

BUILDINGENERGY BOSTON

Leveraging the Logic of Offsite Construction: A Gamified Training

Cody Berwick (Bensonwood)

Seth Clarke (Bensonwood)

Curated by Megan Nedzinski (Vermont Integrated Architecture)

Northeast Sustainable Energy Association (NESEA) | March 20, 2024

Leveraging the Logic of Offsite Panelization



Seth Clarke, AIA NCARB
Director of Preconstruction

 **Bensonwood**



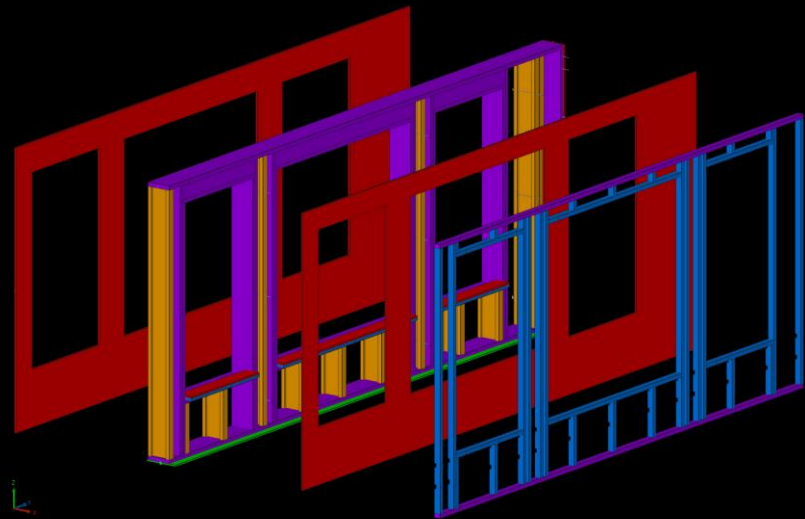
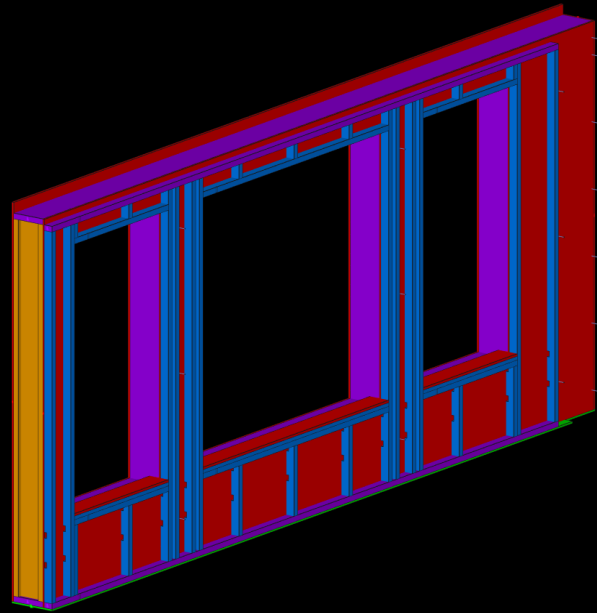
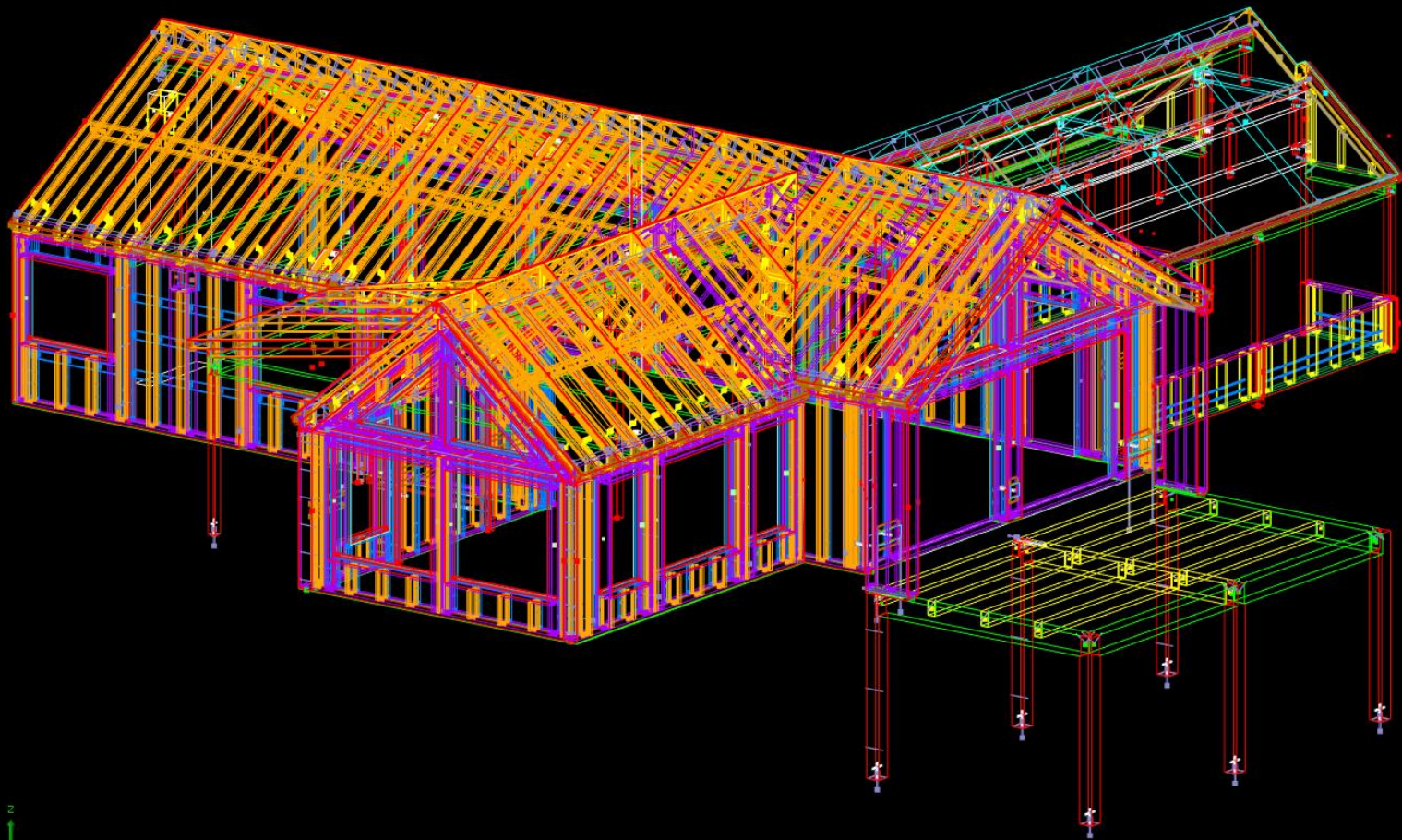
Cody Berwick
Sales Advisor

TEKTONIKS

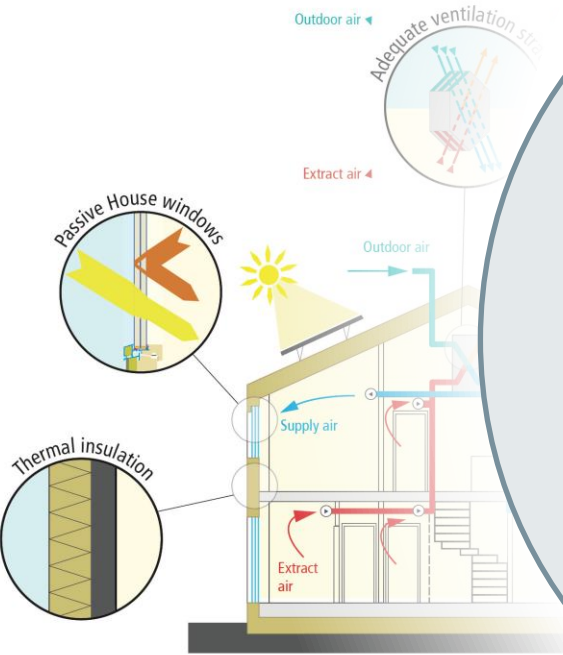
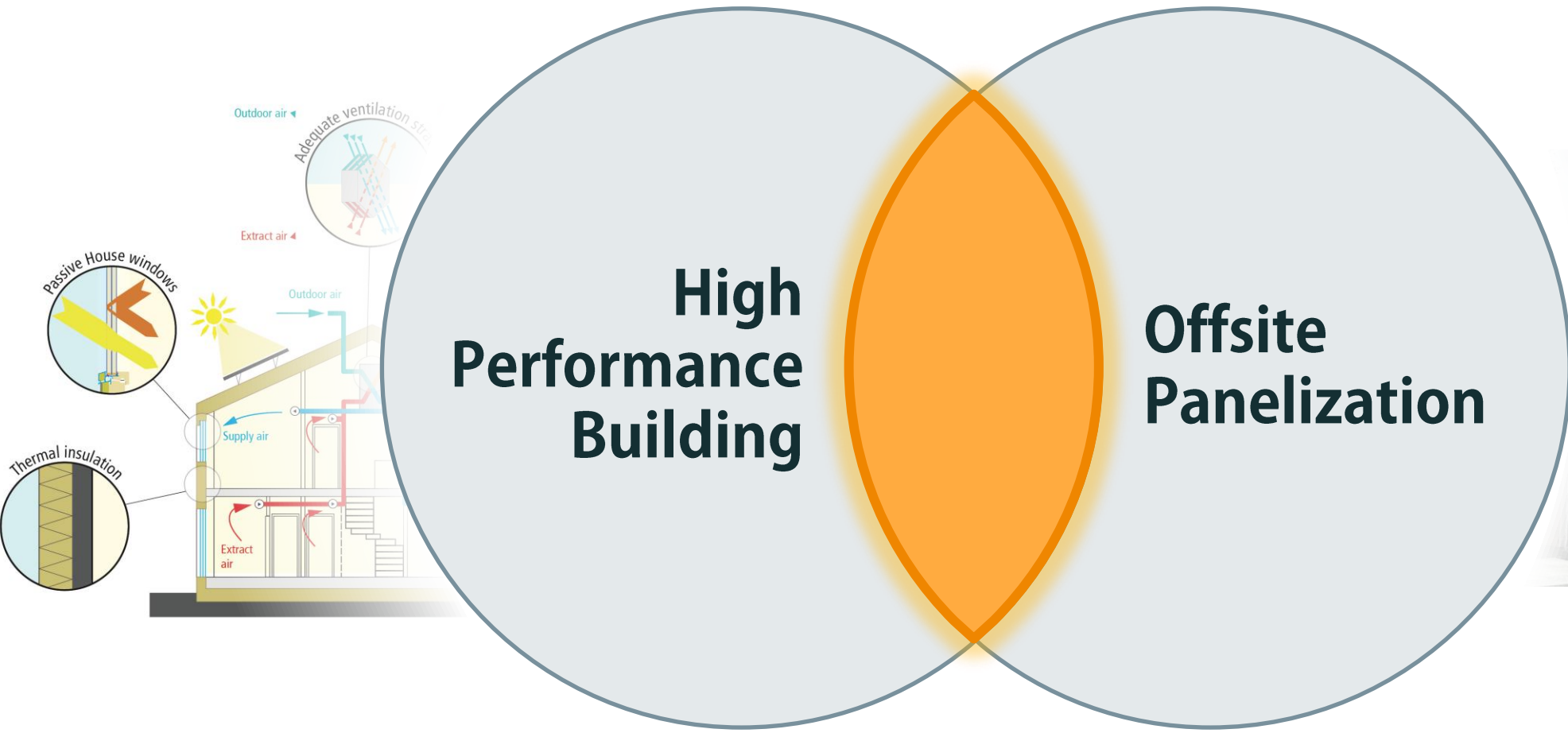
- **Sustainability values**
- **Drivers for success**
- **Practicum (Games!)**
- **Wrap-up**



