

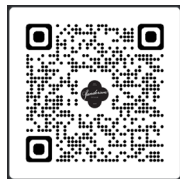
WHAT'S EVERYONE'S GOAL?

PhiusCon 2022:
Emissions Down,
Power Up!

Rethink PrePHab.



SHANNON PENDLETON Principal, CPHC
Sanderson Sustainable Design
Assoc. AIA, NCARB
Passive House Accelerator LIVE Co-Host
Solebury Township, EAC/ETP
Aquetong Watershed Association, BOD



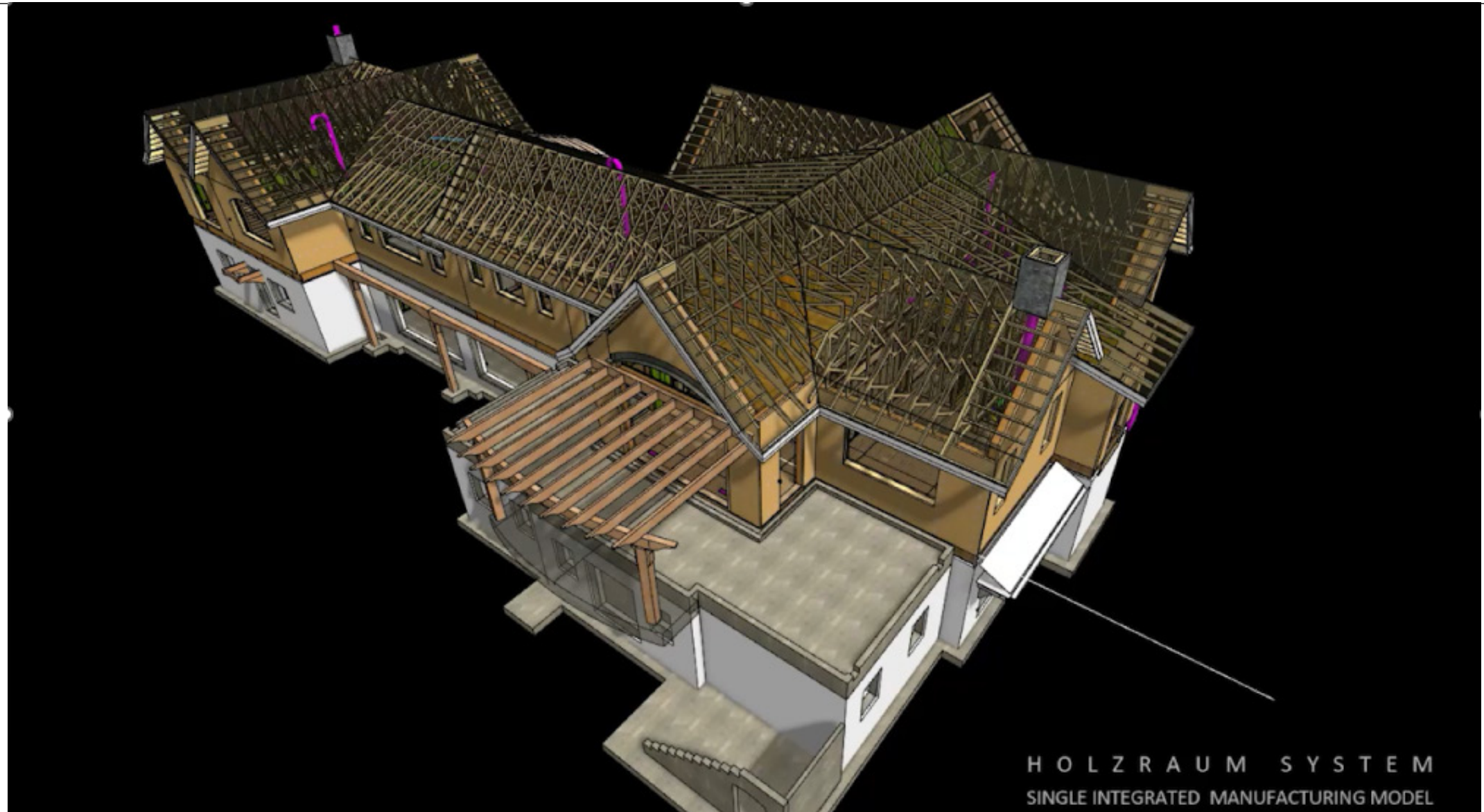
MARK WILLIE, Director
Building Experiences
US Engineered Wood Tstud™
Offsite Dirt, Contributor HPB Lead
Build Smart Chicago, Founder
Carpenter, Welder, Storyteller



ANDREW SEELYE, President
G-pod Americas
PADI Divemaster
Certified ACI, NICET training
NAA CAS / NAHB HCCP
Registered City of Austin Supplier



2019 - 2020



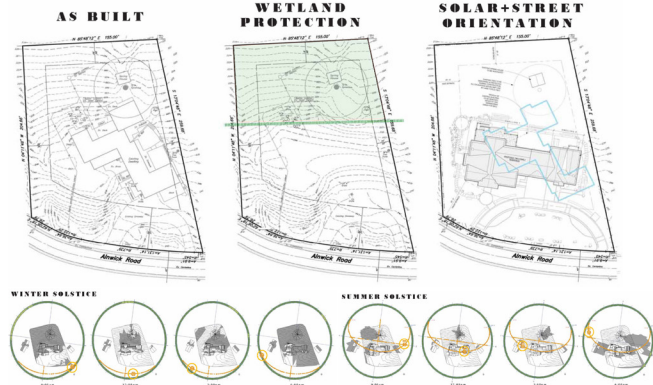
SOURCING + EARLY SEQUENCING



SITE COORDINATION

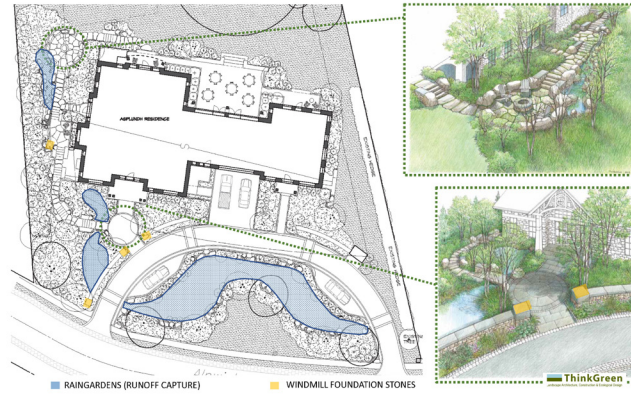
SITE STRATEGY

EXISTING CONDITIONS | TOPOGRAPHY, ORIENTATION, PROTECTED AREAS, RESTORATION



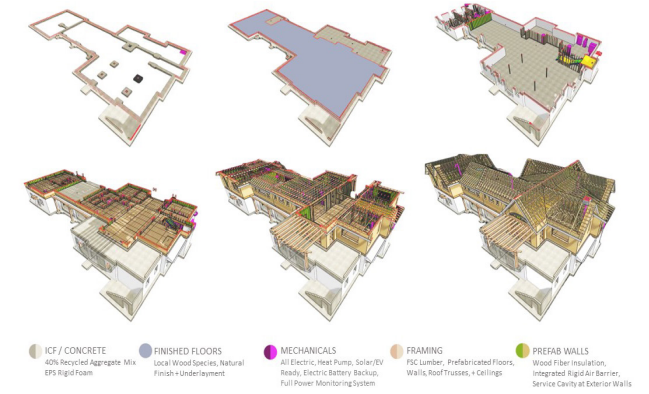
WATER STRATEGY

WATERSHED | PHASE 1: INFILTRATION + GRADING PHASE 2: COMPLETE HARDSCAPING



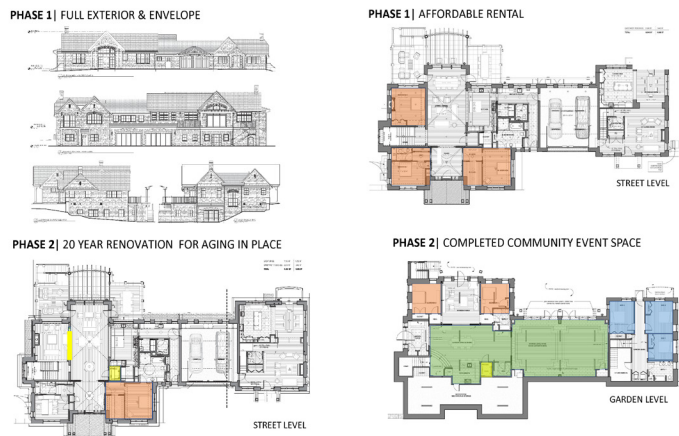
SEQUENCING STRATEGY

CARBON SMART | PREFABRICATION AND SEQUENCING MODEL



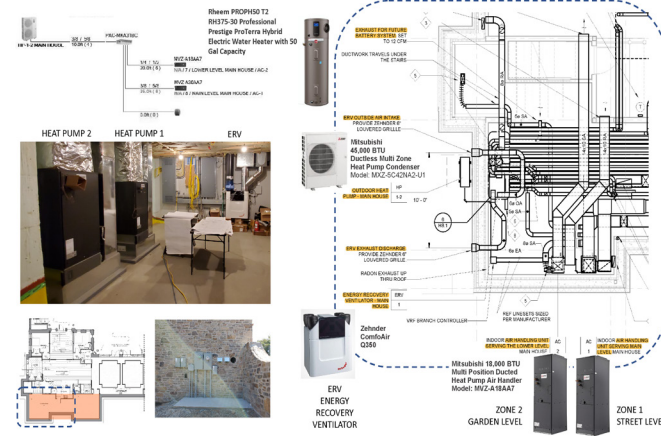
PHASING STRATEGY

SPACEPLANNING | MAIN HOUSE + CARRIAGE HOUSE PHASES



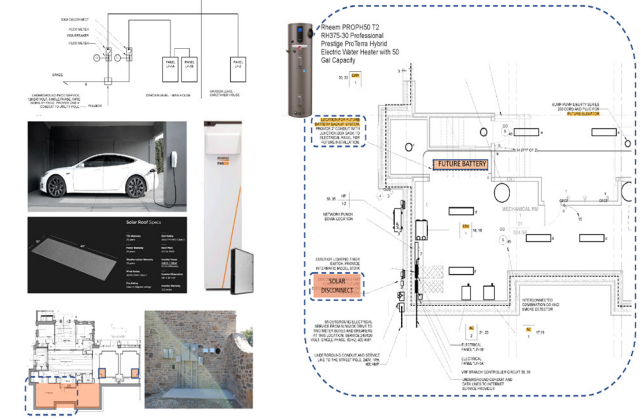
SYSTEMS STRATEGY

ALL ELECTRIC SYSTEMS | MAIN HOUSE HEAT PUMPS + FILTERED VENTILATION



POWER + MONITORING

ELECTRIC | PHASE 1: RESILIENCE + PHASE 2: ON SITE GENERATION



PREPHAB DESIGN-BUILD WORKFLOW

TIMELINE

- 08/18 SCHEMATIC DESIGN
- 01/19 DESIGN DEVELOPMENT
- 04/19 BUILDING PERMIT | SITEWORK COORDINATION MEETING
- 05/19 **EARLY SHOP DRAWING REVIEW***
EARLY DRAWINGS PACKAGE RELEASE*
EARLY WINDOW & DOOR ORDER*
- 07/19 CONSTRUCTION DOCUMENTS | BUILDING PERMITS
- 07/19 CONSTRUCTION KICKOFF MEETING | DEMOLITION
- 08/19 GROUNDBREAKING | FOUNDATION
- 08/19 **WINDOW DELIVERY TO BLUEPRINT ROBOTICS***
- 10/19 PHIUS+ 2018 PRECERTIFICATION MULTI-FAMILY
- 10/19 **PH VERIFIER KICKOFF MEETING***
- 12/19 **BLUEPRINT PANEL DELIVERY + INSTALLATION***
- 02/20 COMMUNITY ECO-TOUR | COLLEGE + ACADEMY ECO-TOUR INVITE
- 03/20 COVID-19 RESTRICTIONS
- 09/20 BLOWER DOOR TEST 1*
- 10/20 BLOWER DOOR TEST 2*
- 12/20 BLOWER DOOR TEST 3* 0.06 ACH@50 PASCALS
- 03/21 FOUR MONTHS TO PROJECT CLOSEOUT

**PREFABRICATION ITEMS IN RED*

**COVID RESTRICTIONS, VERIFIERS ONLY*

BENEFITS

1. INCREASED UPFRONT DESIGN
2. AFFORDABILITY
3. ENERGY EFFICIENCY
4. **MATERIALS CONTROL**
5. **TIME SAVINGS (WEATHER)**
6. **REDUCED WASTE**
7. **FIRST TIME PH BUILDER**

CHALLENGES

1. UPFRONT DESIGN COORDINATION
2. **LOCATION + SITE ACCESS**
3. **PROJECT SIZE REQUIREMENTS**
4. **ZONING + PERMITTING**
5. **PANELS VS. COMPONENTS**
6. SITEWORK UTILITY HOOKUPS
7. TRANSPORTATION
8. ASSEMBLY
9. OTHER HIDDEN COSTS + TAXES
10. **PAYS TO BE NEAR THE FACTORY**
11. **LESS ONSITE DIY**
12. **LOCAL WORKFORCE DEVELOPMENT**

WINTER 2021



FALL 2022



RENTING THE AMERICAN DREAM

The New York Times Magazine

In 2020, ...only 65,000 new entry-level homes completed – **less than one-fifth** of the entry-level homes constructed per year in the late 1970s and early 1980s.

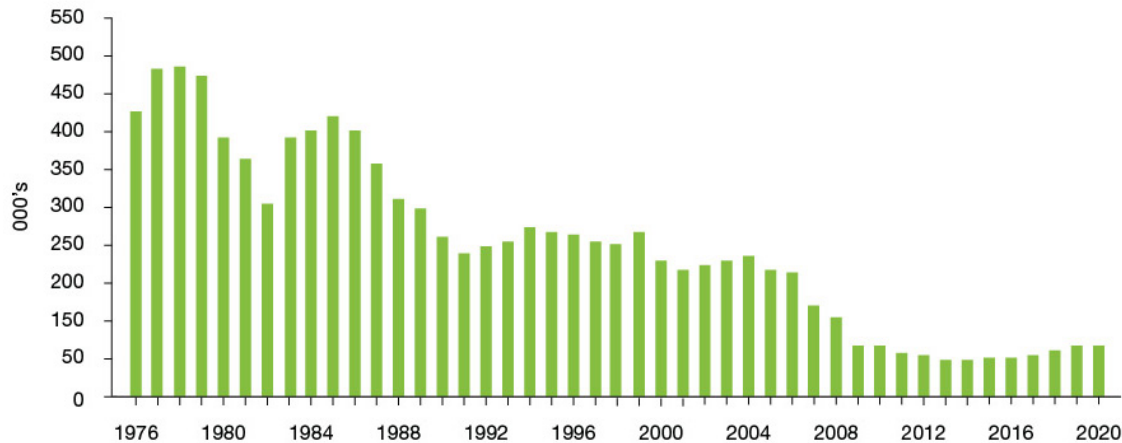
A \$60 Billion Housing Grab by Wall Street

Hundreds of thousands of single-family homes are now in the hands of giant companies — squeezing renters for revenue and putting the American dream even further out of reach.

EXHIBIT 2

Number of new homes constructed below 1,400 square feet

Entry-Level home construction collapsed after the Great Recession and never recovered

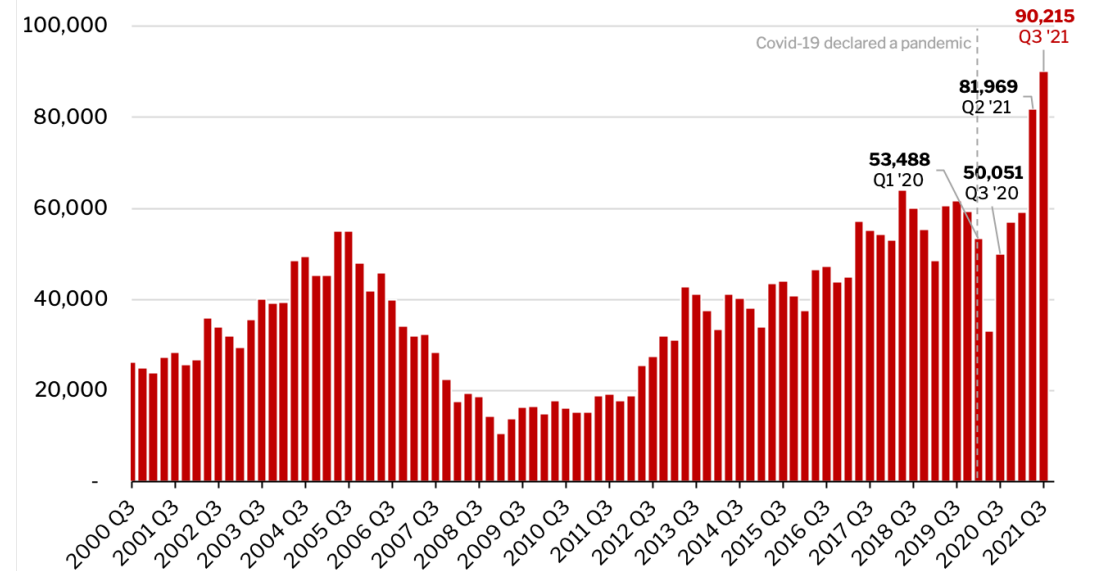


Source: U.S. Census Bureau.



