Floors to Exterior Walls
And Other Detailing Challenges in Mid-Rise Wood Buildings

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WoodWorks- Wood Products Council

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Regional Director TX
WoodWorks- Wood Products Council
Outline

» Allowable Heights, Areas, Number of Stories
  » 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
Building Height Increase
Buildings equipped throughout with an NFPA 13 or 13R* sprinkler system are allowed an additional 1 story and 20 ft over nonsprinklered conditions

*NFPA 13R limited to 60 ft & 4 stories
# Allowable Building Height

IBC 2018 Table 504.3

Provides base (non-sprinklered) & increased heights

<table>
<thead>
<tr>
<th>OCCUPANCY CLASSIFICATION</th>
<th>SEE FOOTNOTES</th>
<th>TYPE I</th>
<th>TYPE II</th>
<th>TYPE III</th>
<th>TYPE IV</th>
<th>TYPE V</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>A, B, E, F, M, S, U</td>
<td>NS&lt;sup&gt;b&lt;/sup&gt;</td>
<td>UL</td>
<td>160</td>
<td>65</td>
<td>55</td>
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<tr>
<td></td>
<td>S</td>
<td>UL</td>
<td>180</td>
<td>85</td>
<td>75</td>
<td>85</td>
</tr>
<tr>
<td>R</td>
<td>NS&lt;sup&gt;d,h&lt;/sup&gt;</td>
<td>UL</td>
<td>160</td>
<td>65</td>
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<td></td>
<td>S13R</td>
<td>60</td>
<td>60</td>
<td>60</td>
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<td>60</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>UL</td>
<td>180</td>
<td>85</td>
<td>75</td>
<td>85</td>
</tr>
</tbody>
</table>

**NS** = Buildings not equipped throughout with an automatic sprinkler system

**S** = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 (NFPA 13)

**S13R** = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.2 (NFPA 13R)

**S13D** (not shown) = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.3 (NFPA 13D)
## Allowable Stories

IBC 2018 Table 504.4

Provides base (non-sprinklered) & increased # of stories

<table>
<thead>
<tr>
<th>OCCUPANCY CLASSIFICATION</th>
<th>TYPE OF CONSTRUCTION</th>
<th>SEE FOOTNOTES</th>
<th>TYPE I</th>
<th>TYPE II</th>
<th>TYPE III</th>
<th>TYPE IV</th>
<th>TYPE V</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>A-2</td>
<td>NS</td>
<td>UL</td>
<td>11</td>
<td>3</td>
<td>2</td>
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<td>S</td>
<td>UL</td>
<td>12</td>
<td>4</td>
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<tr>
<td>A-3</td>
<td>NS</td>
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<td>11</td>
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<td>S</td>
<td>UL</td>
<td>12</td>
<td>4</td>
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<tr>
<td>B</td>
<td>NS</td>
<td>UL</td>
<td>11</td>
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<td>3</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>UL</td>
<td>12</td>
<td>6</td>
<td>4</td>
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<td>4</td>
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<tr>
<td>R-1</td>
<td>NS&lt;sup&gt;d, h&lt;/sup&gt;</td>
<td>UL</td>
<td>11</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>S13R</td>
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<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
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<td>S</td>
<td>UL</td>
<td>12</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>R-2</td>
<td>NS&lt;sup&gt;d, h&lt;/sup&gt;</td>
<td>UL</td>
<td>11</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>S13R</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
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<td>S</td>
<td>UL</td>
<td>12</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>S-1</td>
<td>NS</td>
<td>UL</td>
<td>11</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>2</td>
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<tr>
<td></td>
<td>S</td>
<td>UL</td>
<td>12</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>
Floor Area Increase
Buildings equipped throughout with an NFPA 13 sprinkler system can be increased
300% (single story buildings) or
200% (multi-story buildings) over nonsprinklered conditions
Allowable Story Area

