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

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

Presented by Matthew Laase, AIA, NCARB



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

"The Wood Products Council" is a Registered Provider with The American Institute of Architects Continuing Education Systems (AIA/CES), Provider #G516.

Credit(s) earned on completion of this course will be reported to AIA CES for AIA members.

Certificates of Completion for both AIA members and non-AIA members are available upon Request.

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 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. Presented by a modular design expert from Seattle, this webinar will take a close look at modular wood-frame multi-family projects, with an emphasis on detailing. Due to the unique fabrication, delivery and installation aspects of modular buildings, coordination of detailing and inspections is a must, and this presentation will explain how communication among all parties leads to project success. Other topics will include sourcing techniques and the resulting effects on quality, timeliness, and sustainability.

Learning Objectives

- Highlight potential benefits associated with the use of modular construction in multi-family buildings.
- Discuss unique design considerations for modular projects including room layouts, spans, fire-resistance and acoustic performance.
- Review potential cost and schedule savings realized through the use of off-site wood construction.
- 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.



Modular Building Basics

Kit of Parts

Pre-Approved Boxes



Can Modular Save Me Money?



Where Can Modular Add Value to My Project?

Decrease project schedule

Faster time to dry-in

Controlled labor costs

Inherent sustainability

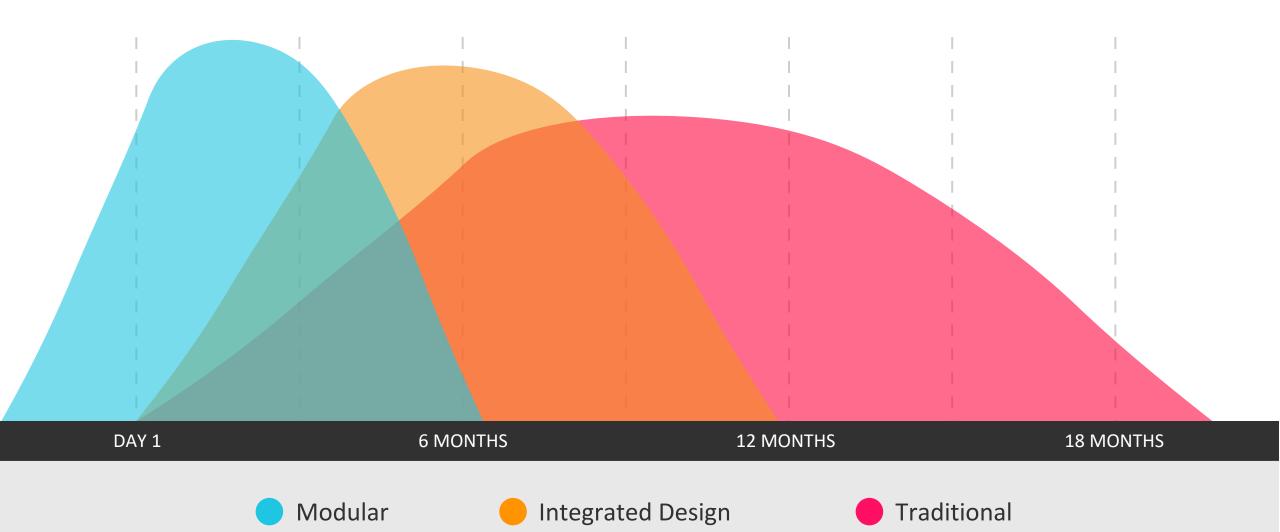
Repeatable quality

Set day is awesome!