Investors Buy Up a Record 90,000 Homes in the Third Quarter

Number of U.S. homes purchased by investors



Source: Redfin analysis of county records



THE COST BENEFIT OF HOME OWNERSHIP



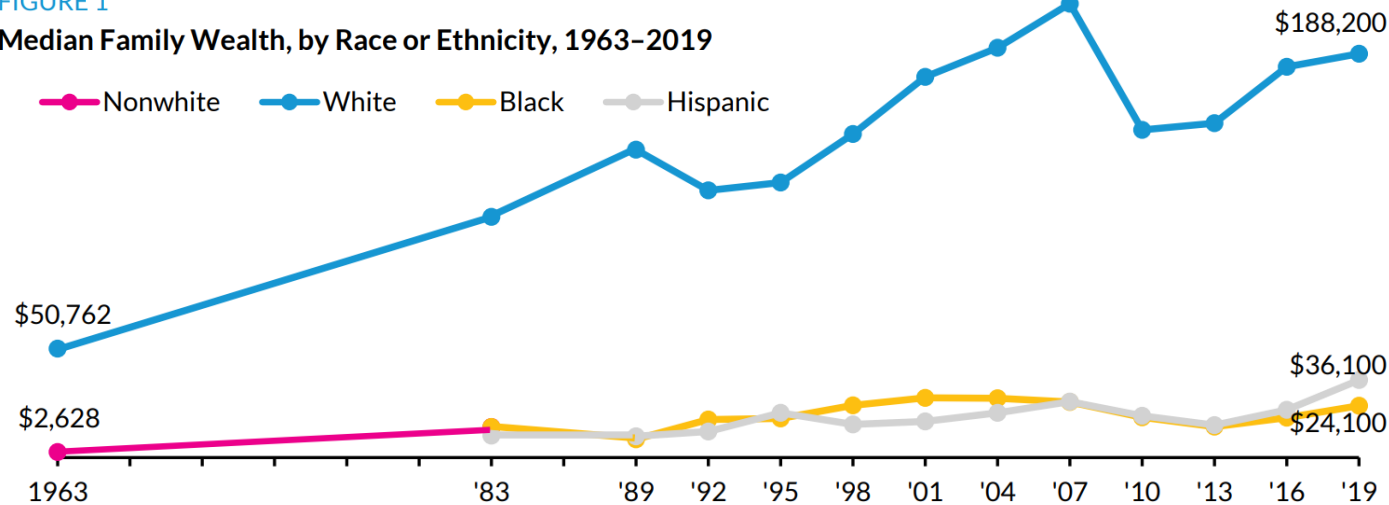
Building Generational Wealth through Homeownership Initiative

MBA is uniquely positioned to harness the necessary internal and external resources to effectuate meaningful change in the mortgage industry that will help more African-American and Hispanic families become homeowners and to close the racial homeownership gap. Through advocacy, partnerships and connections within the industry, MBA can:

1. Raise awareness of homeownership opportunities for African-American and Hispanic borrowers;
2. Secure policy and program changes to expand homeownership readiness to future borrowers; and
3. Assist current homeowners with maintaining and maximizing the benefits of homeownership.

FIGURE 1

Median Family Wealth, by Race or Ethnicity, 1963-2019



URBAN INSTITUTE



HOUSING FINANCE POLICY CENTER

Closing the Gaps

Building Black Wealth through Homeownership

Alanna McCargo

Jung Hyun Choi

November 2020 (updated December 2020)

The main driver of the housing shortfall has been the long-term decline in the construction of single-family homes and that decline has been exacerbated by an even larger decrease in the supply of entry-level single-family homes, or starter homes.



LESSONS FROM THE GREAT 8

Appendix A: List of Pennsylvania Projects

The PHFA first included PHIUS in its 2015 QAP, establishing [10 of 130 points for Passive House]. That year [of] 39 multi-family projects ...eight were PHIUS projects. Table 1 shows a cost comparison between the (7) completed passive house and (17) non-passive house projects funded by the PHFA in **2015**.



INCLUSIVE COMMUNITIES AND NEIGHBORHOODS

March 30, 2022

Who Gives a QAP? Why Non-housers Should Care About Their Local Qualified Allocation Plan



"Kamrad71/Shutterstock."

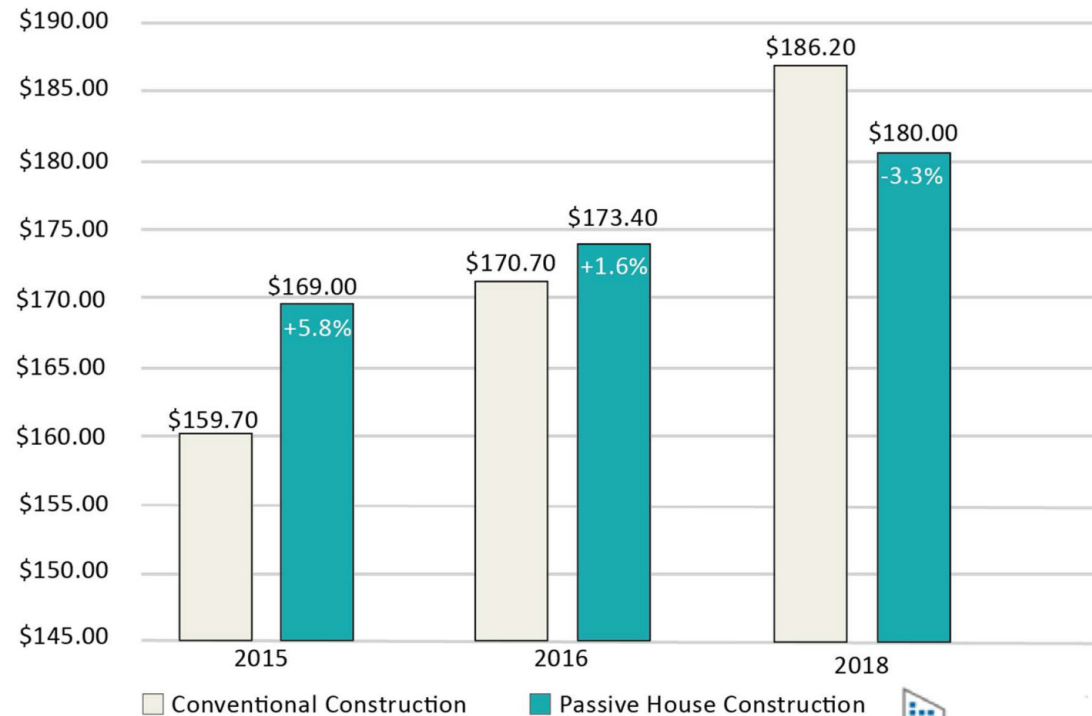
Table 1: COST COMPARISON BETWEEN PASSIVE HOUSE AND NON-PASSIVE HOUSE PROJECTS ⁴

Average Cost/sq. Ft of the Non-Passive House Projects (\$176 (+/-)\$36)			Average Cost/sq. Ft of the Passive House Projects (\$168 (+/-)\$45)		
Non-Passive House Projects			Passive House Projects		
Number of Units	Building Area (Sq. ft)	Cost/sq. ft	Number of Units	Building Area (Sq. ft)	Cost/sq. ft
45	53,021	\$128	54	70,128	\$111
53	82,070	\$129	34	39,447	\$145
40	53,52	\$144	49	54,287	\$151
35	61,504	\$149	66	70,689	\$155
45	63,458	\$154	61	63,949	\$157
40	40,959	\$157	50	55,099	\$226
24	36,064	\$160	52	50,275	\$233
31	43,868	\$162			
53	51,690	\$163			
44	49,406	\$169			
56	56,250	\$176			
28	45,434	\$178			
12	16,796	\$181			
43	55,832	\$185			
51	62,509	\$189			
23	28,205	\$193			
37	48,767	\$199			
88	79,560	\$228			
52	43,868	\$287			

⁴ Source Pennsylvania Housing Finance Agency. <https://passivehouseaccelerator.com/articles/2019-new-gravity-housing-conference-july-1st-2nd>

EXPERIENCE PAYS

Passive House Costs Less with Experience (Cost per Square Foot)



Note: Low-income housing tax credits were not awarded in 2017

Source: "How a PA affordable housing agency is molding ultra-efficient buildings mainstream"
Pittsburgh Post-Gazette December 31, 2018 & Pennsylvania Housing Finance Agency (PHFA)



Table 1: Cost differential between ZEB and Code Building

Multi-Family Building Type	Incremental Cost to Build NZEB against a Building Built to Code
Small Multi-Family (6-unit building)	0.88%
3-Story Multi-Family (14 Unit Building)	0.60%
4-5 Story Multi-Family (50 Unit Building)	0.91%
6 Story Multi-Family (51 Unit Building)	2.21%

Table 2: Summary of Incremental Cost of Multi-Family Buildings Built to the Plus Standard

Project	Number of Units	Incremental Cost
Old Colony; Phase 3C	55	2.8%
North Commons	53	4.3%
Depot Village/Hanson Village	48	4.1%
Finch Cambridge	98	1.4%
Harbor Village	30	1.8%
Mattapan Station	135	2.0%
Bartlett Station/Kinzie	52	1.0%

<https://www.istructe.org/istructe/media/Public/Resources/istructe-how-to-calculate-embodied-carbon.pdf>

PUBLIC + PRIVATE PARTNERSHIPS

The Inflation Reduction Act and Phius

New Energy Efficiency Home Credit – Section 45L

...eligible single-family homeowners ...meeting the Department of Energy's zero energy ready home program. Multifamily credits are available for the same amounts per unit if the building meets prevailing wage requirements. Otherwise, the multifamily credit is up to \$500 for meeting Energy Star requirements and \$1,000 for meeting the DOE's zero energy ready home program

3.Effect of Inflation Reduction Act on cost-effectiveness.

The Inflation Reduction Act (IRA), enacted in August 2022 contains a couple of specific amendments that strongly affect the cost-effectiveness of Phius projects. The law amends the requirements behind the awarding of tax credits under Section 45L of the tax code.

Under this amendment, **single family homes, duplexes and townhouses** are eligible for a \$2500 tax credit if they are built to **Energy Star specifications**. The total rises to \$5,000 for projects achieving DOE ZERH. Since all Phius single family projects must reach these benchmarks, it means that all Phius projects are eligible for this tax credit. Reducing the cost of a Phius project by \$5,000 can have a strong effect on its affordability.

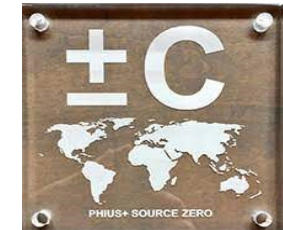
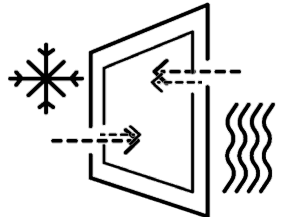
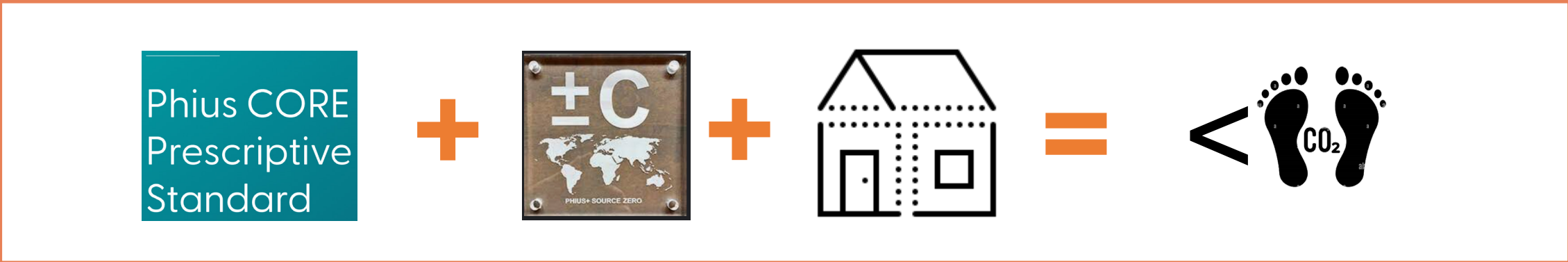
<https://www.phius.org/inflation-reduction-act-and-phius>



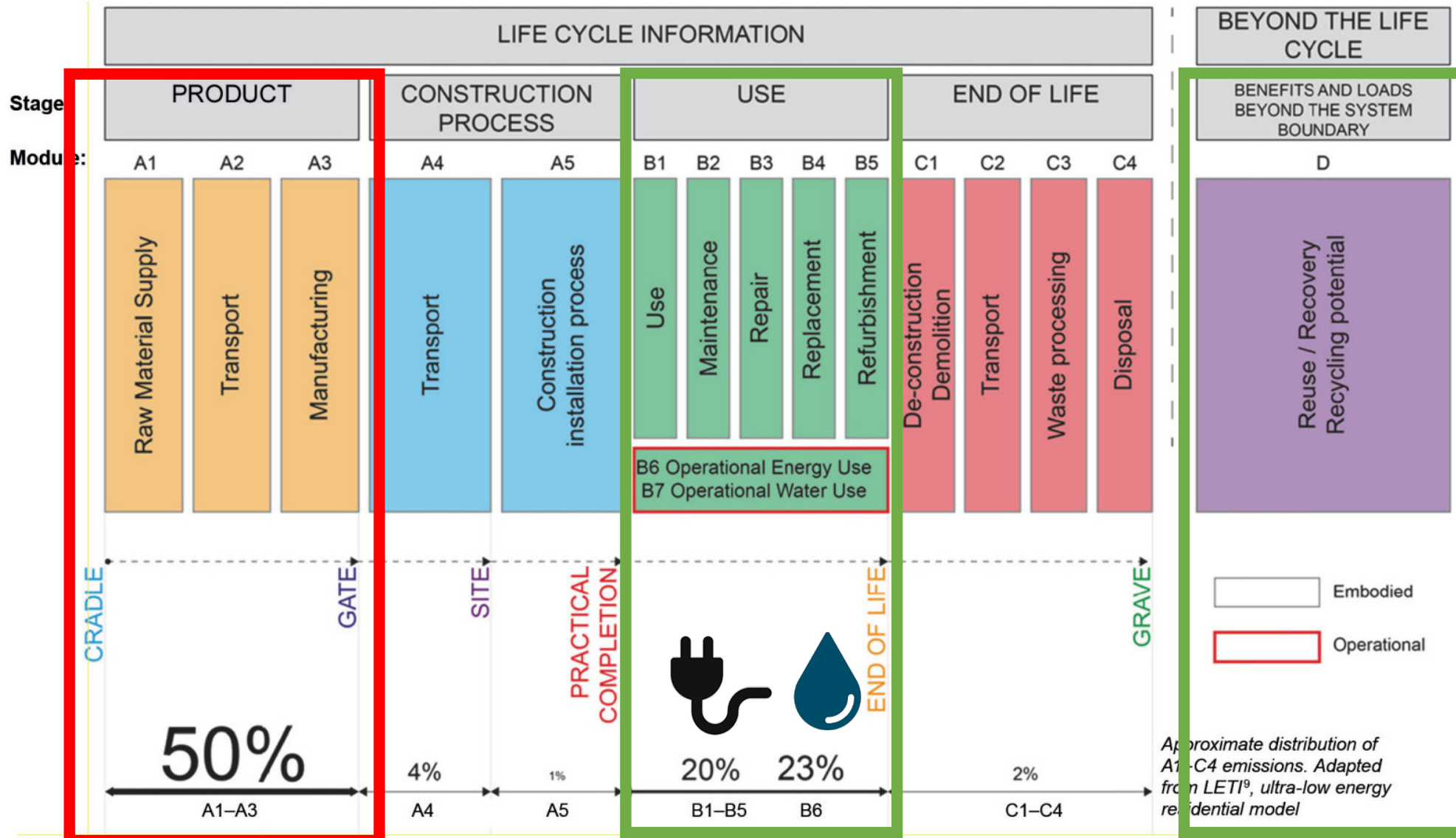
NACEDA is an alliance of 38 regional, state, and national community development associations in 25 states and the District of Columbia. Through our members, NACEDA connects with almost 3,500 community development organizations throughout the United States.



PUBLIC + PRIVATE + LOCAL PREPHAB



LOW ENERGY BUILDING | LIFE CYCLE STAGES



PREPHAB CAN HELP MANAGE UPFRONT CARBON

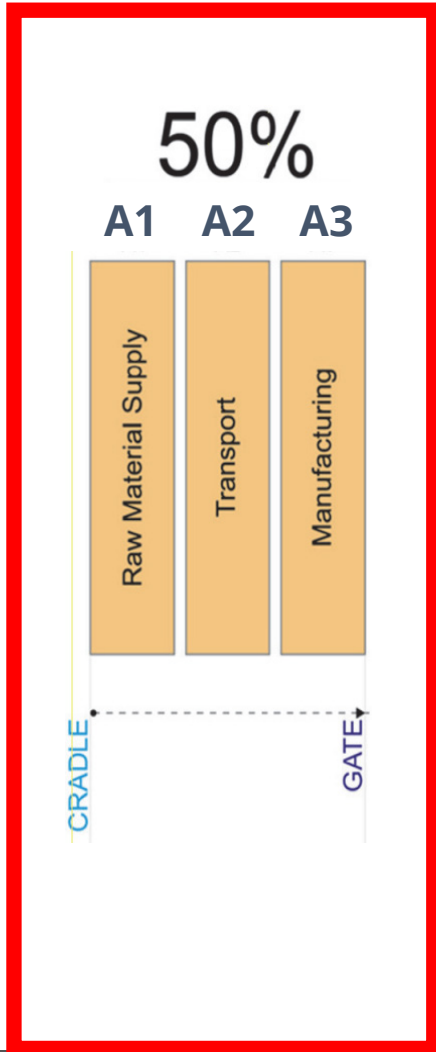


Bringing Embodied Carbon Upfront

“Upfront carbon, will be responsible for half of the entire carbon footprint of new construction between now and 2050”

threatening to consume a large part of our remaining carbon budget.

[-https://www.worldgbc.org](https://www.worldgbc.org)



Science Direct

Journal of Building Engineering

Volume 41, September 2021, 102705



Access through your institution

Prefabricated versus conventional construction:
Comparing life-cycle impacts of alternative structural materials

“In comparison with conventional, prefabricated construction has **lower environmental impacts**, uses **less materials**, and produces a **small** fraction of **waste**: taking **half the time** to be built.”