**Can still increase these areas by the Frontage Factor of Section 506.3**

<table>
<thead>
<tr>
<th>OCCUPANCY CLASSIFICATION</th>
<th>SEE FOOTNOTES</th>
<th>TYPE OF CONSTRUCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>TYPE I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>R-1</td>
<td>NS&lt;sup&gt;d, b&lt;/sup&gt;</td>
<td>UL</td>
</tr>
<tr>
<td></td>
<td>S13R</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S1</td>
<td>UL</td>
</tr>
<tr>
<td></td>
<td>SM</td>
<td>UL</td>
</tr>
</tbody>
</table>

**NS** = Buildings not equipped throughout with an automatic sprinkler system

**S1** = Buildings a maximum of one story above grade plane equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 (NFPA 13)

**SM** = Buildings two or more stories above grade plane equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.2 (NFPA 13R)
Allowable Building Size
IBC 506.2.3

**Total Building Area**
Total building allowable area = allowable area per floor times:
2 for 2 story building
3 for 3 or more story buildings
Area Frontage Increase
Buildings with minimum levels of open frontage can add **up to 75%** of allowable non-sprinklered area to total floor area

**Allowable Story Area**

IBC 506.3
## IBC Building Size Limits with Sprinkler

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

<table>
<thead>
<tr>
<th>Type IIAA Construction Allowable Limit</th>
<th>NS</th>
<th>S13R</th>
<th>S1</th>
<th>SM</th>
<th>Max Frontage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stories</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
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<tr>
<td>Height (ft)</td>
<td>65</td>
<td>60</td>
<td>85</td>
<td>85</td>
<td>85</td>
</tr>
<tr>
<td>Building Area/Story (ft²)</td>
<td>24k</td>
<td>24k</td>
<td>96k</td>
<td>72k</td>
<td>90k</td>
</tr>
<tr>
<td>Total Building Area* (ft²)</td>
<td>72k</td>
<td>96k</td>
<td>96k</td>
<td>216k</td>
<td>270k</td>
</tr>
</tbody>
</table>

* 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.
Mid-Rise vs. High-Rise Definition – IBC 202

If this dimension exceeds 75 feet, building is considered a high rise.

10’ floor to floor

Lowest Level of Fire Dept. Vehicle Access

Determination of high-rise building
IBC Podium Provisions

See Special Provisions for Podiums in IBC 510.2
Increases allowable stories... not allowable building height
Outline

» Allowable Heights, Areas, Number of Stories

» 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
Fire Performance

Combustibility

Fire Resistance

Flame Spread Classification

Fire Protection Systems
## Fire-Resistance Ratings

<table>
<thead>
<tr>
<th>Key Differences in Fire Ratings for Construction Types</th>
<th>IIIA</th>
<th>IIIB</th>
<th>VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exterior wall framing</td>
<td>FRT</td>
<td>FRT</td>
<td>non-FRT</td>
</tr>
<tr>
<td>Exterior bearing wall fire rating</td>
<td>2 hr</td>
<td>2 hr</td>
<td>1 hr</td>
</tr>
<tr>
<td>Interior bearing wall fire rating</td>
<td>1 hr</td>
<td>0 hr</td>
<td>1 hr</td>
</tr>
<tr>
<td>Interior non-bearing wall fire rating</td>
<td>0 hr</td>
<td>0 hr</td>
<td>0 hr</td>
</tr>
<tr>
<td>Floor assembly fire rating</td>
<td>1 hr</td>
<td>0 hr</td>
<td>1 hr</td>
</tr>
<tr>
<td>Fire wall rating</td>
<td>3 hr</td>
<td>3 hr</td>
<td>2 hr</td>
</tr>
</tbody>
</table>

*From IBC Tables 601 & 706.4*

Note: FRT = Fire Retardant Treated
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
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:

» Hourly rating requirements per Tables 601 vs 602
» Structural stability requirements
» 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.
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.
# Exterior Wall Fire Resistance

