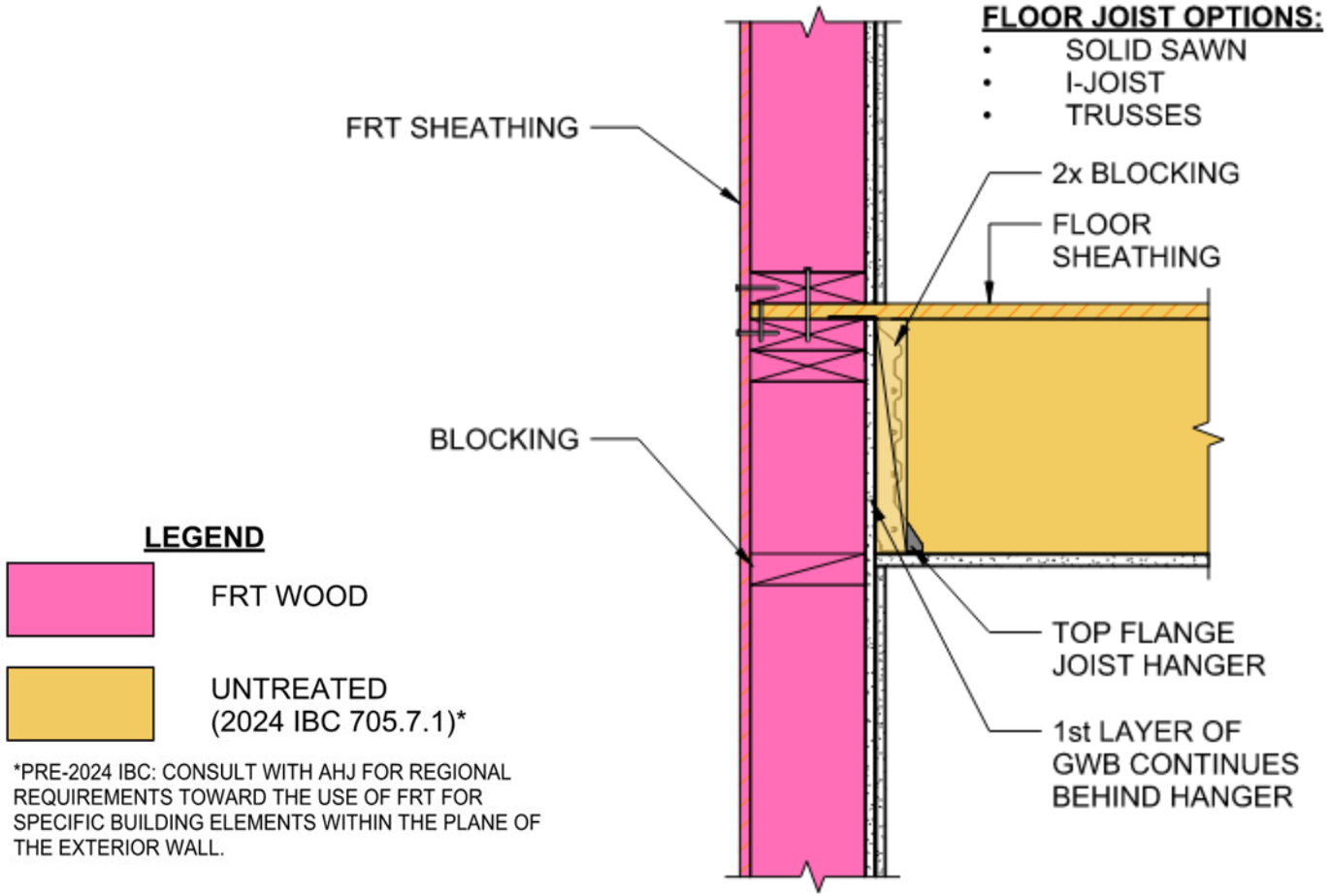


Rationale for detail approval:

- Ceiling membrane provides 1-hr protection
- 1 layer of wall membrane provides 2nd hr

Exterior Walls – Intersecting Floors

Type III Construction: 2-hr Wall, 1-hr Floor
Semi-Balloon Framing

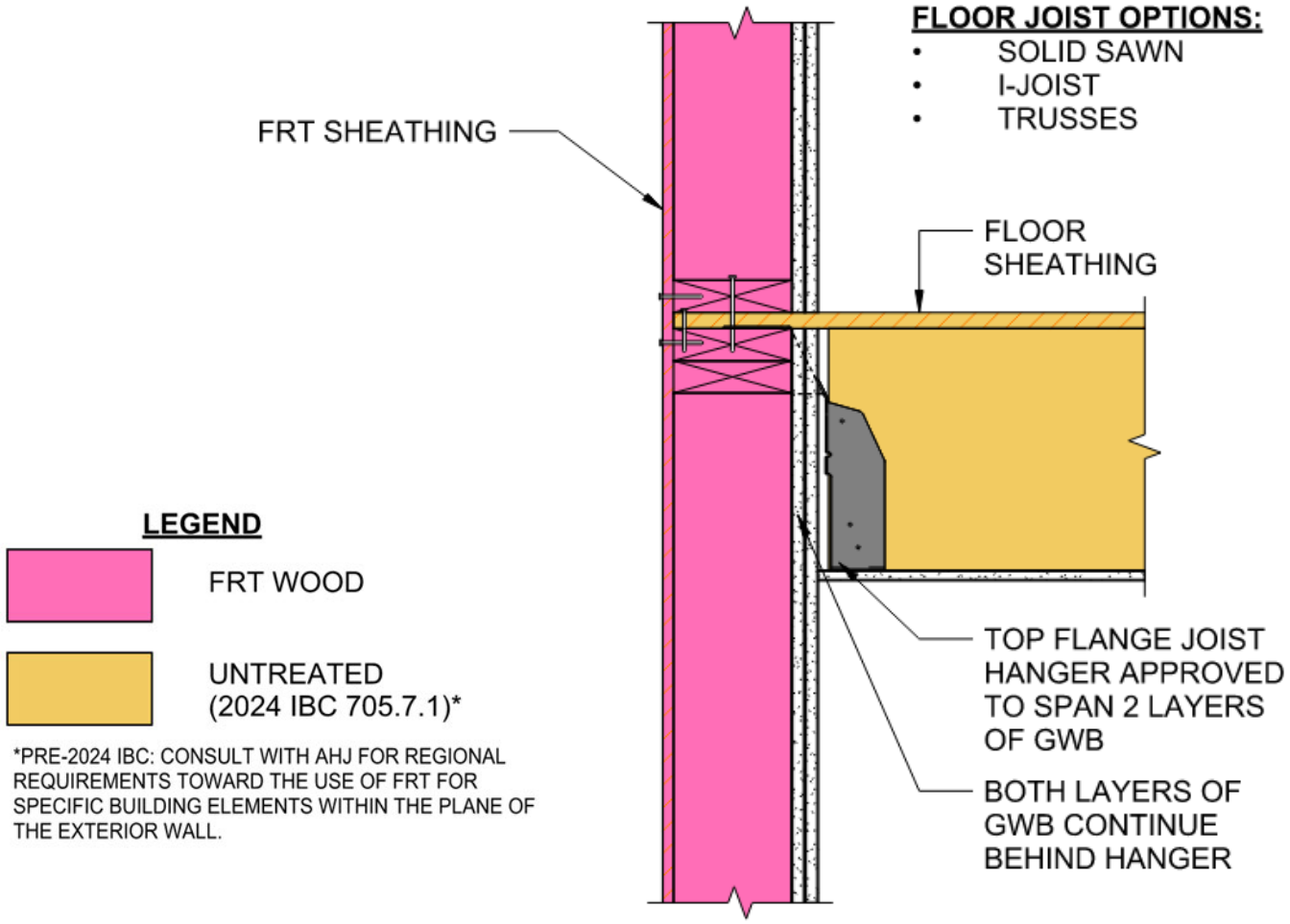


Rationale for detail approval:

- 1 layer of wall membrane provides 1-hr protection
- Blocking between joists provides 2nd hr through char calculations

Exterior Walls – Intersecting Floors

Type III Construction: 2-hr Wall, 1-hr Floor
Semi-Balloon Framing

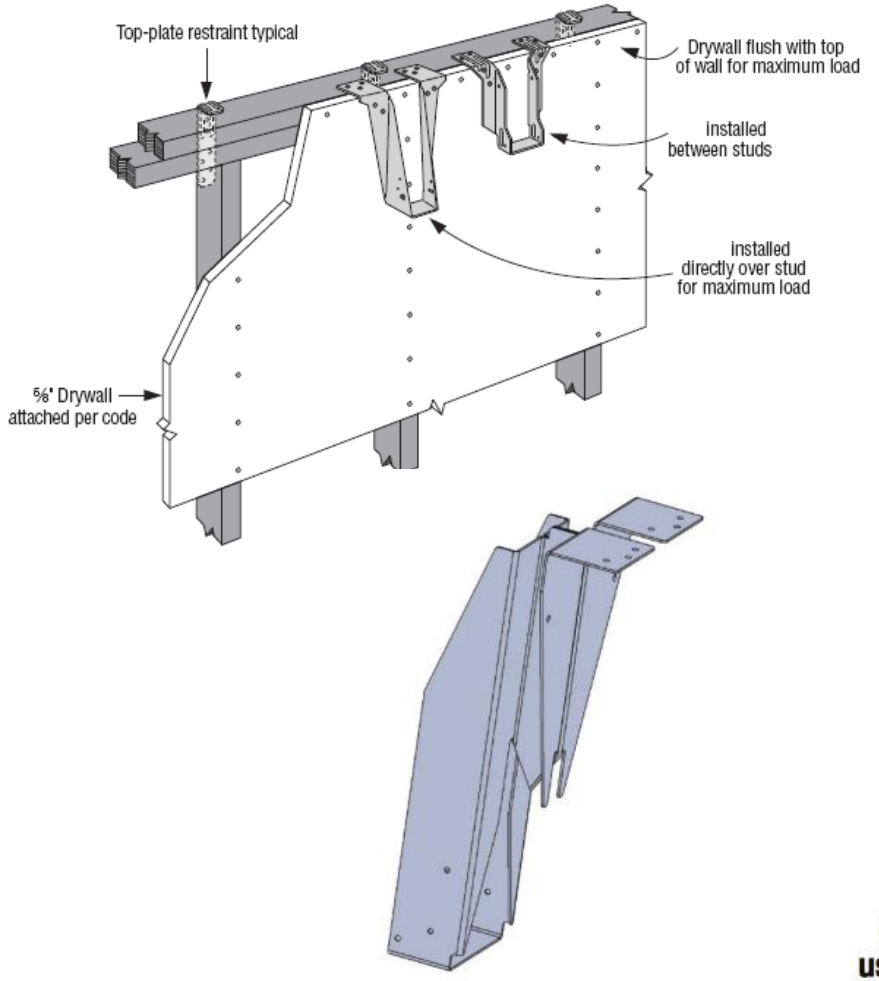


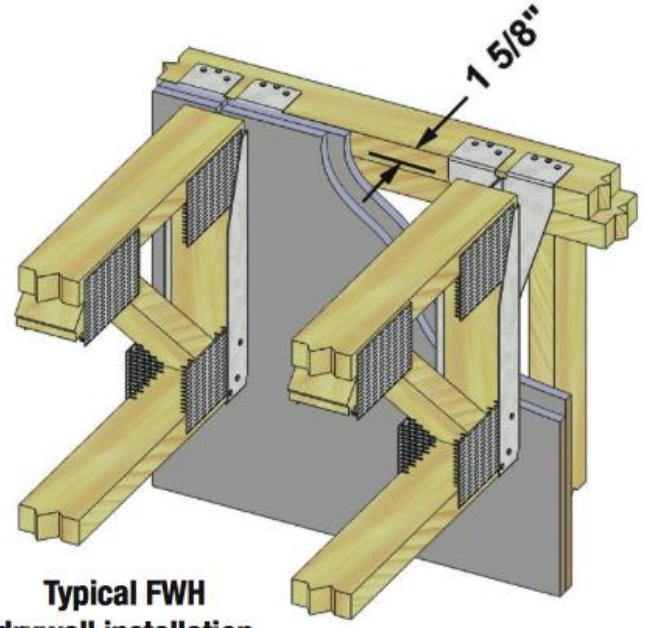
Rationale for detail approval:

» Membranes on both side of wall provide fire resistance via their approved assembly

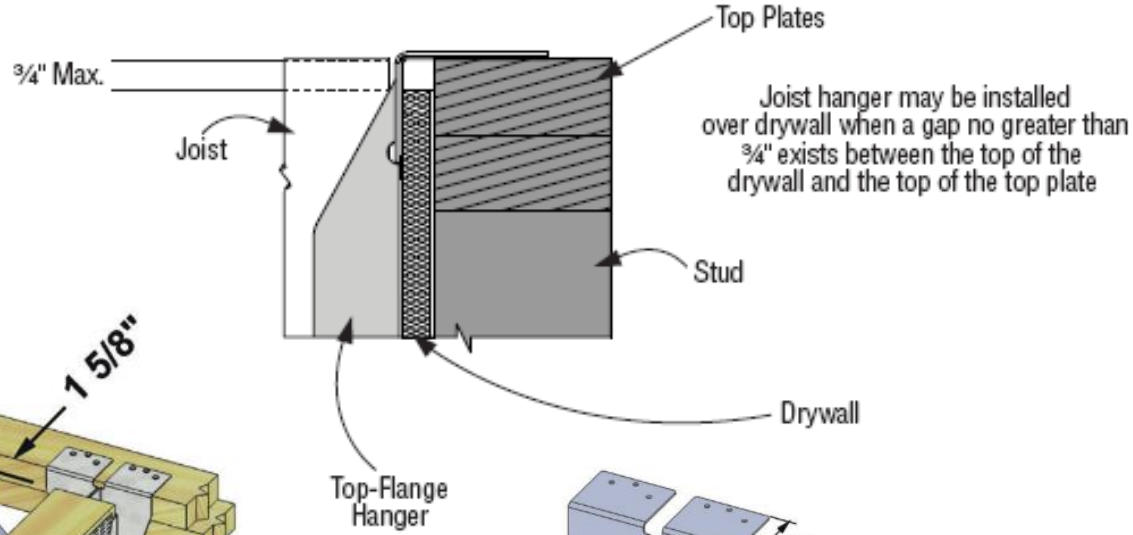
Over Gypsum Hangers

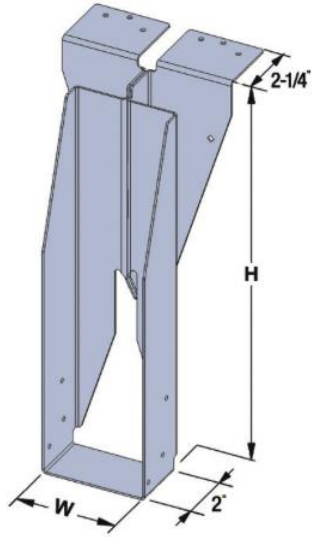
Commonly called Fire Wall or Drywall Hangers





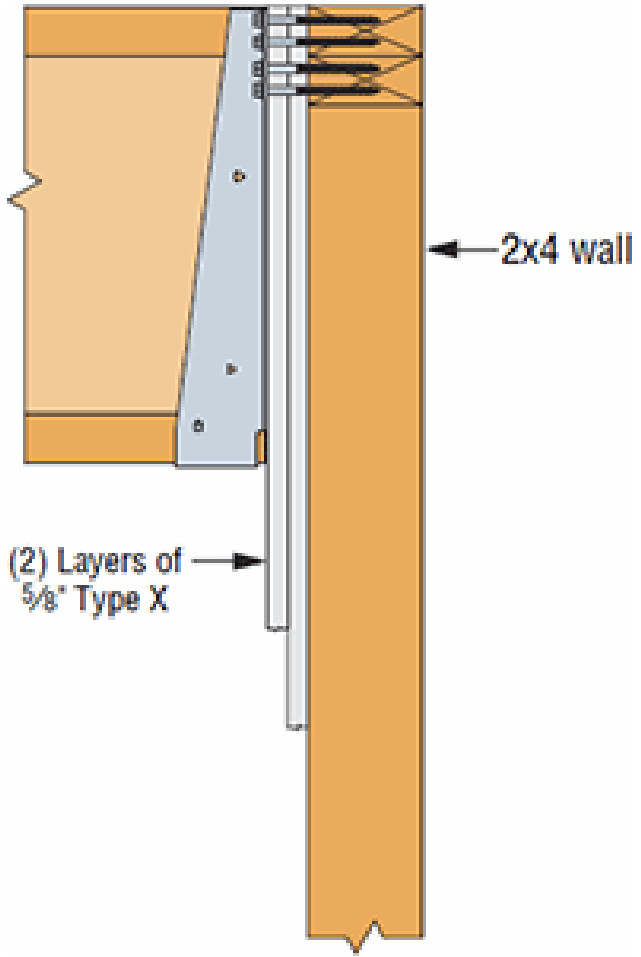
Typical FWH drywall installation using FWH-T Template

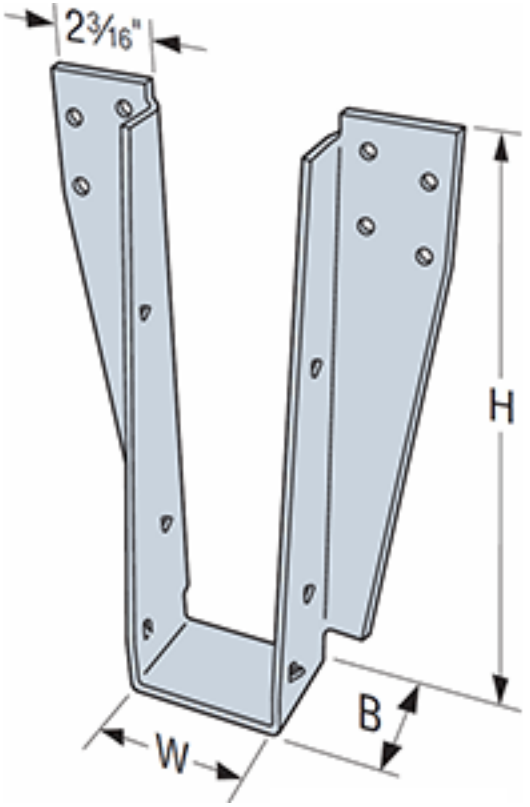




Over Gypsum Hangers

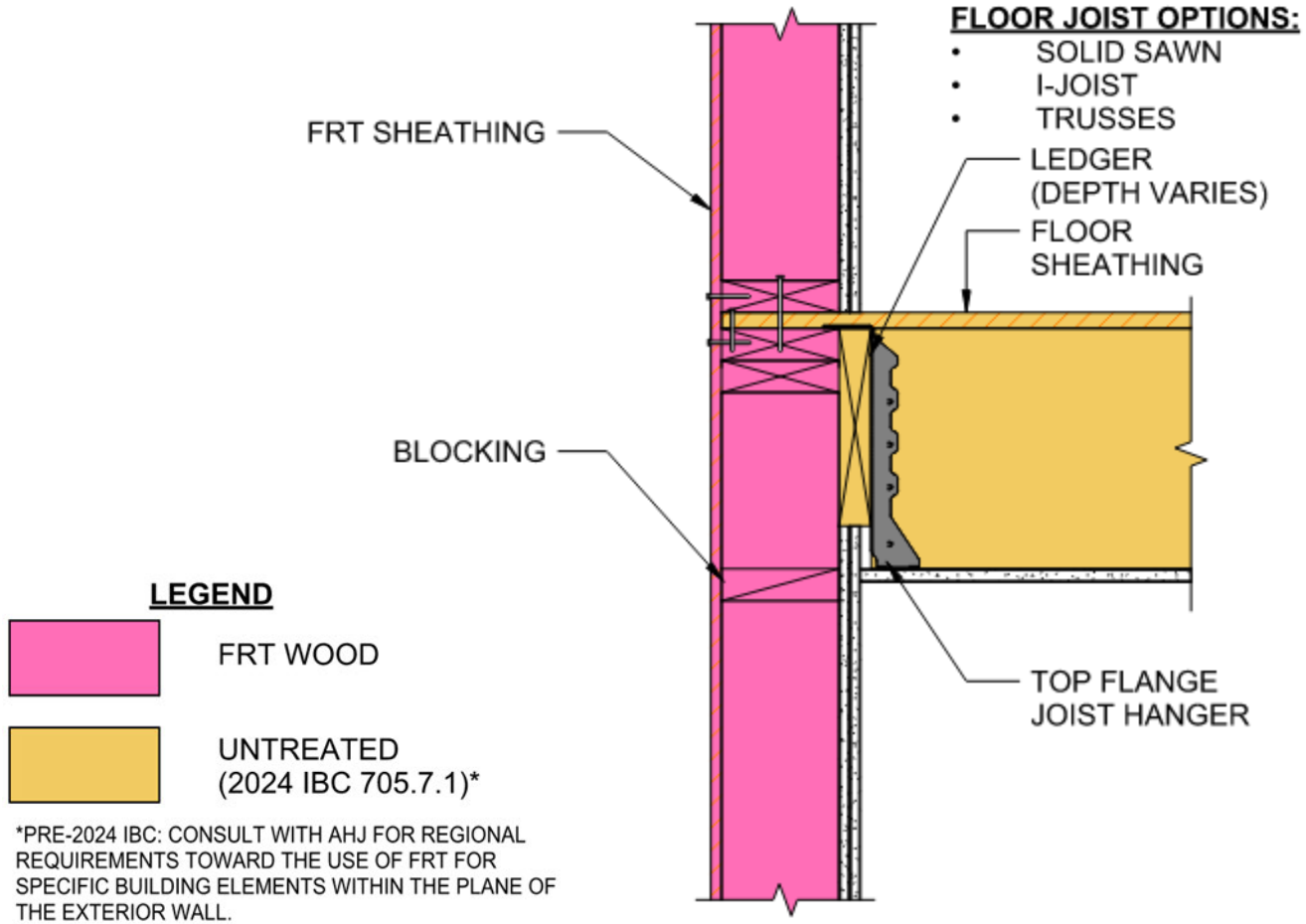
Top Flange Hangers & Face Mount Hangers Available