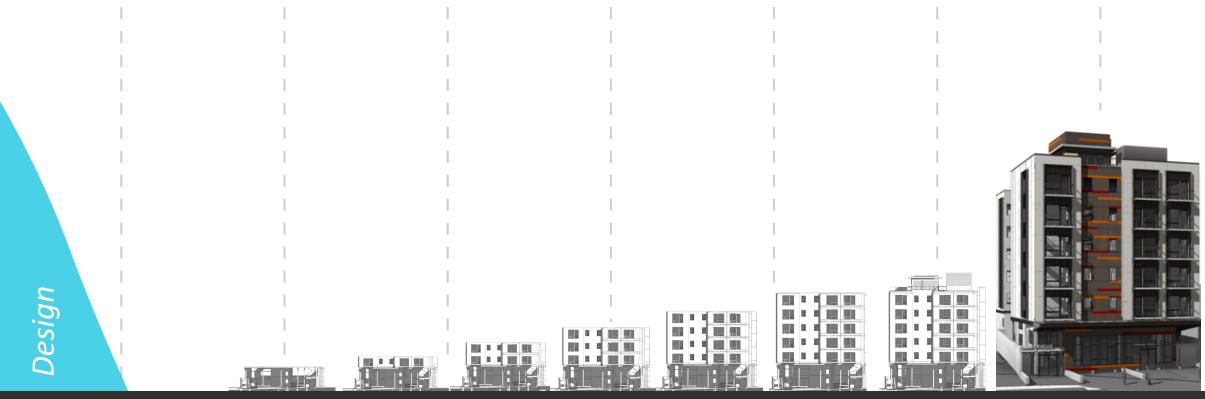




Design Timeline



Standard Construction





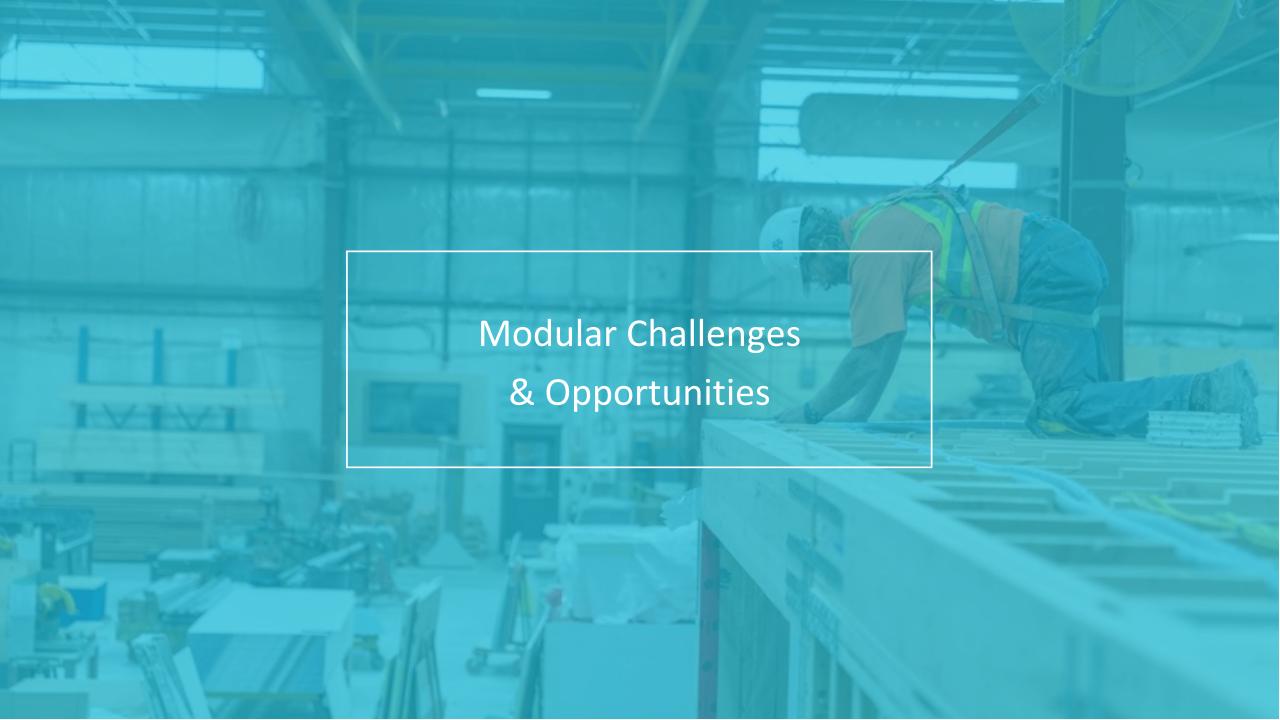


Modular Construction



DAY 1 6 MONTHS 12 MONTHS 14-15 MONTHS





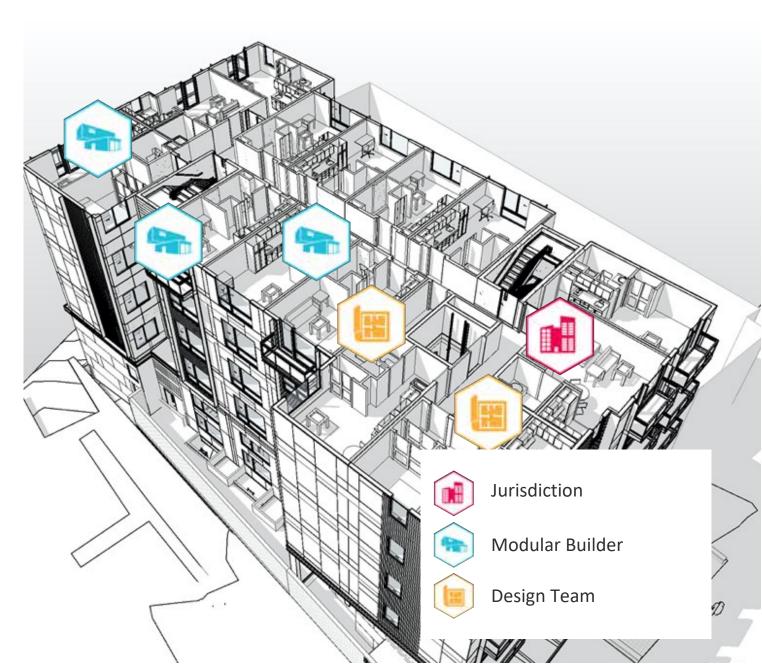
Pain Points & Learning Curve

- In-unit matelines
- Connection detail coordination
 - Coordinated inspections/reviews
 - Multi-story MEP Shafts
 - MEP coordination
 - Non-jurisdiction permit timelines



Opportunities & Improvements

- Coordinated reviews
 - Eliminate in-unit matelines
 - No MEP shafts
 - Simple structural system
 - Bad weather set
 - More factory work
 - More off-site construction
 - Coordinated inspections



AHJ Coordination

"Who gave you the "ok" to cover?"

Clear delineation of jurisdiction

Special inspections vs. the city

Failed inspections & revisions take time

The inspections that the municipality wants to see may not even be in their system to call for





Construction Coordination

What are the gaps we aren't seeing?