## Table 601

<table>
<thead>
<tr>
<th>BUILDING ELEMENT</th>
<th>TYPE I</th>
<th>TYPE II</th>
<th>TYPE III</th>
<th>TYPE IV</th>
<th>TYPE V</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>B</td>
<td>HT</td>
</tr>
<tr>
<td>Primary structural frame (see Section 202)</td>
<td>3&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0</td>
<td>1&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Bearing walls</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exterior&lt;sup&gt;e,f&lt;/sup&gt;</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Interior</td>
<td>3&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Nonbearing walls and partitions</td>
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<tr>
<td>Exterior</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonbearing walls and partitions</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0&lt;sup&gt;d&lt;/sup&gt;</td>
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<tr>
<td>Interior&lt;sup&gt;e&lt;/sup&gt;</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floor construction and associated secondary members (see Section 202)</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1&lt;sup&gt;1/HT&lt;/sup&gt;</td>
</tr>
<tr>
<td>Roof construction and associated secondary members (see Section 202)</td>
<td>1&lt;sup&gt;1/2&lt;/sup&gt;&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1&lt;sup&gt;h,c&lt;/sup&gt;</td>
<td>1&lt;sup&gt;h,c&lt;/sup&gt;</td>
<td>0&lt;sup&gt;c&lt;/sup&gt;</td>
<td>1&lt;sup&gt;h,c&lt;/sup&gt;</td>
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</table>

## Table 602

<table>
<thead>
<tr>
<th>FIRE SEPARATION DISTANCE = X (foot)</th>
<th>TYPE OF CONSTRUCTION</th>
<th>OCCUPANCY GROUP H&lt;sup&gt;+&lt;/sup&gt;</th>
<th>OCCUPANCY GROUP F-1, M, S-1&lt;sup&gt;†&lt;/sup&gt;</th>
<th>OCCUPANCY GROUP A, B, E, F-2, I, R, S-2, U&lt;sup&gt;†&lt;/sup&gt;</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>All</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>X &lt; 5&lt;sup&gt;b&lt;/sup&gt;</td>
<td>IA</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>5 ≤ X &lt; 10</td>
<td>IA, IB</td>
<td>2</td>
<td>1</td>
<td>1</td>
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<tr>
<td></td>
<td>PIB, VB</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>10 ≤ X &lt; 30</td>
<td>IA, IB</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>PIB, VB</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>X ≥ 30</td>
<td>All</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</table>
# Type V Exterior Walls: Fire Rating Requirements

<table>
<thead>
<tr>
<th>Fire Rating of Structural Elements</th>
<th>VA</th>
<th>VB</th>
</tr>
</thead>
<tbody>
<tr>
<td>For occupancy groups A, B, E, F-2, I, R, S-2, U</td>
<td>Int. face of wall</td>
<td>Ext. face of wall</td>
</tr>
<tr>
<td>FSD ≥ 30 ft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exterior bearing walls (hrs)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Exterior Nonbearing walls (hrs)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10 ft &lt; FSD &lt; 30 ft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exterior bearing walls (hrs)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Exterior Nonbearing walls (hrs)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>FSD ≤ 10 ft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exterior bearing walls (hrs)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Exterior Nonbearing walls (hrs)</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
## Type III Exterior Walls: Fire Rating Requirements

<table>
<thead>
<tr>
<th>Fire Rating of Structural Elements</th>
<th>IIIA</th>
<th>IIIIB</th>
</tr>
</thead>
<tbody>
<tr>
<td>For occupancy groups A, B, E, F-2, I, R, S-2, U</td>
<td>Int. face of wall</td>
<td>Ext. face of wall</td>
</tr>
<tr>
<td><strong>FSD ≥ 30 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exterior bearing walls (hrs)</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Exterior Nonbearing walls (hrs)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>10 ft &lt; FSD &lt; 30 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exterior bearing walls (hrs)</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Exterior Nonbearing walls (hrs)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td><strong>FSD ≤ 10 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exterior bearing walls (hrs)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Exterior Nonbearing walls (hrs)</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Exterior Wall Fire Ratings

