

Modular by Design: An Architect's Guide to Off-Site Delivery

Sara-Ann Logan

Volumetric Building Companies



Callie Bailey

ASSEMBLAGE Works





ASSEMBLAGE WORKS (AWI) is one of the first full-service architecture studios solely dedicated to implementing **DFMA** (Design For Manufacturing and Assembly), a 360° approach, to design for all of our projects while maintaining a deep commitment to place, people and the environment. With decades of experience we have delivered award-winning projects in the US and beyond. Our integrated team is revolutionizing design by breaking down traditional silos between design and construction.



ARCHITECTURE

AWI is recognized for design excellence and material innovation. **Our design process is intentionally aligned with modern methods of construction to seamlessly capitalize on system advantages.** Our team creates successful project outcomes through agile project management, innovative design execution, and continuous research and process improvement. Our Architectural Services include feasibility and planning, land use and entitlements, conceptual design, jurisdictional advocacy, documentation, permitting, and construction administration.

OWNER REPRESENTATION

We provide consulting to evaluate approaches to deliver difficult or complex projects. **As the manufacturing landscape changes constantly, we invest the time in continuously assessing new technologies and delivery methodologies.** Our team provides specialized knowledge of offsite construction, contracts, and risk management to provide our clients with integrated understanding for successful project outcomes with increased predictability and decreased schedule and budget risk. AWI's Owner Representation Services include management of due diligence, delivery method, construction schedule, budgets, pro-formas, and team selection.

TECHNOLOGY STEWARDSHIP

We have well established partnerships and decades of building relationships with a variety of industry leaders in Prefabrication, Volumetric Modular and Mass Timber as well as other modern methods of construction. Our Technology Stewardship Services include creating a project action plan, selection of manufacturing and installation partners, and setting approval and quality control benchmarks for fabrication, shipping, and installation of offsite assemblies.

Callie Bailey
Principal & Studio Director



Callie is skillful at navigating the complexities of engagement with various jurisdictions, local communities, technical groups, and executive levels. Collaboration is part of her DNA— she strives to always find opportunities to improve processes, forge agile teams and find innovative solutions to complex problems.

25 Years of Experience
Joined AWI 2023

Selected Project Experience

	Size Sq. Ft.
The Walk, Norwalk, CA - Modular	375,000
Harford, Los Angeles, CA - Modular	83,000
West San Carlos, San Jose, CA - Modular	370,000
675 Middlefield, Mountainview, CA	1,340,000
Confidential MT Office Sunnyvale, CA - MT*	300,000
Wynne Watt Commons, Portland, OR	96,500
The George, San Francisco, CA	301,740
Art Tower, Portland, OR	280,000
Palmetto, Los Angeles, CA	380,000
Trademark, Los Angeles, CA	492,000
The Standard, Eugene, OR	265,000
The Thompson, Portland, OR	290,000
Sera Office Remodel, Portland, OR	40,000
Confidential Mass Timber I, Mountainview, CA - MT*	185,000
250 Taylor Office, Portland, OR	23,065

* Mass Timber



Preconstruction + Project Management

- Design Management
- Client Management
- Scope Definition
- Schedule Management
- Budget and Cost Management