Standard closure details

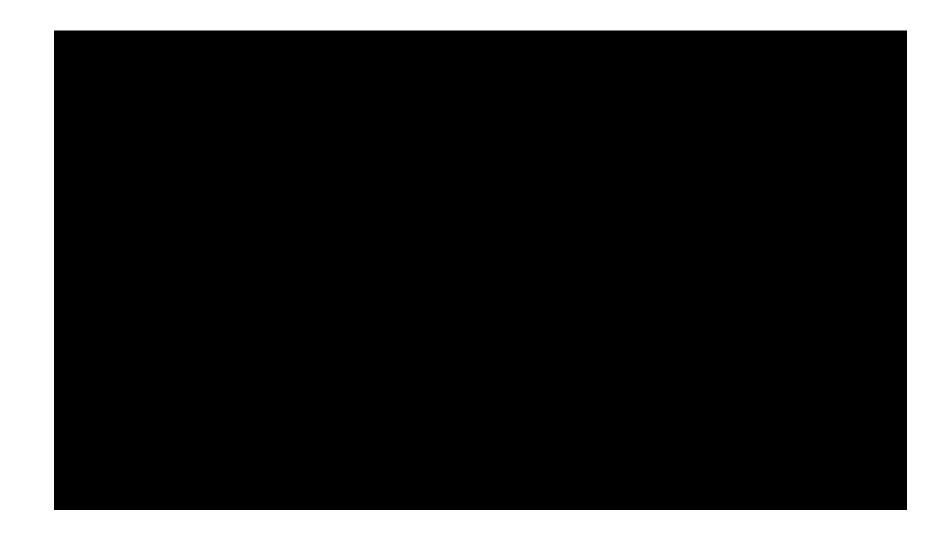
Inspector education

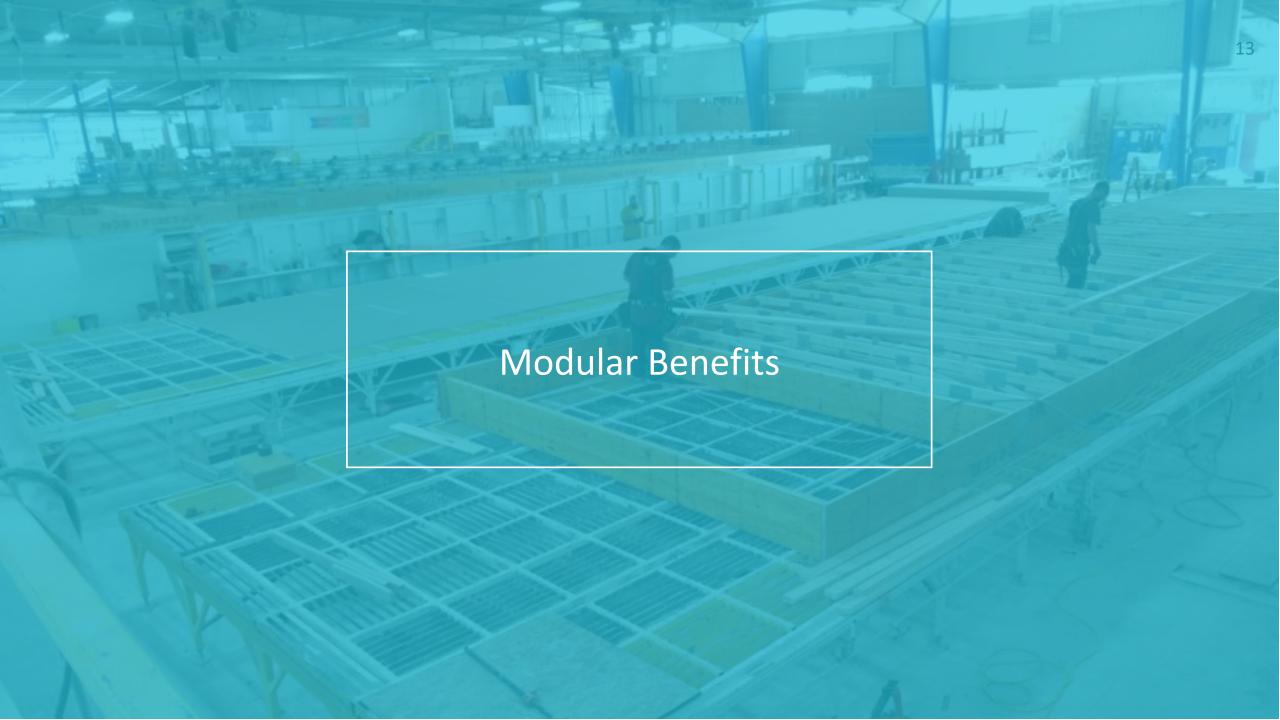
Municipal Coordination

Contractor scope of work









Modular Benefits



Stable Pricing

- Factory work is done under contract
- No wage requirements for factory-built structures



