



## *Massachusetts ADU Design Challenge | Project Cover Sheet*

### **1. Design Team**

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Lead Applicant: Ana Cheng

Additional Applicants: Aren Fenner, Jansen Meals

Design Firm Name (If Applicable): ICON Architecture

Contact Info: acheng@iconarch.com

### **2. Design Information**

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EntryID (randomly assigned by HLC for tracking purposes): 3444

Design Name: Fabricated Module, Local Dwelling: A New England ADU

ADU Gross Floor Area (square footage): 498

Unit Layout: One-Bedroom

ADU Height (feet): 15

Window/Wall Ratio: 19.3%

Foundation Type: Concrete Piers

### **3. Project Narrative**

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The One Truck Modular ADU is a standardized yet site specific dwelling, rooted in New England vernacular, shaped by climate, materials, and spatial logic to reflect the organic growth of a home through additions. Sized for single-truck delivery, its linear form sits along the rear lot line to minimize disruption while preserving privacy and open space for the primary residence. This practical design adapts from urban small lots to larger sites. A 14'-7" x 42'-0" x 9'-4" module is the base - organized by a pragmatic shell and a contextual front facade. A 2'-10" tall panelized clerestory wedge atop the unit, allows for generous height, passive strategies and a base for the sloped roof. The interior grants a series of built-ins for practical living, flexibility and universal use. This Compact ADU scenario favors an adaptive solution, that creates a contextual dialogue bridging function and a responsive architecture by way of sustainable, accessible and innovative construction principles.

***Please note that the information contained in this file was submitted to the Executive Office of Housing and Livable Communities (HLC) by ADU Design Challenge participants and has not been independently verified by HLC or the Commonwealth of Massachusetts. Please direct questions to the designers.***

# FABRICATED MODULE, LOCAL DWELLING: A NEW ENGLAND ADU

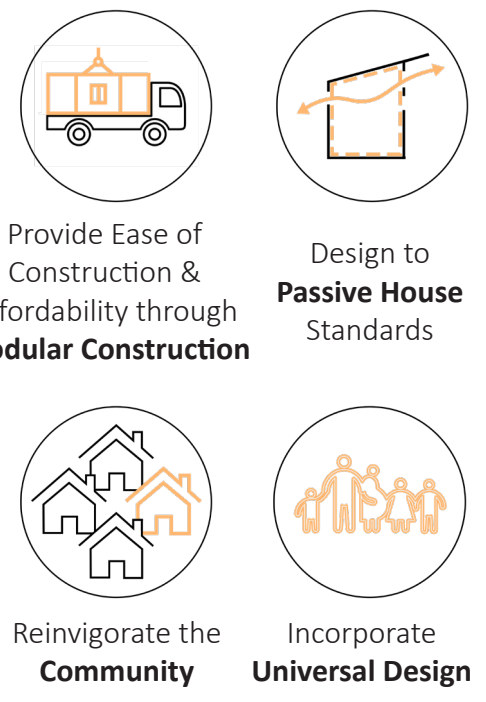


## MEASURED TO THE TRUCK, SHAPED BY THE SITE

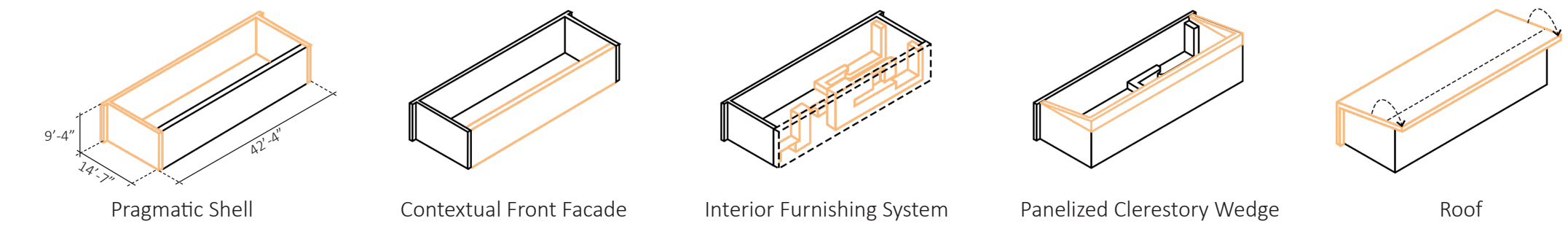
The **One Truck Modular ADU** is a standardized yet site specific dwelling, rooted in New England vernacular, shaped by climate, materials, and spatial logic to reflect the organic growth of a home through additions. Sized for **single-truck delivery**, its linear form sits along the rear lot line to minimize disruption while preserving privacy and open space for the primary residence. This practical design adapts from urban **small lots** to larger sites.