Manufacturing

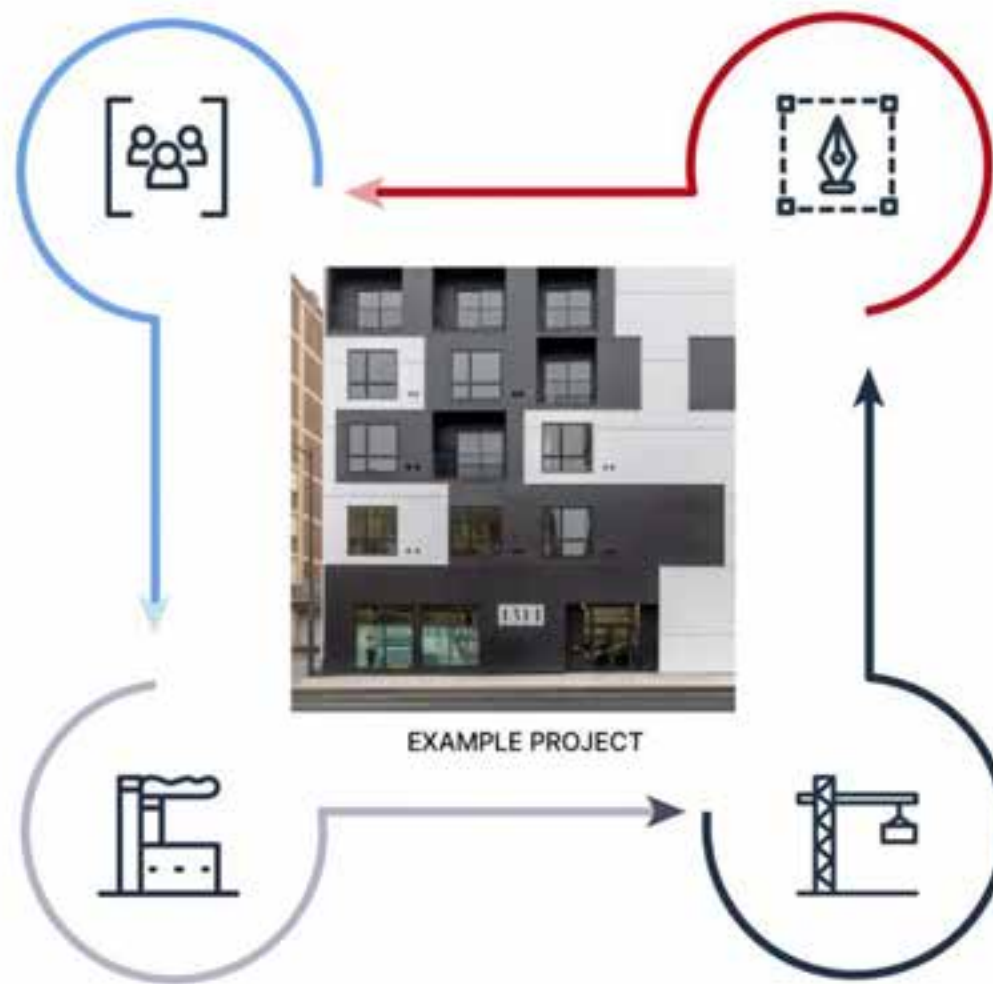
- Production Planning
- Material Procurement
- Manufacturing
- Quality Assurance

DFMA and Engineering

- Product Design [Product, Project]
- Architecture
- Engineering
- Systems Engineering
- Manufacturing Data and Technology

Construction + Site Services

- Logistics and Delivery
- Modular Set, Stitching and Closeout
- Site Construction
- Quality Assurance