Exterior Walls – Intersecting Floors

Type III Construction: 2-hr Wall, 1-hr Floor
Semi-Balloon Framing w/ Ledger



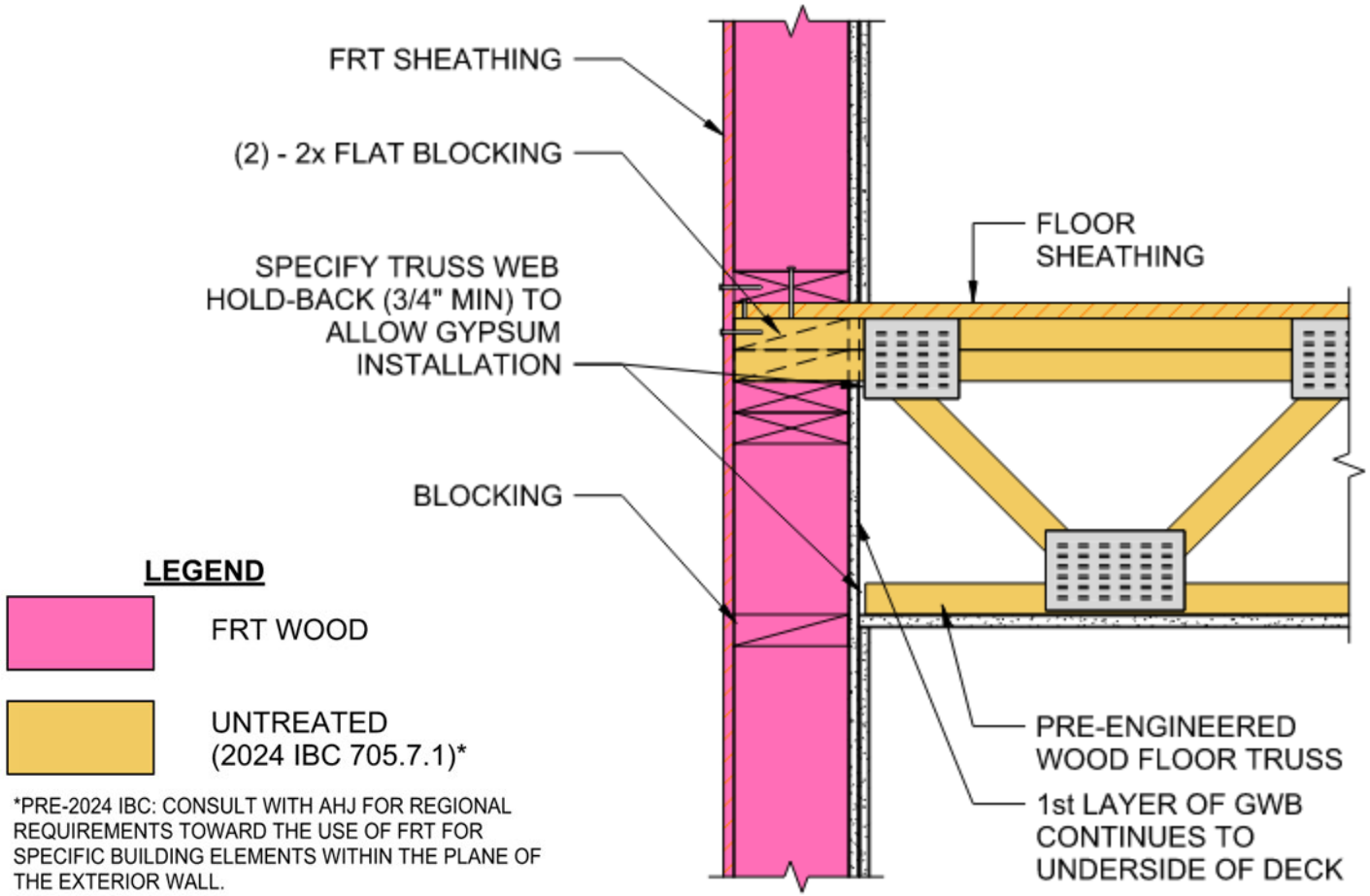
This detail is often used with a balcony; exterior ledger is thru-bolted

Rationale for detail approval:

- Membranes on both side of wall provide fire resistance via their approved assembly
- At floor, ceiling membrane provides 1 hr
- Blocking provides 2nd hr & maintains FRT continuity

Exterior Walls – Intersecting Floors

Type III Construction: 2-hr Wall, 1-hr Floor
Platform Framing w/ Top Chord Bearing

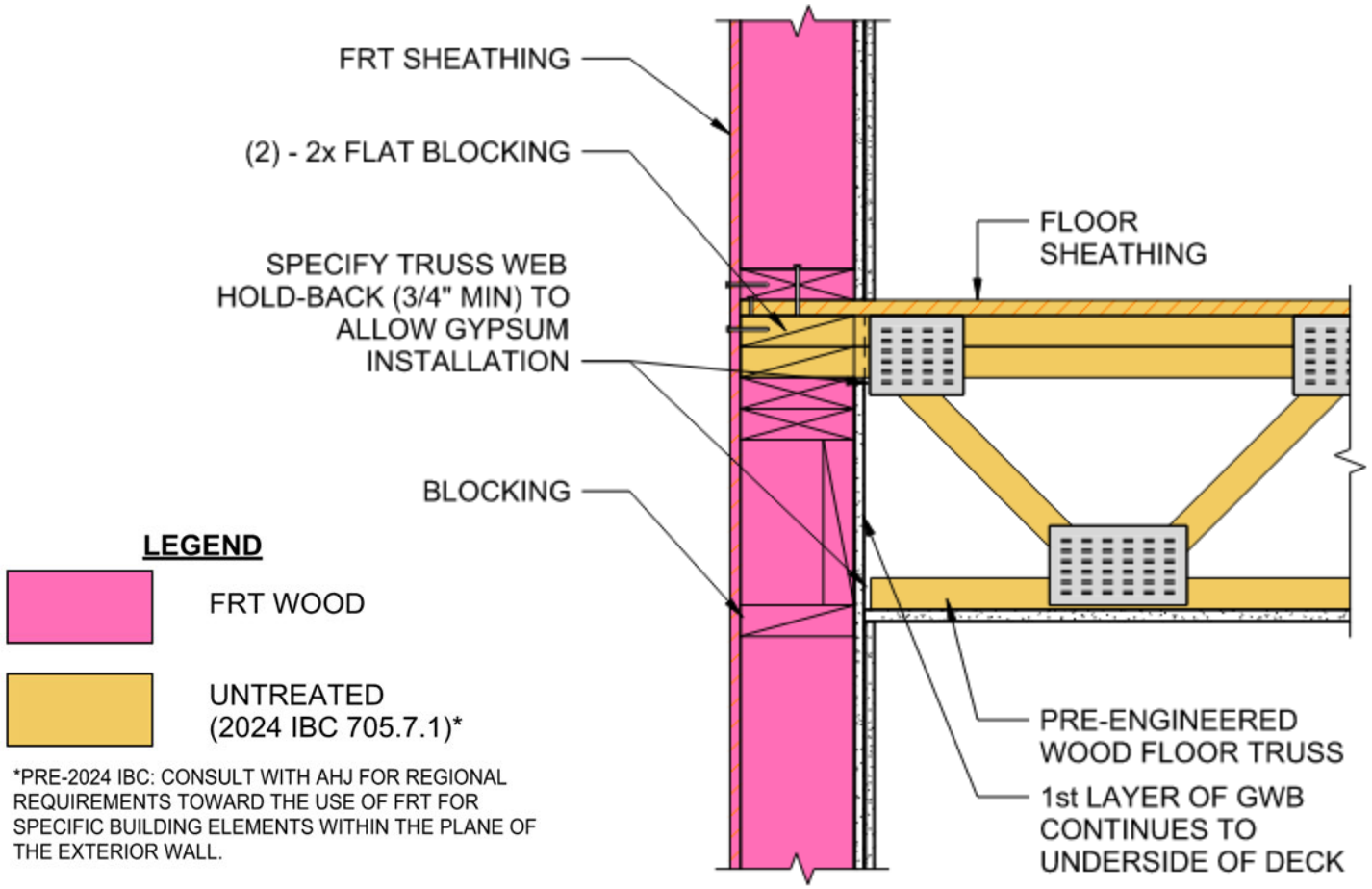


Rationale for detail approval:

- Membranes on both side of wall provide fire resistance via their approved assembly
- At floor cavity ceiling membrane provides 1st hr
- 1 layer of wall membrane provides 2nd hr

Exterior Walls – Intersecting Floors

Type III Construction: 2-hr Wall, 1-hr Floor
Platform Framing w/ Top Chord Bearing

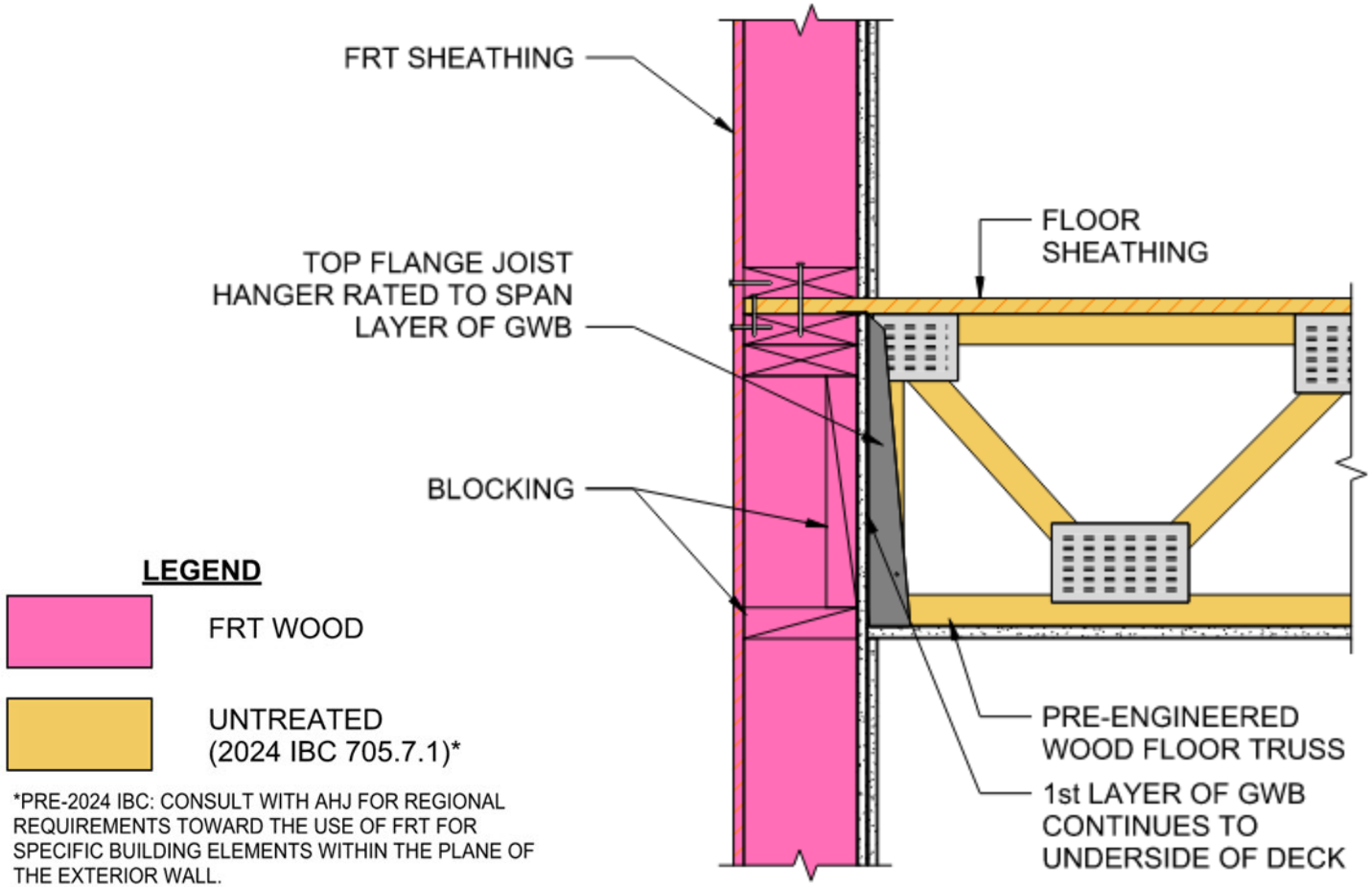


Rationale for detail approval:

- Membranes on both side of wall provide fire resistance via their approved assembly
- At floor cavity, blocking in wall provides 1st hr
- 1 layer of wall membrane and ceiling membrane provides 2nd hr