» Using the provisions of section 705.5 and Tables 601 and 602 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.
Common issues with tested assemblies:

- Assembly asymmetry: separate assemblies for each side
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
# Exterior Walls – 1-hr Int; 0-hr Ext

## IBC Table 721.1(2)

| 16-1.1³ | 2" x 4" wood studs at 16" centers with double top plates, single bottom plate; interior side covered with 3/8" 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 5/16" 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 |
|———|———|———|———|———|
| 16-1.2³ | 2" x 6" wood studs at 16" centers with double top plates, single bottom plate; interior side covered with 3/8" 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 5/16" 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 3 1/2" mineral wool insulation. Rating established from the gypsum-covered side only. | — | — | 6 1/16 |
|———|———|———|———|———|
| 16-1.3³ | 2" x 6" wood studs at 16" centers with double top plates, single bottom plates; interior side covered with 3/8" 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 5/8" 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 |
Exterior Walls – 2-hr Int; 0-hr Ext

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
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.
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
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.
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

» Allowable Heights, Areas, Number of Stories
» 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
» Balconies
Platform Framing

**Structural**
- Direct bearing/no additional hardware
- May require load transfer blocking for concentrated loads from above
- Wall sill/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-balcony Framing

**Structural**
» Additional hardware/no direct bearing
» No load transfer blocking required

**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
### Key Differences in Fire Ratings for Construction Types

<table>
<thead>
<tr>
<th></th>
<th>IIIA</th>
<th>IIIB</th>
<th>VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exterior wall framing</td>
<td>FRT</td>
<td>FRT</td>
<td>non-FRT</td>
</tr>
<tr>
<td>Exterior bearing wall fire rating</td>
<td>2 hr</td>
<td>2 hr</td>
<td>1 hr</td>
</tr>
<tr>
<td>Floor assembly fire rating</td>
<td>1 hr</td>
<td>0 hr</td>
<td>1 hr</td>
</tr>
</tbody>
</table>

**From IBC Table 601**

Note: FRT = Fire Retardant Treated
Intersection of Tested Assemblies

Design No. U301
May 20, 2015

Bearing Well Rating — 2 HR.
Finish Rating — 66 Min.

2 Hour Wall

GA FILE NO. WP 4135
GENERIC

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 9/16" 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 1/4"
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**

<table>
<thead>
<tr>
<th>GA FILE NO. FC 5111</th>
<th>GENERIC</th>
<th>1 HOUR FIRE</th>
<th>50 to 54 STC SOUND</th>
</tr>
</thead>
<tbody>
<tr>
<td>WOOD I-JOISTS, GYPSUM WALLBOARD, RESILIENT CHANNELS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Base layer 1/8" 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 9/16" deep wood I-joists, with minimum 1-1/4" deep x 1-1/2" wide flanges and minimum 3/4" 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 1-1/4" 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 3/8" 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-S7
Sound Test: NRCC B-3150.2, 6-30-00
IIC & Test: (68 C & P) NRCC B-3150.2, 6-30-00
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
Type III and IV-HT Construction - IBC Section 602.3:
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 FRT requirement include?
» Wall Framing (Studs & Plates) – **Yes**
» Wall Sheathing – **Yes**
» Floor sheathing - ?
» Rim boards ?
» Floor Joists- ?
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 in the 2018 IBC clarify this.

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.