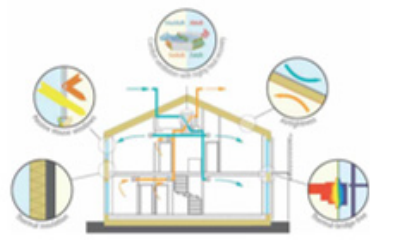
<https://www.istructe.org/istructe/media/Public/Resources/istructe-how-to-calculate-embodied-carbon.pdf>

HOW TO CONTROL THE LOW CARBON NARRATIVE

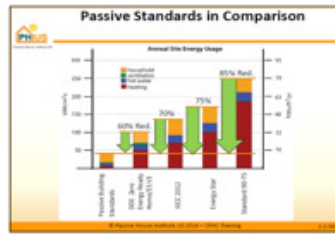
ENERGY

GOAL | PASSIVE HOUSE

STANDARD CONSTRUCTION METHODS + AFFORDABILITY
BEST EFFICIENCY, COMFORT, HEALTH, RESILIENCY



5 PRINCIPLES Passivehaus Institut



PHIUS / Passive House Institute US



SGBUILD.com

PHIUS / Passive House Institute US

DECOUPLE SYSTEMS FROM
THE ENVELOPE

MATERIALS

GUIDE | LIVING BUILDING

NON-TOXIC MATERIALS, SITE + WATER
EQUITY, SOURCING DISTANCES

PLAN FUTURE PENETRATIONS

WORKFORCE DEVELOPMENT

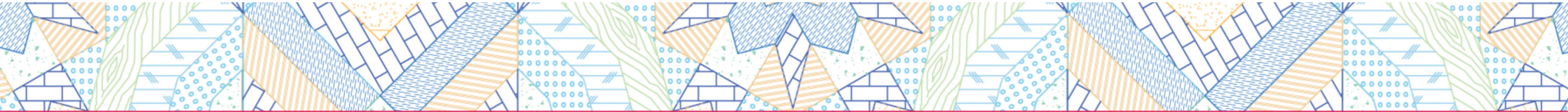
GUILD | LOCAL PREPHAB

BUILDING HOMES, ENRICHING
COMMUNITIES, CHANGING LIVES



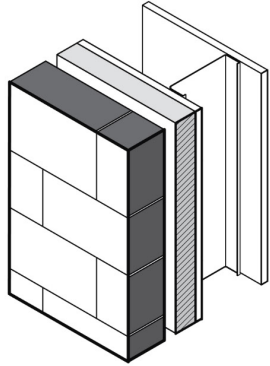
ANTICIPATE CODES USERS +
TECH

FREE + EASY CARBON CALCULATOR



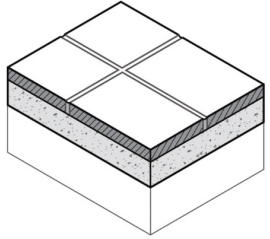
Kaleidoscope: Embodied Carbon Design Tool

ENVELOPES
Exterior Assemblies



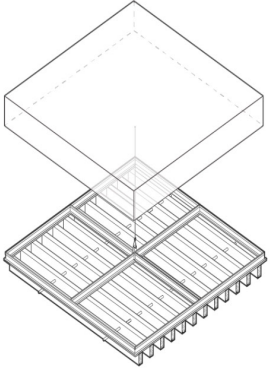
[VIEW ENVELOPES](#)

FLOORING
Flooring Assemblies



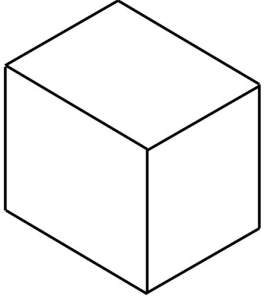
[VIEW FLOORING](#)

CEILING
Ceiling Assemblies



[VIEW CEILINGS](#)

OTHER
Future Assemblies



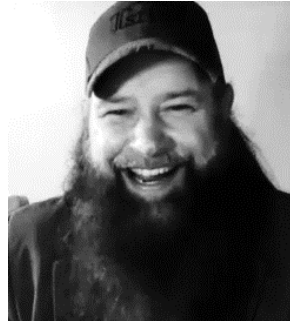
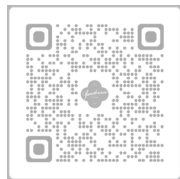
COMING SOON



Rethink PrePHab.



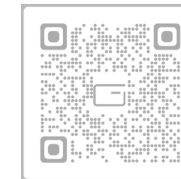
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Registered City of Austin Supplier



SINGLE FAMILY PREFAB DIY TRENDS



SINGLE FAMILY PREFAB INDUSTRY TRENDS

2% in 2016

MAGAZINE

Prefab houses were once the ‘holy grail of design.’ So why aren’t there more of them?

By Michelle Lerner
June 20, 2018 at 7:00 a.m. EDT

built in the future, says Greenwich, Conn.-based Sheri Koones, author of “[Prefabulous Small Houses](#)” and other books about prefab houses. But despite having been around for decades, prefab or modular homes made up just 2 percent of new single-family houses in 2016, according to the [U.S. Census Bureau](#).

The “cool” factor has also helped fuel interest. Actor and environmental activist Robert Redford is so enamored of prefab building that he has written introductions to several of Koones’s books. Design magazines and blogs regularly showcase prefab houses.

https://www.washingtonpost.com/lifestyle/magazine/prefab-houses-were-once-the-holy-grail-of-design-so-why-arent-there-more-of-them/2018/06/11/2af7f14a-1011-11e8-8ea1-c1d91fcec3fe_story.html

5.5% in 2022

Modular Construction Technology Comes Far and Fast During the Pandemic



Modular accounted for about 5.5 percent of the North American construction industry last year, or roughly \$200 billion worth of construction starts, according to the Modular Building Institute, a trade group.

<https://commercialobserver.com/2022/09/modular-construction-technology-after-covid/>

6.4%-7.2% by 2026

Amid the COVID-19 crisis, the global market for Prefabricated Buildings estimated at US\$106.1 Billion in the year 2020, is projected to reach a revised size of US\$153.7 Billion by 2026, growing at a CAGR of 6.4% over the analysis period. **Panel Systems**, one of the segments analyzed in the report, is projected to grow at a **7.2% CAGR** to reach US\$61.9 Billion by the end of the analysis period. After a thorough analysis of the business implications of the pandemic and its induced economic crisis, growth in the **Skeleton Systems** segment is readjusted to a revised **5.8% CAGR** for the next 7-year period. This segment currently accounts for a **22.9% share** of the global **Prefabricated Buildings** market.

<https://www.prnewswire.com/news-releases/global-prefabricated-buildings-market-to-reach-153-7-billion-by-2026--301331348.html>

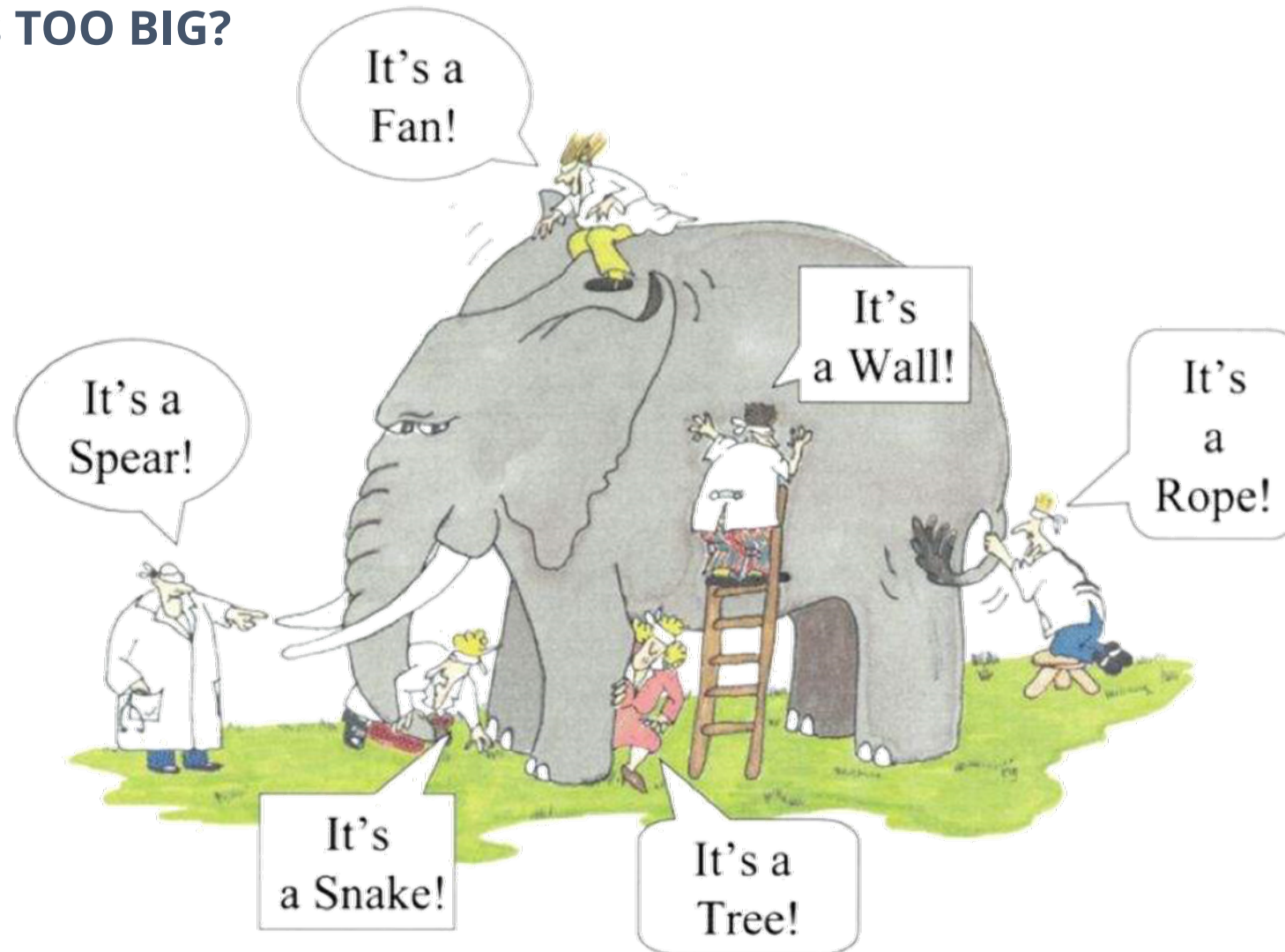
SINGLE FAMILY PREFAB TRENDS

BUT HOW BIG WILL THEY BE?
HOW GREEN WILL THEY BE?
+ WILL THEY DELIVER EQUITY?



How can we re-think PrePHab?

Before it gets TOO BIG?

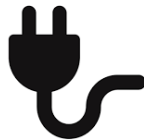


The Blind Men and the Elephant

Himmelfarb J et al. Kidney International 2002; 62: 1524

How can put PREPHAB in it's PLACE?

WE CAN'T TAKE THE SITE OFFSITE:



MATERIALS + SERVICES

DISTANCE

Ideas	12,429.91 mi
Renewable Energy	7000 mi
Consultant Travel	1500 mi
Lightweight Materials	1000 mi
Medium Weight Materials	500 mi
Heavy Materials	250 mi



Phius CORE
Prescriptive
Standard

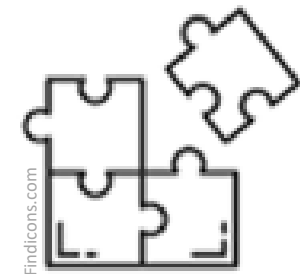
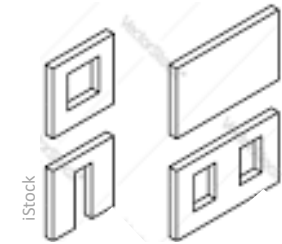


WE CAN SIMPLIFY THE PREPHAB ENVELOPE

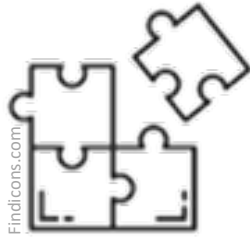
WINDOWS + ENVELOPE + STRUCTURE

...if a minimum of 75% of the
construction materials come
from within 5000 km of the
project site

& MAKE PHRIENDLY
COMPONENTS
for a kit of parts



HYBRID PREPHAB | Keep it Small, Simple, Light + Local



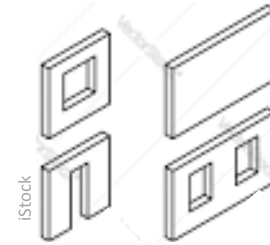
Modules: Complex Rooms

“Modules are great because you can save on time, you can take advantage of lower labor costs, and you can avoid weather delays [from traditional construction],” he said. “The downside of modules is that they’re very expensive to ship. There’s a lot of redundant structure. It’s very hard for the multifamily folks to maximize the number of units and floor plans because of that. They look more to panels as a prefab solution. Panels have more structure so you can solve design problems more elegantly. The challenge with panels is that you save on framing and insulation but you still have to do cladding, drywall, paint on-site.”

Steve Glenn, the CEO of modular construction firm Plant Prefab, explained that his firm uses a hybrid system with both panels and modules, particularly for multifamily buildings.

He said that Plant Prefab often builds modules for more complex rooms, like kitchens and bathrooms, and uses panels for rooms that tend to have fewer finishes and utility lines, like garages, hallways, bedrooms and living rooms.

“Rather than receiving pipe, tub and toilet, we receive a complete bathroom,” he said. “We have a factory, but it’s just clipping things into place.”



Panels: Simple Rooms

“In today’s interest rate environment, the speed of delivery is so important,” Staniforth said. “The faster you finish construction, the quicker you can turn off your high-interest construction loan. So, if you can shave 30 to 50 percent off a project’s construction time,” it can lower the overall construction cost.

SHoP Architects isn’t the only architecture firm with its own modular construction startup. DXA Studio founders Wayne Norbeck and Jordan Rogove recently launched their own modular firm, dubbed Liv-Connected. Their strategy is similar to Plant Prefab’s, because they plan to use a hybrid approach called “component-linked construction” (CLiC). They build and ship kitchens and bathrooms as complete modules, and flatpack smaller components such as porches, walls and headboard modules. The CLiC system can be expanded into three or four bedrooms, or it can be stacked to create a three- or four-unit townhouse.



BIG PREPHAB | What about the little people?



Photo shows Florante Fernando operating a wall processing machine which fastens, trims, and cuts openings in sheathing.
Nick Panetta, Blueprint Robotics



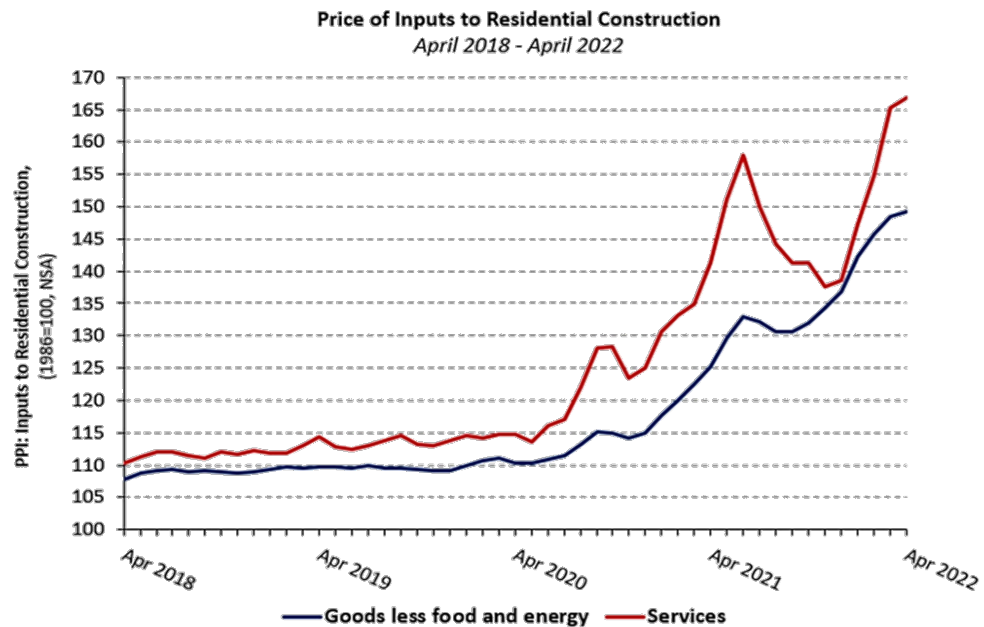
It's not one size fits all.

MATERIALS, SHORTAGES + SHUTDOWNS

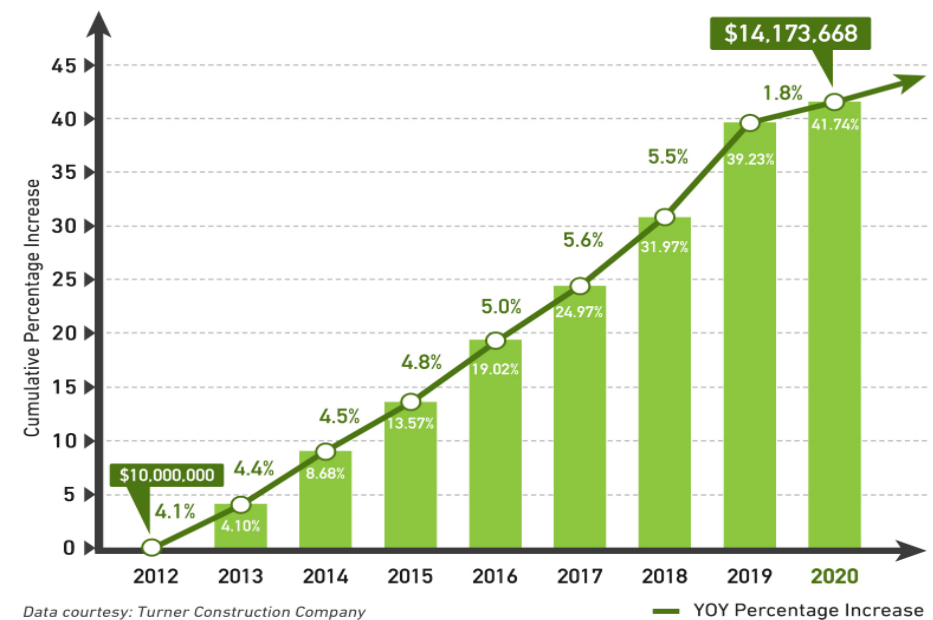
“ COVID-19 has made construction a difficult field to predict and control— with rising prices, supply shortages, and delays. ”



Building Materials Prices Up More Than 19% Year over Year



- According to the report Q4 2020 U.S. Chamber of Commerce Commercial Construction Index, **71% of contractors** surveyed are facing at least one material shortage.
- **Lumber** was the most-cited material shortage (31%) and prices continue to rise.
- **68% of contractors** report experiencing project delays, which are expected to continue into Quarter 2 of 2021.
- With pandemic-related delays, **71% of builders** are struggling to meet schedule requirements, and **53% of contractors** are experiencing major project shutdowns.



PREPHAB | SKILLED Workforce Development

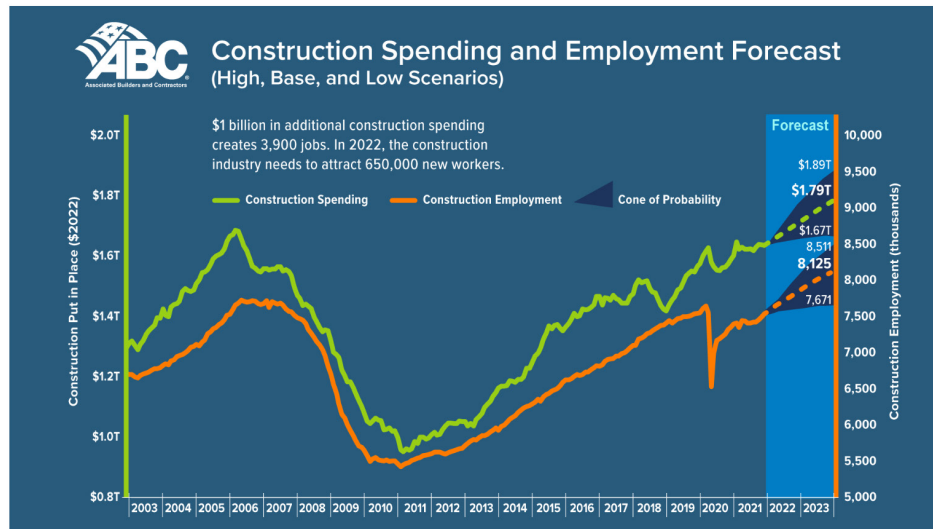


Workforce Shortage of 650,000 in 2022

WEDNESDAY, FEBRUARY 23, 2022 9:50 AM

Posted in [Employment](#), [Construction Economic Update](#), [Construction Economics](#), [Workforce and Safety](#), [News Release 2022](#)

WASHINGTON, Feb. 23—The construction industry will need to attract nearly 650,000 additional workers on top of the normal pace of hiring in 2022 to meet the demand for labor, according to a model developed by Associated Builders and Contractors.



