Mid-Rise Wood Construction
Navigating Codes and Detailing Assemblies

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Presentation Outline

• General Code Topics
  • Podium Basics
  • High-rises
  • Firestop Special Inspections
  • Stair Construction
  • Exterior Walls: NFPA 285 and Projections
  • Fire Walls
  • Vertical Openings
  • Occupied Roofs

• Details and Assemblies

• Fire Safety During Construction
General Code
Podium Code Basics

• Under 2015 IBC, multiple stories are now allowed below 3-hr podium per Section 510.2. Construction below podium is Type IA construction.

• Wood mid-rise podium construction is typically either Type IIIA (5 stories) or Type VA (4 stories). Note that it is possible to have a high-rise wood “mid-rise” Construction Type III building. T-504.3 allows for Type IIIA Group R occupancy to be 85’ above Grade Plane.

• 602.3 requires that Type III exterior walls are non-combustible. Fire-retardant treated wood framing is permitted.
Podium Code Basics

Type IA Construction below 3-hour podium.

- 3-hour horizontal assembly in accordance with IBC 510.2 ("podium").
- 2-story parking garage above grade below 3-hour podium. 1-story space permitted in accordance IBC 510.2 and not strictly limited in height.

Type IIIA Construction above 3-hour podium (5-stories).

- Max. building height is 85 feet in accordance with IBC.
Podium Construction – Bump Ups

• To maintain separation, jog 3-hr fire ratings at up- and down-turns. Vertical wall is often termed “Vertical Separation Wall”
Podium Construction – Bump Ups

- Openings limited to 25% the length of the 3-hr wall (unless tested with the wall)
- Open stair and adjacency to elevators for accessible route
Podium Code Basics

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High-Rise

- Fire Command Center: 1-hr room at Ground Floor lobby with minimum 200 sf area and minimum dimension of 10 ft
- Fire pump: with reliable secondary power source (i.e. generator)
- Fire pump room: dedicated 2-hr room that is accessed directly from the exterior or by way of a 2-hr rated enclosure
- Emergency voice/alarm communication system
- Luminescent means of egress markings
- Pressurized exit stairs
- Elevator lobbies or permitted alternative
- Post-fire smoke removal
Firestop Special Inspections

• Special inspections required for firestopping in all high-rise (new or existing) and/or Risk Category III or IV buildings

• 10% witness installation or 2% destructive testing; inspections increase with failure rates. Very detailed.

• Inspector cannot be an installer, contractor, or manufacturer of firestopping products

• Industry not generally prepared for this

• Could have schedule impacts
Podium Construction – Stairs

• What material is allowed for stairs that span both construction types?

• Safe bet pre-2021 IBC is wood above podium; non-combustible construction below. Some AHJs have allowed wood throughout.

• 2021 IBC will have changes to allow it more prescriptively

1011.7 Stairway construction. Stairways shall be built of materials consistent with the types permitted for the type of construction of the building, except that wood handrails shall be permitted for all types of construction.
Combustible Facades & NFPA 285

• Type III exterior walls of certain heights require NFPA 285 testing when they include foam plastic insulation, combustible facades, or combustible AVBs

• Prior test standard did not accommodate FRT wood-framed backup walls, which are allowed by building code – there was a gap. The standard has been recently revised.

5.7 Construction Details of Test Specimen.

5.7.1 General.

5.7.1.1 The test specimen shall be constructed and secured to the test frame or apparatus using fastening and construction details representative of actual field installations in accordance with the manufacturer’s instructions.

5.7.1.2* Details of the construction of the test specimen shall be representative of actual field installations in accordance with the manufacturer’s instructions.

