Is Wood-Frame Modular the Future of Multi-Family Construction?

Modular Wood-Frame for Multi-Family: Design, Details, Delivery and Why it Pencils

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



Course Description

Modular construction is touted as an opportunity to combat rising interest rates and construction prices through greater efficiency, address skilled labor shortages, and reduce jobsite waste. However, some architects and engineers are hesitant to embrace the modular approach because they don't want their designs to be compromised, and they don't think it has the flexibility or functionality to execute certain project typologies. This presentation will take a close look at modular wood-frame multi-family projects and associated design best practices. It will examine unique design considerations, detailing and sourcing techniques, including a review of the advantages and challenges of the design/delivery process, quality, timeliness, and sustainability.

Learning Objectives

1.Highlight the potential benefits associated with the use of modular construction in multi-family buildings.

2.Discuss unique design considerations for modular projects including room layouts, spans, fire-resistance and acoustic performance.

3.Review potential cost and schedule savings realized through the use of off-site wood construction.

4.Highlight how pre-planning and coordination between the design team and modular component manufacturer can lead to efficiencies in the fabrication and installation process for wood-frame projects.

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Modular Building Basics

KIT OF PARTS
PRE-APPROVED BOXES
PRE-APPROVED CONNECTION DETAILS





Can Modular Save Me Money?

- DECREASE PROJECT SCHEDULE
- FASTER TIME TO DRY IN
- CONTROLLED LABOR COSTS
- INHERENT SUSTAINABILITY
- REPEATABLE QUALITY
- SET DAY IS AWESOME!







STANDARD CONSTRUCTION



MODULAR CONSTRUCTION



Modular Challenges & Opportunities

Modular 1.0

Pain Points & Learning Curve





- CONNECTION DETAIL COORDINATION
 - COORDINATED INSPECTIONS/REVIEWS
 - MULTI-STORY MEP SHAFTS
 - MEP COORDINATION
 - NON-JURISDICTION PERMIT TIMELINES

Modular 2.0

Opportunities and Improvements





- ELIMINATE IN-UNIT MATELINES
- NO MEP SHAFTS
- SIMPLE STRUCTURAL SYSTEM
- BAD WEATHER SET
- MORE FACTORY WORK
- MORE OFFSITE CONSTRUCTION
- **COORDINATED INSPECTIONS**

AHJ Coordination

"Who gave you the okay to cover"

- CLEAR DELINEATION OF JURISDICTION
- SPECIAL INSPECTIONS VS. CITY
- FAILED INSPECTIONS AND REVISIONS TAKE TIME
- THE INSPECTIONS THAT THE MUNICIPALITY WANTS TO SEE MAY NOT EVEN BE IN THEIR SYSTEM TO CALL FOR



Sustainability

Is Built in the Factory



- DISRUPTIVE STRATEGIES ARE NEEDED TO MEET THE 2030 BUILDING CHALLENGE OF 100% NET ZERO BUILDINGS
- FACTORY BUILT CONSTRUCTION EMITS 43% LESS CARBON THAN SITE BUILT
- TYPICALLY 10% OF CONSTRUCTION MATERIALS CAN END UP WASTE, MODULAR FACTORIES CAN ACHIEVE LESS THAN 2 %
- PASSIVE HOUSE LEVEL ENVELOPE FOR A 4-8% INCREASE
- SINGLE SOURCE OF PROCUREMENT FOR SPECIFIED MATERIALS
- SKILLED LABOR TRADES CAN BE CROSS TRAINED IN MANY CONTRUCTION FIELDS WITH EXPERIENCE IN MANUFACTURING AND EVEN ROBOTICS!

Modular Benefits



STABLE PRICING

\$

BUILD IN CONTROLLED ENVIRONMENT

 \bigcirc

EXCELLENT QUALITY CONTROL ASSEMBLY LINE EFFICIENCY

PRE-APPROVED BUILDING COMPONENTS

Product Design Benefits



PRESET DESIGN PIECES

MORE FOCUS ON AMENITIES

 \bigcirc

DESIGN TEST REDESIGN

 $\mathbf{Q}_{\mathbf{a}}^{\mathbf{b}}$

UNIQUE PRODUCT REPETITIVE PARTS



Modular Design: It's in the Details

Setting the boxes is just the beginning....

What are the gaps we aren't seeing?

- STANDARD CLOSURE DETAILS
- INSPECTOR EDUCATION
- MUNICIPAL COORDINATION
- LENDING PRACTICES
- CONTRACTOR SCOPE OF WORK



- HOW DO THE SITE TRADES COORDIANTE AND INTERACT DURRING THE SET?
- SET SEQUENCE PLAN
- DRAFT STOP PLANNING
- INSPECTIONS AND AHJ COORDINATION



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PLAN VIEW



- ADDING THE ELEMENT OF TIME TO YOUR DETAILS
- DEFINING THE SCOPE OF WORK FOR EACH COMPONENT
- DEFINE WHO HAS JURISDICTION IN THE DETAIL
- ANY INSPECTIONS REQUIRED, BY WHO AND WHEN?

PS-PI PLANT SUPPLIED - PLANT INSTALLED PS-SI PLANT SUPPLIED - SITE INSTALLED SS-PI SITE SUPPLIED - PLANT INSTALLED SITE SUPPLIED - SITE INSTALLED SS-SI CS-SI CLIENT SUPPLIED - SITE INSTALLED CS-PI CLIENT SUPPLIED - PLANT INSTALLED CS-CI CLIENT SUPPLIED - CLIENT INSTALLED PLANT = METRIC MODULAR SITE = GENERAL CONTRACTOR CLIENT = NEXGEN HOUSING

CONSTRUCTION SCOPE ABBREVIATIONS

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CONSTRUCTION SCOPE ABBREVIATIONS



- COORIDORS DO ALL THE HARD WORK
- MEP COORDINATION HAS TO BE DONE TO BIM 400 LEVEL
- BALANCE FACTORY WORK VS SITE WORK
- PAY ATTENTION TO FIRE MEMBRANCE CONTINUTY
- MAKE YOUR DETAILS <u>INSPECTABLE</u>!

PS-PI	PLANT SUPPLIED - PLANT INSTALLED
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CONSTRUCTION SCOPE ABBREVIATIONS





What's Next?

Design Concept

Drag Struts – Collectors – Saw

Boxes



Design Concept

Drag Struts – Collectors – Saw Boxes

- CORRIDORS ACT AS DRAG STRUTS, PRECAST STAIR TOWERS AS SHEAR COLUMNS
- NO VERTICAL WOOD SHEAR WALLS
- NO VERTICAL TIE RODS
- SIMPLE EXTERIOR SHEATHING CONNECTION
- SMALLER BOXES ELIMINATE
 NEED FOR PANELIZED INSIDE
 & OUTSIDE CORNERS



Design Concept

Flexible Unit Configurations



KIT OF PARTS

 4 BASIC PARTS, MANY UNIT COMBINATIONS



- MEP CONTINUITY
- FLEXIBLE UNIT CONFIGURATIONS
- A UNIT MIX THAT IS FREE FROM VERTICAL STACKING REQUIREMENTS





"Modular promises are not living up to the sum of their parts."

"Modular doesn't have to be cookie-cutter"

Thank You!



This concludes The American Institute of Architects Continuing Education Systems Course

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