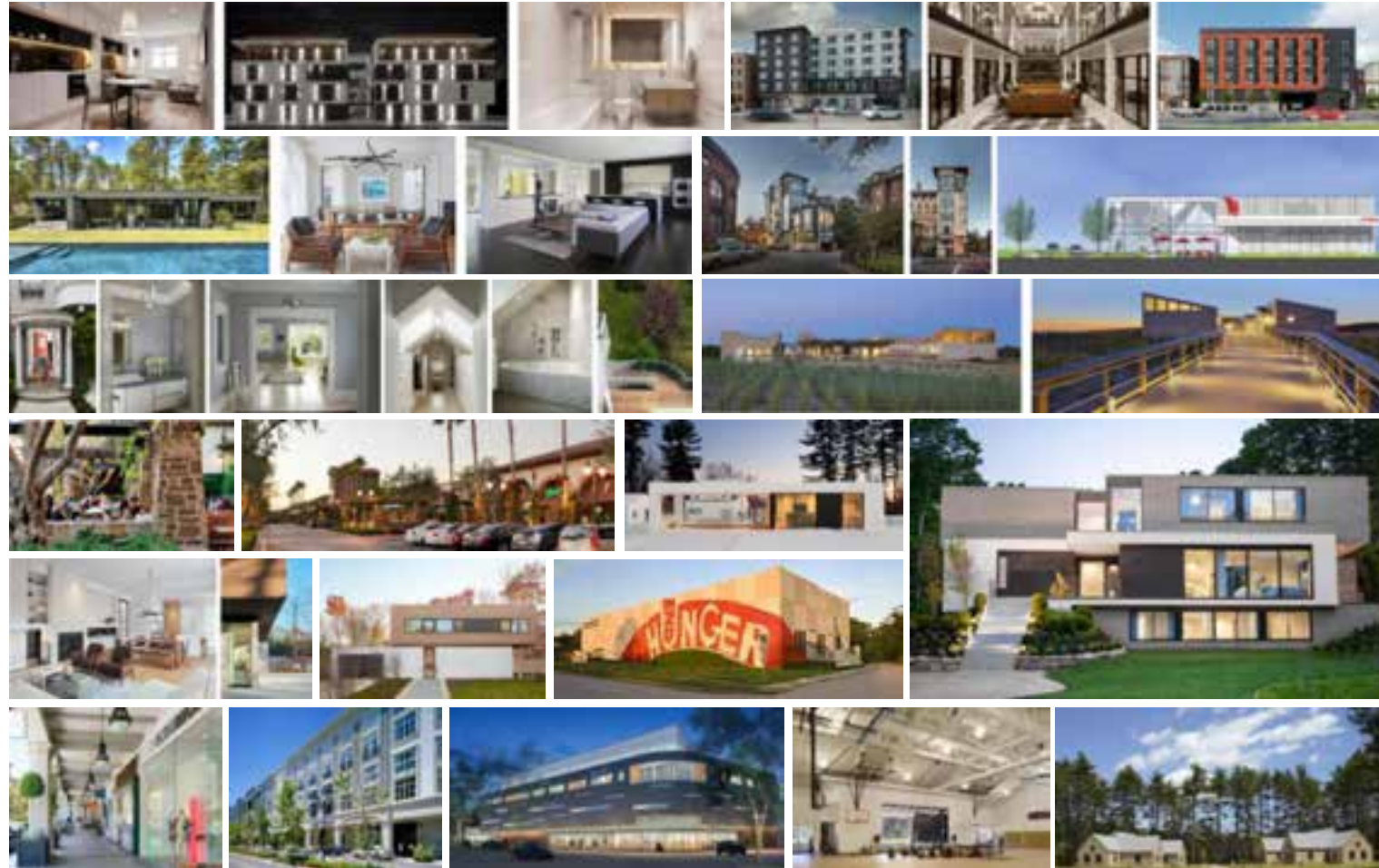


Sara.Ann Logan AIA, RIBA, NCAR
CDO, Principal Architect



Sara.Ann connects product design, architecture, manufacturing, to construction to turn complex challenges in the built environment into scalable solutions. She leads VBC's DfMA Studio and brings a collaborative, systems-driven approach to project delivery by aligning teams, defining interfaces, and balancing design quality with efficiency. Her experience spans the luxury residential and retail sectors, hotels and hospitality, affordable and supportive housing, multifamily, and mixed-use

23 Years of AEC Experience
15 Years of IC Experience
13 Factory Collaborators
Co-founded VBC Studio in 2019



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



Course Description

Architects already possess many of the skills needed for modular construction, but the delivery model requires those skills to be applied earlier and across a more integrated process. Through the perspectives of a site architect/Architect of Record and a modular designer/manufacturer, this session will examine how architects can successfully navigate modular project delivery. Topics will include project suitability, early manufacturer engagement, roles and design authority, coordination of factory and site scopes, and critical interfaces between modules, structure, enclosure, and building systems. Attendees will learn strategies that support code compliance, building performance, occupant safety, and architectural quality.

Learning Objectives

1. Evaluate project characteristics that influence the suitability of modular construction, including building configuration, site conditions, transportation and installation constraints, and requirements affecting occupant health, safety, and welfare.
2. Explain how early engagement and clearly defined responsibilities among the Architect of Record, modular designer/manufacturer, contractors, and consultants can support code compliance, design coordination, and safe project delivery.
3. Identify critical interfaces between modular units, site construction, structural systems, building enclosures, and mechanical, electrical, and plumbing systems that must be coordinated to maintain building performance and life-safety requirements.
4. Apply modular design and coordination strategies that balance repeatability and manufacturing requirements with accessibility, durability, enclosure performance, occupant safety, and overall architectural quality.

Modular by Design

An Architect's Guide to Offsite Delivery

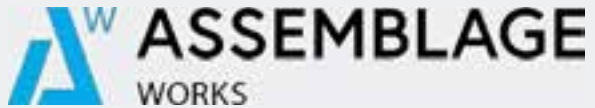


Disclaimer: This presentation was developed by a third party and is not funded by WoodWorks or the Softwood Lumber Board.



Designing for Offsite Construction

PRESENTED BY



- 01 Do you need experience?
- 02 Early considerations
- 03 Design approach
- 04 Permitting process
- 05 Mind the gap: scope delineation
- 06 Standardization & creativity
- 07 Risks to avoid
- 08 Postlogue - MT + Modular

Know the Basics



Mate Wall / Long Wall

Long walls where neighboring modules meet.



End Wall / Short Wall

Short walls that typically face the exterior.



Full Module

Two volumes built together, with a central corridor and one shared floor assembly.



Half Module

One volume, with or without a corridor or portion of one.



Interface / Corridor Bumpout

An interface is a point of connection. The interface closet is a 2' x 10' bumpout for vertical connections, often at the corridor.



Tower

One vertical stack of modules within a multi-story building.



VMX

VBC's brand of modular systems and components.



DfMA

Design for Manufacturing and Assembly: design aligned with manufacturing and assembly methods.



AOR / EOR

Architect / Engineer of Record responsible for the scope completed on site.



MAOR / MEOR

Modular Architect / Engineer of Record responsible for the scope completed in the factory.