Exterior Walls – Intersecting Floors

Type III Construction: 2-hr Wall, 1-hr Floor
Semi-Balloon Framing w/ Hangers

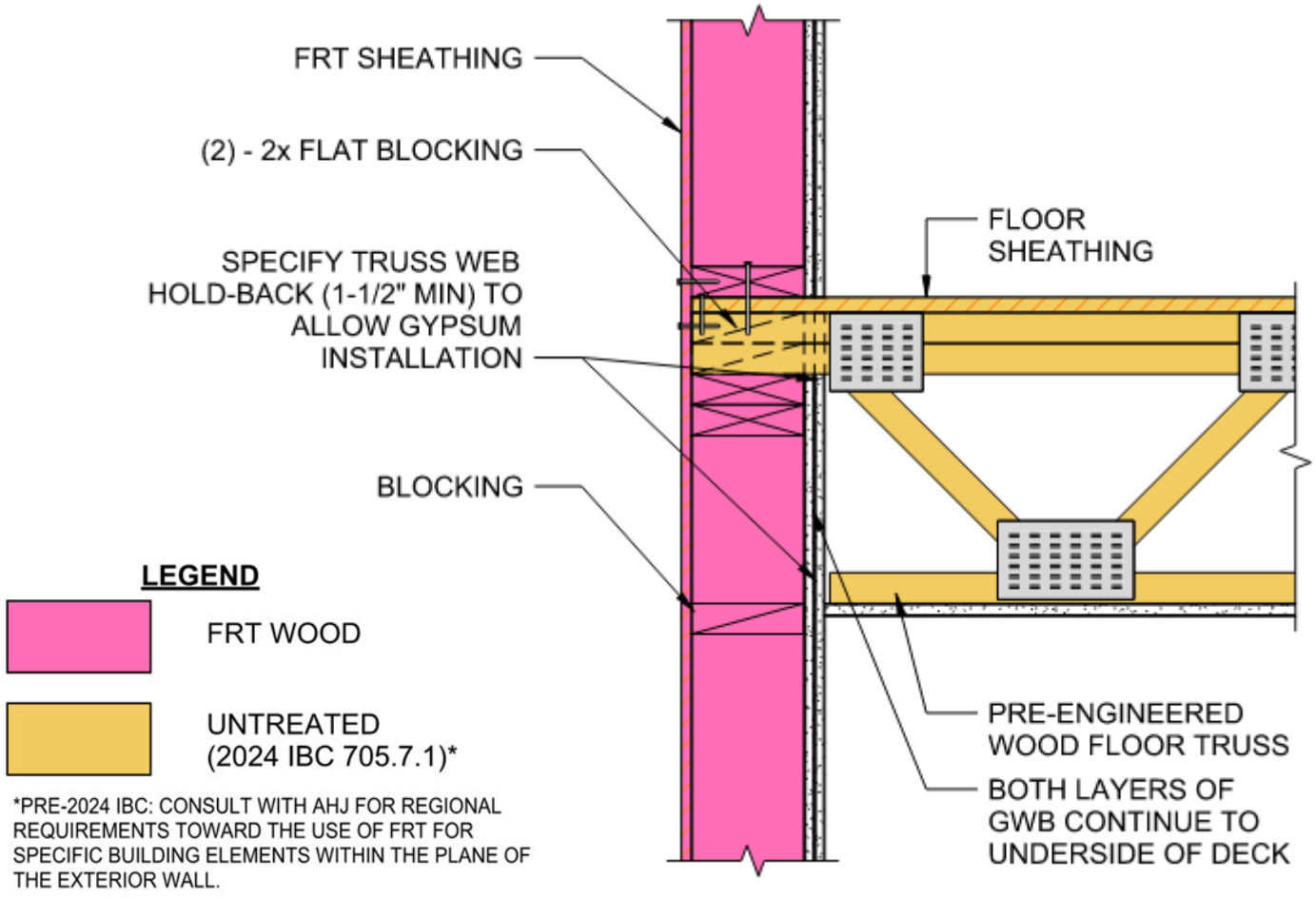


<u>Rationale for detail approval:</u>

- Membranes on both side of wall provide fire resistance via their approved assembly
- At floor cavity, blocking in wall provides 1st hr
- 1 layer of wall membrane and ceiling membrane provides 2nd hr

Exterior Walls – Intersecting Floors

Type III Construction: 2-hr Wall, 1-hr Floor
Platform Framing w/ Top Chord Bearing

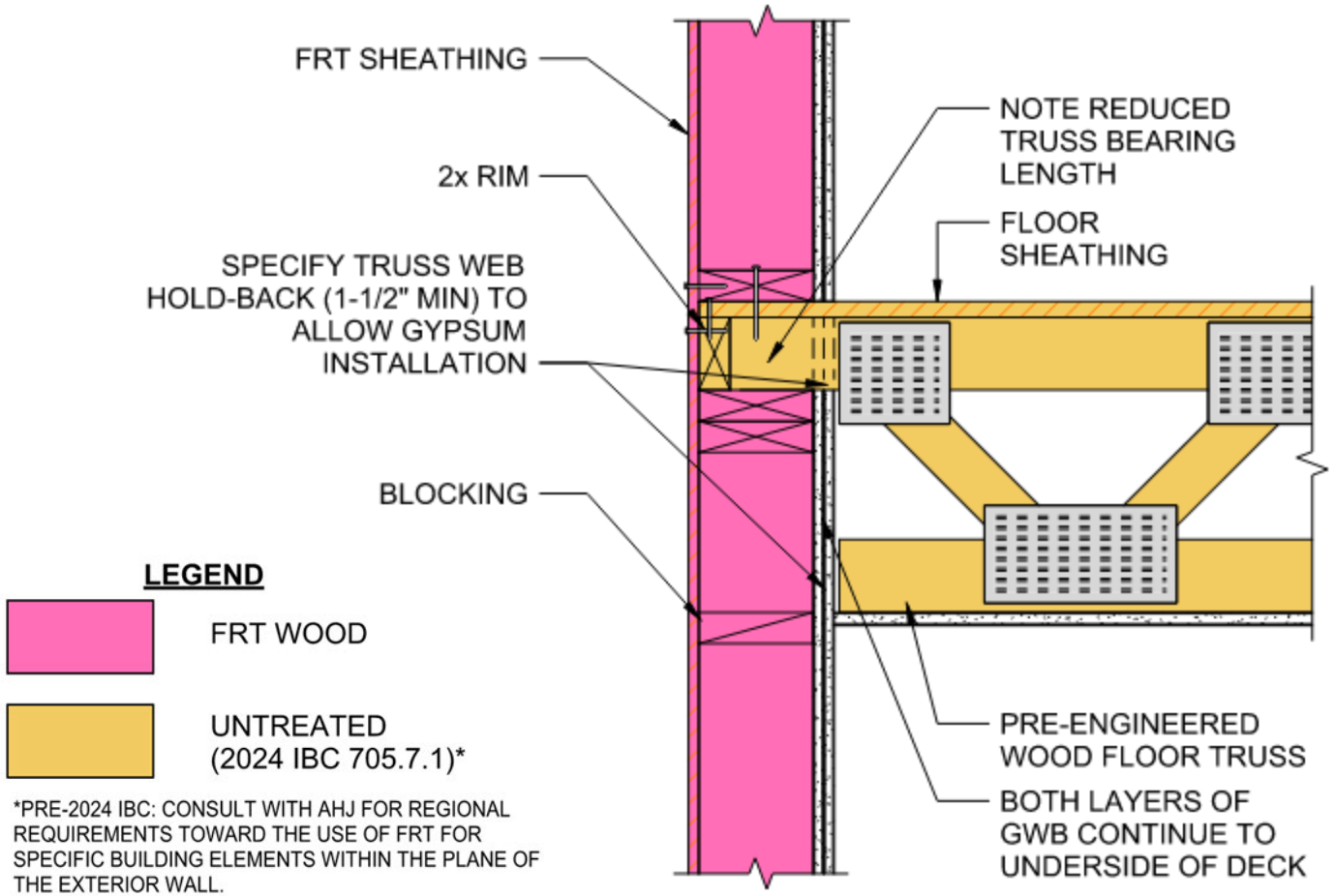


<u>Rationale for detail approval:</u>

- Membranes on both side of wall provide fire resistance via their approved assembly

Exterior Walls – Intersecting Floors

Type III Construction: 2-hr Wall, 1-hr Floor
Platform Framing w/ Top Chord Bearing



Vertical Orientation of truss chords & web members

Rationale for detail approval:

- Membranes on both side of wall provide fire resistance via their approved assembly

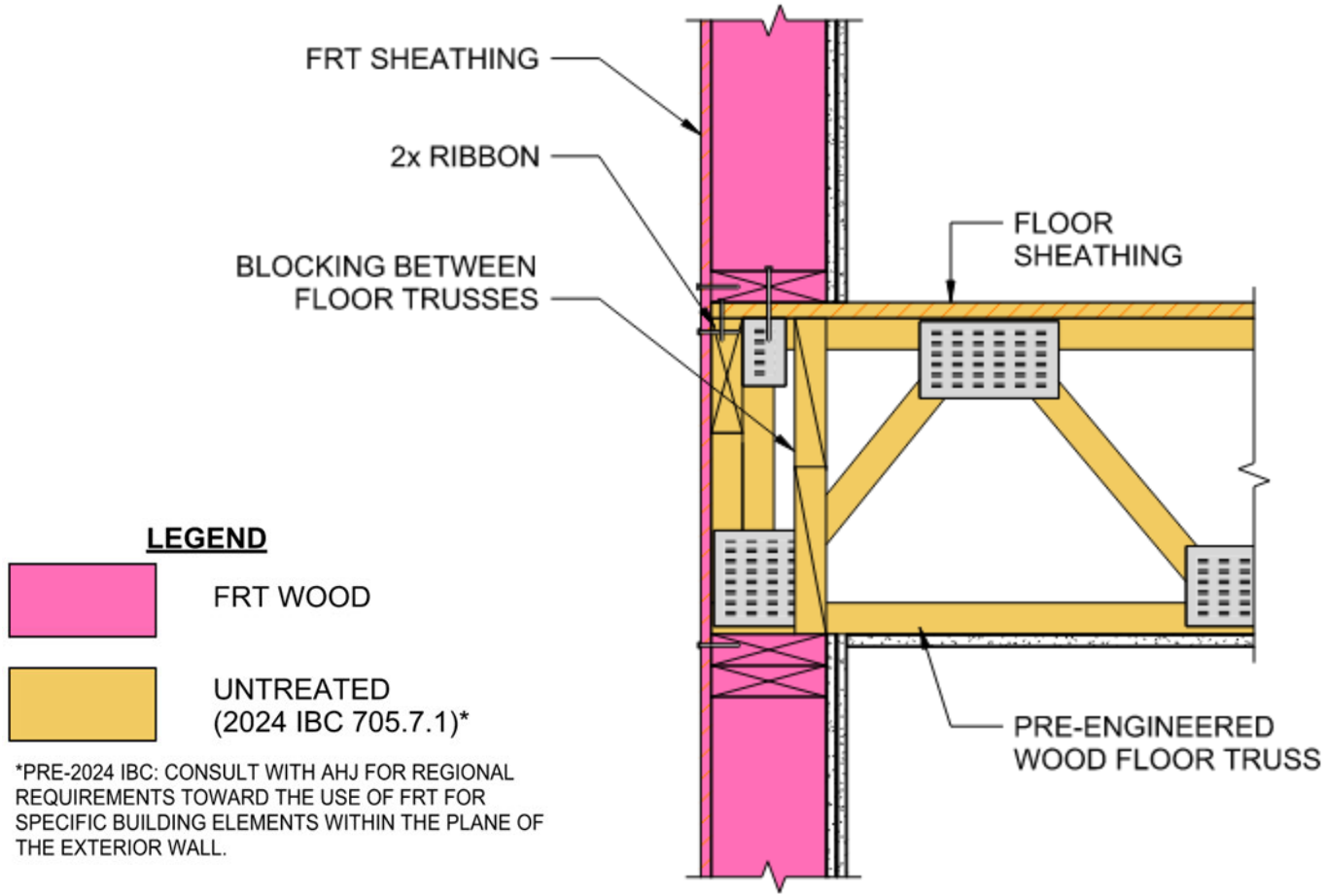
Exterior Walls – Intersecting Floors / Roof

Exter

Gaps between end of truss members and wall framing to allow gypsum install after

Exterior Walls – Intersecting Floors

Type III Construction: 2-hr Wall, 1-hr Floor
Platform Framing w/ Bottom Chord Bearing