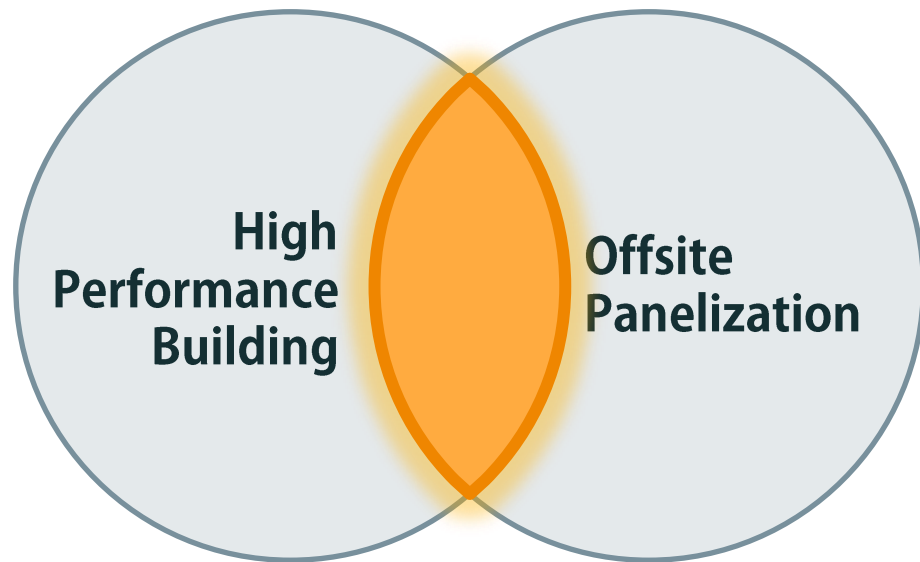




What values does Offsite Panelization offer that are mutually conducive to success with High-Performance Building?



Mutual Priorities & Values



- Expanded Access and Affordability
- Energy Efficiency
- Reduced material waste
- Improved Indoor Air Quality
- Transportation Efficiency
- Shorter Construction time
- Green Technology Integration
- Lower Disruption to Surrounding Ecosystems
- Flexibility and Adaptability
- Healthy materials

MUTUAL PRIORITIES AND VALUES

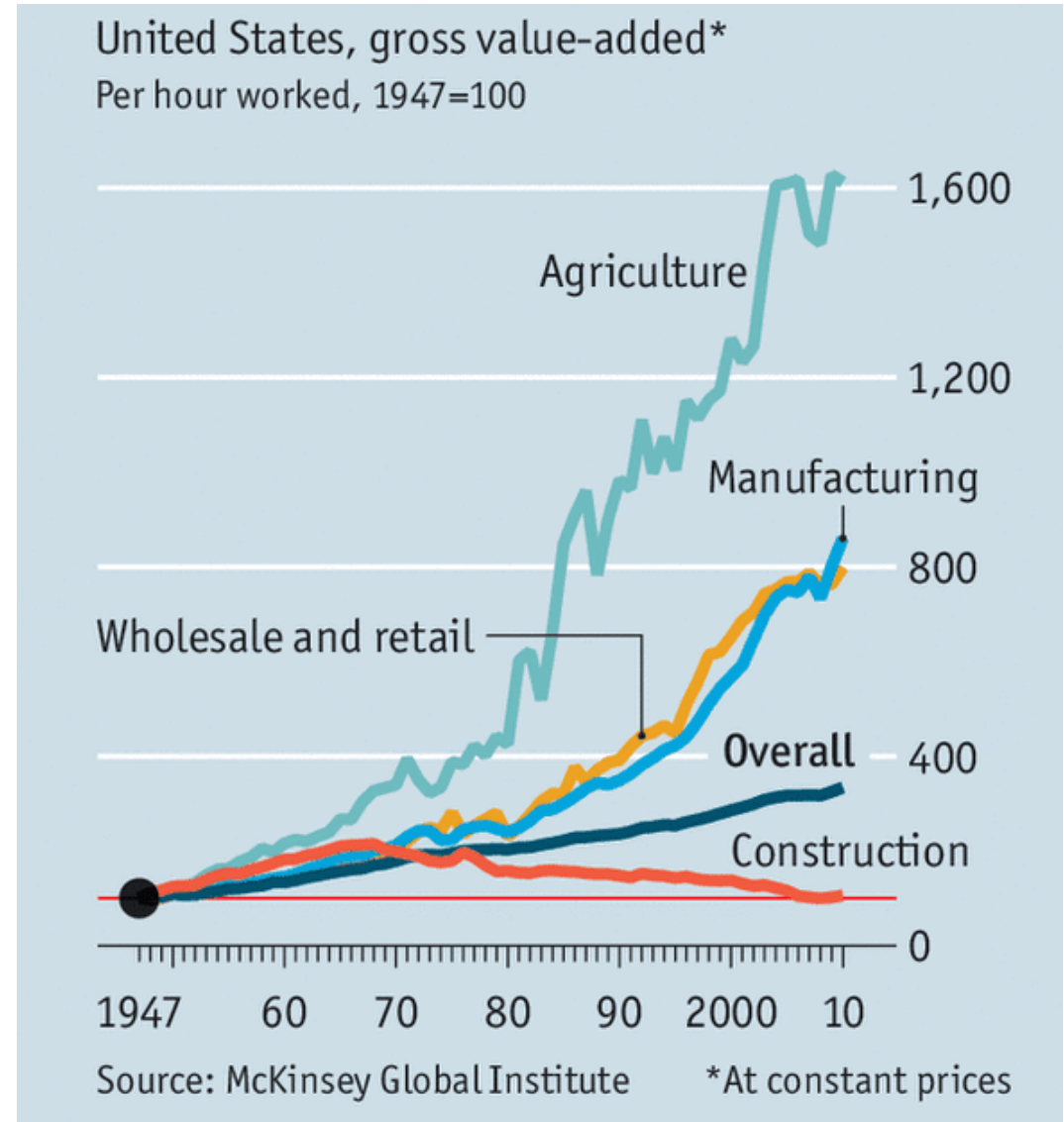
HOW TO
RECONCILE
THIS:



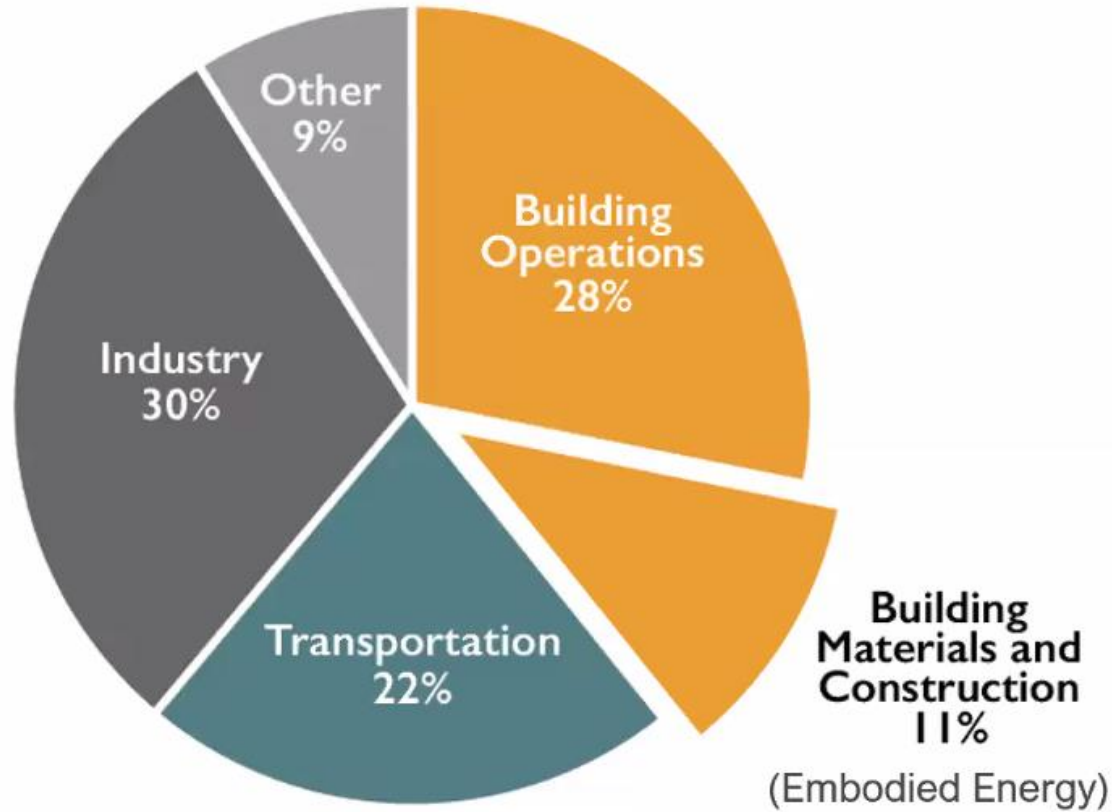
WITH
THAT:

Advancing offsite manufacturing technologies and delivery methods are expanding access to high-performance outcomes.

