Detailing Considerations for Light Wood Framing of Multi-family Structures

Where Structure Intersects with Finish, Acoustics, and Fire Protection

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Disclaimer: This presentation was developed by a third party and is not funded by WoodWorks or the Softwood Lumber Board.

Outline

1. Typical Detailing

- 2. Coordinating Structural and Architectural Requirements
- 3. Shrinkage Detailing
- 4. Acoustic Detailing
- 5. Fire Protection Detailing
- 6. Mechanical/Electrical/Plumbing Detailing
- 7. Structural Observations and Inspections

Light-frame Multi-Family Construction

Multi-Family Development is forecasted by Urban Land Institute to be in the top 3 projects types in the US for 2021

Light-wood framing is a very competitive building material with expansion of sustainable forest and additional production facilities Light-wood framing remains an essential sustainable building material due to its renewable sourcing, energy efficiencies and is projected to significantly contribute to a \$574 billion sustainable materials market by 2027.



Proper & Economical Connection Design & Detailing

- Begins with clear & concise set of plans that are up to date and coordinated with other consultants-Architects, MEP Engineers, Elevators, Landscape, Waterproofing, etc.
 Review wall sections and enlarged details-focus on these fundamental details
- 2. Load bearing walls, non-load bearing walls, shear walls clearly shown on plans.



Proper & Economical Connection Design & Detailing

- 3. Typical details sufficiently indicated on each level. Unique details also indicated on each level. Plan notes indicated.
- 4. Meet & coordinate early & often with Architect and other consultants, Contractor
- 5. Follow through on submittals to ensure design intent is met
- 6. Execution in the field

LOAD PATH, LOAD PATH, LOAD PATH

- 1. Light wood framing is sensitive to deviations in as-built conditions from the designed and detailed conditions. Ensure the load path on the drawings is maintained at all conditions through coordinated plans and fundamentally sound detailing.
- 2. Avoid misaligned load bearing walls-accumulate loads throughout wall stacks
- 3. Evenly distribute shear wall locations throughout the building diaphrams in orthogonal directions
- 4. Maintain diaphragm continuity in plane and reinforce around openings
- 5. Detail collectors, and other load accumulating members

KEEP DETAILS SIMPLE!

- 1. Not only is light-framing sensitive to load path through framing members, it is also sensitive to load path through connections. Keep connections as simple and straight forward as possible.
- 2. Simple to detail = simple to construct (and affordable)
- 3. Study the details in depth

Coordinating Architectural & Structural Requirements

Typical Fundamental Structural Details-Most Projects

- 1. Base of Exterior Wall-Brick Ledge or No?
- 2. Exterior Wall-Typical Floor
- 3. Interior Walls-Load Bearing vs Non-Load Bearing
- 4. Exterior Wall at Hallways, Breezeways, or Balconies
- 5. Exterior Wall-Roof
- 6. Interior Walls-Roof

Floor-Wall Intersections - Foundations

Structural Grade Beam w/Brick Ledge

Architectural Grade Beam w/Brick Ledge





Floor-Wall Intersections - Exterior Walls

Structural Detail









Floor-Wall Intersections – Interior Walls

Structural Detail

Architectural Detail





Floor-Wall Intersections – Corridors, Breezways, or Balconies

Structural Detail



Architectural Detail





- 1. Gypsum board on interior walls-shrinkage
- 2. Floor members-ceiling gypsum board
- 3. Exterior walls-stucco, brick, metal panel
- 4. Canopy through brick coordination



Shrinkage – Loss of Moisture Content

- 1. Wood's natural characteristics contribute to shrinkage and while it is unavoidable, shrinkage effects can be mitigated.
- 2. Shrinkage may cause distress in architectural finishes, MEP systems, and waterproofing systems.
- 3. Typical shrinkage on the order of magnitude of 3/8" per floor.
- 4. Reduce Shrinkage using proper detailing, protecting wood, delaying caulk application-expect maintenance
- 5. Reduced Shrinkage to order of magnitude of $1/8'' \frac{1}{4}''$ per floor
- 6. Fundamental details at typ exterior & interior walls, sill, jamb, and head of windows
- 7. Wood arrives wet and dries Brick arrives dry and absorbs moisture, swells

Shrinkage



- 1. Also refer to: Accommodating Shrinkage in Multi-Story Wood-Frame Structures available from WoodWorks
- 2. Detailing for Wood Shrinkage, August 12, 2015

Acoustics

- 1. Two Primary Causes 1. Room-to-Room: Air Borne use barriers, 2. Mechanical: Structure Borne – use isolators (and barriers)
- 2. Wall Assembly between units-Gyp layers, resilient channels-no short circuits, studs
- 3. Floor-Ceiling Assembly-Gyp layers, resilient channels, floor underlayment at hard floors
- 4. Verify Testing for products/assemblies!
- 5. Elevators & Stairs, Parking garages (adjacent to units-separation joint)
- 6. Mechanical Units-AHU, pool pumps, trash chutes/rooms
- 7. Engage an Acoustical Consultant-Details review & special conditions
- 8. Also refer to: Sound Solutions: Designing for Acoustics in Wood Structures WoodWorks and Industry tested assemblies from Gypsum, Insulation, and Acoustical product mfr.

Acoustic Details

Interior Section



Exterior Plan View



Interior Plan View – Offset Penetrations





Fire Protection

- Reference UL, National Design Specification Manual, & product manufacturers for Fire Rated Assemblies-Walls, Joist Floor Assemblies, Truss Floor Assemblies, and Roof Truss Assemblies
- 2. Coordinate closely with Architect for UL assemblies-ensure structure and architecture do not clash and violate UL requirements
- 3. Check with local building code departments-some jurisdictions are more detailed and stringent with their requirements
- 4. Shaft Wall requirements unique-reference IBC and WoodWorks.org for more detailed treatment
- 5. Also refer to: The Evolution of Fire Life Safety in Building Codes WoodWorks

Fire Protection Details



Floor-to-Wall



Balcony/Terrace Conditions

- 1. Typically require step in top of finished floor and corresponding step at supporting structure
- 2. Avoid discontinuity of structure-ESPECIALLY AT CANTILEVERED CONDITIONS
- 3. Simple pass through of framing
- 4. Handrail blocking
- 5. Any special loading requirements? Higher live loading, tieback loading, topping, landscape loads

Mechanical Coordination

- 1. Duct routing-Trusses planned openings or between web members
- 2. Heavy equipment hangers
- 3. Floor supported equipment-additional blocking
- 4. Roof top equipment
- 5. Elevators also ref: Shaft Wall Solutions for Wood-Frame Structures - WoodWorks



Electrical & Plumbing Coordination

- 1. Every tradesman is a potential demolition contractor
- 2. Vertical plumbing-Sill & header plates, thermal expansion of piping vs. wood shrinkage
- 3. Horizontal plumbing floors: joists vs truss, holes in studs properly placed, sized, and pipes protected
- 4. Sprinklers
- 5. Horizontal electrical conduit

Structural Observations & Inspections

- 1. Contractor's Obligations
- 2. Structural Observations by EOR
- 3. Structural Inspections-IBC & Independent Testing Laboratory
- 4. Architectural Observations
- 5. Architectural Inspections-Firestops, firewalls, life safety systems



Common Issues

- 1. Poor dimensional control in the field-misaligned walls
- 2. Lack of preconstruction planning from trades-too many field modifications to structure
- 3. Quality labor shortages
- 4. Field Quality Control
- 5. Too few structural & architectural field observations



This concludes The American Institute of Architects Continuing Education Systems Course

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