5.7.1.3* The framing system used to support the wall assembly that makes up the test specimen shall consist of steel studs or wood studs.
Exterior Walls: Projections

<table>
<thead>
<tr>
<th>FIRE SEPARATION DISTANCE (FSD)</th>
<th>MINIMUM DISTANCE FROM LINE USED TO DETERMINE FSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 feet to 2 feet</td>
<td>Projections not permitted</td>
</tr>
<tr>
<td>Greater than 2 feet to 3 feet</td>
<td>24 inches</td>
</tr>
<tr>
<td>Greater than 3 feet to less than 30 feet</td>
<td>24 inches plus 8 inches for every foot of FSD beyond 3 feet or fraction thereof</td>
</tr>
<tr>
<td>30 feet or greater</td>
<td>20 feet</td>
</tr>
</tbody>
</table>
Exterior Walls: Projections
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**PREVIOUS EDITIONS**
- FSD = 12.8 FEET
- FIRE RATED EXTERIOR WALL
- 45% OPENINGS PERMITTED

**METHOD 1 GOVERNS:**
12.8 FEET / 3 = 4.26' DEEP BALCONY

**2015 IBC**
- FSD = 12.8 FEET
- FIRE RATED EXTERIOR WALL
- 45% OPENINGS PERMITTED

**BALCONIES MUST BE 8.53' FROM PROPERTY LINE (24 INCHES + 8'(8.8)).**
12.8' - 8.53' = 4.27' DEEP BALCONY
Exterior Walls: Projections
Podium Construction – Fire Walls

• Reference to NFPA 221 for use of:
  • Tied fire walls
  • Cantilevered fire walls
  • Double fire walls
Podium Construction – Fire Walls
Podium Construction – Fire Walls
Vertical Openings

• 2015 IBC: reorganization of requirements for clarity

• Previously combined with shafts – Shafts now located in Section 713

• Intended to clarify floor opening requirements:
  • Elevator/escalator openings with fire shutters or draft stops with closely-spaced sprinklers
  • Two-story openings
  • Open exit access stairs – reference to Section 1019 for configuration
Vertical Openings

LEGEND

- **30-MIN CORRIDOR**
- **1-HOUR FIRE PARTITION**
- **2-HOUR FIRE BARRIER**

EGRESS NOTES

- **Occupant Load (IBC 1014.1.2)**
- Residential = 4.625 x 900 = 24 occupants
- Total Occupant Load = 24 occupants

Number of Exits & Exit Configuration (IBC 1021.1, 1021.2):
- Exit Configuration
- Exit Access Stairway = 44’ / 2 = 220 occupants
- Exit Access Stairway = 44’ / 3.2 = 137.5 occupants
- Total Egress Capacity: 440 occupants

Travel Distance (IBC 1016.2):
- Allowable Distance: 250 feet
- Actual Distance: 109 feet
Vertical Openings

**LEGEND**
- **Light Blue** - 30-MIN CORRIDOR
- **Red** - 1-HOUR FIRE PARTITION
- **Blue** - 2-HOUR FIRE BARRIER

**EGRESS NOTES**
- **Occupant Load (IBC 1004.1.2)**
  - Residential = 4,803 sf / 265 = 24 occupants
  - Total Occupant Load = 24 occupants

- **Number of Exits & Exit Configuration (IBC 1021.1, 1021.2)**
  - Number of Exits Required = 2
  - Number of Exits Provided = 2
  - One exit is interior exit stairway
  - One exit is exit access stairway protected by draft curtain/oven space sprinklers (IBC 1009.3, Exception 4)

- **Exit Capacity (IBC 1005.3)**
  - Exit Stairway = 44'/0.2 = 220 occupants
  - Exit Access Stairway = 44'/0.2 = 220 occupants
  - Total Egress Capacity: 440 occupants

- **Travel Distance (IBC 1016.2)**
  - Allowable Distance: 250 feet
  - Actual Distance: 109 feet
Occupied Roofs

• 2015 IBC Requirements:
  • Addresses required number of exits
  • Does not address height and area

I006.3 Egress from stories or occupied roofs. The means of egress system serving any story or occupied roof shall be provided with the number of exits or access to exits based on the aggregate occupant load served in accordance with this section. The path of egress travel to an exit shall not pass through more than one adjacent story.

Each story above the second story of a building shall have not less than one interior or exterior exit stairway, or interior or exterior exit ramp. Where three or more exits or access to exits are required, not less than 50 percent of the required exits shall be interior or exterior exit stairways or ramps.

Exceptions:

1. Interior exit stairways and interior exit ramps are not required in open parking garages where the means of egress serves only the open parking garage.