<https://www.abc.org/News-Media/News-Releases/entryid/19255/abc-construction-industry-faces-workforce-shortage-of-650-000-in-2022>



With millions looking for work, stigmas create a dearth of skilled tradespeople

Feb 18, 2021 6:25 PM EDT

Jobless claims were high again this past week with more than 860,000 people filing for unemployment benefits for the first time. Millions of people are still looking for work, but some employers say they can't find enough skilled workers for certain jobs. That is due in part, they say, because of stigmas that need to change. Paul Solman reports for our series "Work Shift."

<https://www.pbs.org/newshour/show/with-millions-looking-for-work-stigmas-create-a-dearth-of-skilled-tradespeople>

PREPHAB | Replenishing the Workforce Understory



<https://vnps.org/manage-white-tailed-deer-to-protect-our-natural-heritage/>

HYBRID PREPHAB | Local Labor, Materials, Economy + Flavor

RURAL
STUDIO

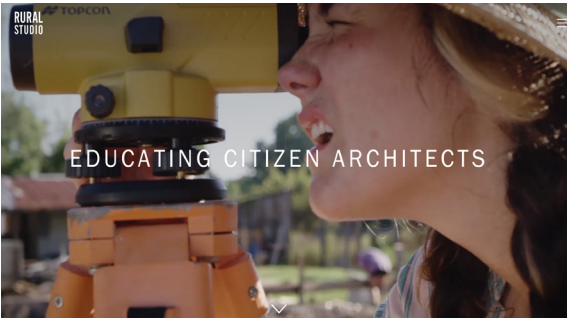


Students design beautiful homes for mass-production at just \$20,000 each

INHABITAT

FRONT PORCH INITIATIVE

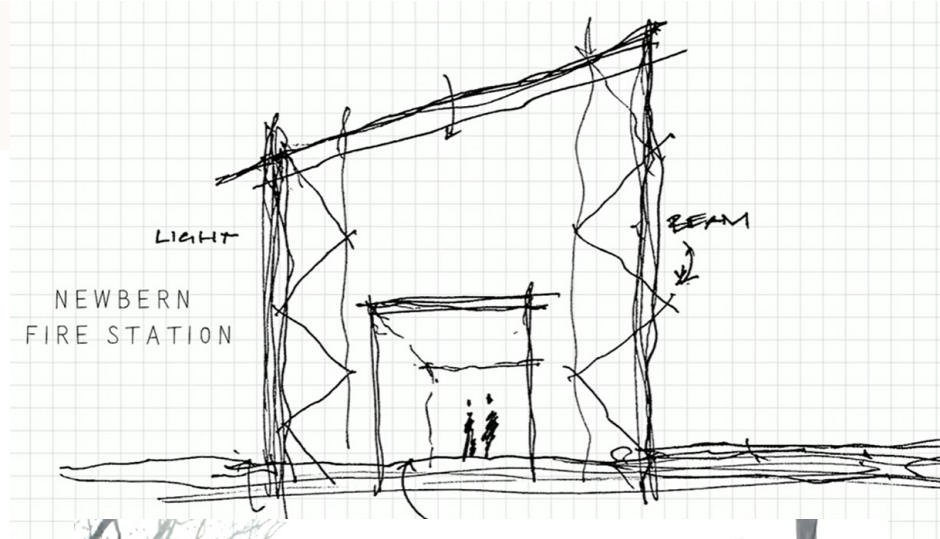
We are working to develop a scalable, sustainable, agile, and resilient delivery process for beautiful, well-designed, high performance affordable homes that can be titled as real property while also supporting an industry of home building in underserved rural communities.



<https://ruralstudio.org/>

HYBRID PREPHAB | Local Understanding

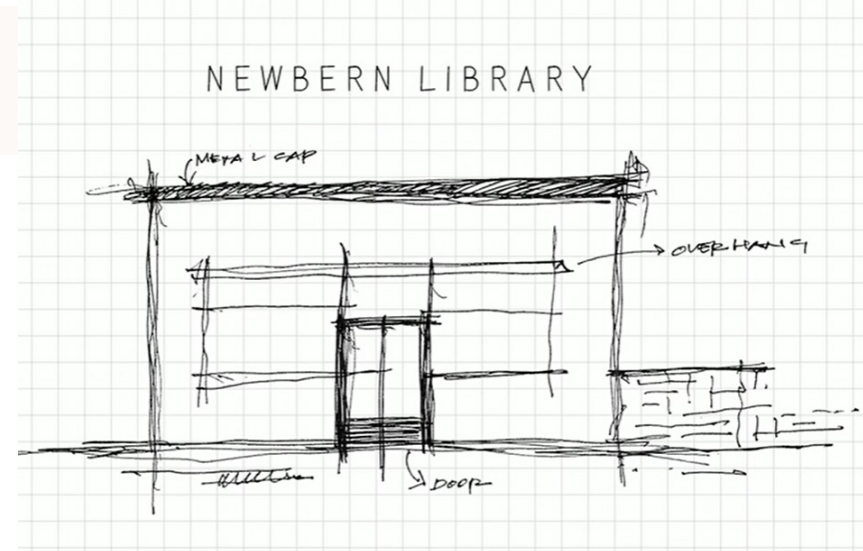
RURAL
STUDIO



<https://youtu.be/QkqCE1V8u-U>

HYBRID PREPHAB | Local Understanding

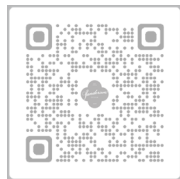
RURAL
STUDIO



Rethink PrePHab.



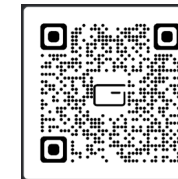
SHANNON PENDLETON Principal, CPHC
Sanderson Sustainable Design
Assoc. AIA, NCARB
Passive House Accelerator LIVE, Co-Host
Solebury Township, EAC/ETP
Aquetong Watershed Association, BOD



MARK WILLIE, Director
Building Experiences
US Engineered Wood Tstud™
Offsite Dirt, Contributor HPB Lead
Build Smart Chicago, Founder
Carpenter, Welder, Storyteller



ANDREW SEELYE, President
G-pod Americas
PADI Divemaster
Certified ACI, NICET training
NAA CAS / NAHB HCCP
Registered City of Austin Supplier



How it started, 1990



Saba N.A. | Ft Bay Harbor Renovation Project 1990-1991

- Heavy Marine Construction in surf zone
- Subsea Construction in a Marine Park
- No OSHA
- Wavelength used in engineering spec failed



From surf zone hardscape days to cloud forest nights

- How to live in a cloud forest without displacing the cloud forest?

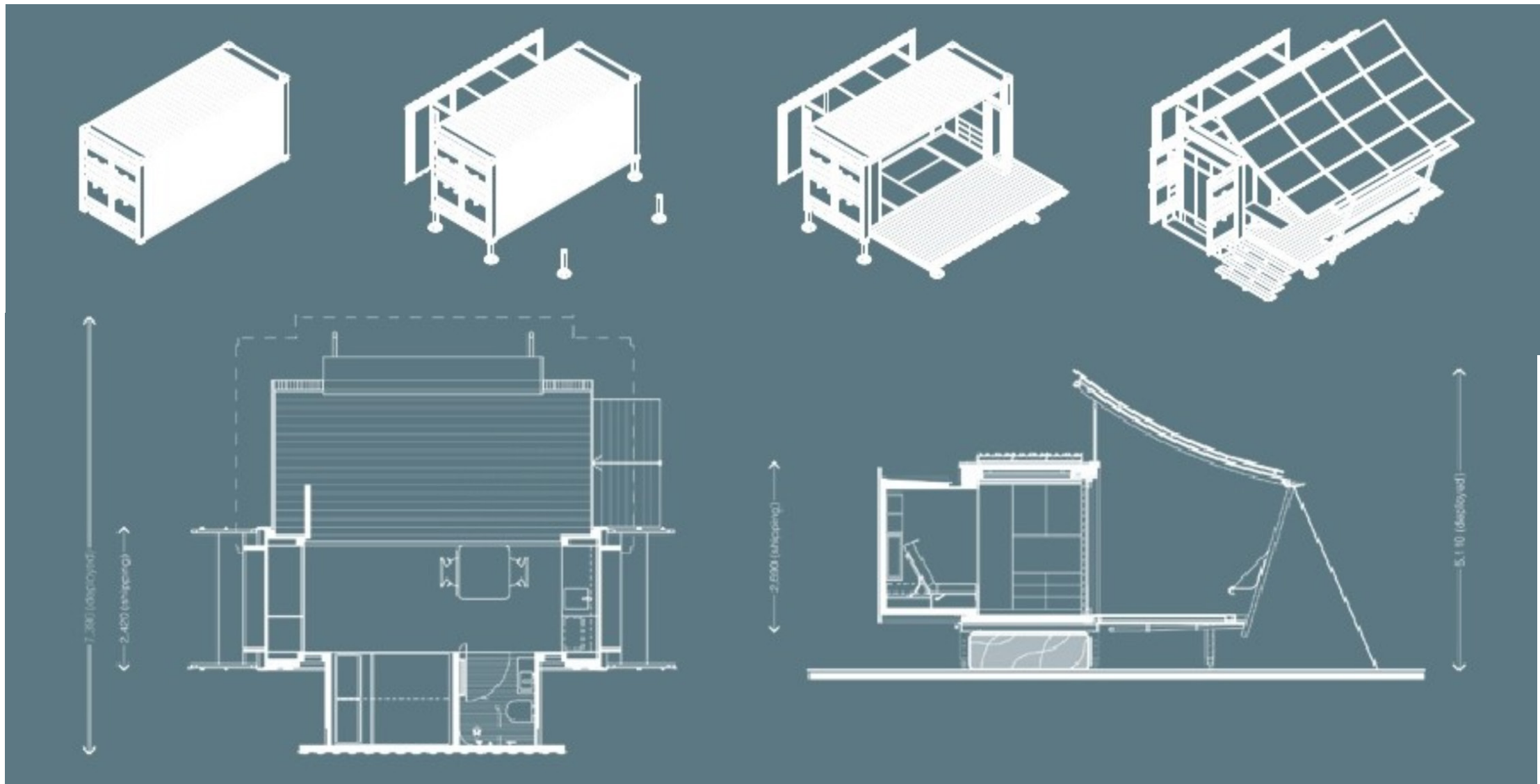


Keep it green

- Decentralize
- Work with natural structure
- Avoid displacing natural elements



TAKE 1 | DWELL - RELOCATABLE SOLUTION IN A BOX



TAKE 1 | DWELL - RELOCATABLE SOLUTION IN A BOX



POWER | OFF GRID SOLUTION FROM THE START

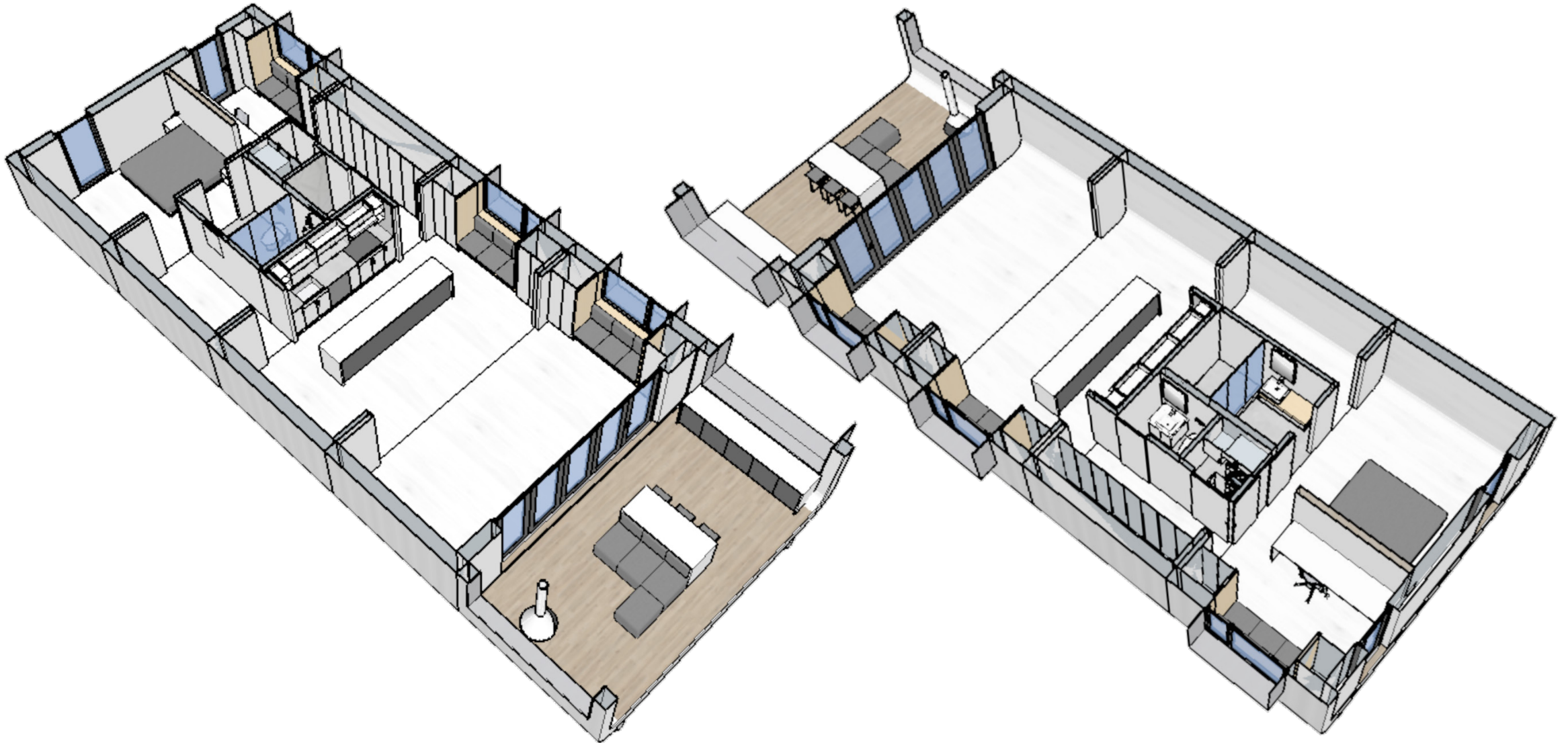
- Why not build with renewables?
- Generation + energy storage + building
- Permanent, Temporary or Relocatable
- Offsite brings added value, lower impact