EXPANDED ACCESS AND AFFORDABILITY

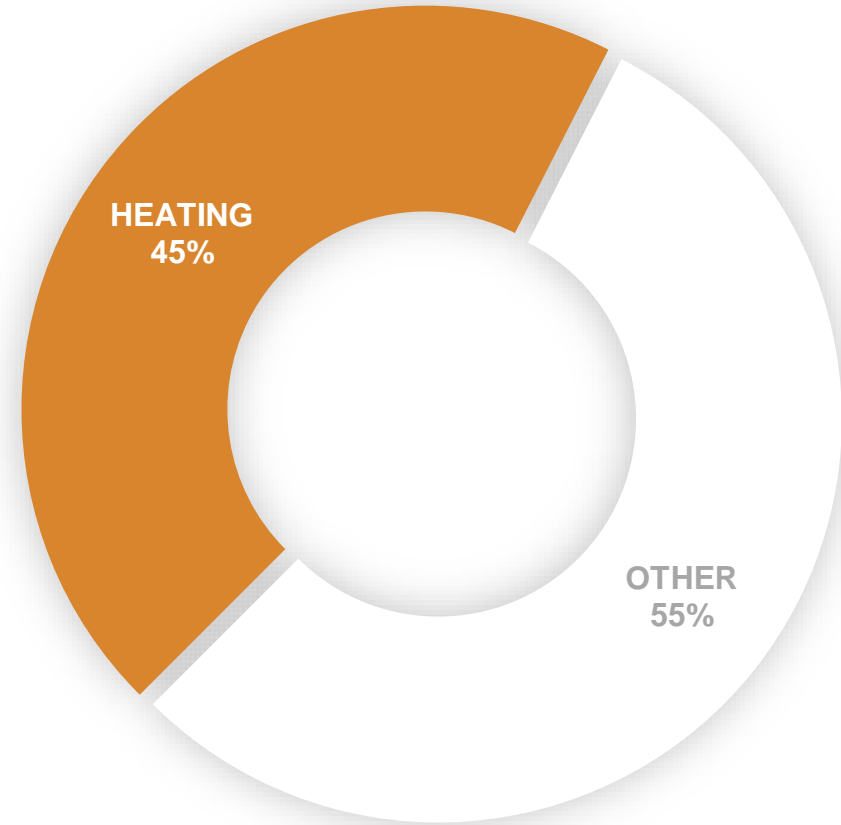


GLOBAL CO2 EMISSIONS BY SECTOR



Source: © 2018 2030, Inc. / Architecture 2030. All Rights Reserved. Data Sources: UN Environment Global Status Report 2017; EIA International Energy Outlook 2017

ENERGY BILLS FOR THE AVERAGE AMERICAN HOME



25% home heating is lost through small cracks and holes

MUTUAL PRIORITIES AND VALUES

ENERGY EFFICIENCY, INDOOR AIR QUALITY



MUTUAL PRIORITIES AND VALUES



Image by TEXASJOHNS

CONVENTIONAL BUILDING METHODS

8,000 pounds (4 tons) waste per average new home

REDUCING CONSTRUCTION WASTE





MUTUAL PRIORITIES AND VALUES

DAMPNESS DURING CONSTRUCTION



IMAGE: U.S. Department of Energy

MUTUAL PRIORITIES AND VALUES

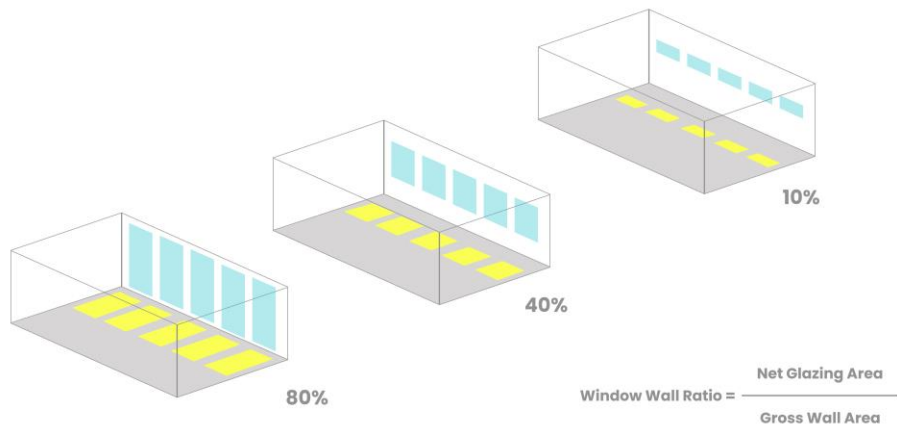


DAMPNESS DURING CONSTRUCTION



MUTUAL PRIORITIES AND VALUES

WINDOW TO WALL RATIO

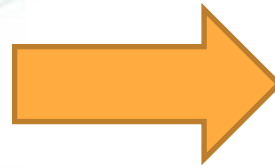


Credit: Snaptrude.com

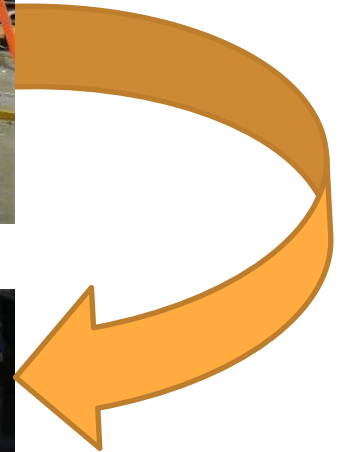
Photo Hugo Hébrard via v2com



MUTUAL PRIORITIES AND VALUES



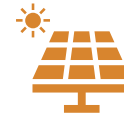
PREDEVELOPMENT + QUALITY CONTROLS



High-fidelity 3D modeling

- Direct-to-fabrication machinery
- Distributed quality control points
- 3rd party monitoring

Panel logic & Success drivers



High performance priority



Early team integration



Local climate



Dimensional considerations



Glazing



Aligning to a structural grid



Site considerations

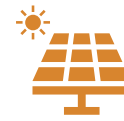


Schedule considerations

Game 1

Passive Prefab Bingo!

- What elements are conducive to panelization and PH principles?
- What elements challenge or defeat this approach?
- What can be done to help it work?



High performance priority



Early team integration



Local climate



Dimensional considerations



Glazing



Aligning to a structural grid

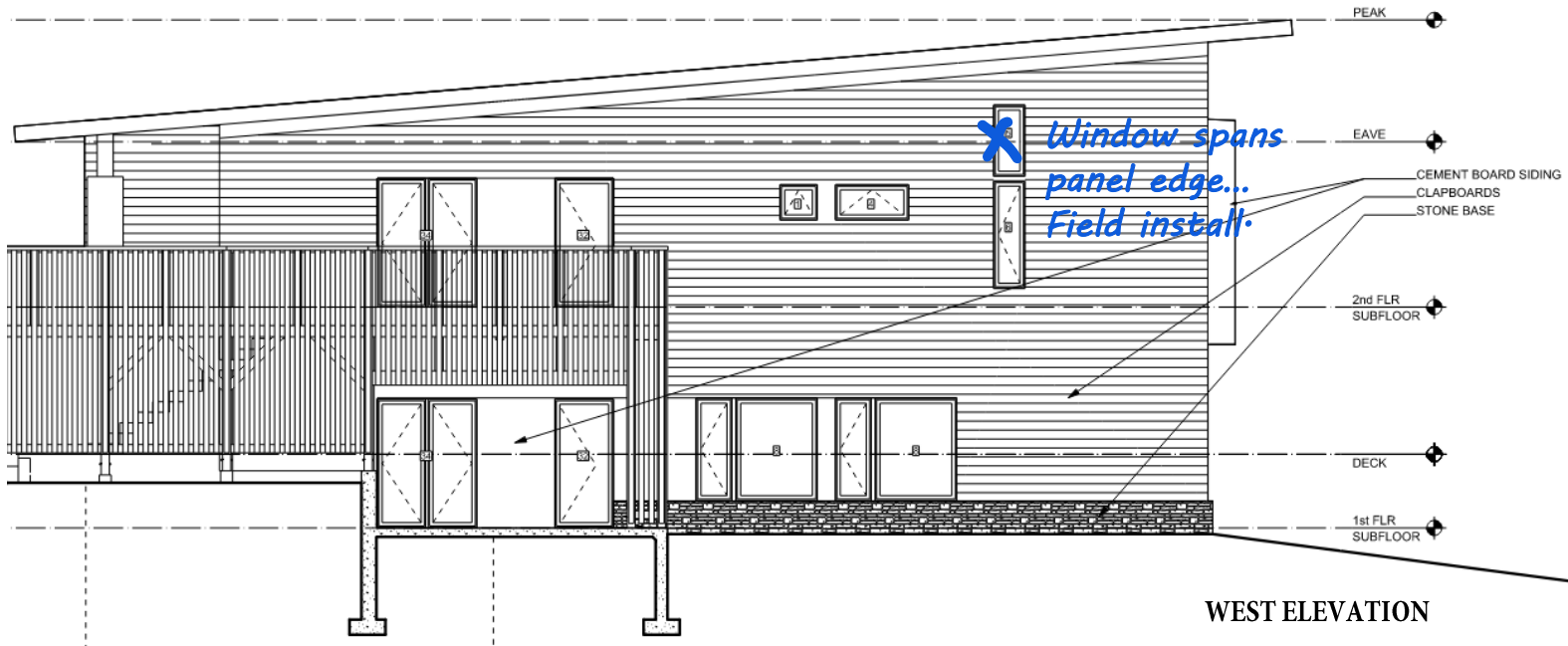


Site considerations

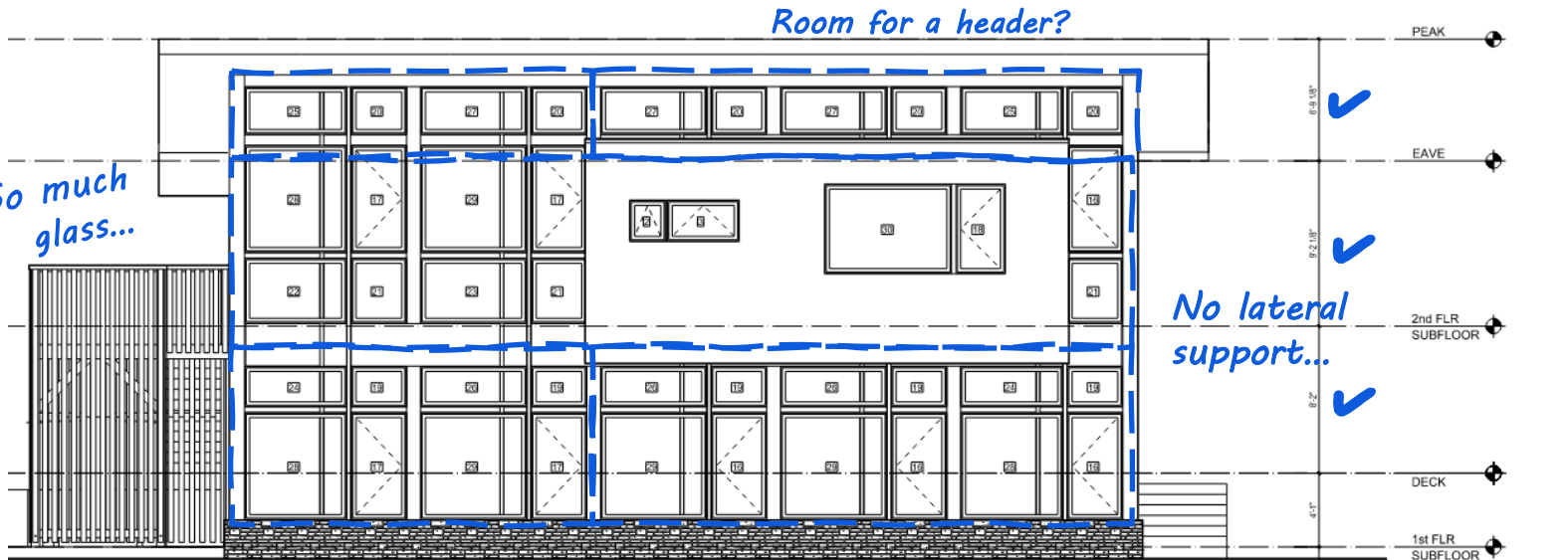


Schedule considerations

UNDERGRADUATE ARTS CENTER



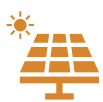
WEST ELEVATION



SOUTH ELEVATION

So much glass...