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.
IBC 705.6 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 (IBC 2018 and previous) or 705.5 (IBC 2021 & 2024) for the exterior wall.
Code Commentary – 2018 IBC 705.6

- Structural stability of fire-resistance-rated construction is an important concern. Section 705.6 requires elements providing bracing support to be fire-resistance-rated for the same duration of time as the exterior wall. 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 construction may not be required to be of fire-resistance-rated construction in Type IIB and VB construction, efforts must be made to ensure that the floors, at least at the exterior wall, are 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. 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.”
Exterior Walls – Intersecting Floors

Disclaimer:
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
» Protection of rim for fire

Rationale for detail approval:
» Intersection of rated assemblies (wall & floor) considered sufficient

Floor Joist Options:
• Solid Sawn
• Trusses
• I-Joists

Legend
- Untreated or FRT
- FRT Wood

Diagram elements:
- FRT sheathing
- Rim board
- Floor sheathing
Exterior Walls – Intersecting Floors

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

Typical Platform Framing

- FRT sheathing
- Rim board
- Blocking between floor joists
- Floor sheathing
- Floor Joist Options:
  - Solid Sawn
  - Trusses
  - I-Joists

Legend
- Untreated or FRT
- FRT Wood

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
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, 2 layers of blocking provide 2-hr protection through char calculations
AWC’s DCA3 provides floor to wall intersection detailing options.

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

https://awc.org/codes-standards/publications/dca3
Exterior Walls – Intersecting Floors

Two-hour fire-resistance-rated exterior wall assembly, rated for exposure from interior side (and from exterior side as required by IBC 705.5)

FRTW wall framing (studs, plates, blocking, etc.)

Untreated wood rim board, designed to support full wall load (with a minimum thickness of 1 1/8" if wall is required to be rated from exterior per IBC 705.5)

Untreated wood blocking with minimum thickness of 1 1/8" (Case A), 1 1/4" (Case B) or 1 5/8" (Case C). Blocking must be designed to support full wall load if wall is required to be rated from exterior per IBC 705.5.

FRTW wall framing (studs, plates, blocking, etc.)

FRTW sheathing (as required)

Exterior fire protection (as required to achieve fire-resistance rating per IBC 705.5)

Two-hour fire-resistance-rated exterior wall assembly, rated for exposure from interior side (and from exterior side as required by IBC 705.5)

One-hour fire-resistance-rated floor / ceiling assembly made with untreated framing members and floor sheathing

Untreated wood or other approved material to fill gap between blocking and joist web (if joists are used)

Ceiling membrane (as required for one-hour floor assembly):
- Case A: Two layers of min 3/8" Type X GWB or equivalent (used in conjunction with min 1 1/8" blocking)
- Case B: Two layers of min 1/2" Type X GWB or equivalent (used in conjunction with min 1 1/4" blocking)
- Case C: One layer of min 3/8" Type X or Type C GWB (used in conjunction with min 1 1/8" blocking and min 1 1/2" 2.5 pcf (nominal) mineral wool batt insulation resting on furring or resilient channels)

Figure 1A: Example detail for Type III-A exterior wall-floor intersection with rim board and blocking
Exterior Walls – Intersecting Floors

Methodology:
Fire-resistance for exposure from interior side:

- Case A: Minimum 1 1/4-inch-thick inner rim board plus two layers of minimum 5/8 in. Type X GWB in the ceiling membrane provides 2 hours of protection to the outer rim board, based on the NDS-calculated time for the char depth to reach the inner rim board / outer rim board interface plus 40 minutes for each layer of 5/8 in. Type X GWB (per IBC Table 722.6.2(1)).
- Case B: Minimum 1 3/4-inch-thick inner rim board plus two layers of minimum 1/2 in. Type X GWB in the ceiling membrane provides 2 hours of protection to the outer rim board, based on the NDS-calculated time for the char depth to reach the inner rim board / outer rim board interface plus 25 minutes for each layer of 1/2 in. Type X GWB (per IBC Table 722.6.2(1)).
- Case C: Minimum 1 5/8-inch-thick inner rim board plus one layer of minimum 5/8 in. Type X GWB in the ceiling membrane plus minimum 1 1/2-inch-thick, 2.5pcf (nominal) mineral wool batt insulation provides 2 hours of protection to the outer rim board, based on the NDS-calculated time for the char depth to reach the inner rim board / outer rim board interface, plus 40 minutes for the 5/8 in. Type X GWB (per IBC Table 722.6.2(1)), plus 15 minutes for the mineral wool insulation.