2. Interior exit stairways and interior exit ramps are not required in outdoor facilities where all portions of the means of egress are essentially open to the outside.
Occupied Roofs

- 2018 IBC clarifies:
  - Roof deck is permitted provided the occupancy of the roof complies with Table 504.4 for story located below the roof (no limit if building is sprinklered)
  - Roof deck is not required to be included in building area
  - Elements and structures located on roof deck are not permitted to exceed 48” above occupied roof area
Occupied Roofs

• Example:
  - Existing Type IIIB building
  - Fully sprinklered
  - Groups B & A-3
  - 5 stories

• Assembly within building would be limited to 3 stories above grade

• Open roof deck permitted since building is sprinklered

• Note: Egress requirements must still be met
Assemblies & Details
Loadbearing Exterior Walls

• 2-hour Load Bearing Exterior Wall
  • UL W408 (*FSD)
  • UL U349 (*FSD)
**Floors Framing into Exterior Walls**

**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 complying with Section 2303.2 shall be permitted within *exterior wall* assemblies of a 2-hour rating or less.
Corridor Walls

- Interior bearing walls and floor-ceiling assemblies required to be 1-hr under Type IIIA and VA. Note exceptions to IBC 708.4.
Corridor Walls

- Floor or roof sheathing
- Corridor ceiling as required for 1 hour floor or roof
- Room side membrane to deck above
- Corridor membrane permitted to stop at ceiling
- Firestopping

- Corridor ceiling constructed as required for the corridor walls
- Room side membrane to deck above
- Corridor membrane permitted to stop at ceiling
- Firestopping
Interior Wall / Floor Intersections

- Demising Walls
  - UL U341

- 1-hour Floors
  - UL L563, System 2 (gypcrete)
  - UL L529, System 1 (no gypcrete)
  - UL L579, System 3 & 5 (gyp/mat)

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

   System No. 1

Subflooring — Min 23/32 in. thick T & G wood structural panels, min grade "Underlayment" or "Single-Floor". Face grain of plywood or strength axis of panels to be perpendicular to the trusses with end joints staggered 4 ft. Panels secured to trusses with construction adhesive and No. 6d ringed shank nails spaced 12 in. OC along each truss. Adhesive applied as 3/8 in. diam bead to top chord of trusses and grooved edges of plywood or panels.
Interior Wall / Floor Intersections

- **Ceiling Membrane Interruption**

- New to 2015 IBC: Exception 7 to §714.4.2
  
  - The ceiling membrane of 1- and 2-hour fire-resistance-rated horizontal assemblies is permitted to be interrupted with the double wood top plate of a wall assembly that is sheathed with Type X gypsum wallboard, provided that all penetrating items through the double top plates are protected in accordance with Section 714.1.1 or 714.4.1.2 and the ceiling membrane is tight to the top plates.
Interior Wall / Floor Intersections

- Ceiling Membrane Interruption
Interior Wall / Floor Intersections

- Floor System Interruption
Interior Wall / Floor Intersections

- Floor System Interruption

Design No. L529
January 08, 2018
Unrestrained Assembly Rating: 1 hr.
Fire Rating: 22 Min.

This design was evaluated using a load design method other than the Limit States Design Method (e.g., Working Stress Design Method). For jurisdictions employing the Limit States Design Method, such as Canada, a load restriction factor shall be used — See Guide R80.3 or R80.5.

* Indicates such products shall bear the UL or ULR Certification Mark for Jurisdictions employing the UL or ULR Certification (such as Canada), respectively.

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Fire Safety During Construction
Minimum Compliance No Longer Cutting It

- Site superintendent responsible for fire safety
- Zero detection until FD F/A test
- Zero suppression until C of O
- One dry manual standpipe
- Stockpiling of combustibles
- Stair installation when subs are coordinated
- Dumpsters near buildings with non-FRT trash chutes
- Phased occupancy
Features for Consideration

- Strong NFPA 241 Plan
- Fire Protection Program Manager (FPPM)
- Passive barriers complete with rated doors installed
- Wireless detection and monitoring
- Onsite security with training and education
- Infrared scanning after hot work
- Active suppression during construction with central station monitoring
This concludes The American Institute of Architects Continuing Education Systems Course

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