Adopting PH principles



Late stage of design



Cold weather climate,
Good south-facing glazing
for passive SHG



Floor to floors good



Unclear how extent of south
glazing will be panelized



Does not conform to 2' grid



Unclear: Access to meadow?



LOCATION: Caneadea, NY
SIZE: 8,000 GSF
Summer 2024!
Not possible

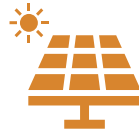


SCHEDULE: Raising desired Summer 2024 !!

SITE: Gently sloping meadow on edge of liberal arts college campus.

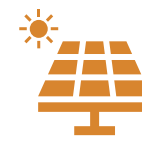
PROGRAM: Student facility for graphic and performance art education. Lithography studio and gallery on lower level, with dance studio on upper level. Rooftop solar.

PERFORMANCE: Aiming for PH principles but not certification.



High performance priority

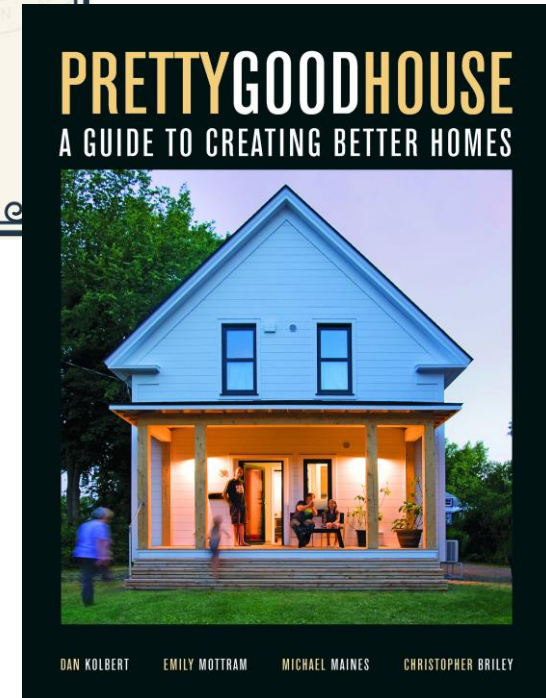
PANEL LOGIC + DRIVERS



High performance priority



"Passive house principles"



What are the indications that the project aims to be high-performance?
Is the project poised to be fossil fuel free?





Early team integration

PANEL LOGIC + DRIVERS



Early Team Integration

Architect

Drives the design and upholds standards in consultation with Manufacturer



Consulting Engineer

Work in tandem with Architect and provides permit drawings including Structural and Mechanical design.



Clients & Institutions

Local Builder / GC

Executes site scope including foundations, MEP systems and interior/exterior finishes.



Manufacturer

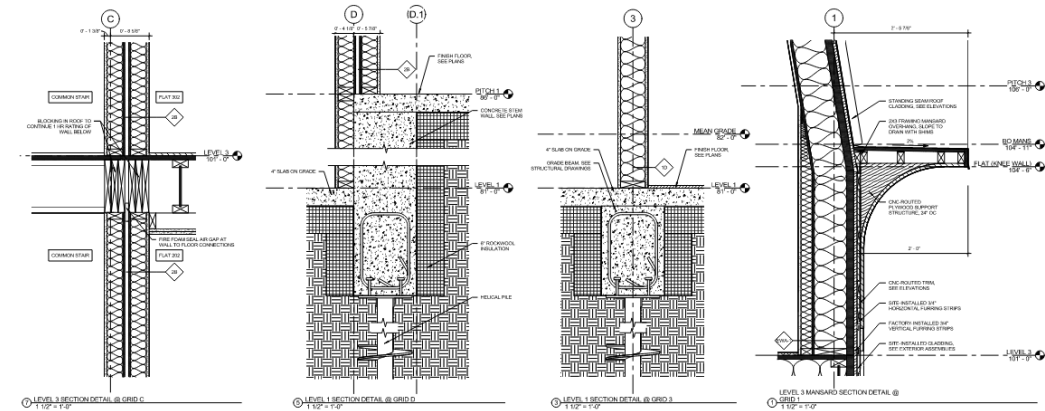
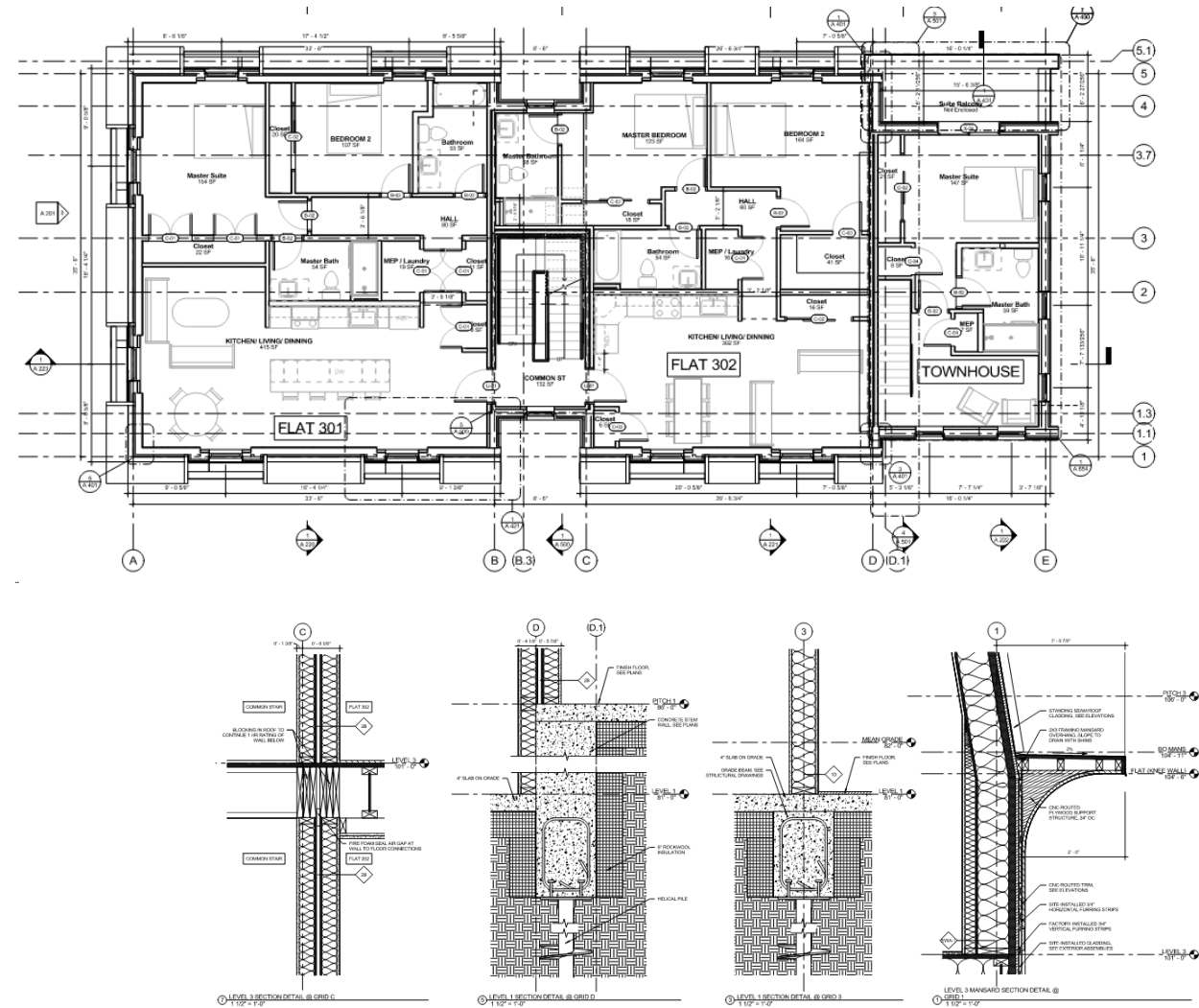
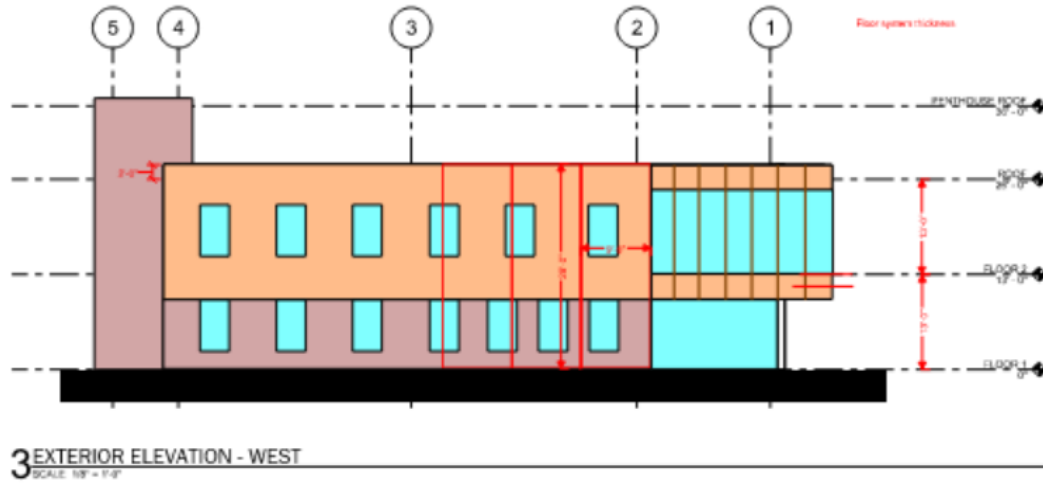
Coordinates, fabricates and installs airtight envelope, timberframe and other offerings



PANEL LOGIC + DRIVERS



Early Team Integration



Is your project already at a late stage in design where incorporating passive house or panelization strategies may be too disruptive?