Know the Limitations *(so you can push them)*

1

15'-9" MAXIMUM WIDTH

Modular stud-to-stud dimension is limited by transportation

- > 11'-0" for general safety and maneuverability
- < 14'-0" for reduced shipping costs

2

68'-0" MAXIMUM LENGTH

Modular stud-to-stud dimension is limited by transportation and set

3

8'-0", 8'-6", 9'-0" INTERIOR ROOM HEIGHT

Two standard interior room heights are offered to comply with transportation limitations*

*Some states limit overall transportation height to 13'-6" which only allows for 8'-0" or 8'-6" interior room height

4

9'-10 3/8", 10'-4 3/8", 10'-10 3/8" FLOOR-TO-FLOOR HEIGHT

Respective heights with floor/ceiling assembly to 8'-6" or 9'-0" interior room heights.

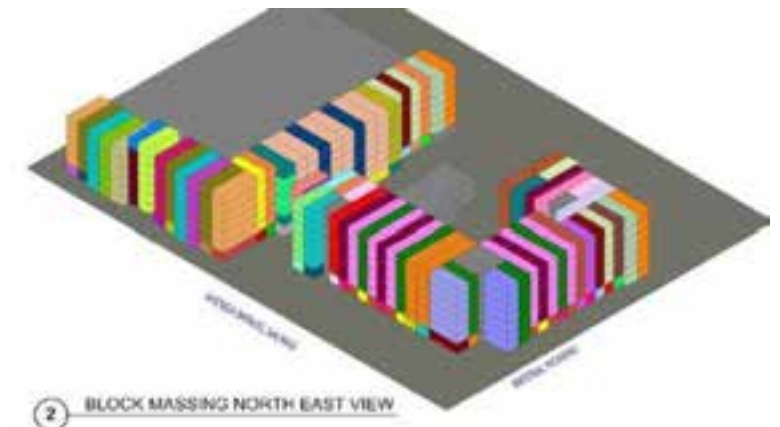
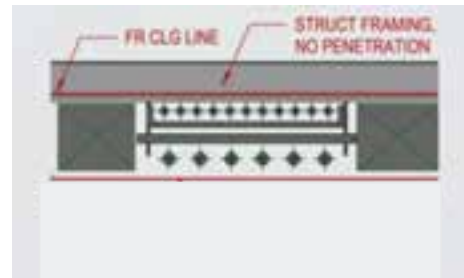


Design Decisions

- 01 Grid and mod-size and height
- 02 Transportation / laydown / crane availability
- 03 Lateral system
- 04 MEP systems: all chases must be stacked-
bathrooms in the back
- 05 Keep MEP out of fire rated ceilings

Simplify to amplify!

Reduce unit types. Everything must stack!



Make Decisions Early

DESIGN LOCK 1

- Base building height
- Code cycle, special inspections, or other specific code requirements
- Unit ceiling heights
- Base building and modular grid lines
- MEP basis of design (system description, performance requirements)

DESIGN LOCK 2

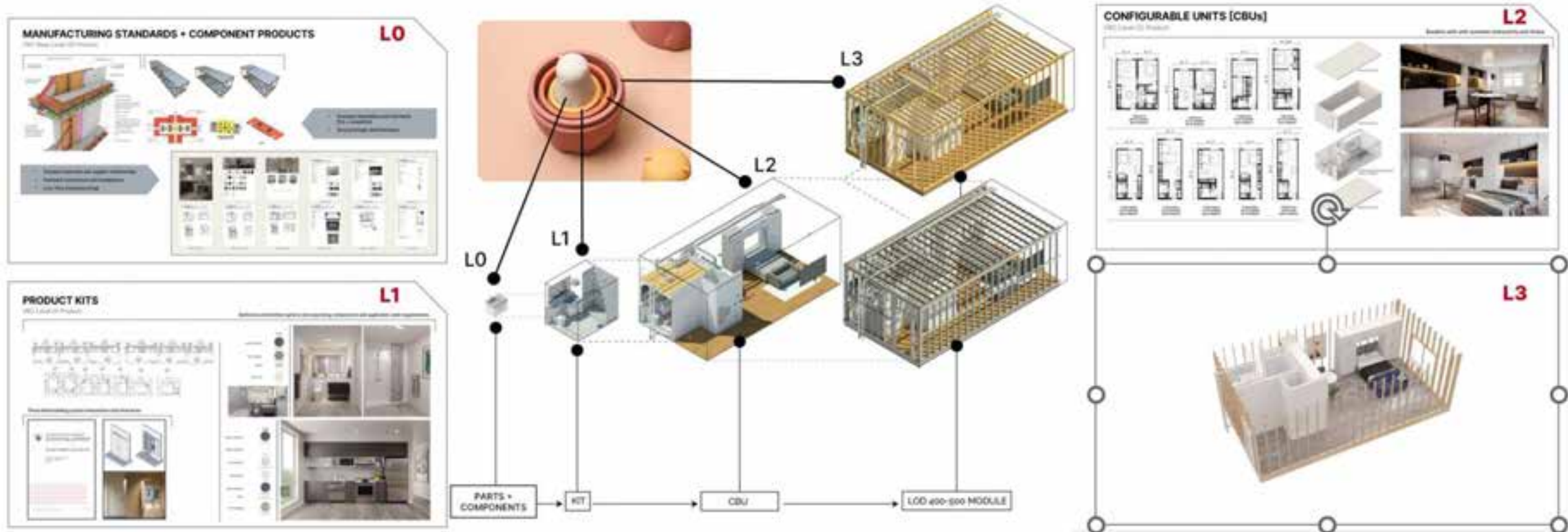
- Roof loading based on roofing material, amenities, and appurtenances
- Base building mechanical equipment locations and specifications at roof
- Specialty roof, wall anchoring loading and locations (balconies / overhangs)
- Pilot house and elevator overrun locations (modular versus onsite versus panels)
- Roof occupancy categories
- Drain locations (assume 4" drain size)
- Unit layouts (including all interior elements)
- Windows and louver legends (sizing, location, and placement)
- Green roof basis of design (including paving and decking)
- Solar basis of design (if roof or building mounted)
- EBM Connection Locations and Specification
- Parapet Design and Anchoring Details
- Interior basis of design for common spaces and amenities for confirmation
- Flow test & full building fire alarm + sprinkler BOD