The outer rim board must be designed to support the load from the wall above.

Fire-resistance for exposure from exterior side (where required per IBC Section 705.5): A combination of exterior fire protection, FRTW sheathing, and minimum 1 1/8-inch-thick outer rim board is used to provide two hours of protection to the inner rim board. Layers to the exterior of the outer rim board (e.g., exterior fire protection, FRTW sheathing, etc.) must be sufficient to provide at least 80 minutes of protection to the outer rim board. The inner rim board must be designed to support the load from the wall above.

Figure 1A: Example detail for Type III-A exterior wall–floor intersection with rim board and blocking
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

Source: AWC’s TR 10
Exterior Walls – Intersecting Floors

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

Legend

- Untreated or FRT
- FRT Wood
- Untreated

Rationale for detail approval:
» Intersection of rated assemblies (wall & floor) considered sufficient
Exterior Walls – Intersecting Floors

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

FRT sheathing
Floor sheathing
2x ribbon
Blocking between floor trusses

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 2\textsuperscript{nd} 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
Exterior Walls – Intersecting Floors

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

Floor Joist Options:
• Solid Sawn
• Trusses
• I-Joists

Rationale for detail approval:
» Intersection of rated assemblies (wall & floor) considered sufficient

Legend
- Untreated or FRT
- FRT Wood
- Untreated

Floor sheathing
FRT sheathing
Blocking
Joist hanger
Exterior Walls – Intersecting Floors

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

Floor Joist Options:
• Solid Sawn
• Trusses
• I-Joists

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

Floor Joist Options:
• Solid Sawn
• Trusses
• I-Joists

Rationale for detail approval:
» Ceiling membrane provides 1-hr protection
» 1 layer of wall membrane provides 2nd hr protection

Legend
- Untreated or FRT
- FRT Wood
- Untreated

Diagram:
- FRT sheathing
- Blocking
- Floor sheathing
- Top flange joist hanger

Legend:
- Untreated or FRT
- FRT Wood
- Untreated
Exterior Walls – Intersecting Floors

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

Floor Joist Options:
• Solid Sawn
• Trusses
• I-Joists

Rationale for detail approval:
» 1 layer of wall membrane provides 1-hr protection
» Blocking between joists provides 2\textsuperscript{nd} hr through char calculations

Legend

- Untreated or FRT
- FRT Wood
- Untreated
Exterior Walls – Intersecting Floors

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

Floor Joist Options:
• Solid Sawn
• Trusses
• I-Joists

Top flange joist hanger approved to span 2 layers GWB

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
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

Floor Joist Options:
- Solid Sawn
- Trusses
- I-Joists

This detail is often used with a balcony; 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

Legend
- Untreated or FRT
- FRT Wood
- Untreated
Exterior Walls – Intersecting Floors

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

FRT sheathing
(2) 2x flat blocking
Floor sheathing

Rationale for detail approval:
» Membranes on both side of wall provide fire resistance via their approved assembly
» At floor cavity ceiling membrane provides 1 hr
» 1 layer of wall membrane provides 2\textsuperscript{nd} hr

Legend
- Untreated or FRT
- FRT Wood
- Untreated

Should specify truss web holdback (3/4” min) to allow gypsum installation

Blocking
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 1 hr
» 1 layer of wall membrane provides 2\textsuperscript{nd} hr
Exterior Walls – Intersecting Floors

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

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
» 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

- FRT sheathing
- (2) 2x flat blocking
- Floor sheathing

Rationale for detail approval:
» Membranes on both side of wall provide fire resistance via their approved assembly

Legend
- Untreated or FRT
- FRT Wood
- Untreated

Should specify truss web holdback (1 1/2” min) to allow gypsum installation
Exterior Walls – Intersecting Floors

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

Legend

- Untreated or FRT
- FRT Wood
- Untreated

Rationale for detail approval:
» Membranes on both side of wall provide fire resistance via their approved assembly

FRT sheathing

2x rim

Floor sheathing

Note reduced truss bearing length

Should specify truss web holdback (1 1/2” min) to allow gypsum installation
Exterior Walls – Intersecting Floors
Exterior Walls – Intersecting Floors

Gaps between end of truss members and wall to allow gypsum install after
IBC 2024 Changes: Floor to Wall Intersections

Two key changes that have been approved for inclusion in the 2024 IBC clarify platform framed floor to wall details.