TAKE 2 | NEXUS – EXPANDABLE LIVING SOLUTION

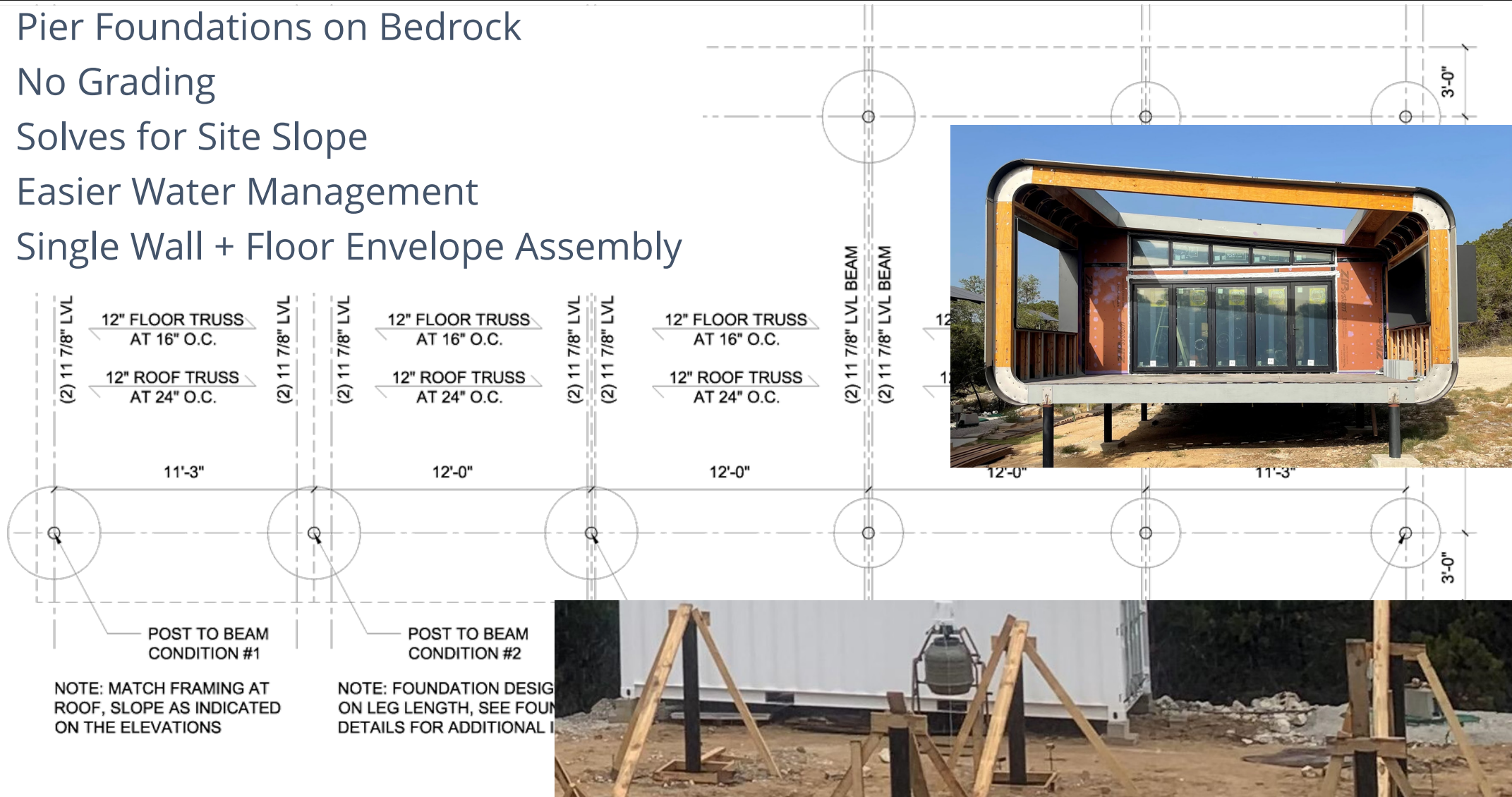


NEXUS | Small ENVELOPE PANELS – Integrated INTERIOR MODULES

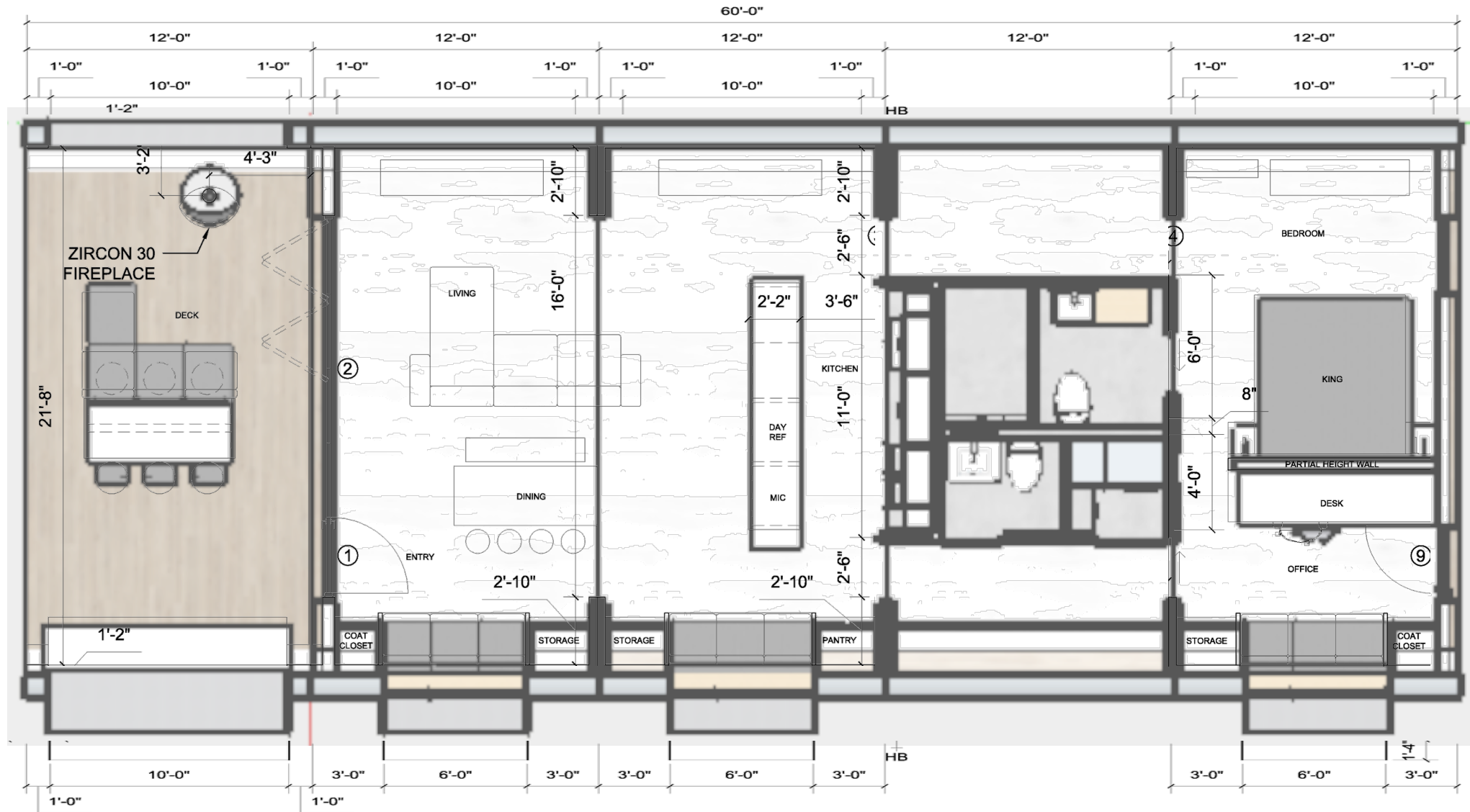


FOUNDATION | Minimal Site Impact, Minimal Concrete

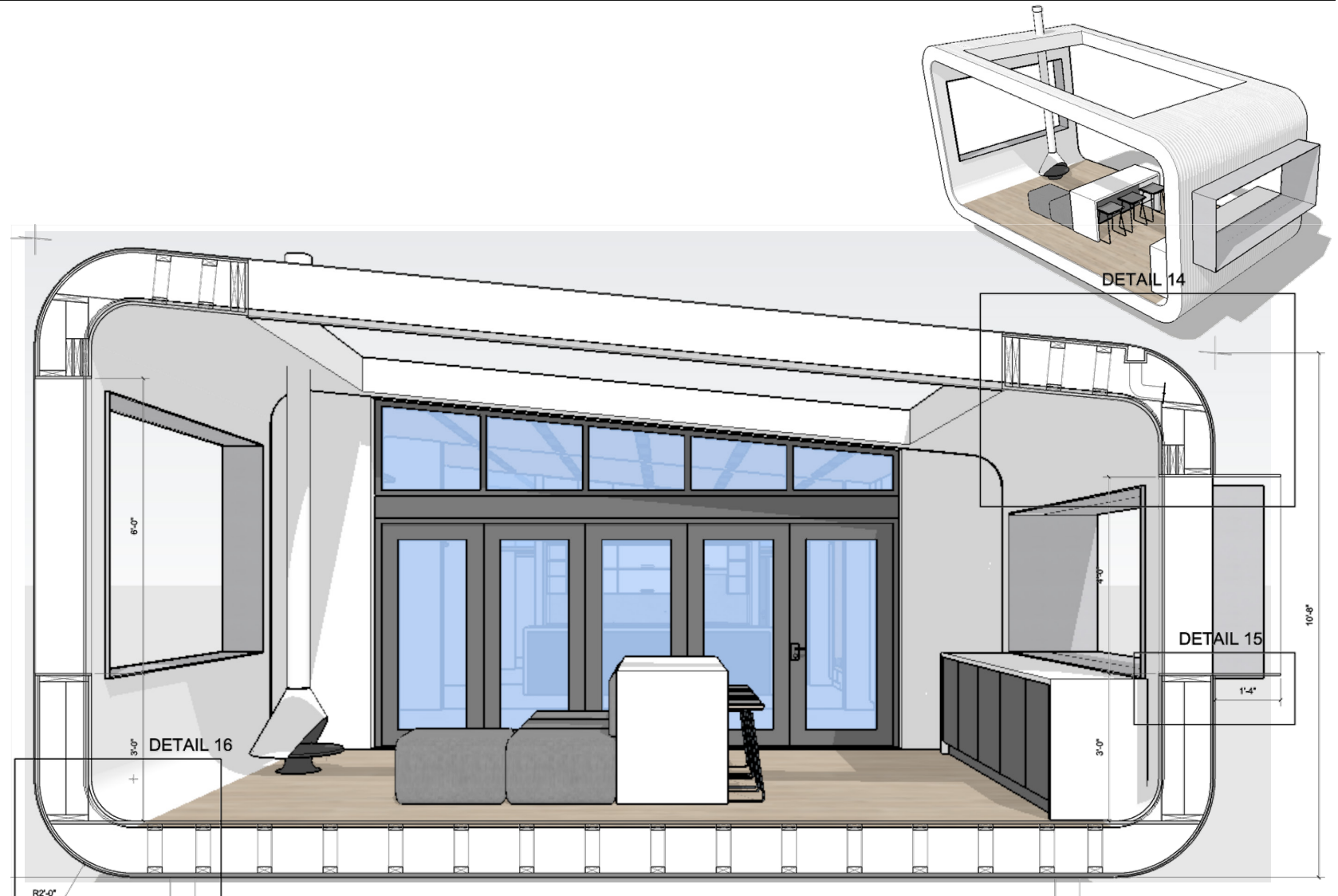
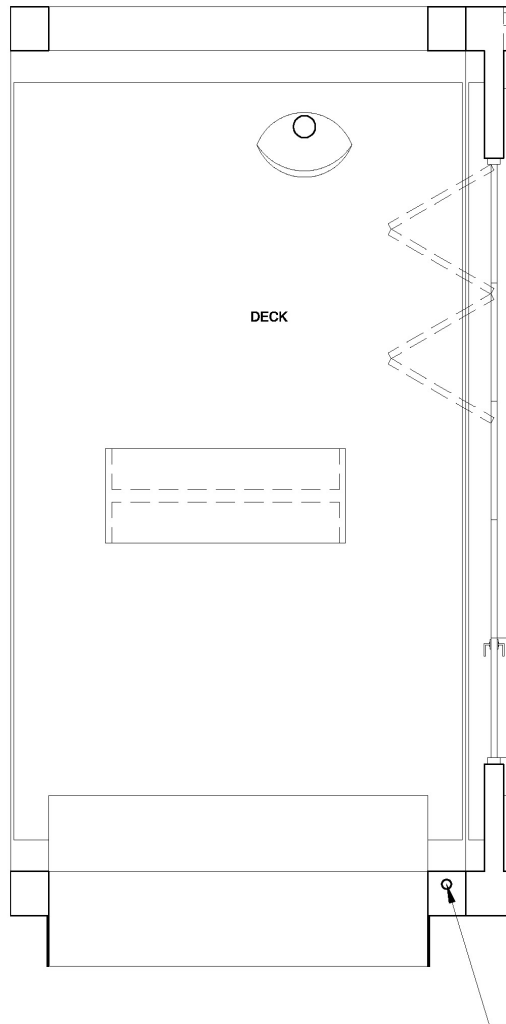
- Pier Foundations on Bedrock
- No Grading
- Solves for Site Slope
- Easier Water Management
- Single Wall + Floor Envelope Assembly



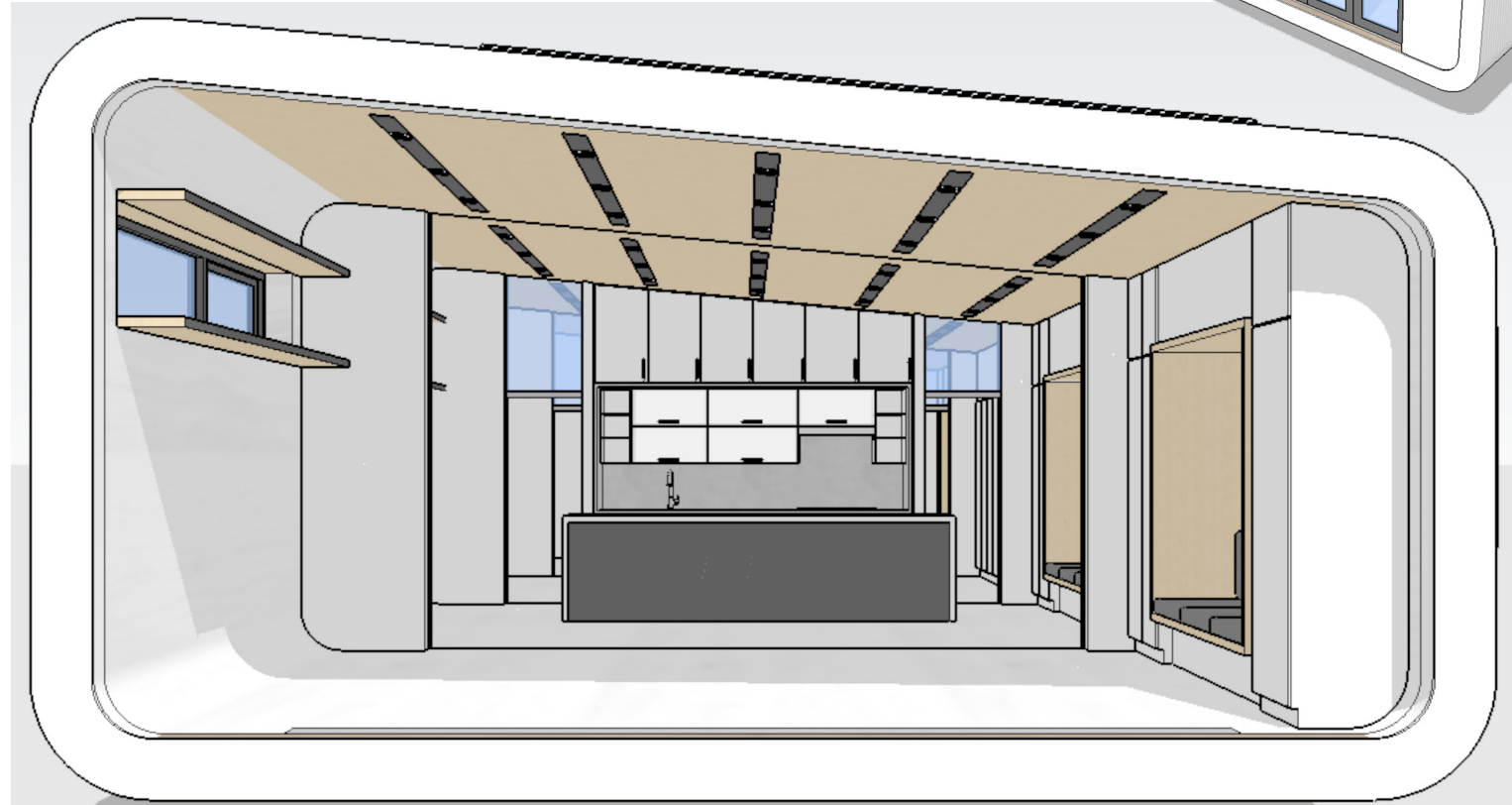
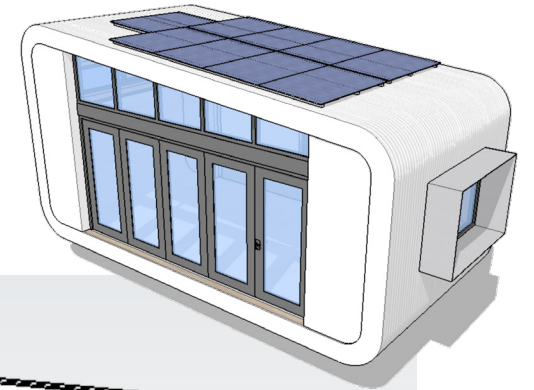
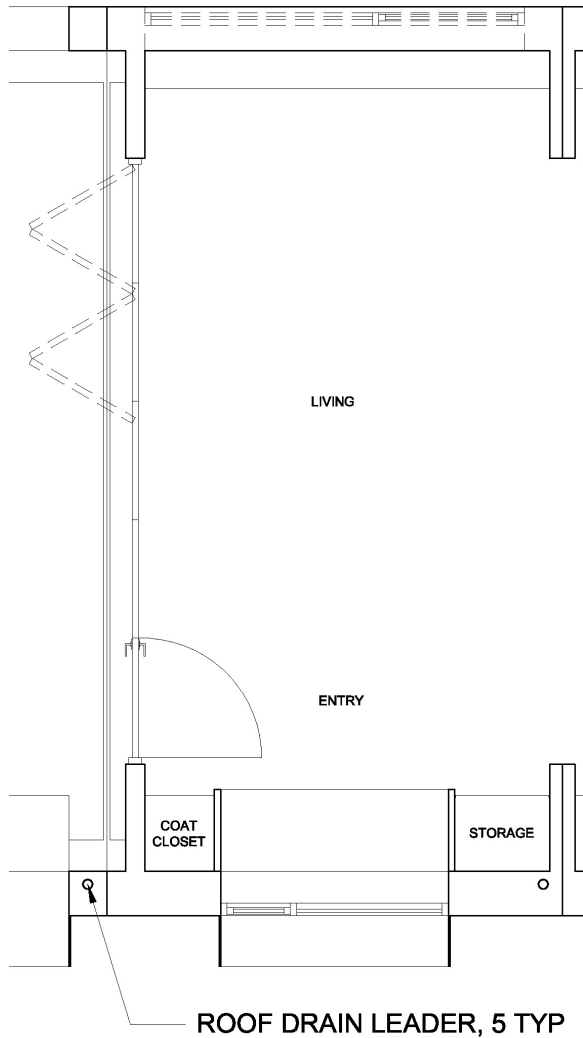
FLOORPLAN | 5 PODS - SMALL STANDARD SIZES



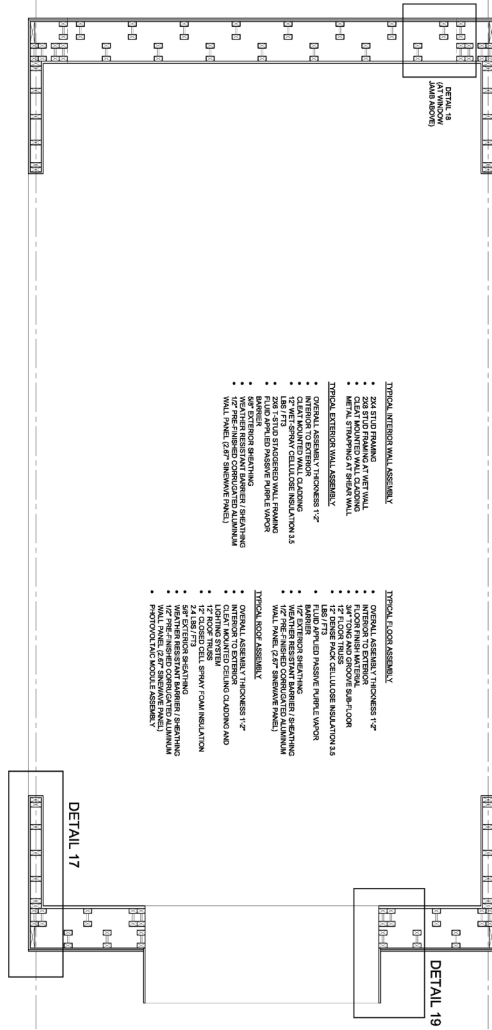
DECK POD | COVERED OUTDOOR AREA + WOOD FIREPLACE