DESIGN LOCK 3

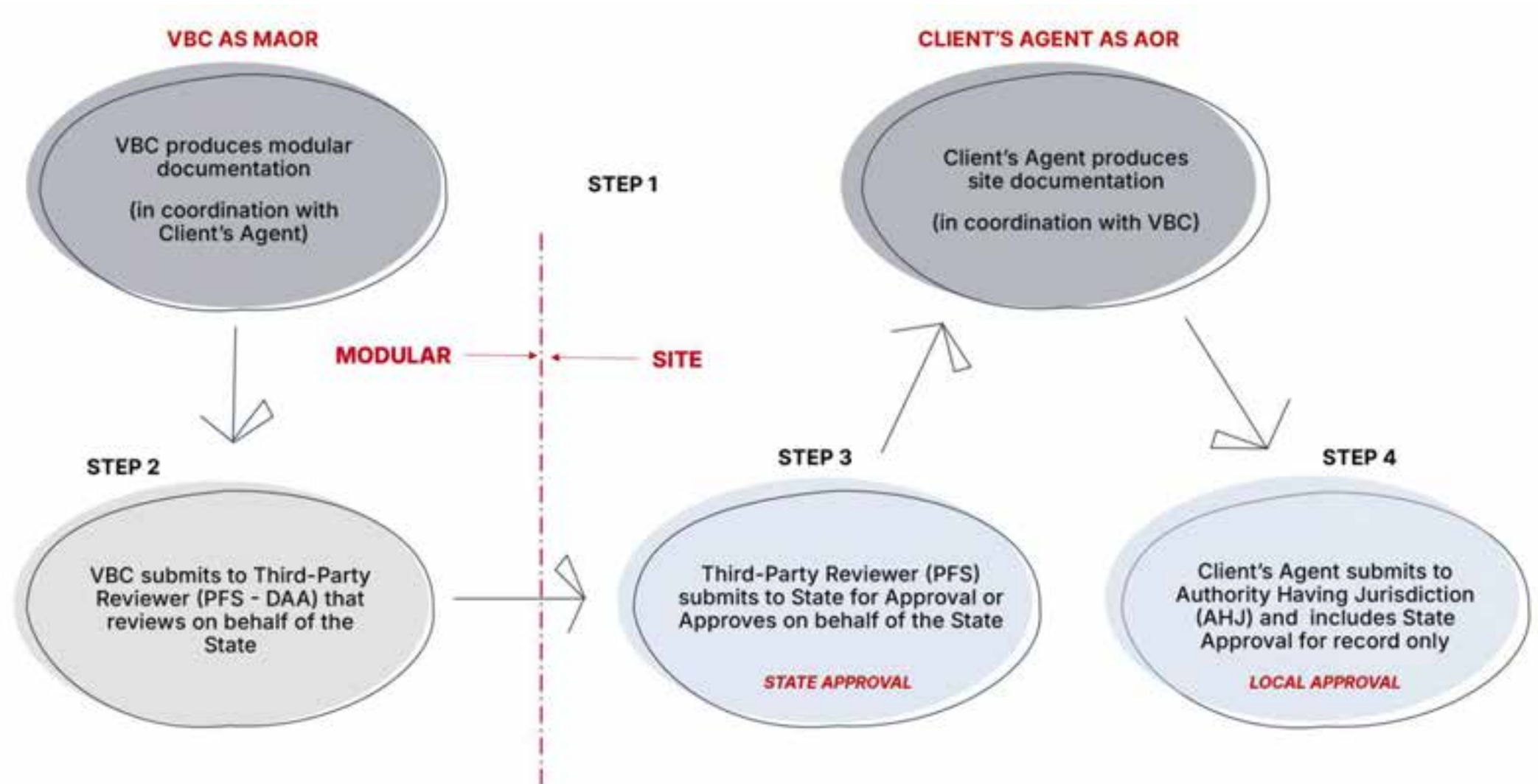
- Slab edge and shaft location and sizes
- Base building mechanical equipment requirements (openings, attachments, etc.).
- Interior unit color selections (last opportunity for change)
- Elevator company, model, operation and sizing confirmation
- Special building service items including specification (trash chute etc.)
- Building services and utility information including scope of work descriptions