**Code change 1:** clarifies fire-resistance continuity requirements for exterior walls:

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**2021 International Building Code**

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 or roof sheathing, deck or slab above.

2. The underside of a one-hour fire-resistance-rated floor/ceiling or roof/ceiling assembly. Assembly having a fire-resistance rating equal to or greater than the exterior wall and the fire separation distance is greater than 10 feet.
IBC 2024 Changes: Floor to Wall Intersections

2021 International Building Code

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 or roof sheathing, deck or slab above.
2. The underside of a one-hour fire-resistance rated 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.

Example 1: Type VA Construction, Group R-2
1-hour exterior wall, 1-hour floor

Fire-resistance rating extends from the top of the floor/ceiling assembly below to the underside of an assembly having a fire-resistance rating equal to the exterior wall.
IBC 2024 Changes: Floor to Wall Intersections

2021 International Building Code

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

Example 2: Type IIIA Construction, Group R-2
2-hour exterior wall, 1-hour floor

Fire-resistance rating extends from the top of the floor/ceiling assembly below to the underside of the floor sheathing above.
IBC 2024 Changes: Floor to Wall Intersections

Example 2: Type IIIA Construction, Group R-2
2-hour exterior wall, 1 hour floor

Since FRR of exterior wall is greater than FRR of floor, the exterior wall’s FRR must extend to the underside of the floor sheathing. As noted previously, this doesn’t mean that the wall needs to fully bypass the floor, but we do need to demonstrate the wall’s 2-hour FRR through the depth of the floor.
IBC 2024 Changes: Floor to Wall Intersections

Two key changes that have been approved for inclusion in the 2024 IBC clarify platform framed floor to wall details.

Code change 2: clarifies material requirements for floor construction at exterior walls intersections (i.e. does floor sheathing, joists, rim board at exterior walls in Type III Construction need to be FRT?):

705.6.1 Supporting construction Floor Assemblies in Type III Construction. Construction that in Type III construction where a floor assembly supports gravity loads from fire-resistance-rated exterior walls shall have a fire-resistance rating that is equal to or greater than the required fire resistance rating of the supported wall. For achieving the required fire resistance rating for exposure from the interior of the building, ceiling materials shall be permitted to contribute to the required fire-resistance of the supporting construction. An exterior wall, the fire-resistance rating of the portion of the floor assembly that supports the exterior wall shall not be 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.
IBC 2024 Changes: Floor to Wall Intersections

705.6.1 Supporting construction Floor Assemblies in Type III Construction. Construction that In Type III construction where a floor assembly supports gravity loads from fire-resistance-rated exterior walls shall have a fire-resistance rating that is equal to or greater than the required fire resistance rating of the supported wall. For achieving the required fire resistance rating for exposure from the interior of the building, ceiling materials shall be permitted to contribute to the required fire-resistance of the supporting construction. – an exterior wall, the fire-resistance rating of the portion of the floor assembly that supports the exterior wall shall not be 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.

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.

Interior building elements (floor construction) in Type III is not required to be FRTW
Outline

» Allowable Heights, Areas, Number of Stories
» 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

» Balconies

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

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
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.
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. The impervious moisture barrier system protecting the structure supporting floors shall provide positive drainage of water that infiltrates the moisture-permeable floor topping.
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 PT wood and an impervious moisture barrier system with positive drainage is the best approach, even though it exceeds ‘code minimums’.
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 $\frac{1}{150}$ of the area of each separate space.
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.