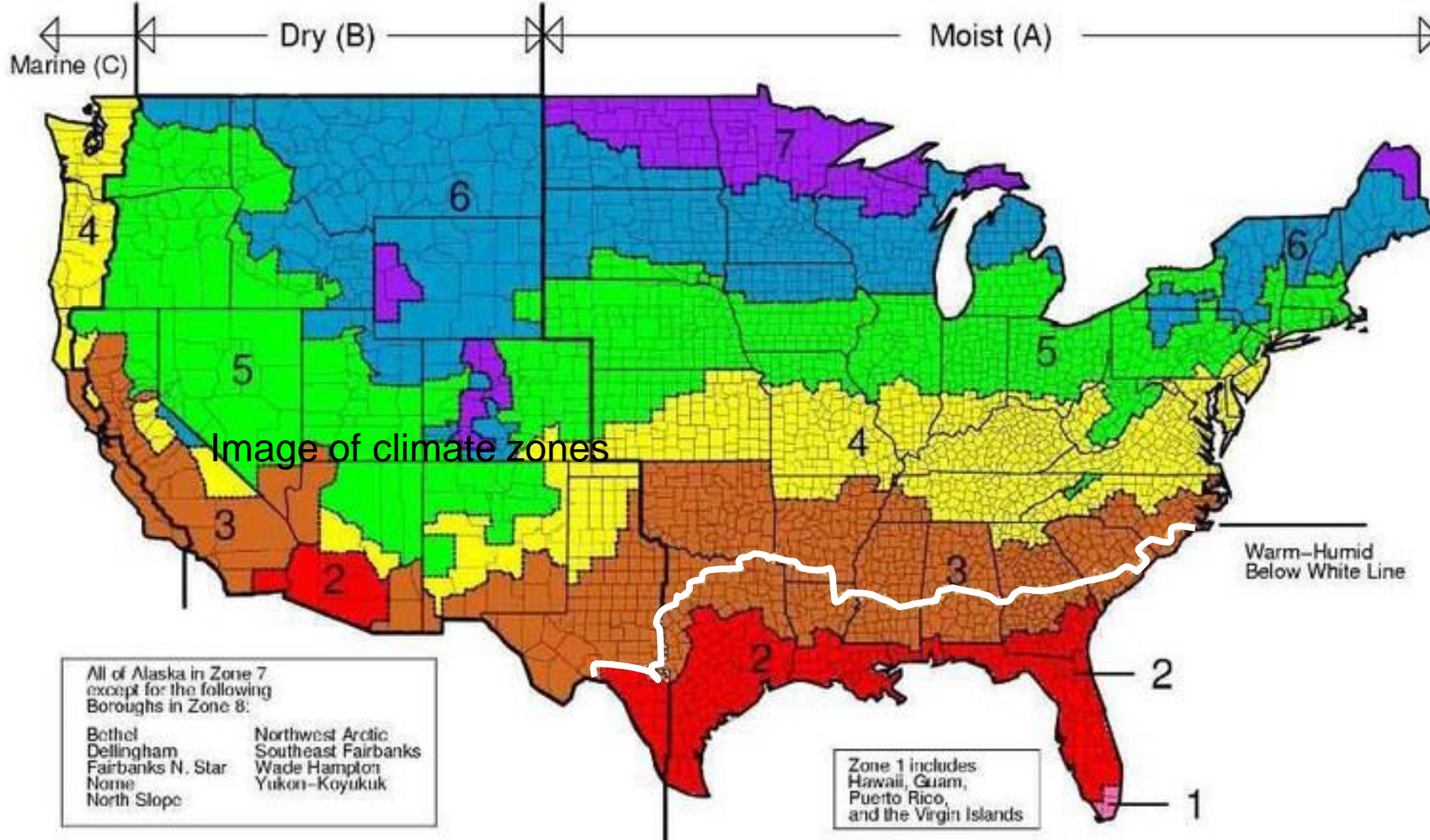
OFFSITE PANELIZATION



Local climate

PANEL LOGIC + DRIVERS

 Local climate



Does your manufacturer produce a wall assembly to suit the local climate where you are building?

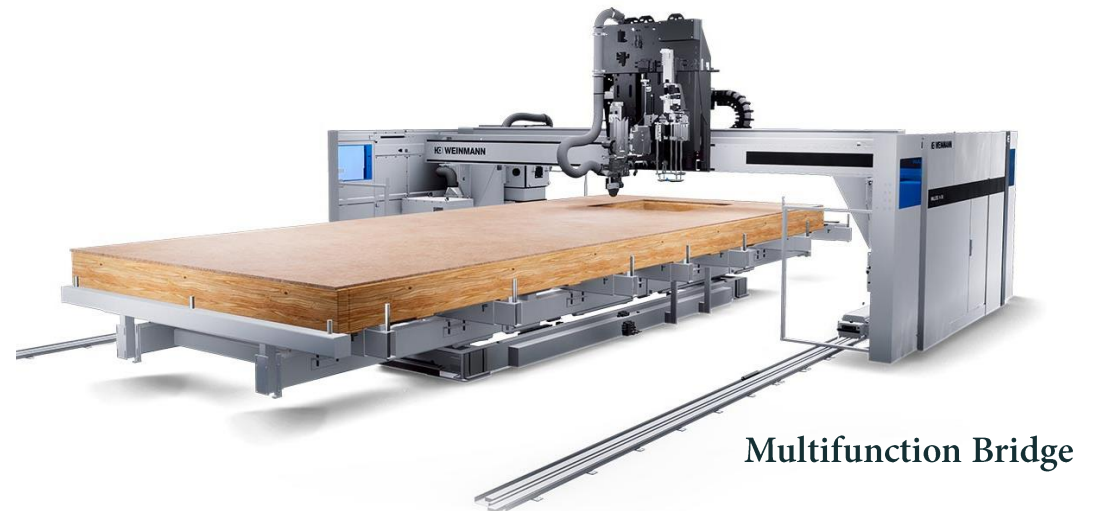
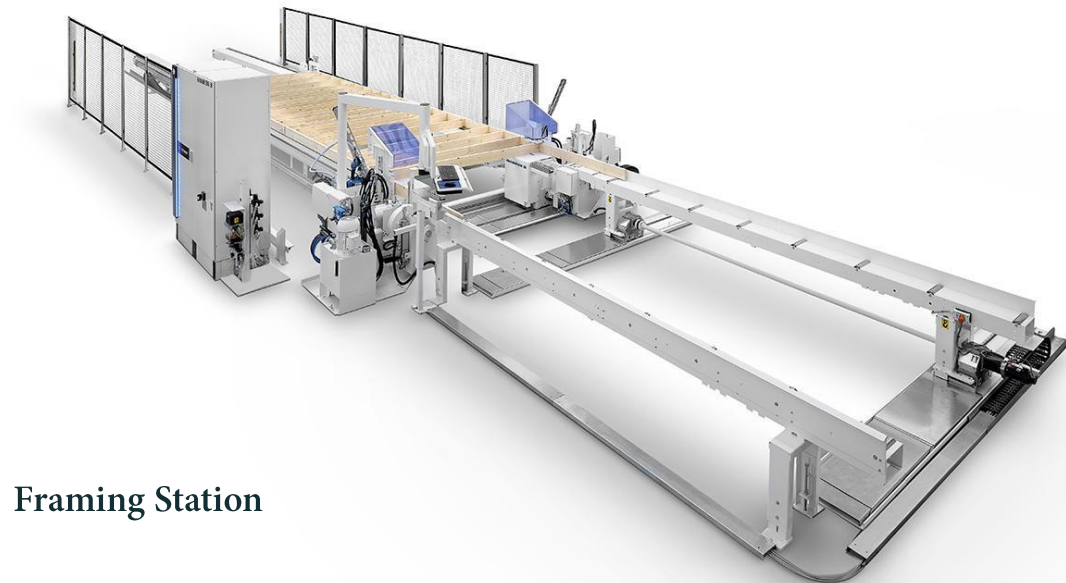
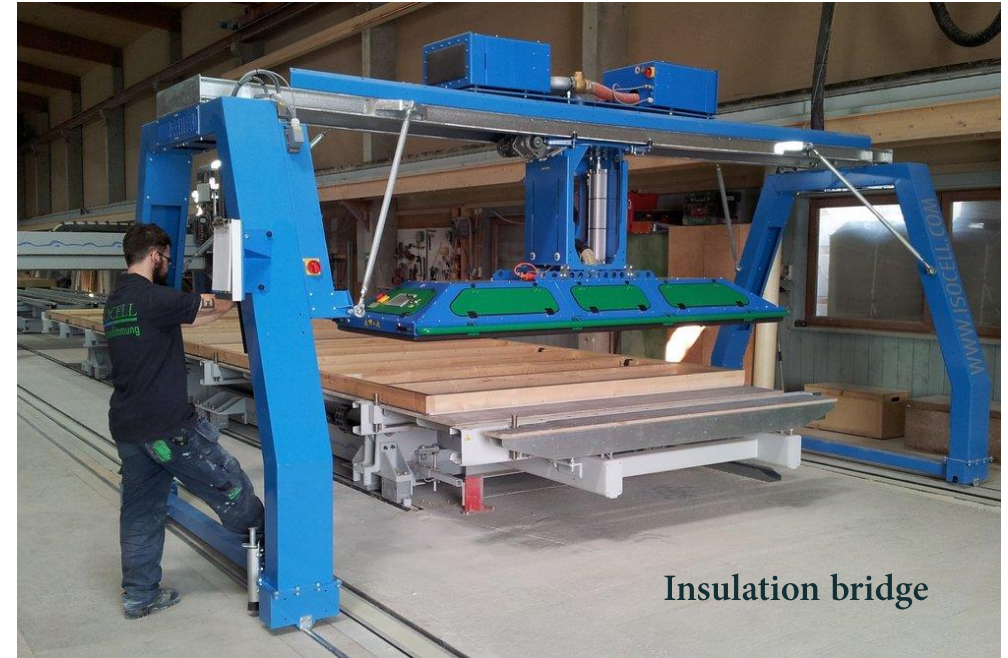