Understand the Parts *(and how they go together)*



Know the AHJ



Permitting Peculiarities



Preliminary meeting

How familiar is the AHJ with offsite?



Onsite prototype

An excellent socialization, teaching and bidding tool



A picture is worth a thousand words

Show images of connection points and onsite inspections

PLAN REVIEW AND INSPECTION MATRIX

Description + Notes	Plan Review				Inspection		
	CASP	HCD	City of Norwalk	LACFD	HCD	City of Norwalk	LACFD
FIRE PROTECTION: Site Built Components							
Stairs (Standpipe)			X	X		X	X
Fire Pump (all)			X	X		X	X
Fire Sprinkler System LAFCD to inspect field-installed work up to point of connection and sign off on overall pressure test and system. LAFD to be plan reviewer for system, issued to NTA for information.			X	X		X	X
FIRE PROTECTION: Modular Components							
Fire Sprinkler System Subes and modular amenity and maintenance rooms (FPS system within factory-built modules to be inspected by NTA up to stub-out to corridor.		X	X	X	X		
Overall system testing (LAFCD to sign off on overall pressure test and system)							X
FIRE ALARM: Site Built							
All Fire Alarm work (all non modular amenity spaces, corridors)...			X	X		X	X
FIRE ALARM: Modular Components							
Suites and Mod. Common spaces (roughin for ADA devices and in unit/module devices connected locally to power panel)...		X		X	X		X
ADA: Site Built							
Suit Built Accessibility (Accessible Path of Travel, Offsite Parking, Entrances, Accessible Routes, Doors, Clearances, Seating, Plumbing Fixtures, Stairs, Handrails, Guardrails)			X			X	
Stair Accessibility Levels (Stairway, Doors, Handrails, Landings, Clearances)			X			X	
ADA: Modular Components							
Modular Accessibility (Doors, Plumbing Fixtures, Clearances, Mobility)		X			X		
GREEN CODE							
Model Water Efficiency Landscape Ordinance (MWELO) Compliances			X			X	
Planning & Design Compliances (Stormwater, Outdoor Lighting, Parking, Bike Parking)			X			X	
Commissioning (Commissioning Plan, BOD, OPS, Testing & Adjusting)			X			X	
Modular (Energy Efficiency, Water Efficiency-Plumbing Fixtures, Materials)		X		X	X	X	
Site Built Elements(Energy Efficiency, Water Efficiency-Plumbing Fixtures, Materials & Resources, Environmental Quality - Acoustics, HVAC, VOC, Finishes)			X			X	
STRUCTURAL: Site Built							
Concrete foundations, concrete shear walls, concrete slabs (transfer at level 1 on residential east wing, transfer at level 2 on residential south wing, and all slabs inside elevator/stair cores), concrete columns, CMU bearing walls...			X			X	