LIVING POD | INDOOR / OUTDOOR LIVING ROOM

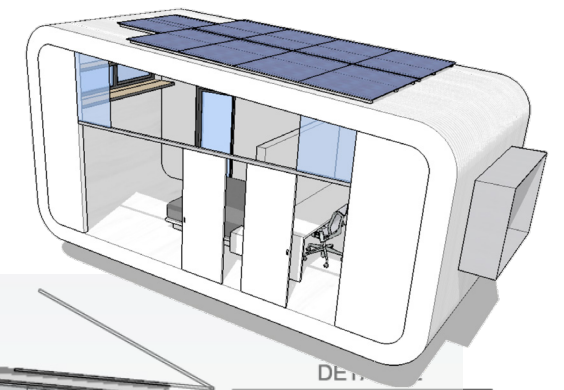
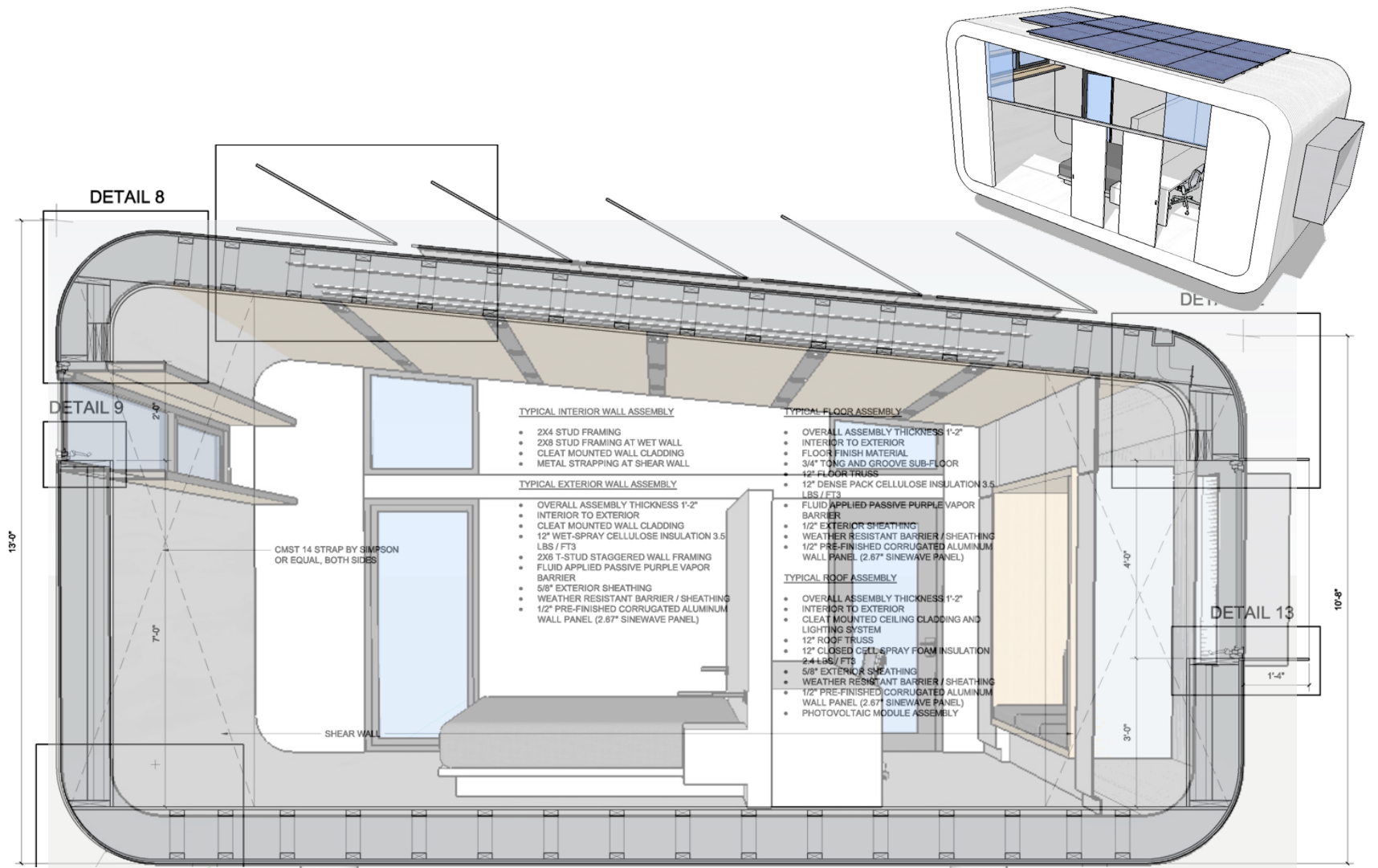


SUITE POD | BEDROOM + OFFICE

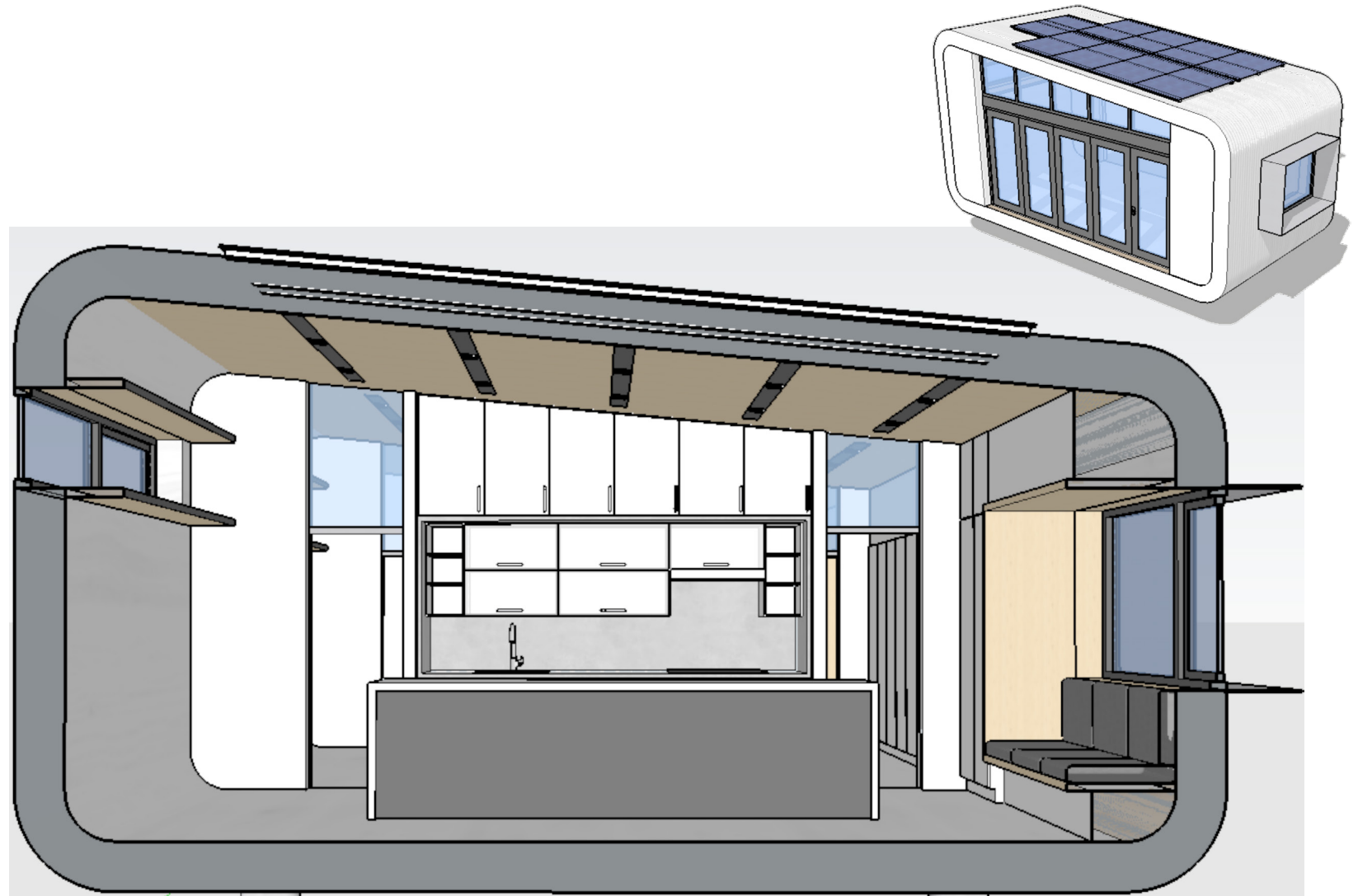
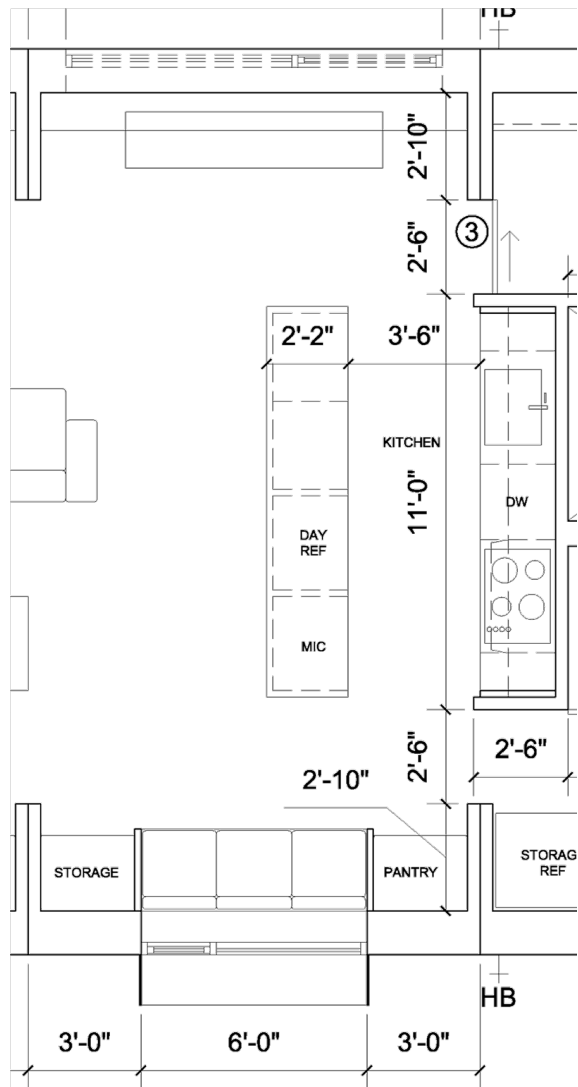


- TYPICAL INTERIOR WALL ASSEMBLY**
- 2X4 STUD FRAMING AT WET WALL
 - CLEAT MOUNTED WALL CLADDING
 - METAL STRAPPING AT SHEAR WALL
- TYPICAL EXTERIOR WALL ASSEMBLY**
- OVERALL ASSEMBLY THICKNESS 1'-2"
 - INTERIOR TO EXTERIOR
 - CLEAT MOUNTED WALL CLADDING
 - 12" WET-SPRAY CELLULOSE INSULATION 3.5 LBS / FT³
 - 2X6 T-STUD STAGGERED WALL FRAMING
 - FLUID APPLIED PASSIVE PURPLE VAPOR BARRIER
 - 5/8" EXTERIOR SHEATHING
 - WEATHER RESISTANT BARRIER / SHEATHING
 - 1/2" PRE-FINISHED CORRUGATED ALUMINUM WALL PANEL (2.67' SINEWAVE PANEL)

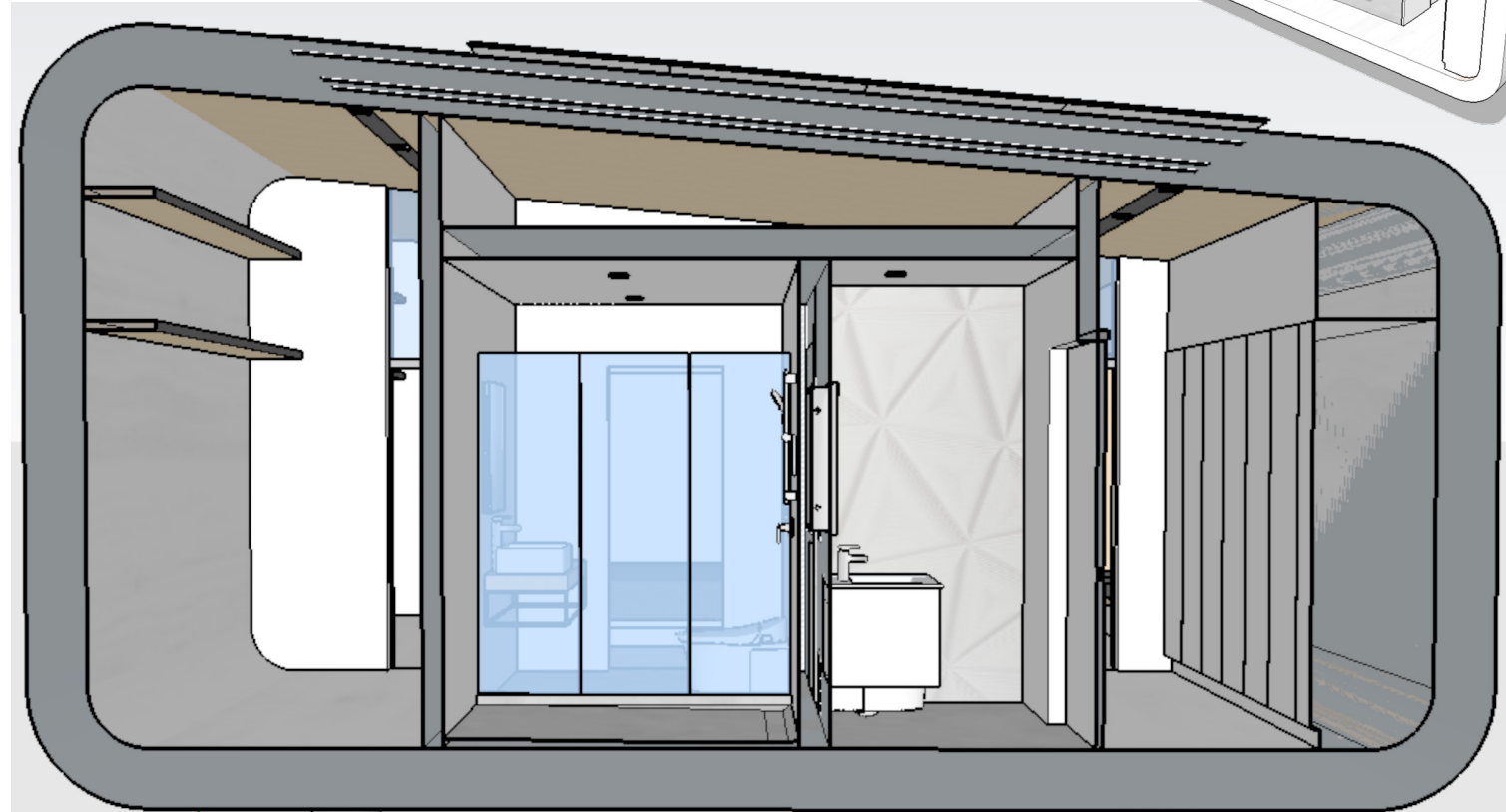
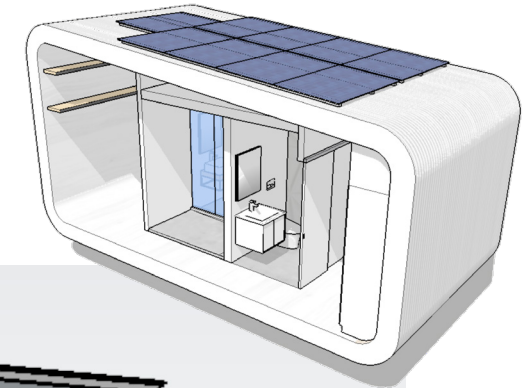
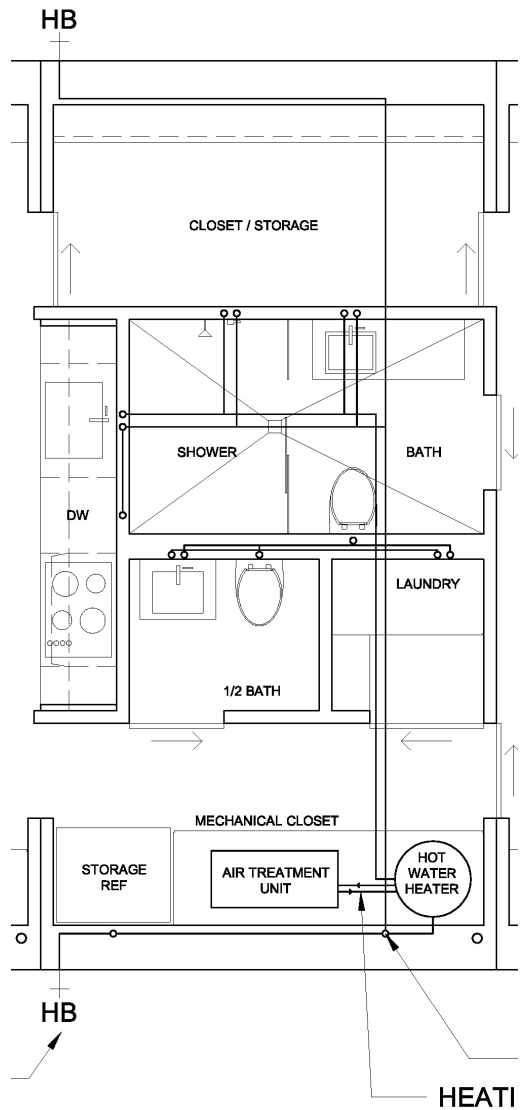
- TYPICAL FLOOR ASSEMBLY**
- OVERALL ASSEMBLY THICKNESS 1'-2"
 - INTERIOR TO EXTERIOR
 - FLOOR FINISH MATERIAL
 - 3/4" TONG AND GROOVE SUB-FLOOR
 - 12" FLOOR TRUSS
 - 12" DENSE PACK CELLULOSE INSULATION 3.5 LBS / FT³
 - FLUID APPLIED PASSIVE PURPLE VAPOR BARRIER
 - 1/2" EXTERIOR SHEATHING
 - WEATHER RESISTANT BARRIER / SHEATHING
 - 1/2" PRE-FINISHED CORRUGATED ALUMINUM WALL PANEL (2.67' SINEWAVE PANEL)
- TYPICAL ROOF ASSEMBLY**
- OVERALL ASSEMBLY THICKNESS 1'-2"
 - INTERIOR TO EXTERIOR
 - CLEAT MOUNTED CEILING CLADDING AND LIGHTING SYSTEM
 - 12" ROOF TRUSS
 - 12" CLOSED CELL SPRAY FOAM INSULATION 2.4 LBS / FT³
 - 5/8" EXTERIOR SHEATHING
 - WEATHER RESISTANT BARRIER / SHEATHING
 - 1/2" PRE-FINISHED CORRUGATED ALUMINUM WALL PANEL (2.67' SINEWAVE PANEL)
 - PHOTOVOLTAIC MODULE ASSEMBLY