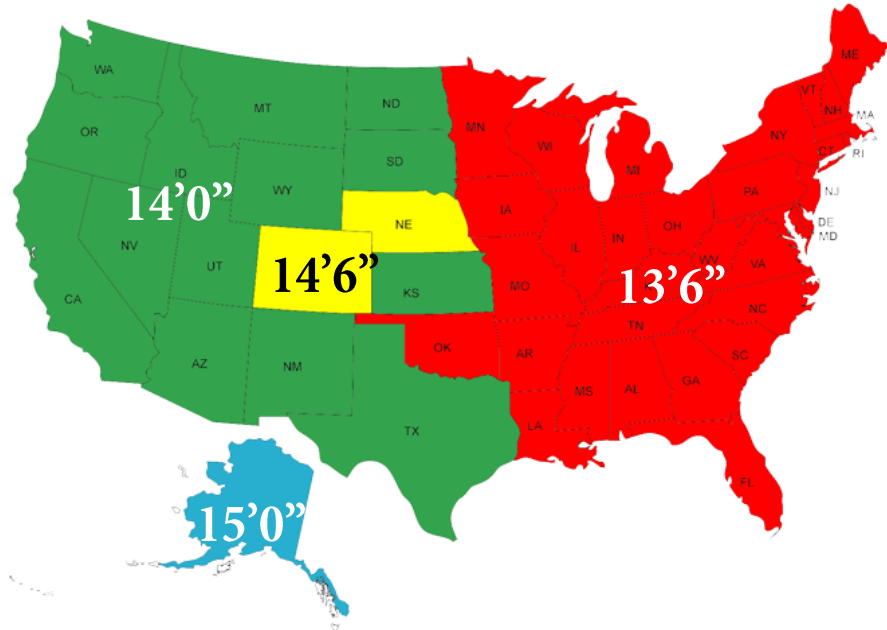
Dimensional considerations

PANEL LOGIC + DRIVERS

Dimensional considerations



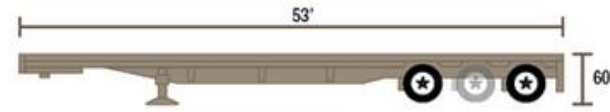
PANEL LOGIC + DRIVERS



State Map of Legal Height Limits

Dimensional considerations

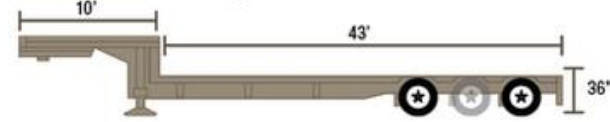
53' Flatbed



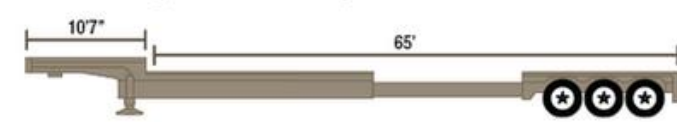
53' Drop Deck



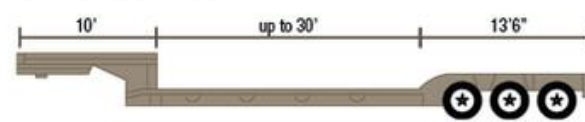
53' Low Pro Drop Deck



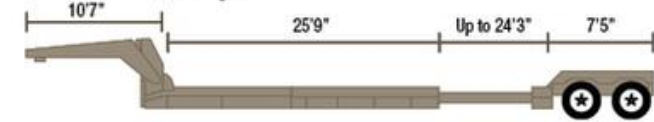
3-Axle Expandable Drop Deck



2 or 3-Axle RGN



2 or 3-Axle Expandable RGN



Typical trucking options



And other options. . .

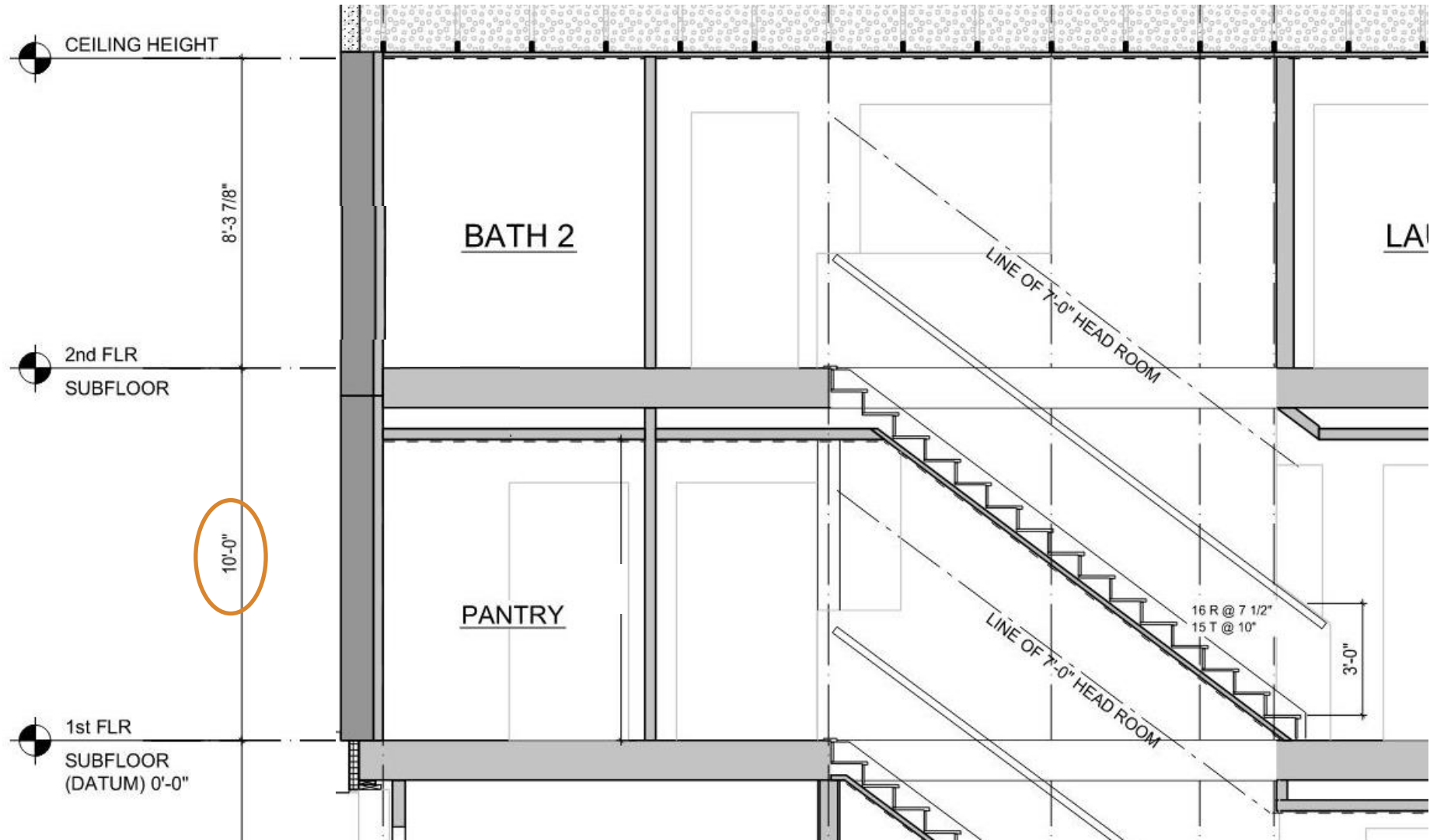


2018-02-20 09:06:19

11foot8-2b

A surveillance camera view of a road intersection. A yellow truck is driving away from the camera, and a motorcycle is in the foreground. There are traffic lights and a bridge in the background. The text '11foot8.com' is overlaid in the center.

11foot8.com

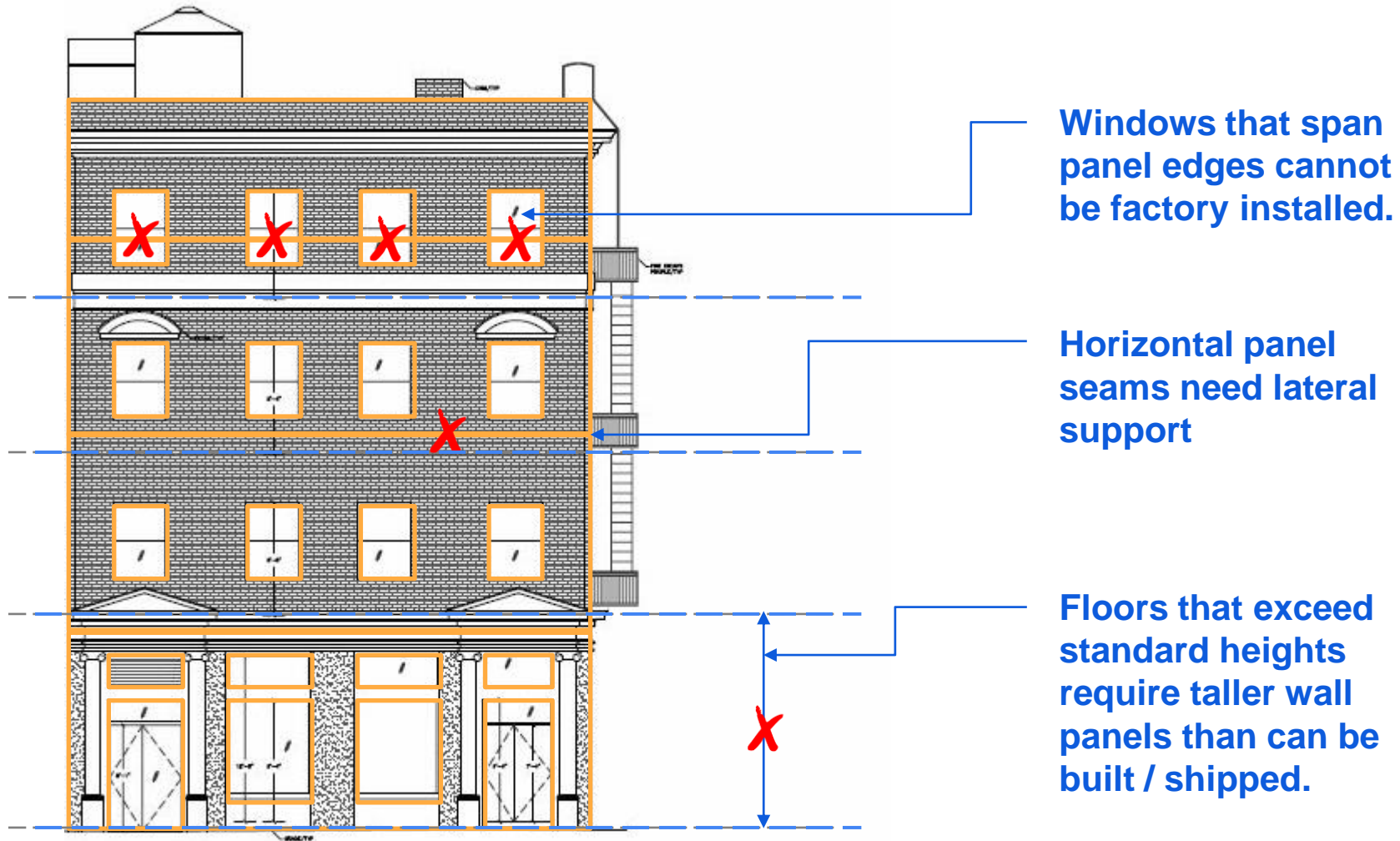


**Will the design require taller panels than your manufacturer can provide?
Does the floor-to-floor exceed 10 foot 6 inches?**



PANEL LOGIC + DRIVERS

Dimensional considerations





Vertical Panels may achieve height but are limited to 8'0" wide.