Detailed Scope of Work Required

ACCESS DOORS AND PANELS - WITHIN CORRIDORS AND OTHER UNFINISHED AREAS	
ACCESS PANELS FOR CHASE/SHAFT CORRIDOR SIDE	
ACCESS DOORS INSIDE FINISHED MODULE AREAS	
ACCESS DOORS OUTSIDE FINISHED MODULE AREAS	
ACCESS DOORS AND PANELS - ON THE CEILING WITHIN CORRIDORS AND OTHER UNFINISHED AREAS	
SPECIALTY DOORS SUCH AS SMOKE/FIRE DOORS	←
DIVISION 9 - FINISHES	
LIGHT GAUGE STEEL LGS STUD FRAMING & FURRING (PARTITIONS AND CEILINGS) FOR MODULES	
GYPSUM BOARD FOR WALLS & CEILINGS WITHIN MODULAR FINISHED AREAS (EXCLUDES MODULE SEAMS)	
GYPSUM BOARD AND RESILIENT CHANNEL WITHIN MODULE FINISHED AREAS (EXCLUDES MODULE SEAMS)	
MOISTURE RESISTANT GYPSUM BOARD AT BATHROOMS (TUB & SHOWER WALLS ONLY)	
GYPSUM BOARD: EXTERIOR	
GYPSUM BOARD: CORRIDOR WALLS (EXCLUDES MODULE SEAMS) - LEVEL 4 FINISH ONLY	
GYPSUM BOARD AND PLUG WALL ASSEMBLY SUPPLY & INSTALL: FINISHING AT CONTINUITY OF MECHANICAL SHAFT/SHAFTS FOR FIRE RATING	
T-BAR CEILING AT MODULAR CORRIDOR	
FLOORING WITHIN FINISHED MODULE AREAS (EXCLUDES MODULE SEAMS)	
FLOORING BASE WITHIN FINISHED MODULE AREAS (EXCLUDES MODULE SEAMS)	
FLOORING IN CORRIDOR, LOBBIES & PASSAGE	

SOW Matrix

01

Need a living matrix document reviewed on a schedule for SOW between Manf, GC, Owner & Architect

02

Pick a point where this is frozen and aligned with the budget, so that everything following is an add or deduct

03

Establish documentation graphic conventions (color-coding) before the design process, aligned with the SOW matrix, as AWI and Manf concurrently draw sets and details

AHJ / NTA REVIEW PLAN LEGEND



FACTORY BUILT



SITE-BUILT / SITE-INSTALLED



NOT IN SCOPE



FACTORY SUPPLY / ON-SITE INSTALL

SCOPE CATEGORIES

- Manf built & shipped
- Manf supplied, shipped & site-installed
- GC site-installed and sourced
- Manf built & shipped, site-removed (for fireproofing, etc.)

SAN JOSE, CA

Mid-Rise Conversion

COMPLETION

Estimated – ?

SCOPE

Conversion of conventional podium Type IIIA to 1B

TOTAL AREA / UNITS

305,000 SF / 237 units

- Start with experience & collaboration skills
- Remember others are watching, e.g. financial equity & debt due-diligence groups
- Modeling and BIM capabilities are critical



V1 • CONVENTIONAL CONSTRUCTION



V2 • MODULAR CONSTRUCTION

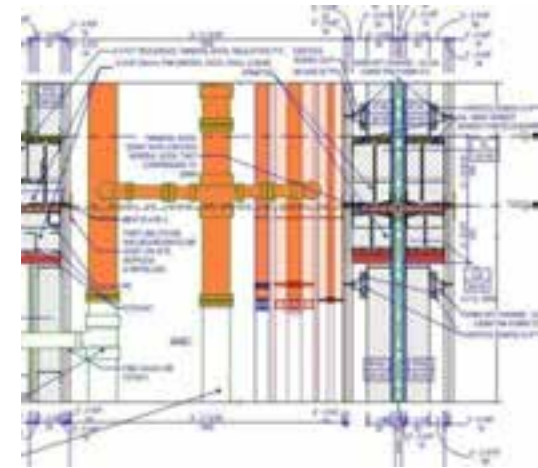
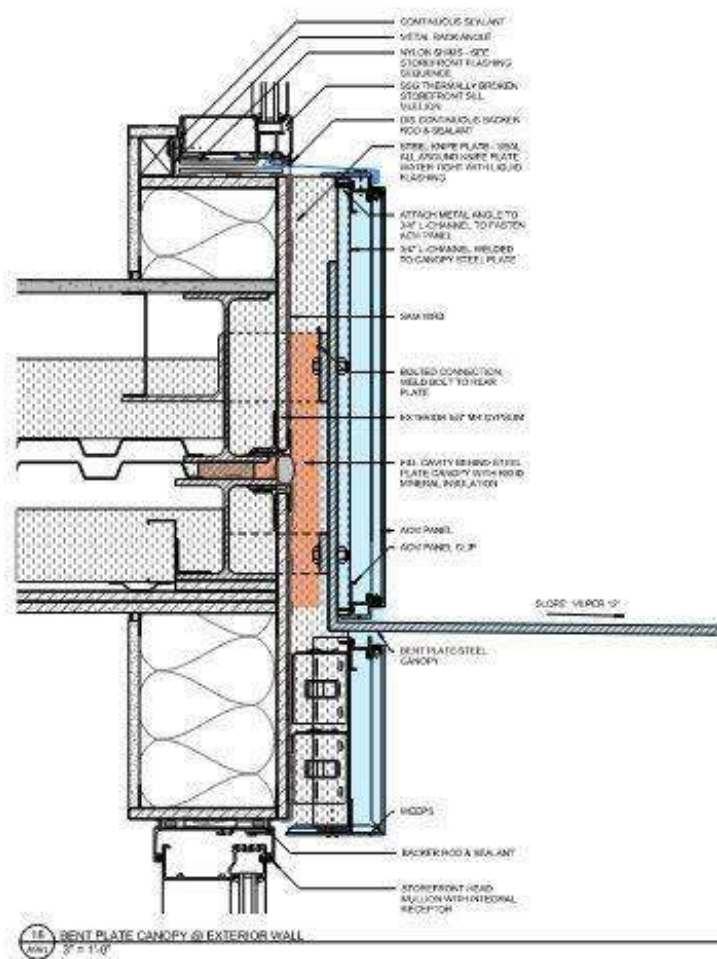
MIND THE GAP