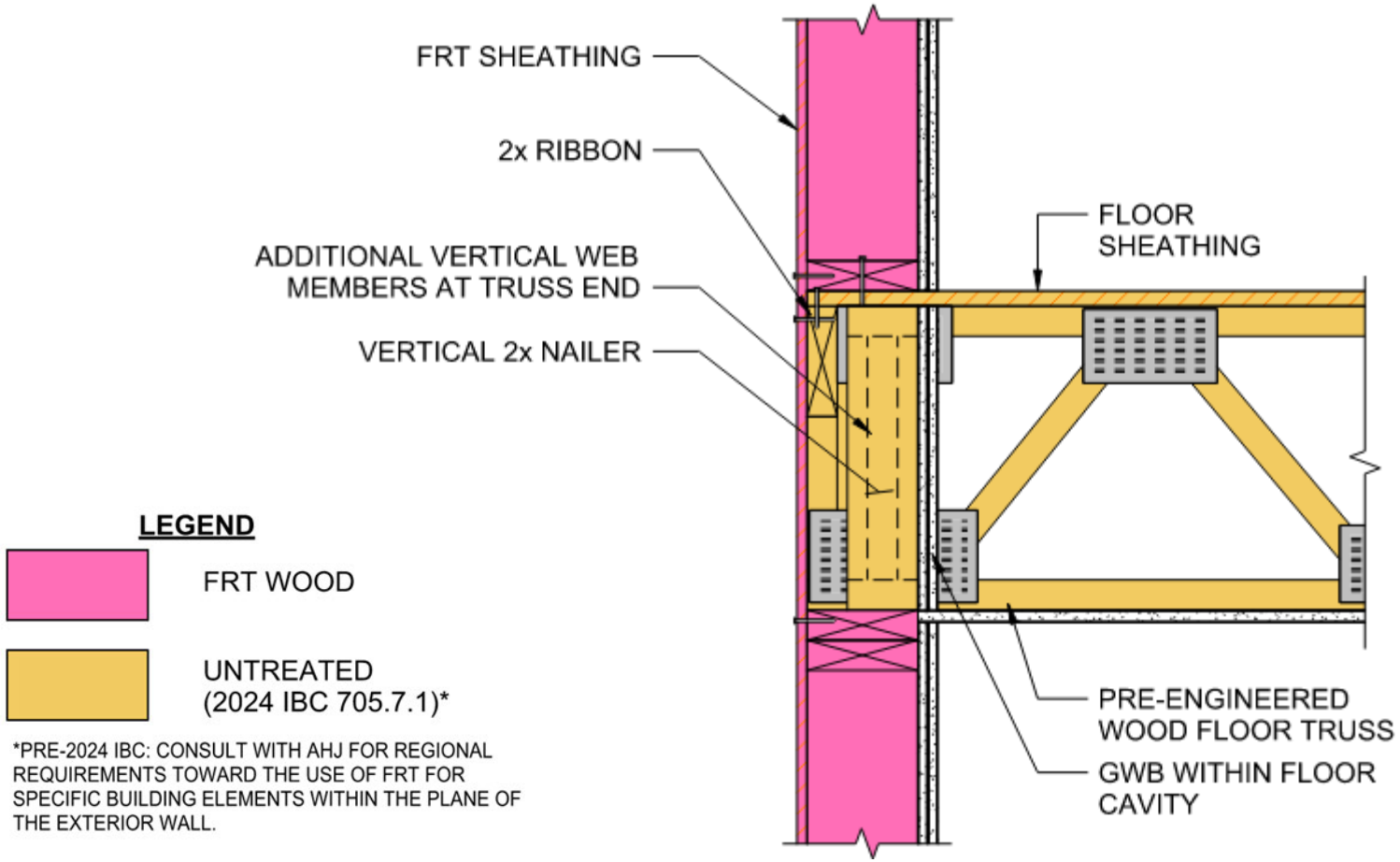


Rationale for detail approval:

- Membranes on both side of wall provide fire resistance via their approved assembly
- At floor cavity, blocking in wall provides 1 hr
- Ceiling provides 2nd hr

Exterior Walls – Intersecting Floors

Type III Construction: 2-hr Wall, 1-hr Floor
Platform Framing w/ Bottom Chord Bearing



Rationale for detail approval:

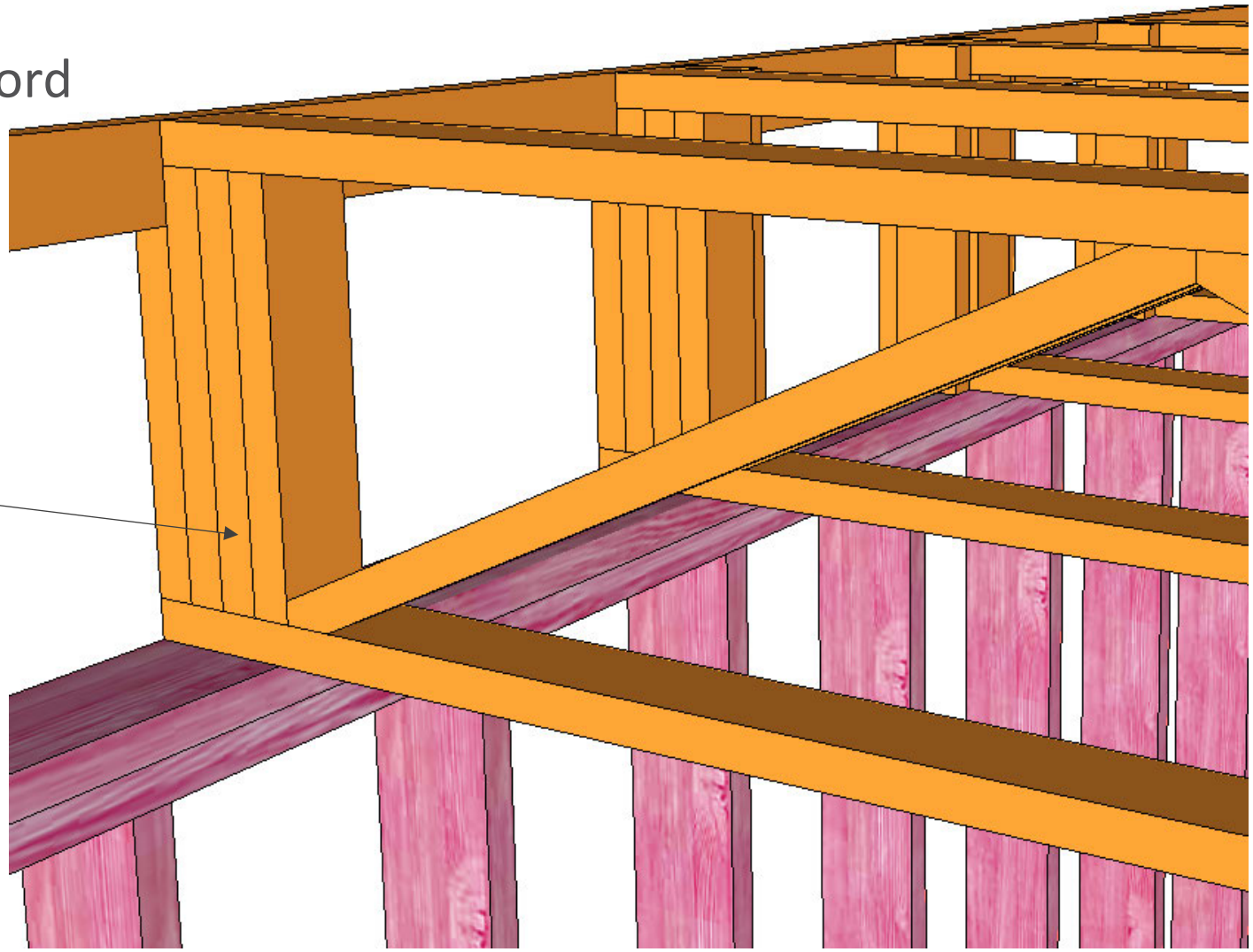
- Membranes on both side of wall provide fire resistance via their approved assembly

Exterior Walls – Intersecting Floors

Type III Construction: 2-hr Wall, 1-hr Floor

Platform Framing w/ Bottom Chord Bearing Truss

Designed with two or more additional verticals at the exterior wall to provide enhanced FRR based upon charring calculations in NDS Chapter 16 and solid edges for WSP or GWB penetration or transition

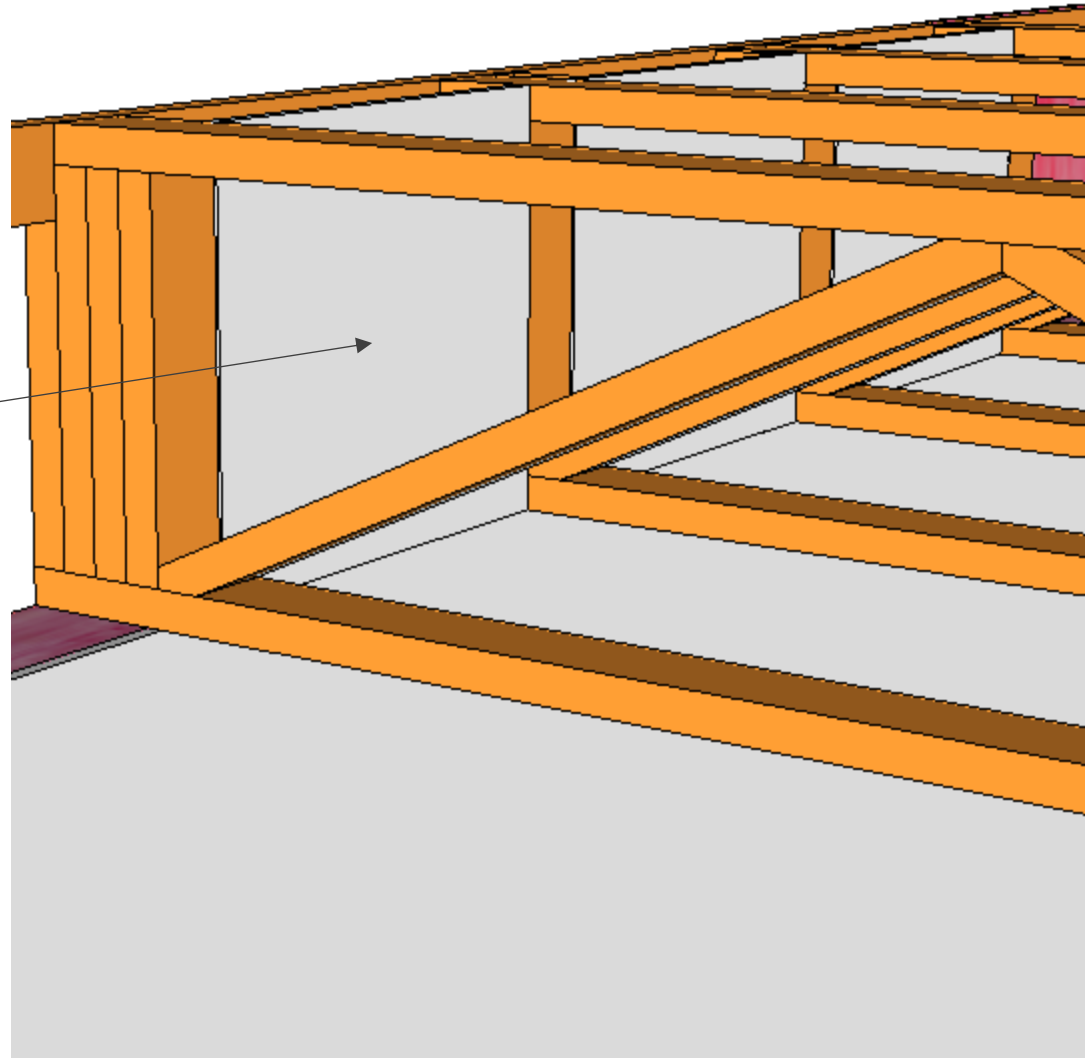


Exterior Walls – Intersecting Floors

Type III Construction: 2-hr Wall, 1-hr Floor

Platform Framing w/ Bottom Chord Bearing Truss

Gypsum wall panels installed as required between trusses to maintain FRR of building elements supporting or in the plane of the exterior wall (ceiling gypsum omitted in illustration for clarity)