- More crane picks.
- More joints to seal.
- More fasteners.
- More manual labor in factory.
- More labor on site.
- Panels ship on their side so all windows must be site installed.

More cost. More risk.

Can the design be plausibly panelized with standard sized panels?



PANEL LOGIC + DRIVERS



Glazing

PANEL LOGIC + DRIVERS

Field prepared and installed

- Exposed to weather
- Costly to subcontract installation
- Responsibility for Air-tightness is shared



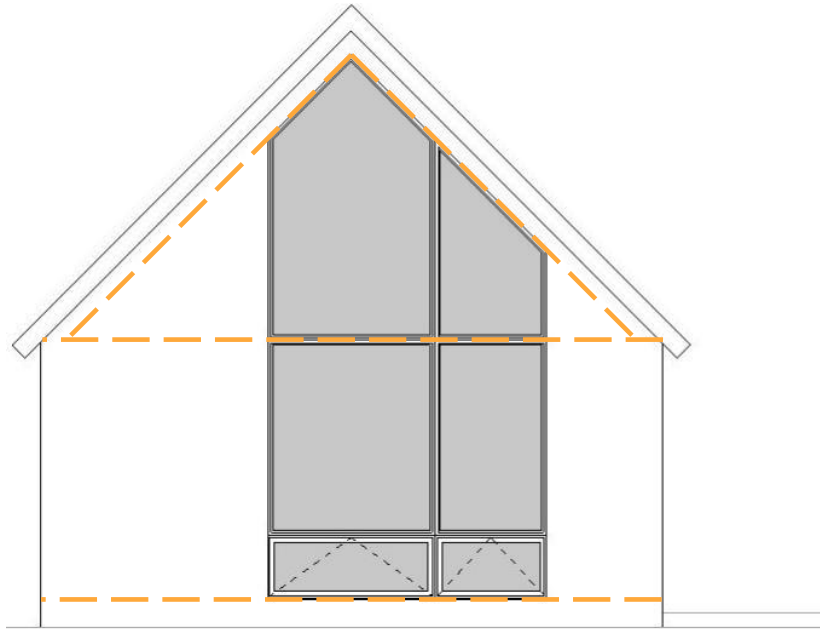
(Just found religion)

PANEL LOGIC + DRIVERS

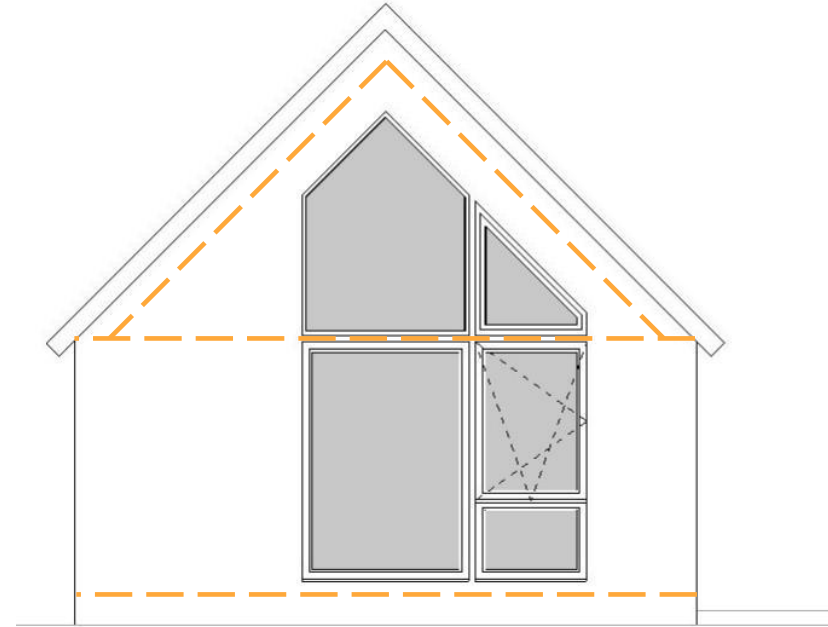
Factory prepared and installed in ideal conditions.

- Use of specialty lift
- Work at eye-level on the ground
- Openings flashed and sealed





- Additional site install cost,
- No roof for structural header above the glass
- likely requires steel



- Opportunity for shop installation (if available)
- higher level of precision.
- All wood framed solution

**Can all the windows be factory installed?
Does the window-to-wall ratio make all-electric HVAC implausible?**



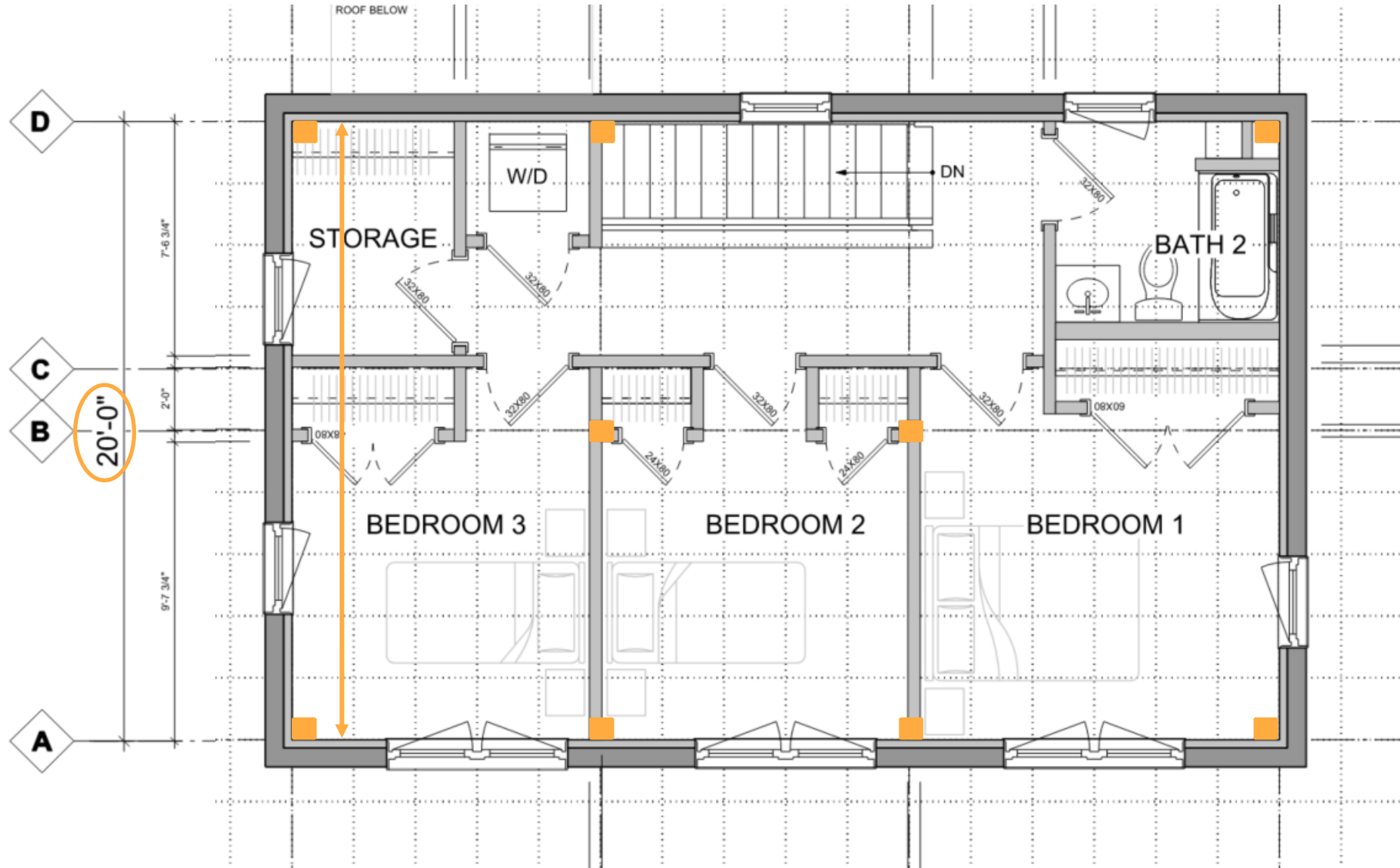


**Align to a
structural grid**

PANEL LOGIC + DRIVERS



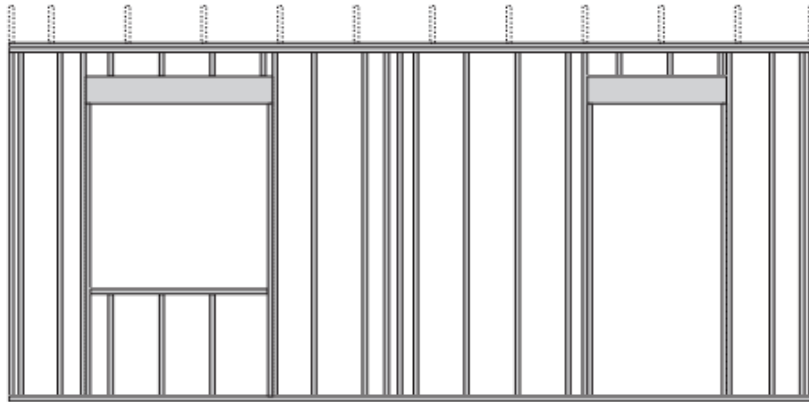
Align to a structural grid



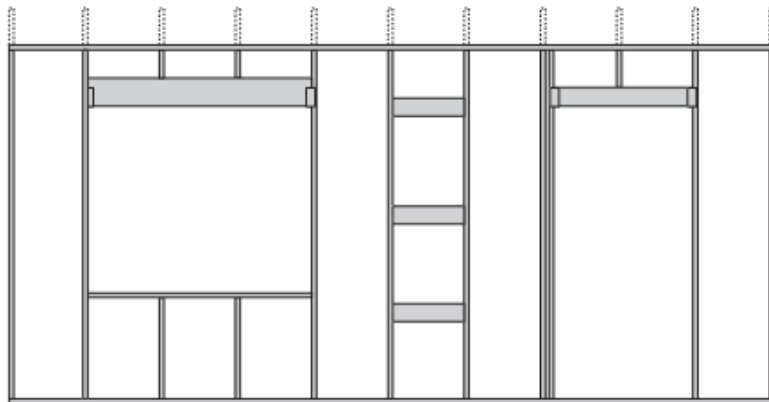
PANEL LOGIC + DRIVERS



Align to a structural grid



Conventional wall framing with studs @ 16" O.C.



Advanced wall framing technique w/ studs @ 24" O.C.