Visual Scope of Work Required

Drawings to match
spreadsheet by spec section

AHJ / NTA REVIEW PLAN LEGEND

	FACTORY BUILT
	SITE-BUILT / SITE-INSTALLED
	NOT IN SCOPE
	FACTORY SUPPLY / ON-SITE INSTALL



Mixed Mods and Panels



Prefab Components



Prefabricated exterior



Modular + hospitality finishes = ❤️

Design Constraints Are Part of the Fun



01

Windsor Chair

Anonymous English
craftsmen

Early 1700s

*Proof that a folk object can
become a timeless classic*



02

Thonet No. 14

Michael Thonet

1859

*One of the first true mass-
produced chairs*



03

Red Blue Chair

Gerrit Rietveld

c. 1918



04

Wassily Chair

Marcel Breuer

1925

*Tubular steel enters the
living room*



05

Barcelona Chair

Ludwig Mies van der Rohe
& Lilly Reich

1929

*The lobby chair of the 20th
century*



06

Wishbone Chair (CH24)

Hans J. Wegner

1949

*Danish craft at its most
graceful*

Common mistakes

01

More financing required upfront- ensure that you talk with lenders early and plug financing milestones into design schedule

02

You need a moisture mitigation plan, and a chain of custody plan. Who is responsible in shipping, at laydown, and review the factories QA/QC plan.

03

SOW AND EARLY DESIGN LOCK!! DO NOT PAY FOR SOMETHING TWICE!

04

All projects should not be modular - the early you get a factory involved the better. Conversions don't always work.

Chain of Custody: Factory to Final Set

Every module carries one unbroken, signed record of who holds it, where, and in what condition.



01 Fabrication

Manufacturer

RECORD

Module traveler, QC checklists, third-party inspection label



02 Factory Release

Manufacturer → Carrier

RECORD

Release certificate, pre-shipment photos, bill of lading



03 Transport

Carrier

RECORD

Route permits, GPS log, securement and weather checks



04 Site Receipt

Carrier → Contractor

RECORD

Delivery inspection, damage report, signed receipt



05 Set & Close-out

Contractor → Owner

RECORD

Set report, connection sign-off, final inspection

DESIGN CONSTRAINTS

MASS TIMBER- CLT + MODULAR

01

Similar in cost to site built systems - 40% faster to erect. Setting logistics and accessibility are project drivers.

02

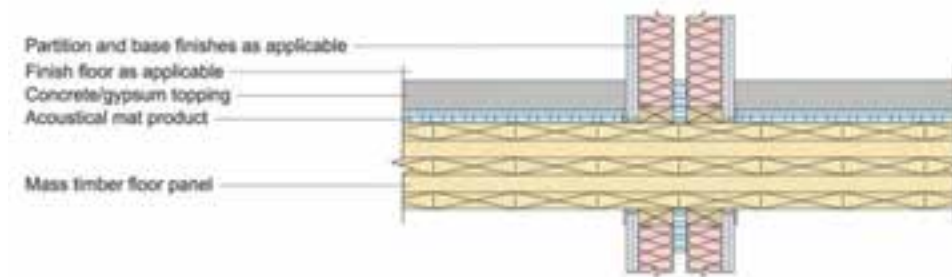
Ensure the factory has bonding capabilities and a balance sheet

03

Some increased exposure to Builder's Risk Issues - Moisture mgmt planning. Dependent on GC and MEP Sub(s) capabilities and skill.

04

Significantly lower Carbon/Trackable Material Procurement. There is the potential to disassemble in the future.



Thank You

Modular by Design

*This concludes The American Institute of
Architects Continuing Education Systems Course.*