KITCHEN POD | CORE 1 – GALLEY COUNTER + ISLAND

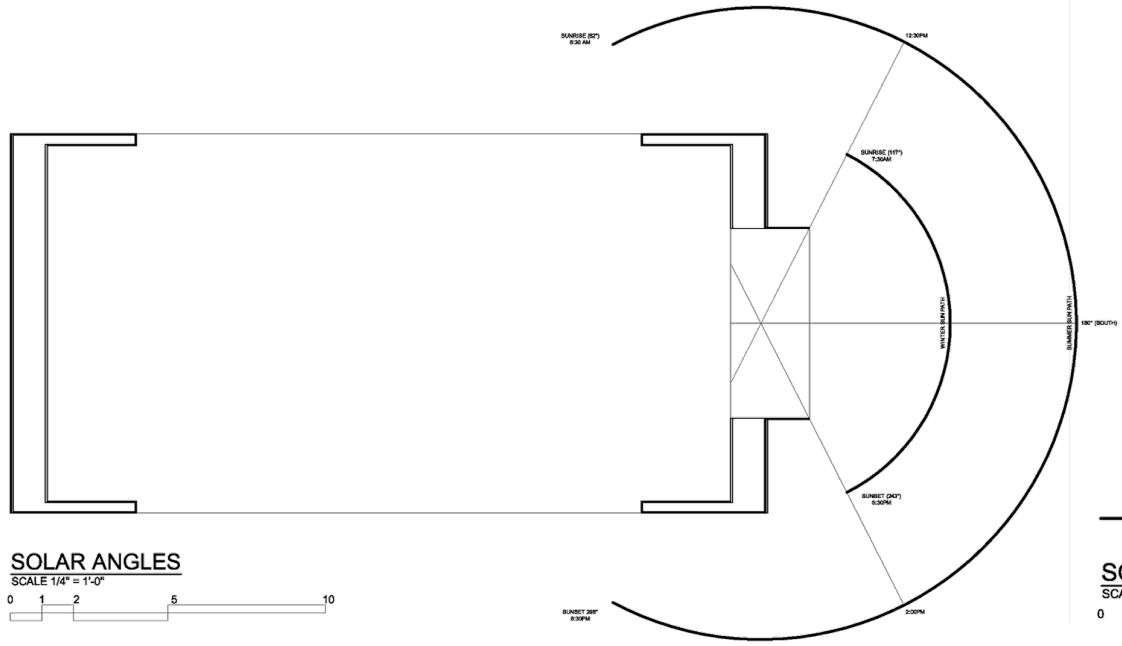
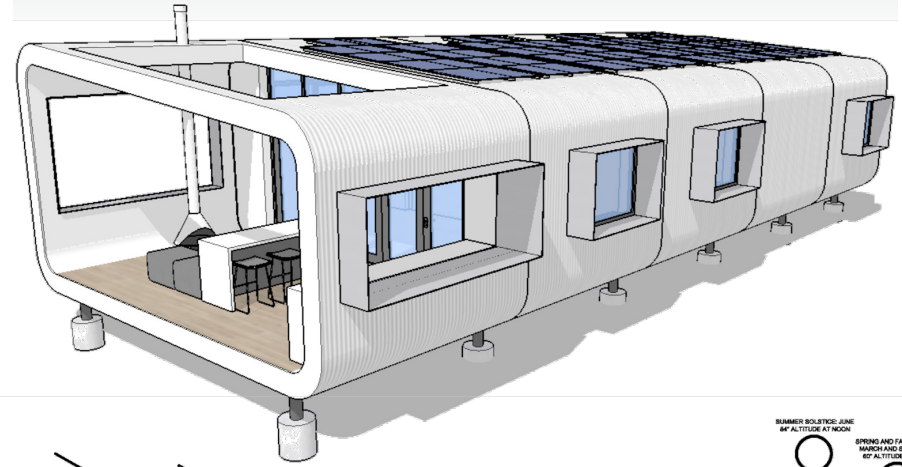
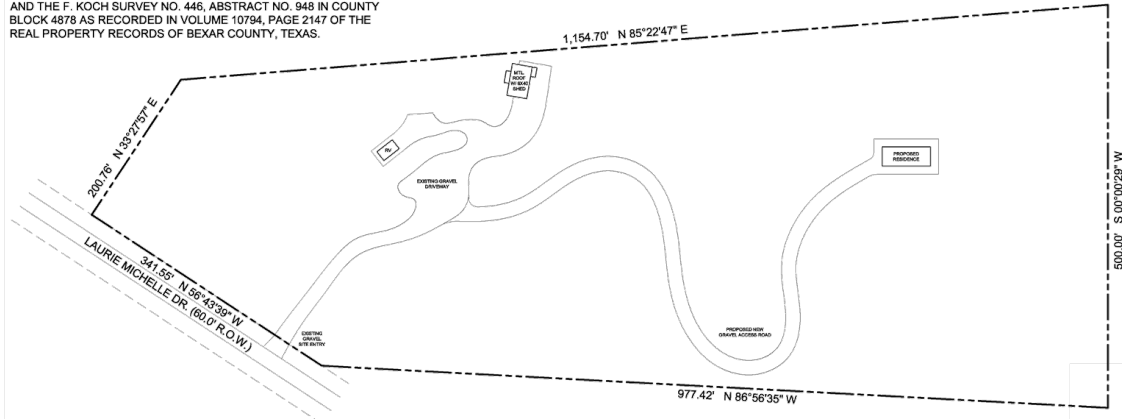


PLUMBING POD | CORE 2 BATH + LAUNDRY + 1/2 BATH c/o Gary Klein



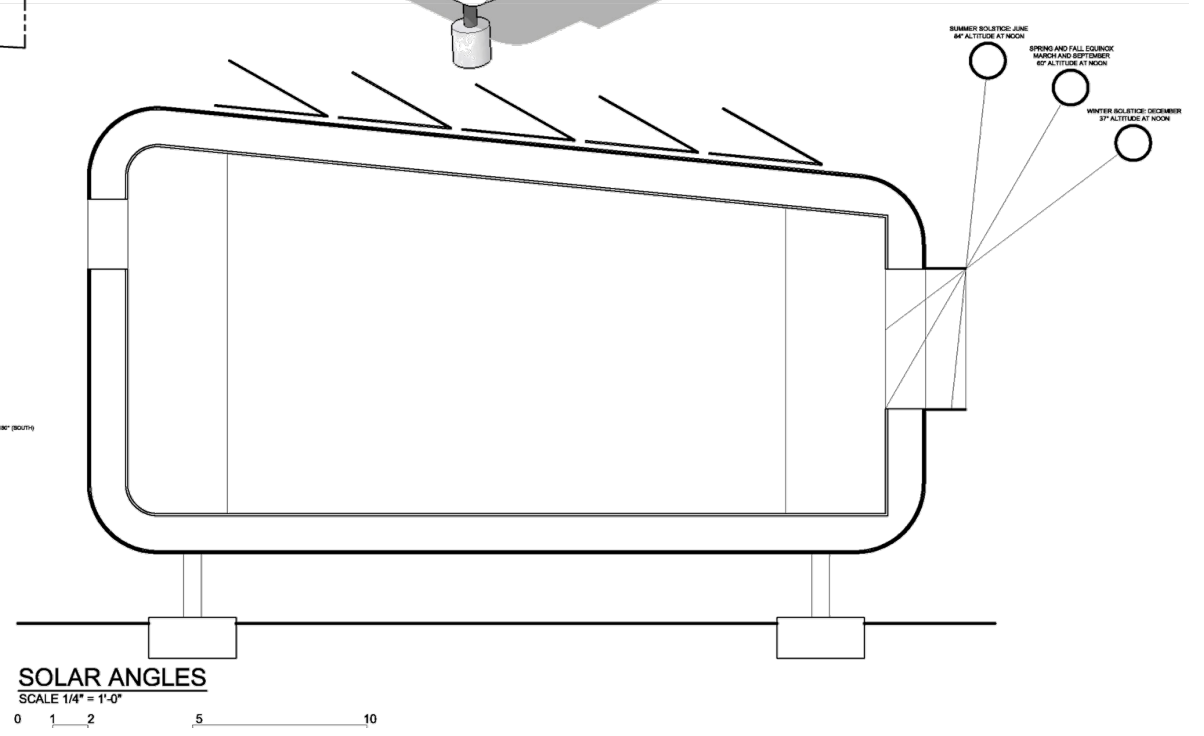
SUN STUDIES | Free Winter Heat + Summer Shading

LEGAL DESCRIPTION:
 AN 11.26 ACRE TRACT OUT OF A 22.71 ACRE TRACT IN THE C. VOGES
 AND THE F. KOCH SURVEY NO. 446, ABSTRACT NO. 948 IN COUNTY
 BLOCK 4878 AS RECORDED IN VOLUME 10794, PAGE 2147 OF THE
 REAL PROPERTY RECORDS OF BEXAR COUNTY, TEXAS.



SOLAR ANGLES

SCALE 1/4" = 1'-0"
 0 1 2 5 10



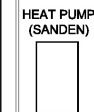
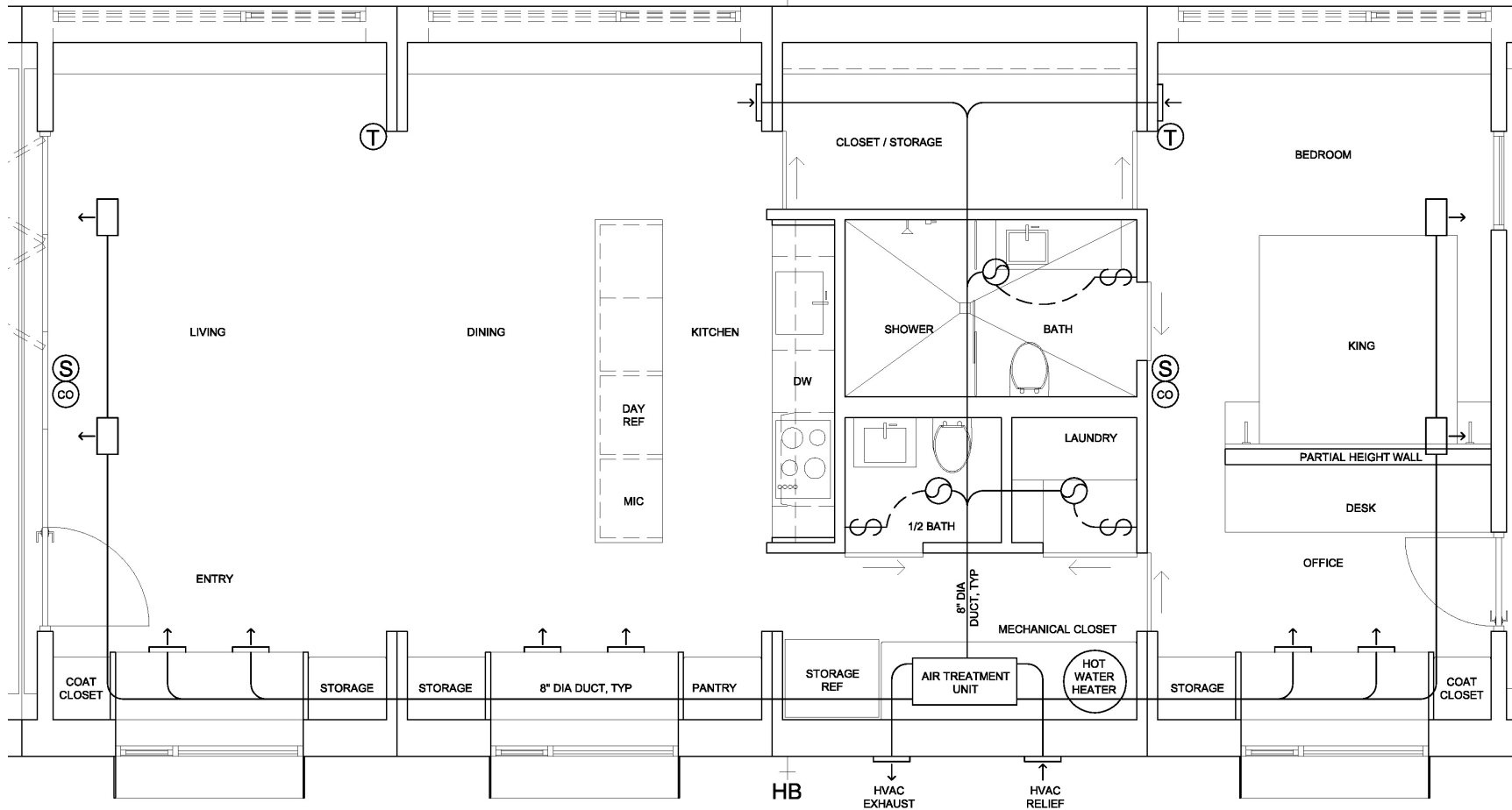
SOLAR ANGLES

SCALE 1/4" = 1'-0"
 0 1 2 5 10

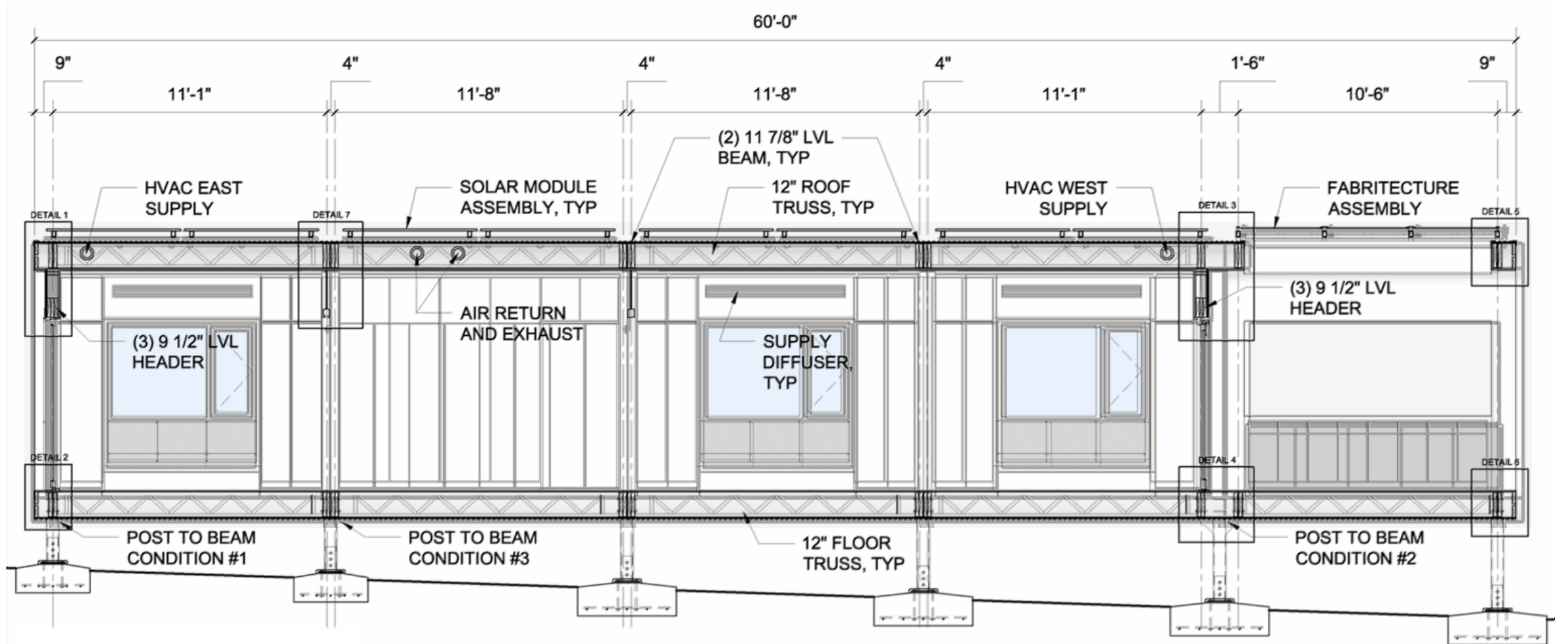
MECHANICALS | Balanced + Centralized

Load / Airflow Summary

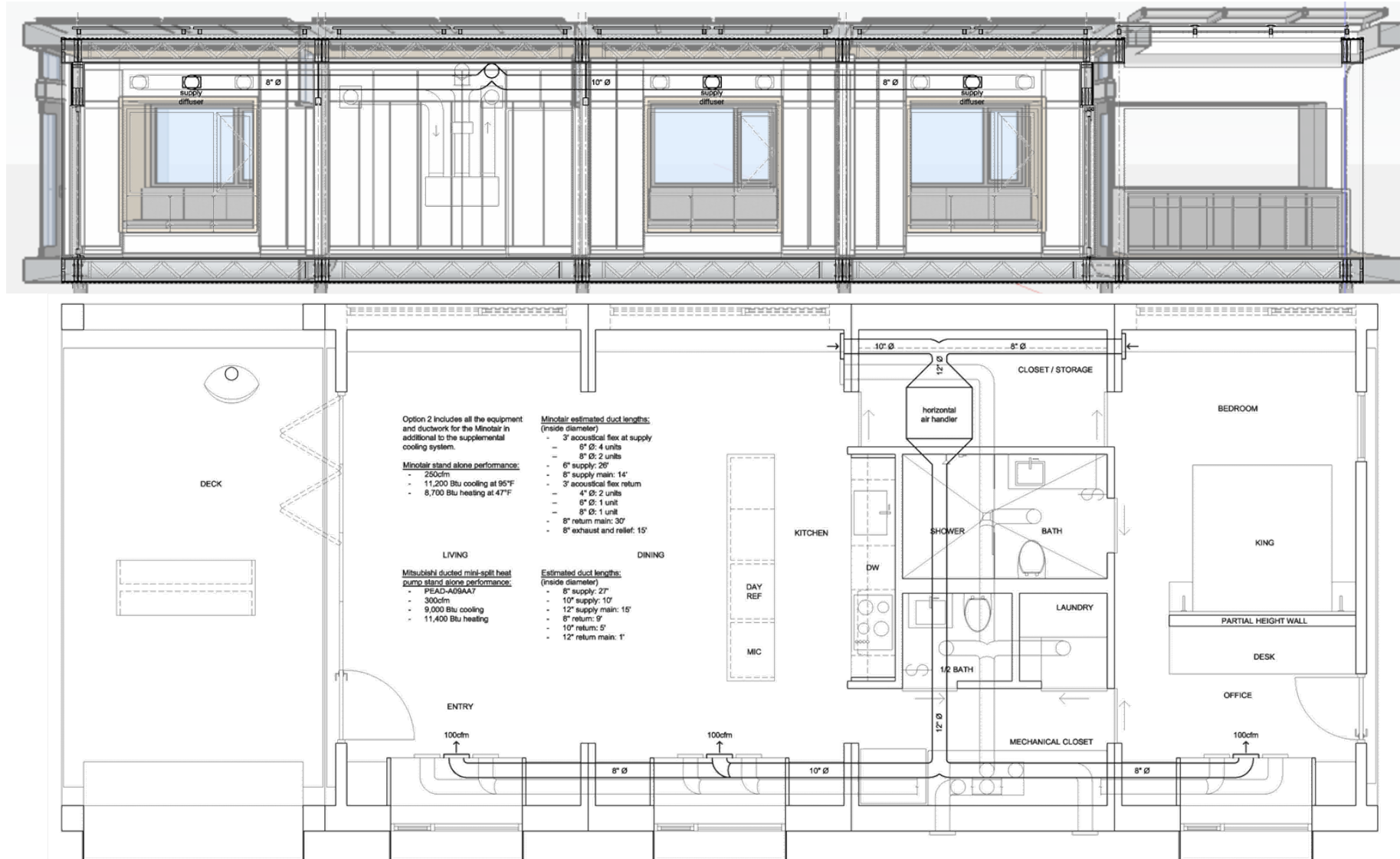
System	Zone	Room **	Floor Area ft²	People #	Coil Cooling Sensible Btu/h	Coil Cooling Total Btu/h	Space Design Max SA cfm	Air Changes ach/hr	VAV Minimum SA cfm	VAV Minimum %	Main Coil Heating Sensible Btu/h	Heating Fan Max SA cfm	Percent OA Cig	Htg
Alternative 1														
	Bathrooms	Rm Peak	120	0.0	170	170	9	0.40	0	0	-60	9	0.0	0.0
	Bedroom/Office	Rm Peak	260	2.0	3,837	4,237	225	4.79	0	0	-1,004	225	0.0	0.0
	Closets	Rm Peak	128	0.0	1,425	1,425	73	3.17	0	0	-293	73	0.0	0.0
	Kitchen	Rm Peak	260	2.0	3,795	4,195	222	4.73	0	0	-359	222	0.0	0.0
	Living	Rm Peak	260	2.0	3,143	3,543	176	3.76	0	0	-685	176	0.0	0.0
System - 001		Sys Peak	1,028	6.0	12,370	13,570	705				-2,401	705	0.0	0.0