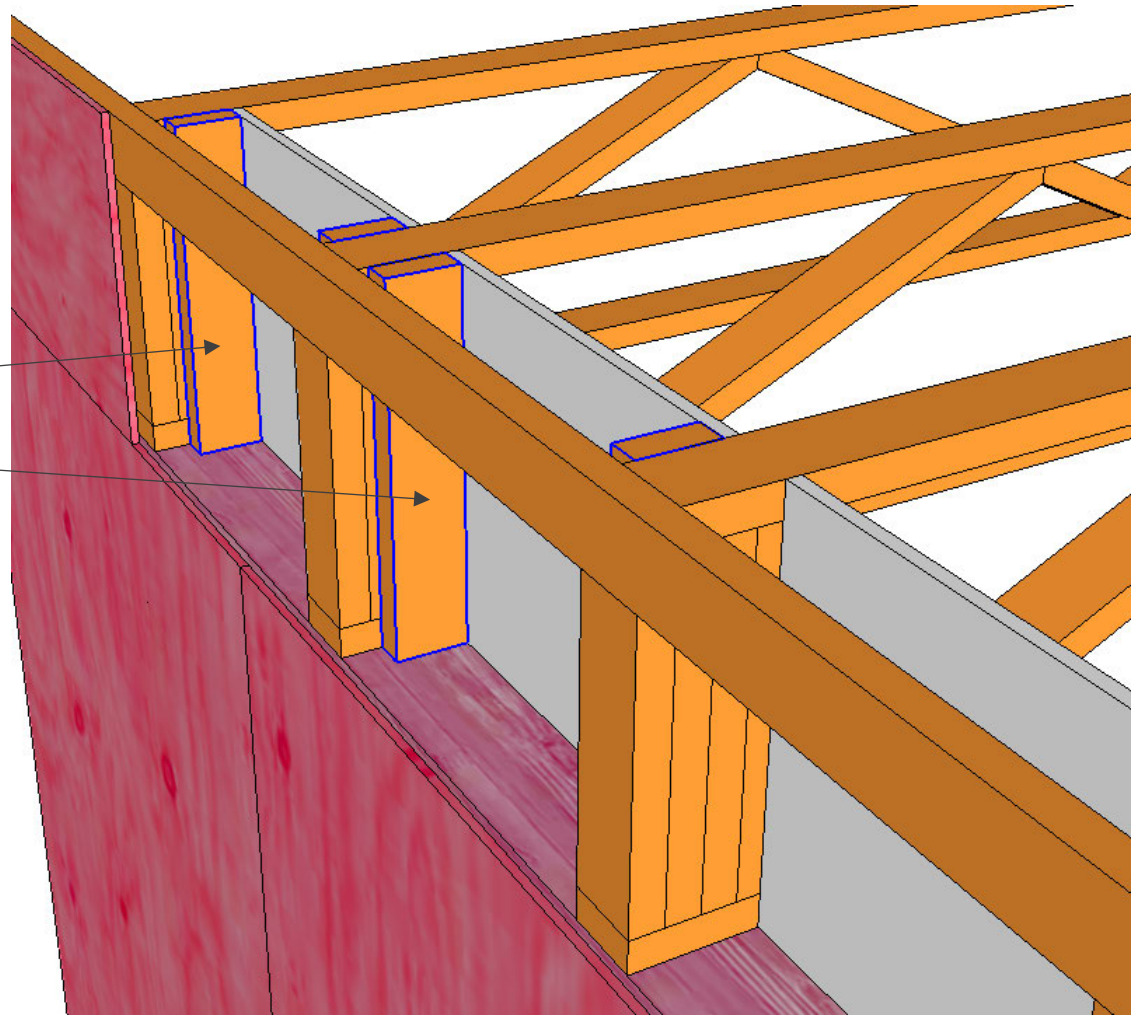


Exterior Walls – Intersecting Floors

Type III Construction: 2-hr Wall, 1-hr Floor

Platform Framing w/ Bottom Chord Bearing Truss

Add vertical blocking each side of truss (highlighted blue) to provide nailing base for gypsum panels between trusses



The extra vertical members, vertical blocking members and gypsum wallboard panels combine with ceiling membrane to provide req'd fire resistance rating for building members supporting or within the plane of the exterior wall

Outline

- Context for Type III Construction
- Fire Rating Requirements for Exterior Walls
  - Assembly Asymmetry
  - Addition of Wood Structural Panel
  - Bearing vs. Non-bearing
  - Vertical offsets
- Exterior Wall to Floor Intersection
  - Fire Resistant Continuity
  - Fire Retardant Continuity
- Parapets & Balconies

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

Exterior Wall – Roof Intersection

Unlike firewalls, fire barriers and fire partitions, the code does not specify continuity requirements for exterior walls

At the roof – wall interface, how far do fire resistance protection measures need to extend?

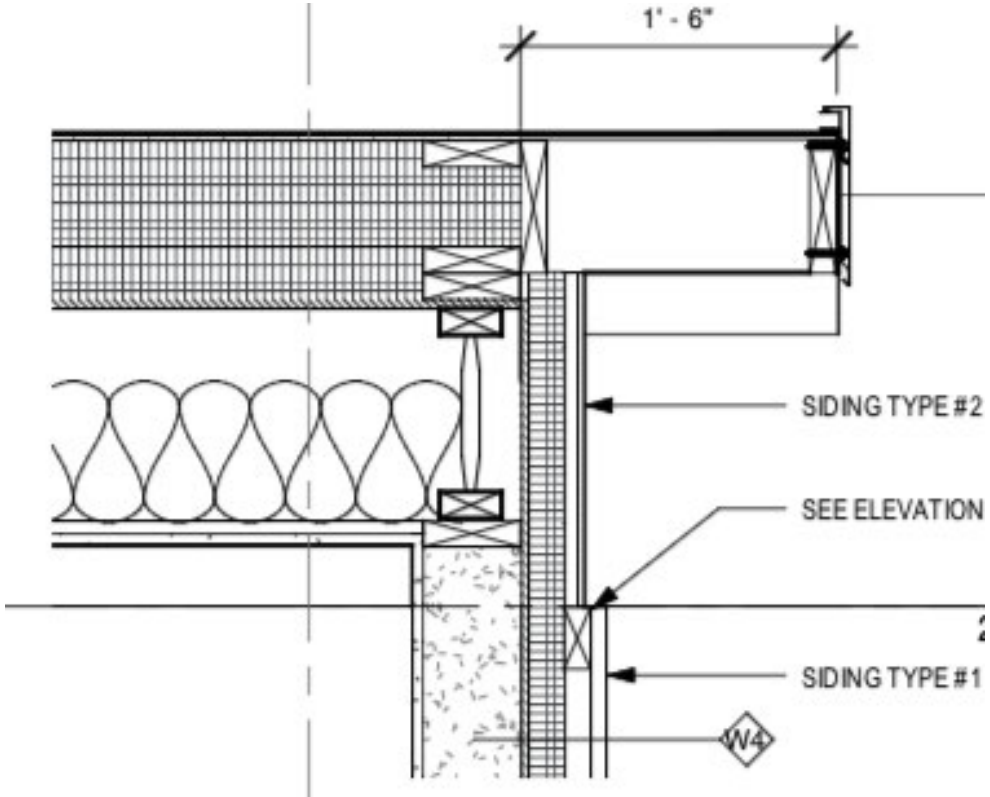
- To the underside/ceiling of a rated roof assembly?
- To the underside of the roof sheathing regardless of whether or nor the roof assembly is rated?
- Beyond the top of the roof (i.e. parapet)?

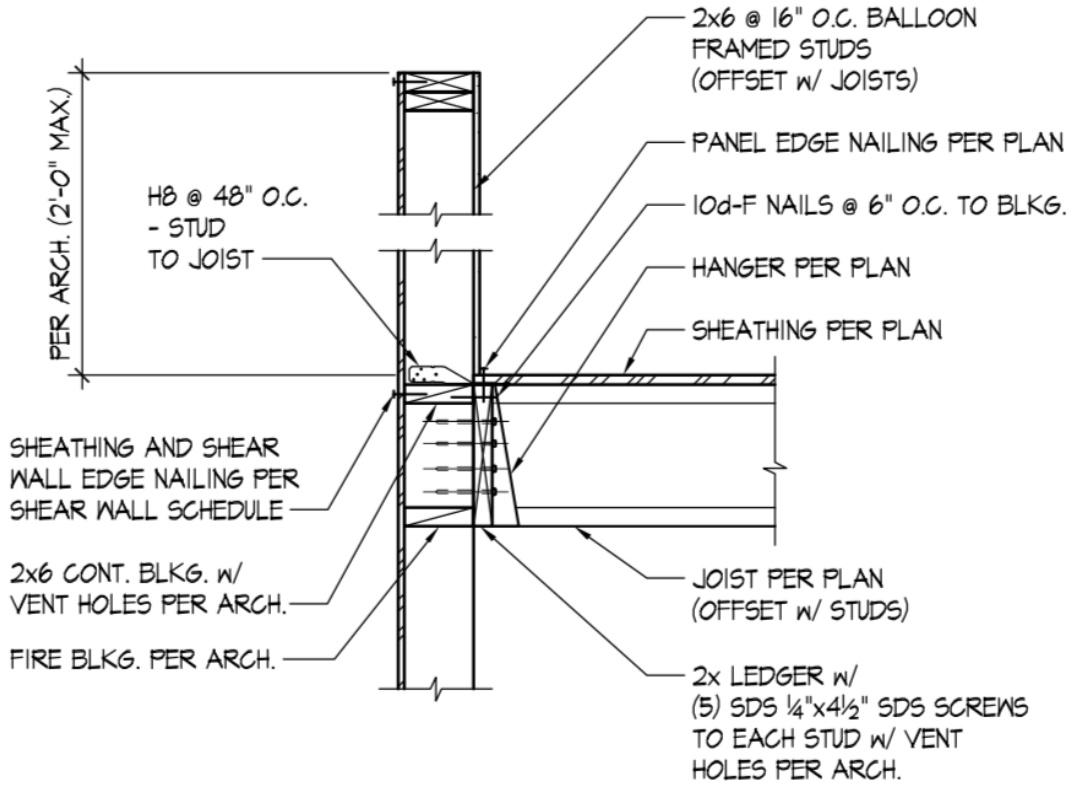
Similarly, in type III construction, do roof framing elements in the plane of the exterior wall need to be FRT?

Exterior Wall – Roof Intersection

The floor-wall intersection principles discussed previously apply here too - DCA 3 details could be applied to this condition

Discussion with Building Official to determine their interpretation and requirements is often warranted





Parapets – IBC 705.11.1

Parapets, where required, shall have:

- the same fire resistance as the supporting wall
- minimum height of 30” above roof surface