Build in Controlled Environment

- Multiple buildings can have duplicate parts ensuring brand consistency
- Trade damage and sequence issues are avoided in factory



Excellent Quality Control

- Factory allows for high quality and consistency within a controlled environment
- Multiple buildings in a portfolio can be assembled with similar parts ensuring brand quality



Assembly Line Efficiency

- Modules arrive with finishes in apartments
- Modules set onsite in weeks rather than months of framing

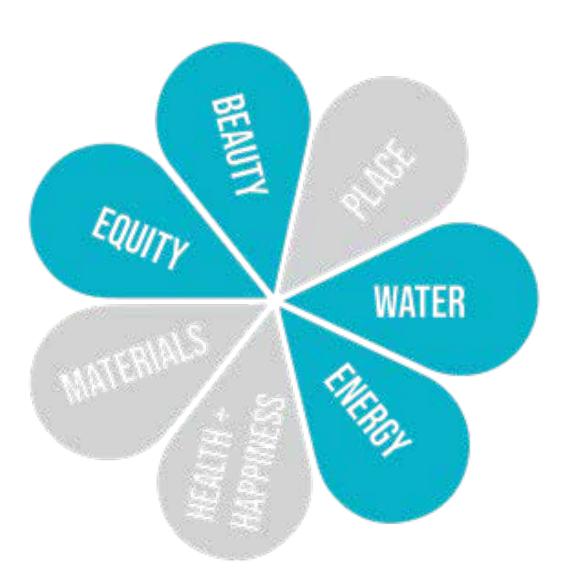


Pre-Approved Building Components

- State-approved building plans make up most of local building permit
- Pre-approved modular units can be re-used in multiple projects, expediting permit process

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%

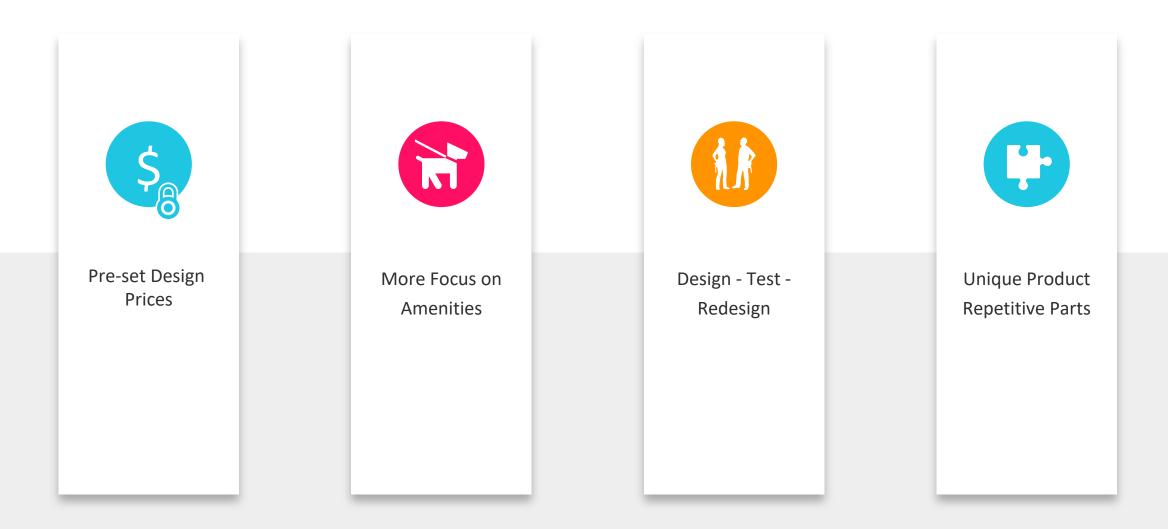
Passive house level envelope for a 4-8% increase