Illustration: SavingSustainability.com

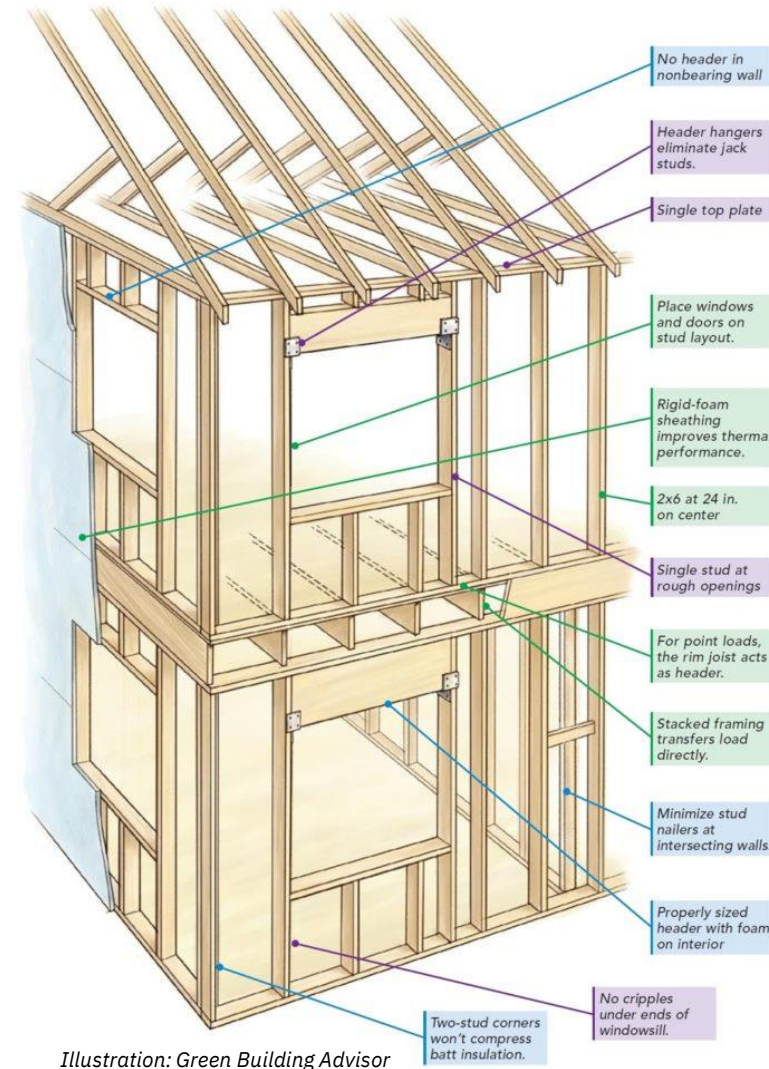


Illustration: Green Building Advisor

Does the building structure conform to a dimensional grid?



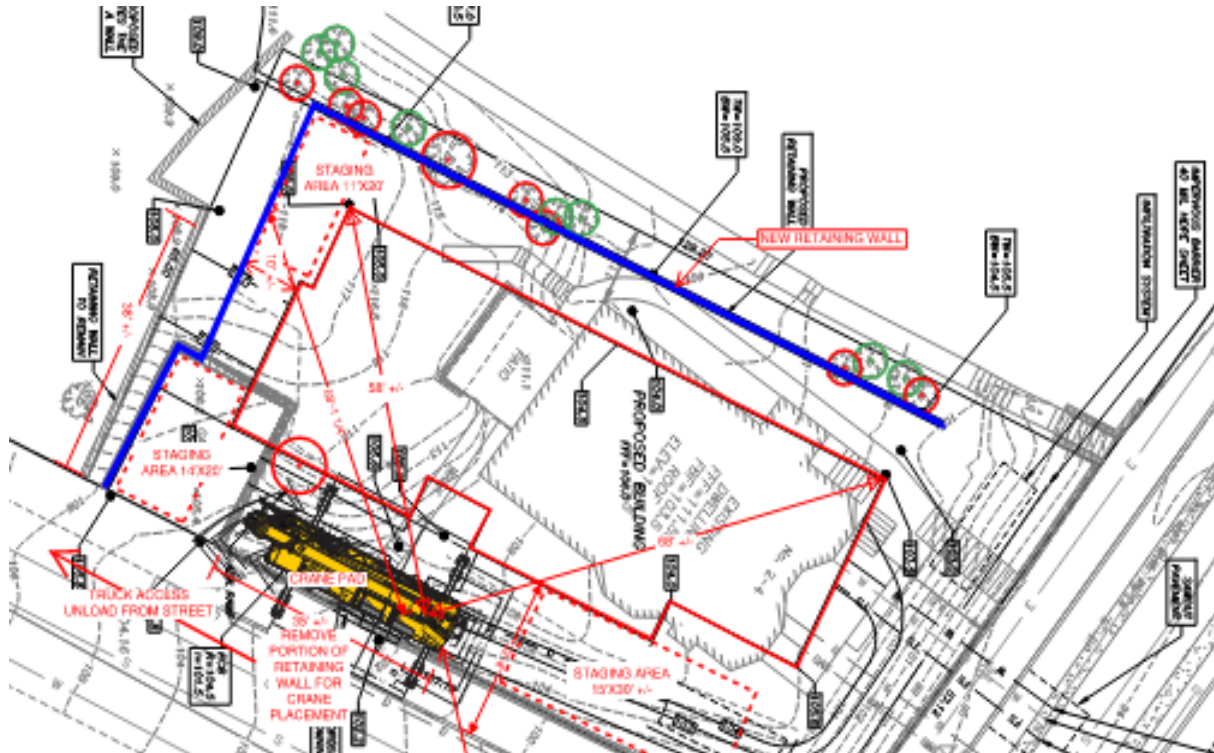


Site considerations

PANEL LOGIC + DRIVERS



Site Considerations



Does the site allow for crane/trailer access and lay-down space?
Are there low hanging wires or branches that make crane work impractical?





Schedule considerations

PANEL LOGIC + DRIVERS



Schedule Considerations



Will the schedule allow 26 - 30 weeks between design sign-off and raising?
Will it be mud season on site during delivery and raising?

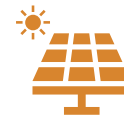


Game 2

Win, Lose or DRAFT!

Design a rapid façade study that uses **PH principles** balanced by sound **panelization logic**.

- 15m table work
- 10m shares around the room



High performance priority



Early team integration



Local climate



Dimensional considerations



Glazing



Aligning to a structural grid



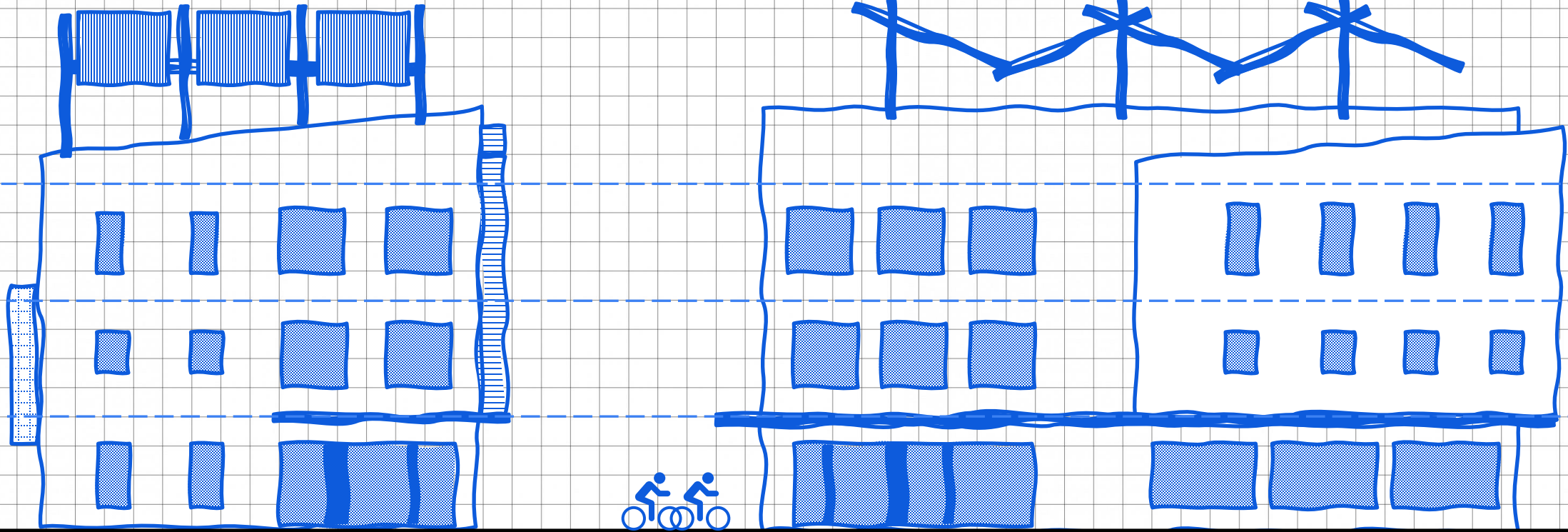
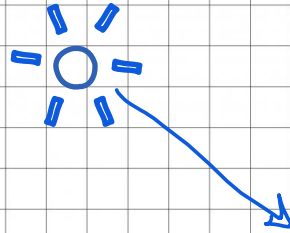
Site considerations



Schedule considerations

COMMUNITY REC CENTER

REMEMBER THE PRINCIPLES! →



PROGRAM: Sketch two façades for a suburban community center for youth recreational and sports activities, split over three floors, plus a roof deck with community gardens.

LOCATION: Ann Arbor, MI

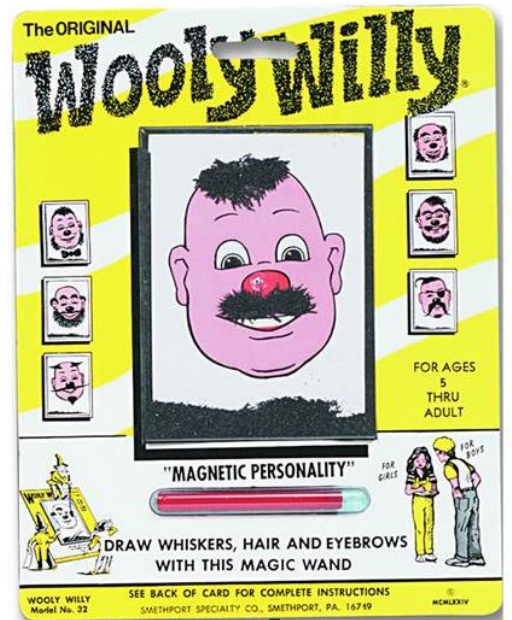
SIZE: 18,000 GSF

BUDGET: \$8.6m

SITE: Corner lot in a Commercial zoned area with a limited street frontage of 100 feet on the South side and 60 feet on the West.



TARGET
ZONE FOR
ACCURACY



HAND SKETCH CONTINUUM

Wrap up





- Pin up the work
- Complete evaluations
- **Visit Booth 29**
info@bensonwood.com

TEKTONIKS