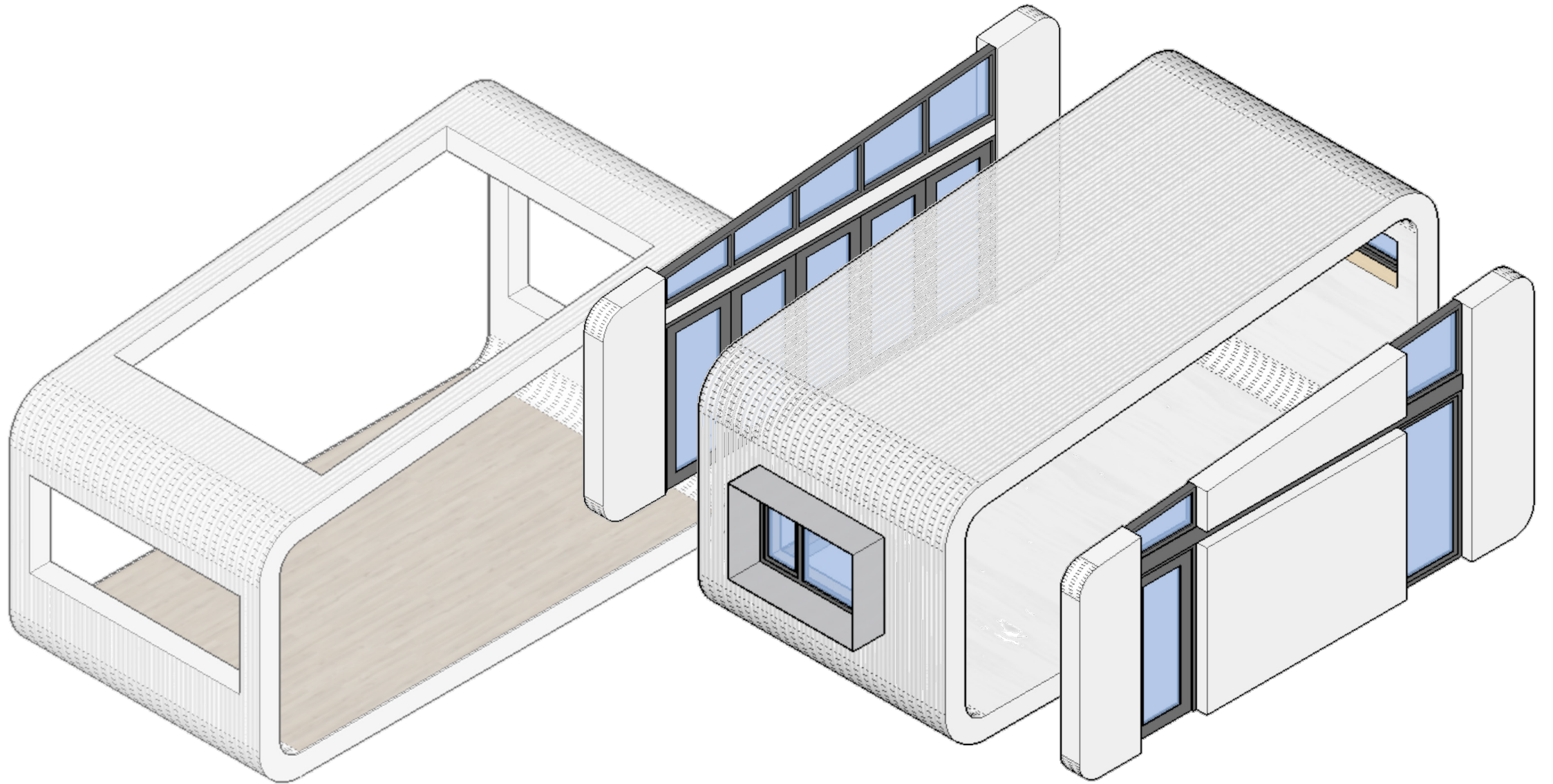
BUILDING SECTION v1 | ...Improved to Decouple Systems



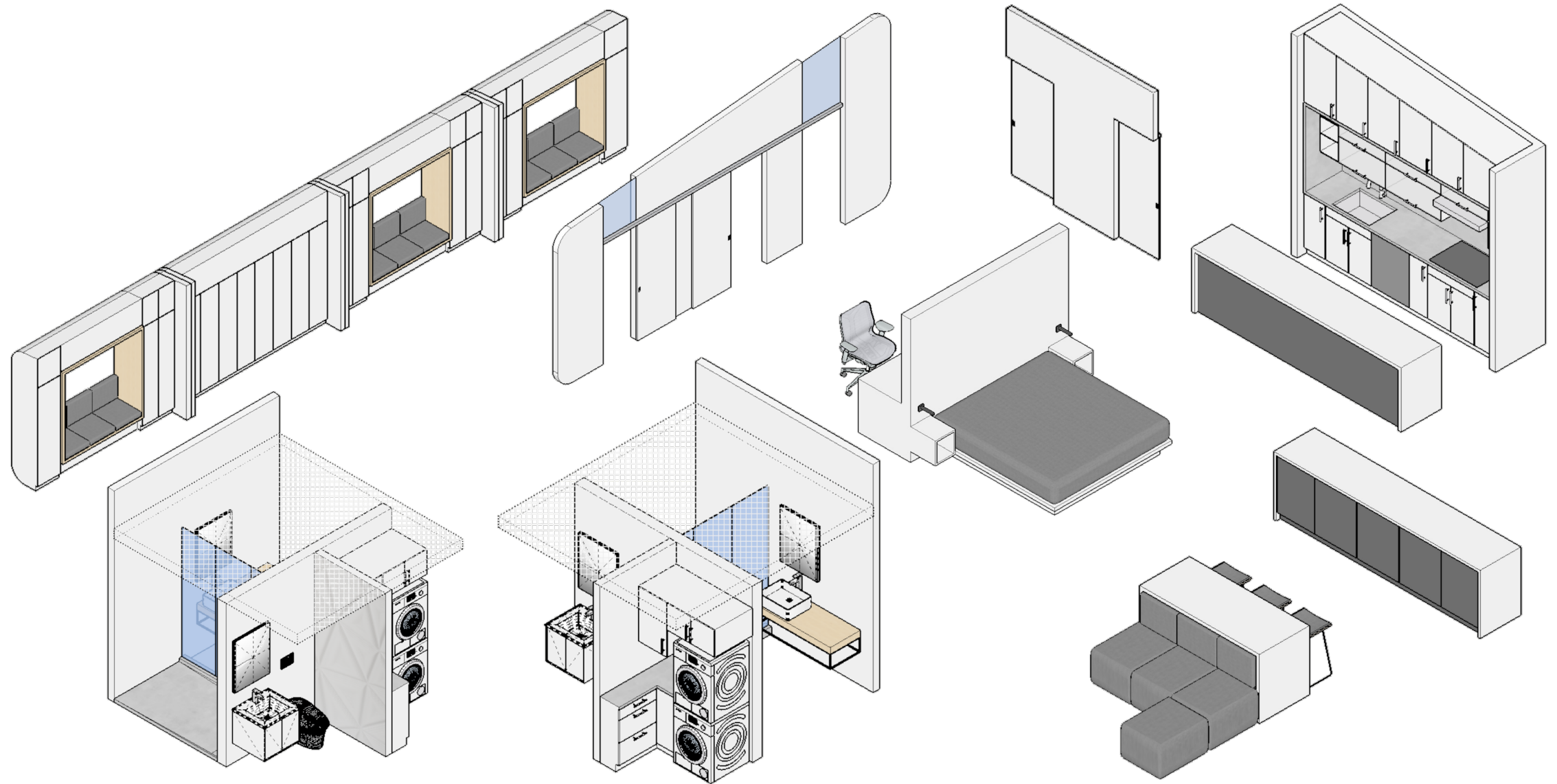
MECHANICAL SECTION v2 | Decoupled + Integrated



PANELS | ENVELOPE ONLY



COMPONENTS | INTERIORS ONLY

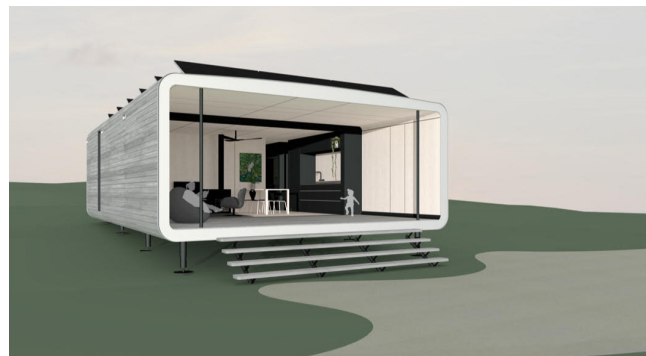
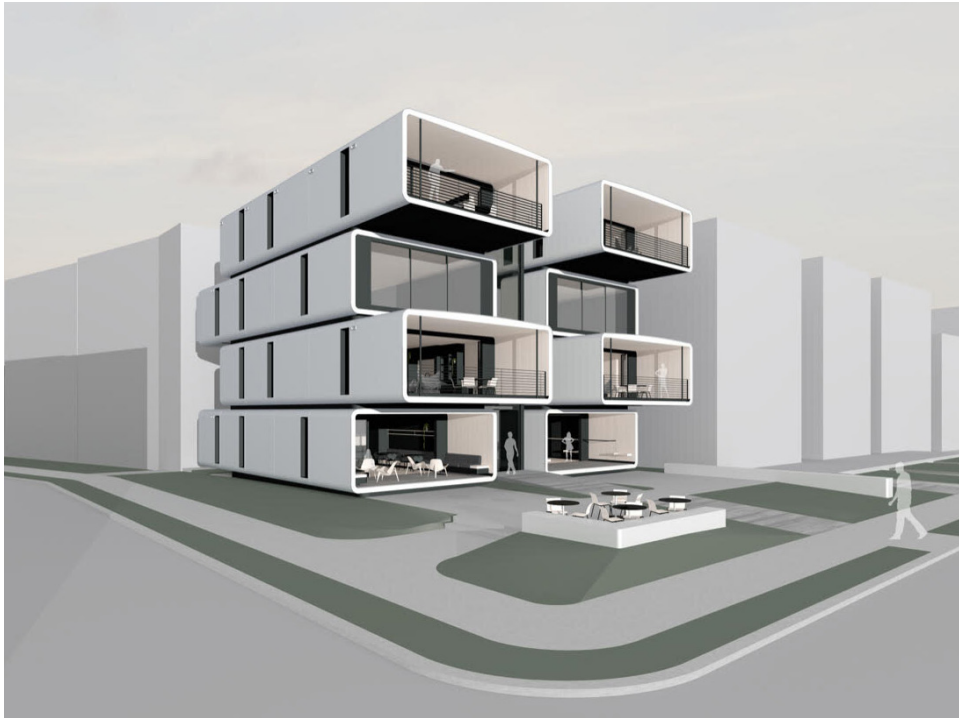


EXTENSIONS | ADU MOD

| ACCESSORY SPACE



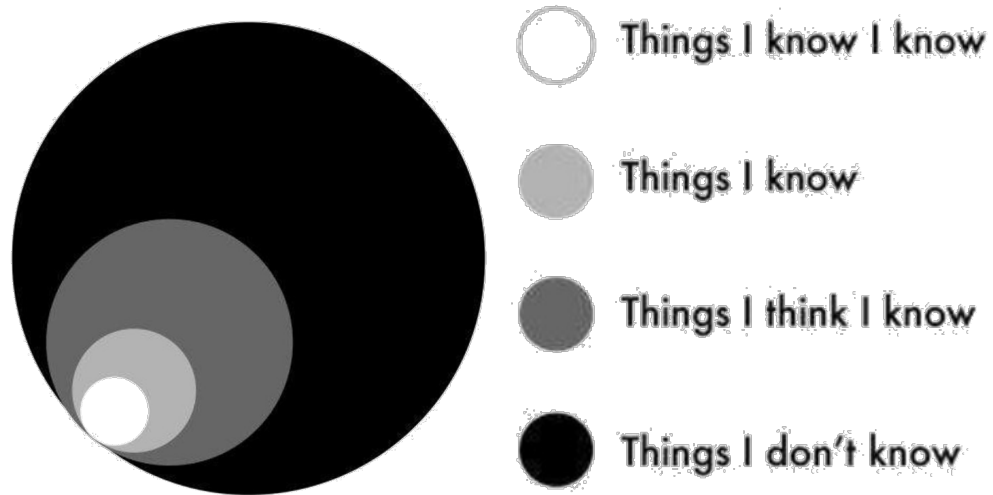
ITERATIONS | URBAN + SUBURBAN + RURAL + REMOTE



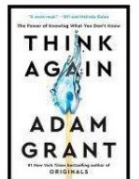
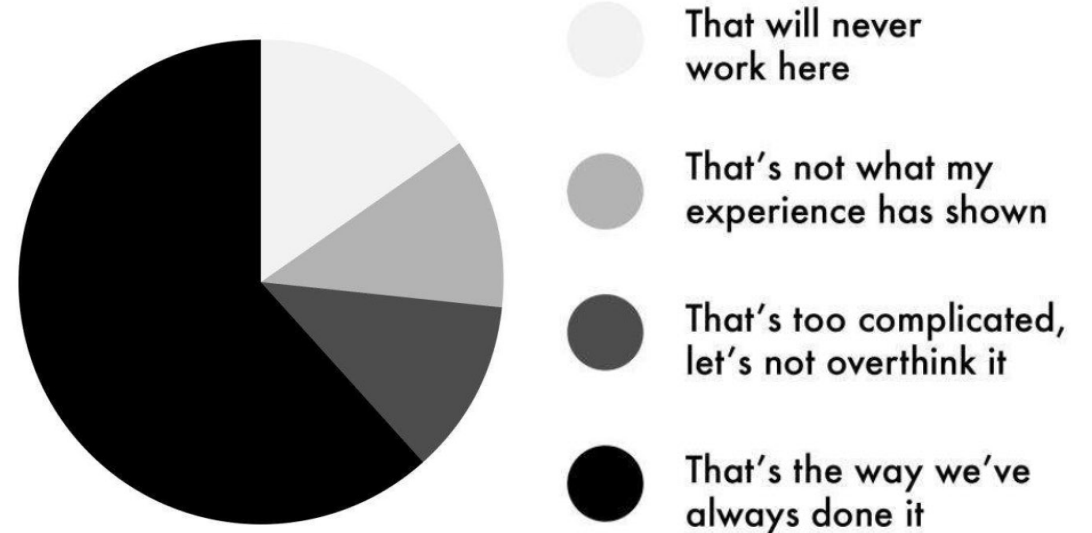
CONSTRUCTION PHOTOS |



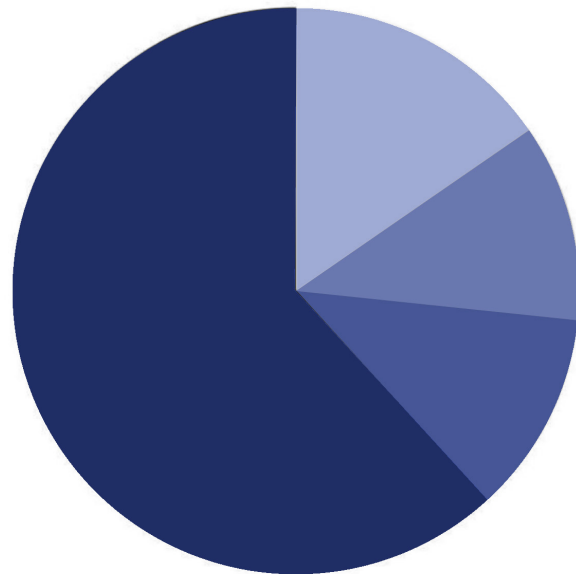
WHAT I KNOW



THE MOST ANNOYING THINGS PEOPLE SAY INSTEAD OF RETHINKING



THE MOST ENCOURAGING THINGS PEOPLE ASK WHEN RETHINKING



- What will work here?
- What experience will we need?
- How can we rethink it simply?
- In what ways will our community do it better?

HOW WILL WE GET THERE?

If you want to go quickly,
go alone.

If you want to go far,
go together.

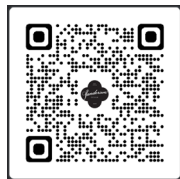
African Proverb

LET'S DO BOTH.

THANK YOU! QUESTIONS?



SHANNON PENDLETON Principal, CPHC
Sanderson Sustainable Design
Assoc. AIA, NCARB
Passive House Accelerator LIVE, Co-Host
Solebury Township, EAC/ETP
Aquetong Watershed Association, BOD



MARK WILLIE, Director
Building Experiences
US Engineered Wood Tstud™
Offsite Dirt, Contributor HPB Lead
Build Smart Chicago, Founder
Carpenter, Welder, Storyteller



ANDREW SEELYE, President
G-pod Americas
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