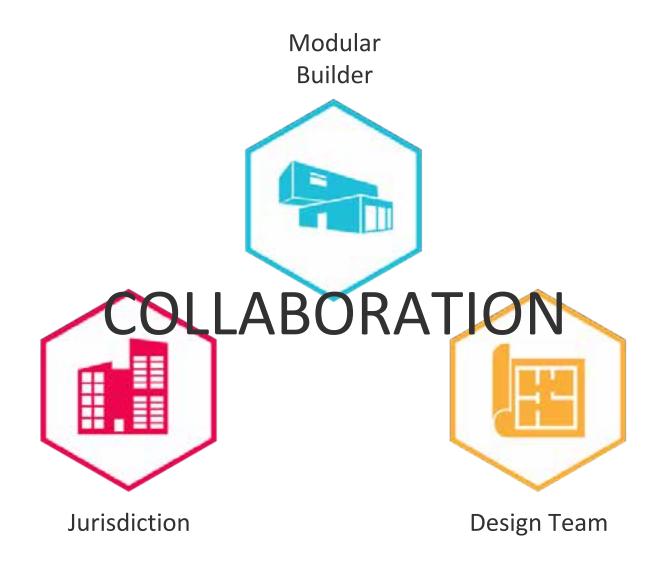
Single source of procurement for specified materials

Skilled labor trades can be cross-trained in many construction fields with experience in manufacturing and even robotics!



Product Design Benefits







Design Concept: Architectural

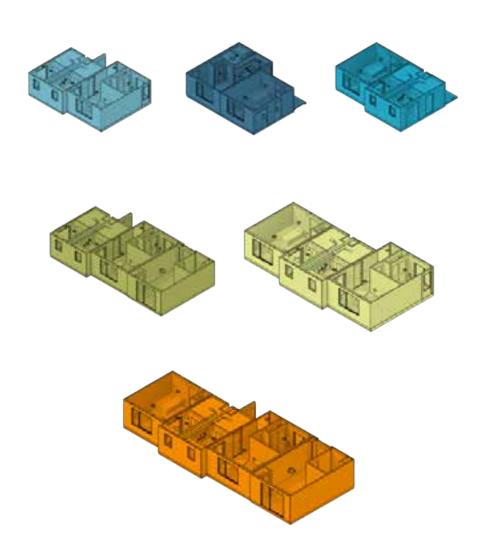
Flexible Unit Configurations

Assembling the kit of parts

Mixing unit configurations

Flexibility in design

Consistency during the set



Design Concept: Structural

Drag Struts – Collectors – Saw Boxes

Boxes can be individually built, cross corridor or internal mateline

Vertical shear is transferred at box party walls

Vertical tie rods should be accessible during set or designed without

Simple exterior sheathing connections recommended

Smaller boxes can simplify or eliminate site-built parts when turning 90-degree corners

Typical modular boxes can be stacked 4 to 6 stories depending on jurisdiction



Design Concept: MEP

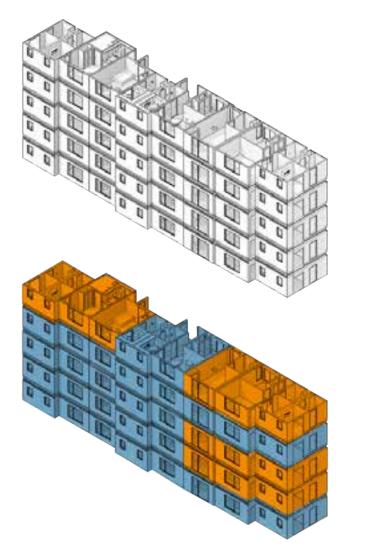
Unstacking the Units

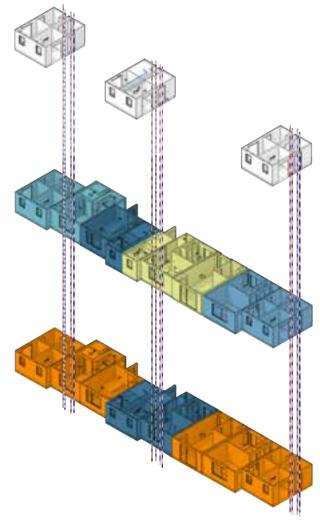
Chases no shafts along hallways

A unit mix that is free from vertical stacking requirements

Align MEP services vertically

And horizontally







It's in the Details

How do the site trades coordinate and interact during the set?