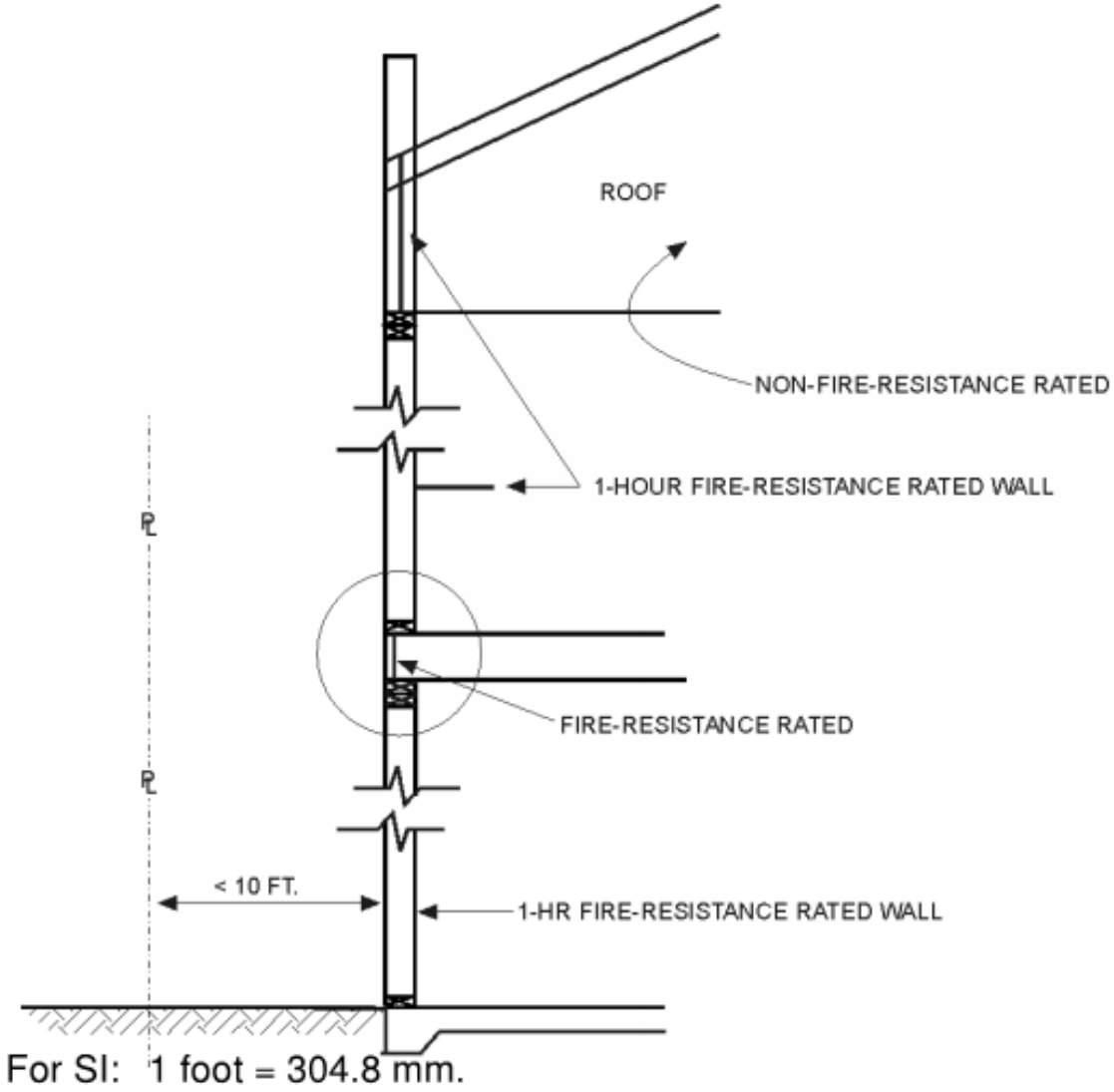


Figure 705.6
TYPE IIB AND VB EXTERIOR FIRE-RESISTANCE-RATED WALL CONTINUITY AND STRUCTURAL STABILITY

Parapets – IBC 705.11

Parapets shall be provided on exterior walls of buildings.

Exceptions:

1. The wall is not required to be fire rated per Table 602
2. Floor area is ≤ 1000 sf on each floor
3. Walls terminate at a roof that is rated for 2-hr or more OR

   Where roof and supporting construction are non-combustible

Parapets – IBC 705.11 (IBC 705.12 – 2024 IBC)

Parapets shall be provided on exterior walls of buildings.

Exceptions:

4. 1hr rated exterior walls that terminate at the underside of the roof sheathing where:
    - Framing parallel to wall is not less than 1-hr rated for 4’ for Group R/U and 10’ for other occupancies
    - Framing perpendicular to wall is 1-hr rated for entire span
    - Openings are not located within 5’ of the exterior wall for Group R/U and 10’ for other occupancies.
    - Entire building has class B roofing
5. Groups R-2 and R-3 where roofing is Class C, 1-hr rated exterior walls that terminate at the underside of the roof sheathing where:
    - Sheathing is FRT for 4’ OR
    - 5/8” Type X gyp on underside of deck for 4’
6. Exterior wall is permitted to have >25% unprotected openings

Code Commentary – IBC 705.11.1

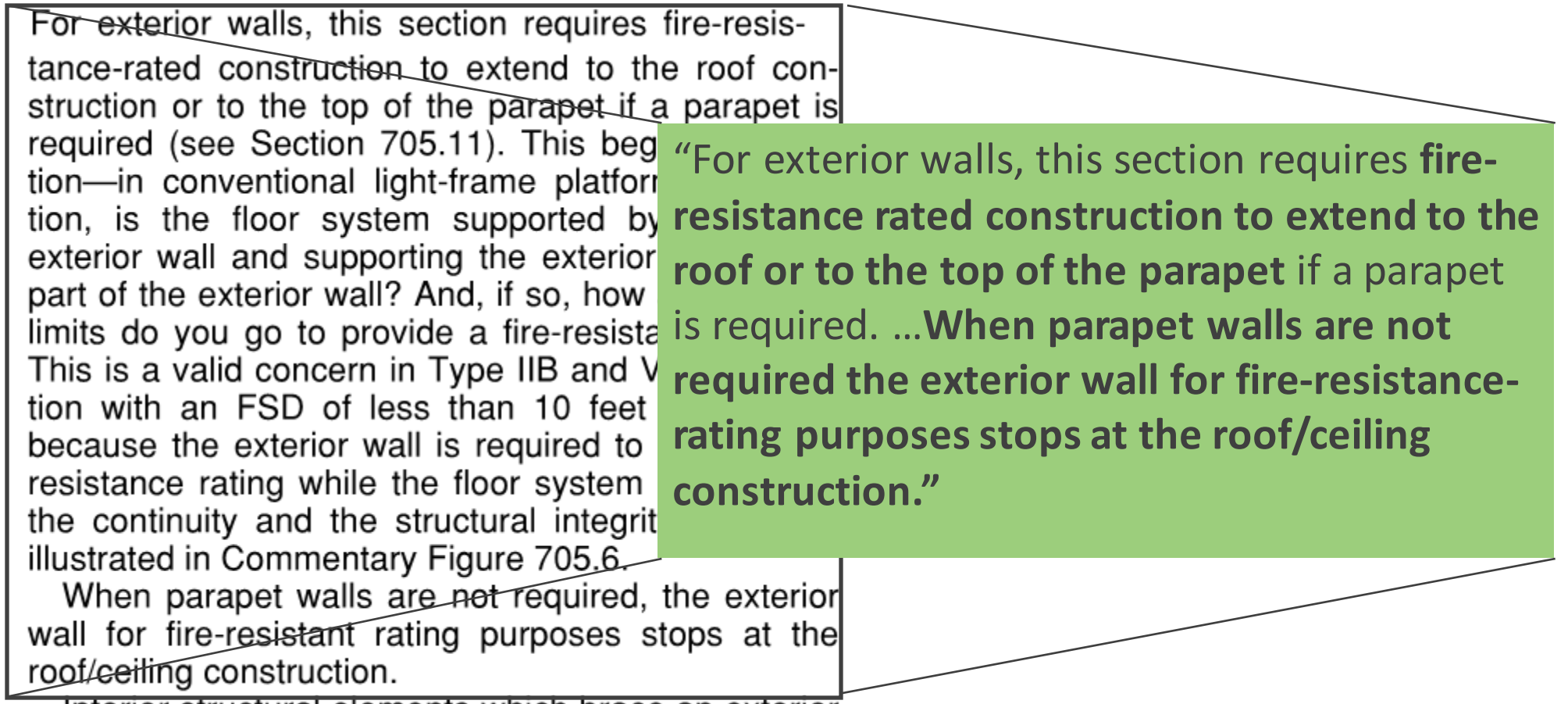
If a building is type III construction and the exterior walls are framed with fire-retardant treated wood, do the parapets need to be framed with FRTW?

❖ Parapet wall construction shall be of combustible or noncombustible material depending on the exterior wall requirements of the type of cons shall be of fire-resistance-rated cor required for the exterior wall. The interi ing facing the roof, including the flash noncombustible to a height of 18 inch above the roof. The required height o shall be 30 inches (762 mm) above the unless the roof slopes upward away fro a pitch of 2 in 12 or greater. In some c part of this section requires a higher para ing on the FSD. When the slope of the in 12, the parapet shall extend to a height equal to the height of the roof at the point determined as follows:

"Parapet wall construction shall be of combustible or noncombustible material **depending on the exterior wall requirements of the type of construction** and shall be of **fire-resistance-rated construction as required for the exterior wall**."

Code Commentary - IBC 705.6

What is the requirement for continuity with regard to parapets?



For exterior walls, this section requires fire-resistance-rated construction to extend to the roof construction or to the top of the parapet if a parapet is required (see Section 705.11). This beg
tion—in conventional light-frame platfor
tion, is the floor system supported by
exterior wall and supporting the exterior
part of the exterior wall? And, if so, how
limits do you go to provide a fire-resista
This is a valid concern in Type IIB and V
tion with an FSD of less than 10 feet
because the exterior wall is required to
resistance rating while the floor system
the continuity and the structural integrit
illustrated in Commentary Figure 705.6.

When parapet walls are not required, the exterior wall for fire-resistant rating purposes stops at the roof/ceiling construction.

Interior structural elements which brace an exterior

"For exterior walls, this section requires **fire-resistance rated construction to extend to the roof or to the top of the parapet** if a parapet is required. …**When parapet walls are not required the exterior wall for fire-resistance-rating purposes stops at the roof/ceiling construction."**

Balconies – IBC 705.2.3.1

Balconies of combustible construction and non-FRT shall be:

- Rated in accordance w/ Table 601 for floors
- Or be of Type IV
- And shall not exceed 50% of bldg perimeter

Exceptions

- Balconies in Type III, IV and V can be of type V construction and shall not have fire resistance rating if sprinkler protection provided
- Non-FRT wood is permitted for rails and guardrails

Balconies – IBC 705.2.3.1

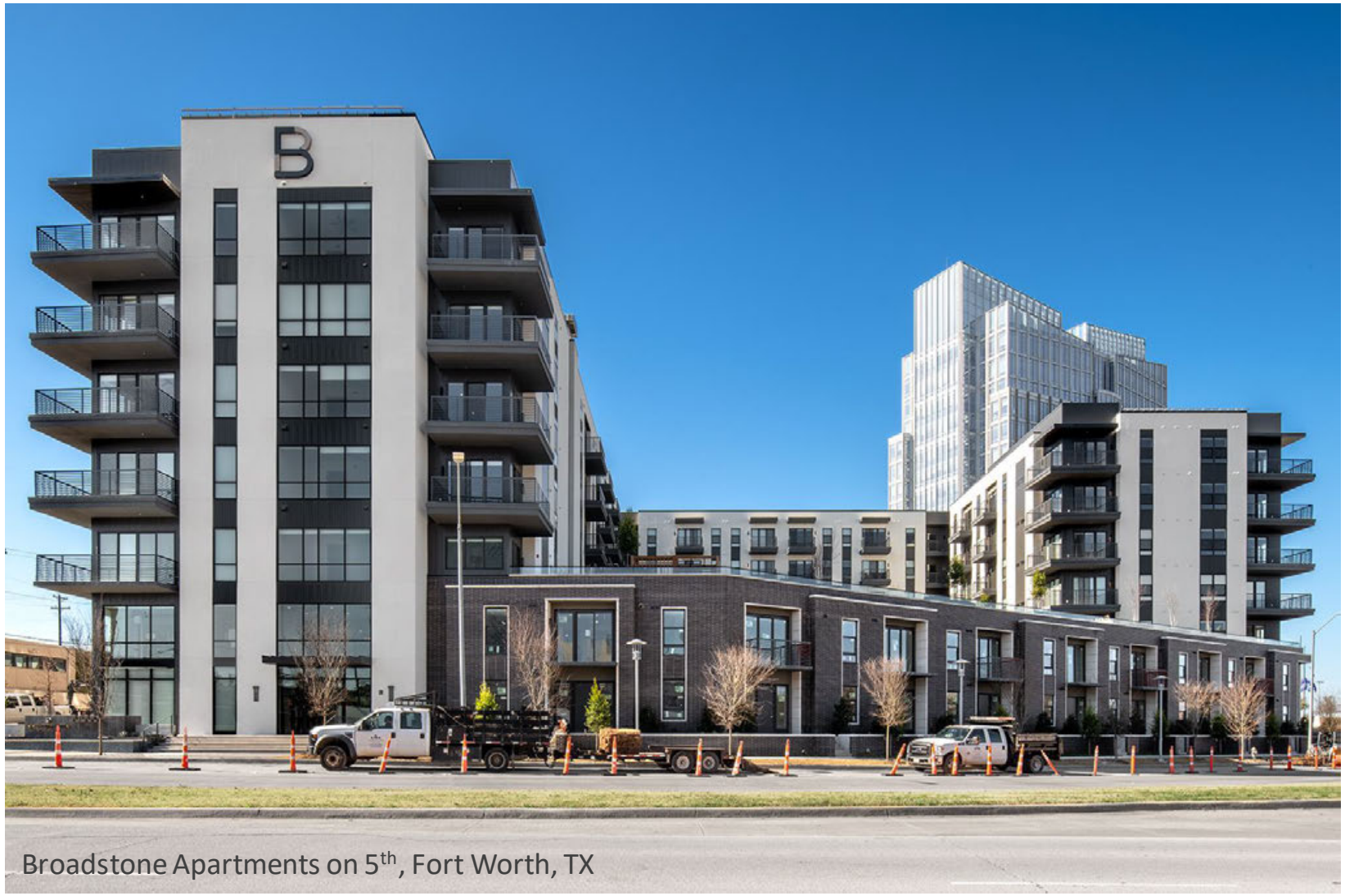
So….