Set sequence plan

Draft stop planning

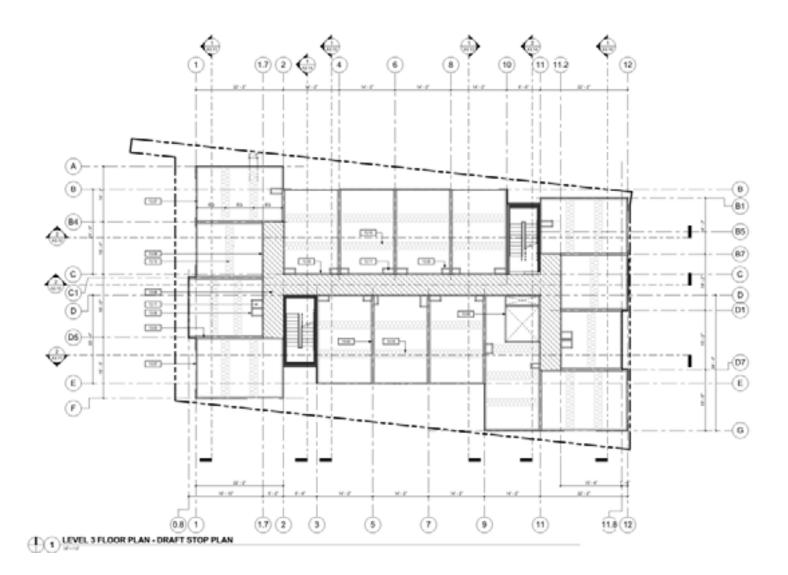
Inspections and AHJ coordination

Detailed set coordination planning

Staging site location

How many crane picks?

Stacking order, boom lock?



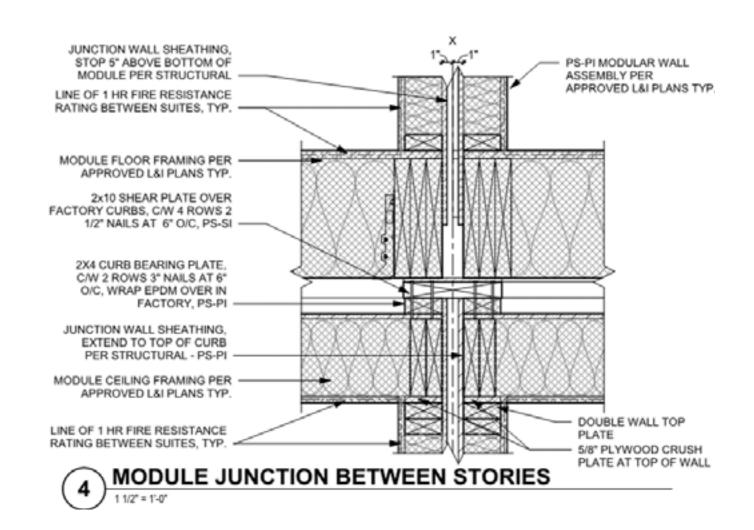
It's in the Details

Adding the element of time to your details

Defining the scope of work for each component

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
SS-SI	SITE SUPPLIED - SITE INSTALLED
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



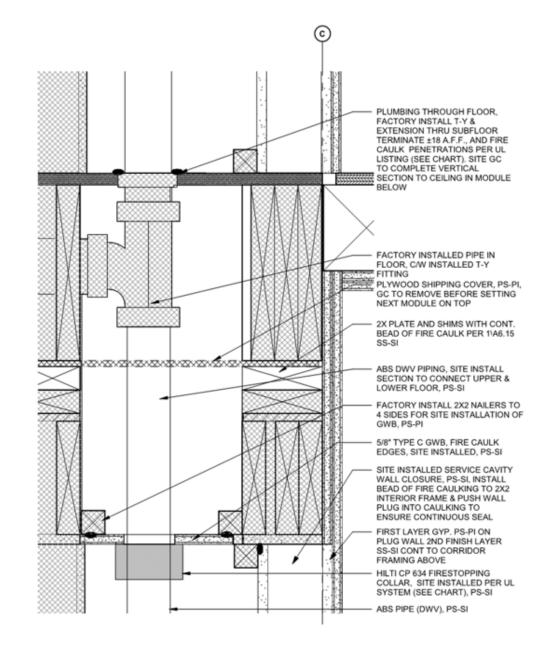
It's in the Details

Adding the element of time to your details

Defining the scope of work for each component

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
SS-SI	SITE SUPPLIED - SITE INSTALLED
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



RATED UTILITY CONNECTON BTWN FLOORS

It's in the Details

Corridors do all the hard work

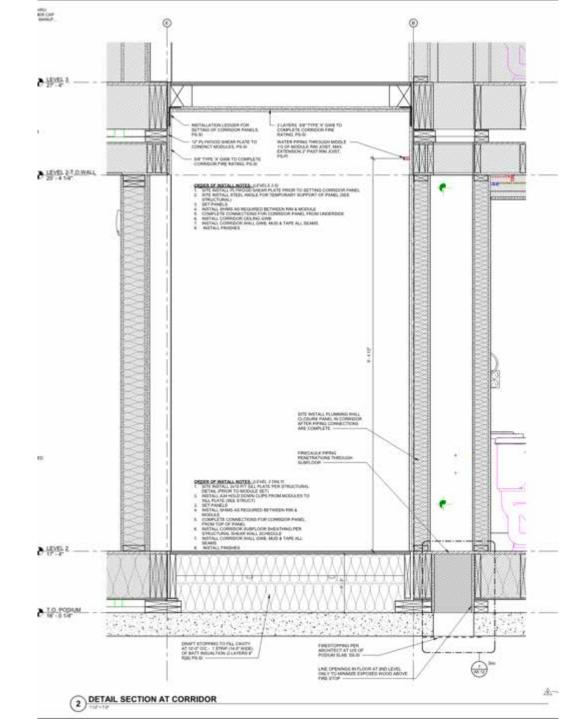
MEP coordination has to be done to BIM 400 level

Balance factory work vs. site work

Pay attention to fire membrane continuity

Make your details inspectable

PS-PI	PLANT SUPPLIED - PLANT INSTALLED
PS-SI	PLANT SUPPLIED - SITE INSTALLED
SS-PI	SITE SUPPLIED - PLANT INSTALLED
SS-SI	SITE SUPPLIED - SITE INSTALLED
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







Future Proof

Climate change will have the largest Impact on the built environment In the next decade

Architecture 2030 Challenge and Net zero buildings

Municipal coordination and outreach

Building inspector training

Skilled labor training in factory setting

Policy advocacy





Partnering

For the Future

Continued investment into product

Validation of concept through apartment development projects

Iterative improvement through ROI data

Future opportunities via licensing arrangements





Sharing the Knowledge of Investment

Open Source for the Design Community

"It's not what you know that matters, it's what you do when you don't know." – Unknown

Industry knowledge shared for Architects, Engineers and Owners

Diagrams, details and instructions for designing modular

Made available for everyone to help ensure success

Advocating for the use of modular



> Questions?

This concludes The American Institute of Architects Continuing Education Systems Course

Presented by Matthew Laase, AIA, NCARB Jackson | Main Architecture Matt.Laase@JacksonMain.com