For Type III or V balcony options are:

1. **Non-combustible**: no sprinklers, no fire rating
2. **FRT**: no fire sprinklers, no fire rating
3. **Type IV**: no fire sprinklers, no fire rating
4. Non-FRT: **with fire sprinkler**, no fire rating
5. Non-FRT: no sprinkler, **fire rated per 601 & 602**

Disclaimer: These options are allowed by code for meeting construction type and fire-resistance rating requirements. They do not address durability considerations. Other code requirements may apply.

2018 IBC Balcony Code Changes



Broadstone Apartments on 5th, Fort Worth, TX

2018 IBC Balcony Code Changes

As a result of the Berkeley balcony collapse in 2015, several code changes were implemented in the 2018 IBC relative to balcony durability, inspections, ventilation and moisture protection

Changes Included:

Impervious moisture barrier system changes:

- Thorough documentation on construction documents
- Inspections
- Positive drainage

Ventilation requirements

Broadstone Apartments on 5th, Fort Worth, TX

2018 IBC Balcony Code Changes

Documentation of impervious moisture barrier system on the construction documents, IBC 107.2.5 (new section)

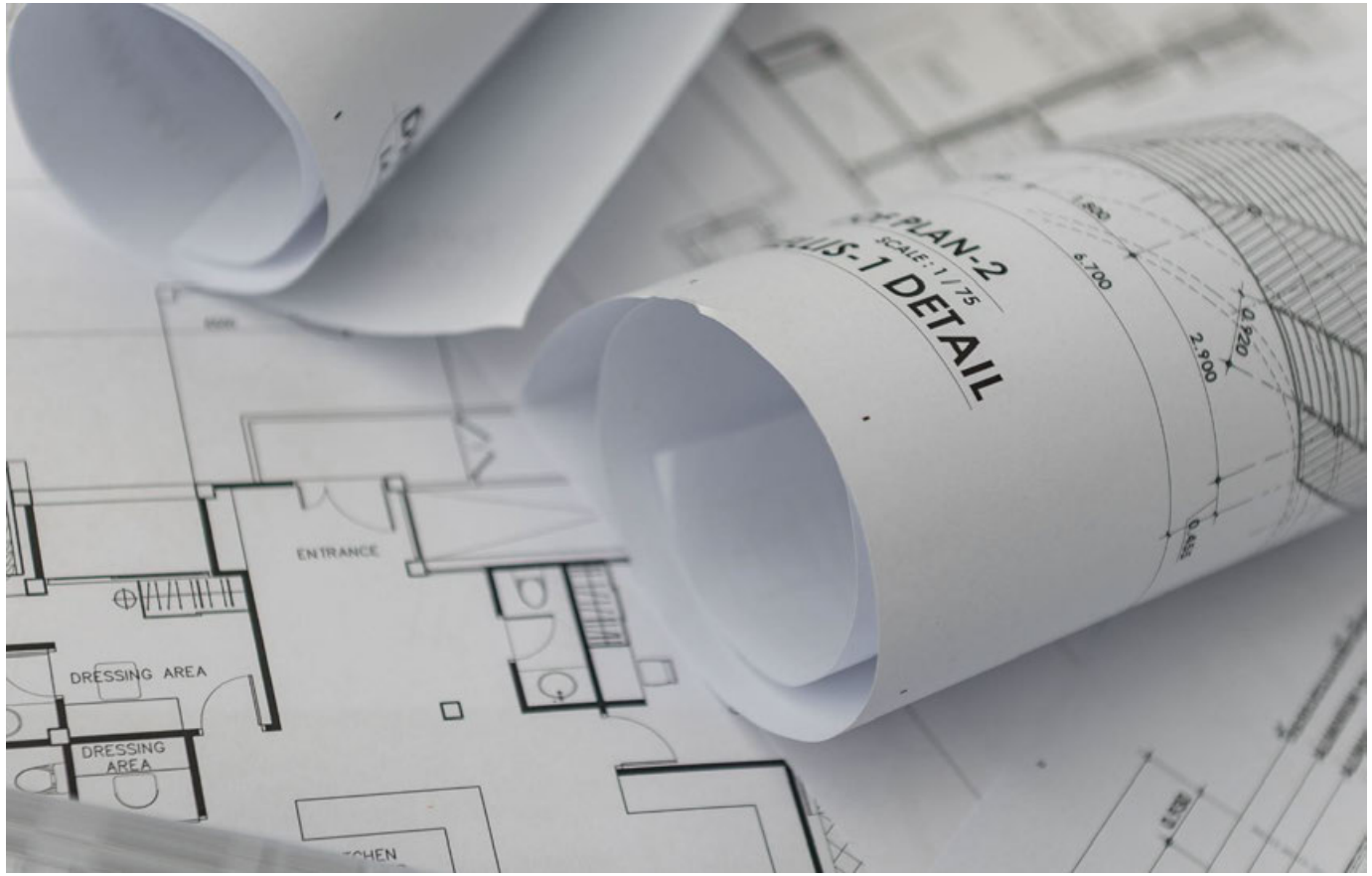
IBC 107.2.5 Exterior balcony and elevated walking surfaces. Where balcony or other elevated walking surfaces are exposed to water from direct or blowing rain, snow, or irrigation, and the structural framing is protected by an impervious moisture barrier, the construction documents shall include details for all elements of the impervious moisture barrier system. The construction documents shall include manufacturer's installation instructions.

Credit: Larry Harwell

2018 IBC Balcony Code Changes

Documentation of impervious moisture barrier system on the construction documents, IBC 107.2.5 (new section)

Purpose: ensure that all installation details and system components are fully documented to enable proper installation techniques and material use



2018 IBC Balcony Code Changes

Required inspection of impervious moisture barrier system, IBC 110.3.6 (new section)

IBC 110.3.6 Weather exposed balcony and walking surface waterproofing. Where balcony or other elevated walking surfaces are exposed to water from direct or blowing rain, snow, or irrigation, and the structural framing is protected by an impervious moisture barrier, all elements of the impervious moisture barrier system shall be not be concealed until inspected and approved.

Exception: Where special inspections are provided in accordance with Section 1705.1.1, Item 3.

2018 IBC Balcony Code Changes

Required inspection of impervious moisture barrier system, IBC 110.3.6 (new section)

Purpose: ensure that an inspection of the impervious moisture barrier system takes place prior to enclosing the space.

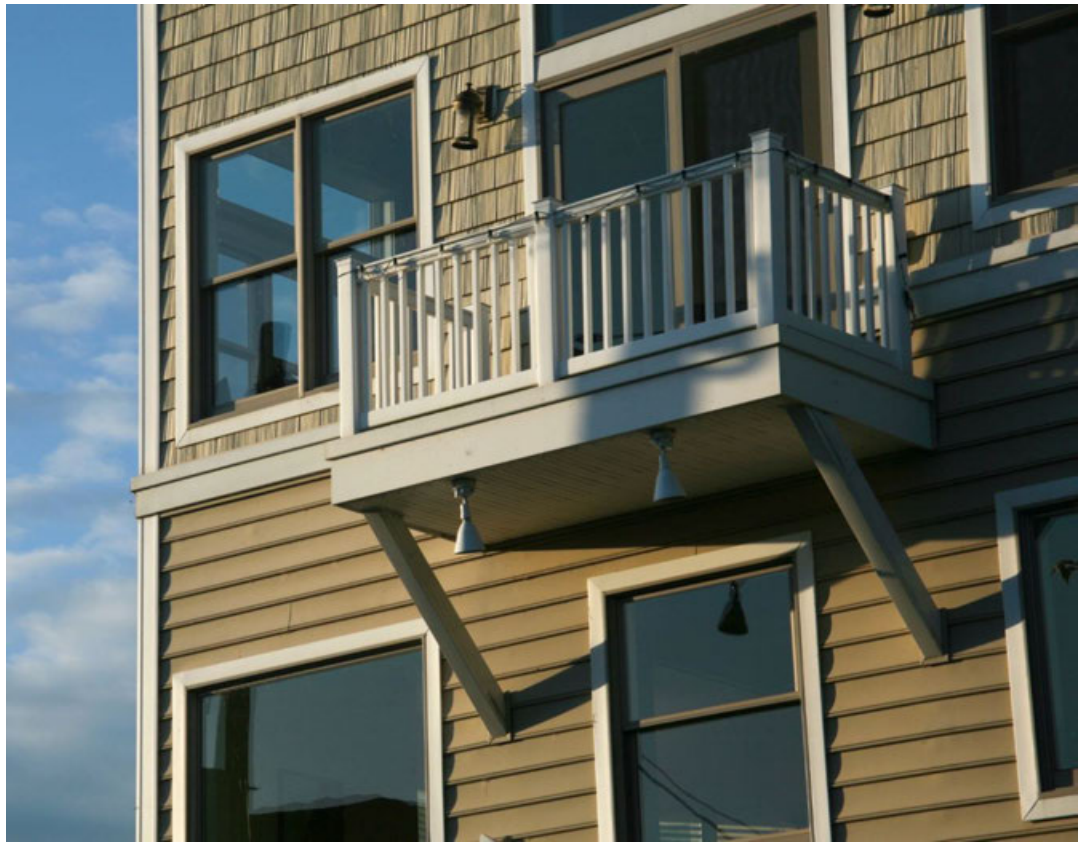
A further step toward ensuring that systems are installed in the intended manner with the ability to function as designed

2018 IBC Balcony Code Changes

Positive drainage for impervious moisture barrier systems, IBC 2304.12.2.5 (added language underlined)

IBC 2304.12.2.5 Supporting members for permeable floors and roofs.

Wood structural members that support moisture-permeable floors or roofs that are exposed to the weather, such as concrete or masonry slabs, shall be of naturally durable or preservative treated wood unless separated from such floors or roofs by an impervious moisture barrier. <u>The impervious moisture barrier system protecting the structure supporting floors shall provide positive drainage of water that infiltrates the moisture-permeable floor topping</u>.



2018 IBC Balcony Code Changes

So what are the options?

When wood balcony framing is covered with a moisture permeable topping such as a concrete slab, the wood framing must meet one of the following criteria:

- Be preservative-treated or naturally decay resistant wood

or

- Be covered with an impervious moisture barrier system **with positive drainage**


Credit: Larry Harwell

2018 IBC Balcony Code Changes

If the impervious moisture barrier system does not have positive drainage, water that infiltrates the topping can remain stagnant over the impervious moisture barrier system, creating hydrostatic pressure

Positive drainage components commonly include a drainage mat above a waterproof membrane

Some feel that using both preservative treate wood and an impervious moisture barrier system with positive drainage is the best approach, even though it exceeds 'code minimums'

Walter Huntington Apartments

2018 IBC Balcony Code Changes

Enclosed balconies must be ventilated, IBC 2304.12.2.6 (new section)

IBC 2304.12.2.6 Ventilation required beneath balcony or elevated walking surfaces. Enclosed framing in exterior balconies and elevated walking surfaces that are exposed to rain, snow, or drainage from irrigation, shall be provided with openings that provide a net free cross ventilation area not less than 1 /150 of the area of each separate space.

2018 IBC Balcony Code Changes

What's the purpose of ventilating enclosed balcony framing spaces?

No matter how well detailed and installed the balcony moisture protection system is, moisture may still find its way into enclosed spaces. There needs to be a way for this moisture to exit – the ventilation strategy aims to solve that.

Note that the inclusion of ventilation openings will create membrane voids within the balcony floor assembly. The use of sprinklers may be req'd.

Credit: Balcony Inspection Vents

Type III Construction Detail Examples

What is being enforced in jurisdictions you are working in?

QUESTIONS?

This concludes The American Institute of Architects Continuing Education Systems Course

Speaker name

Speaker organization

Speaker email address

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