A **14'-7" x 42'-0" x 9'-4"** module is the base - organized by a **pragmatic shell** and a **contextual front facade**. A **2'-10"** tall **paneled clerestory wedge** atop the unit, allows for generous height, passive strategies and a base for the **sloped roof**. The interior grants a series of **built-ins** for practical living, flexibility and **universal use**.

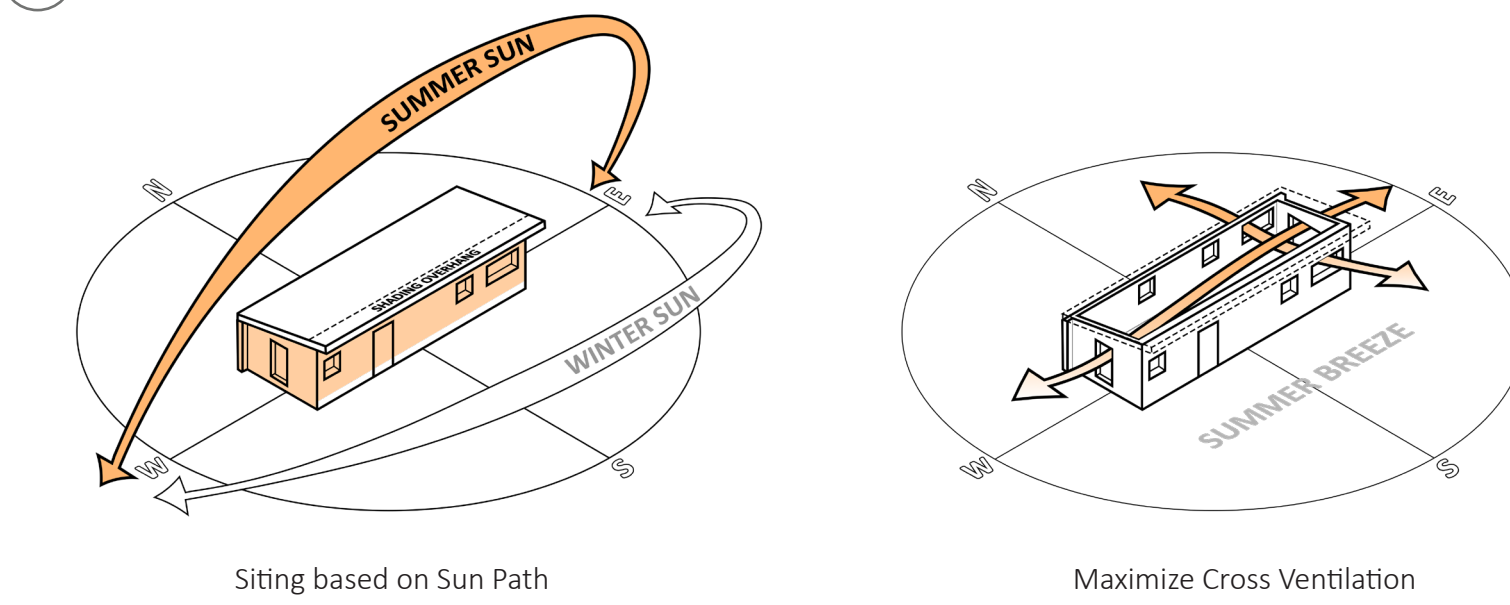
This **Compact ADU** scenario favors an adaptive solution, that creates a contextual dialogue bridging function and a responsive architecture by way of sustainable, accessible and innovative construction principles.



### 1 FORM DEVELOPMENT



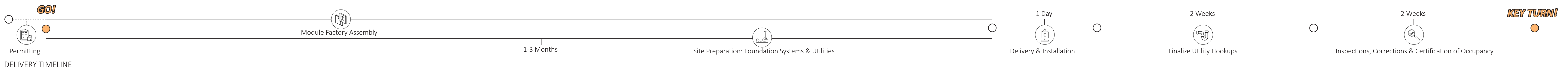
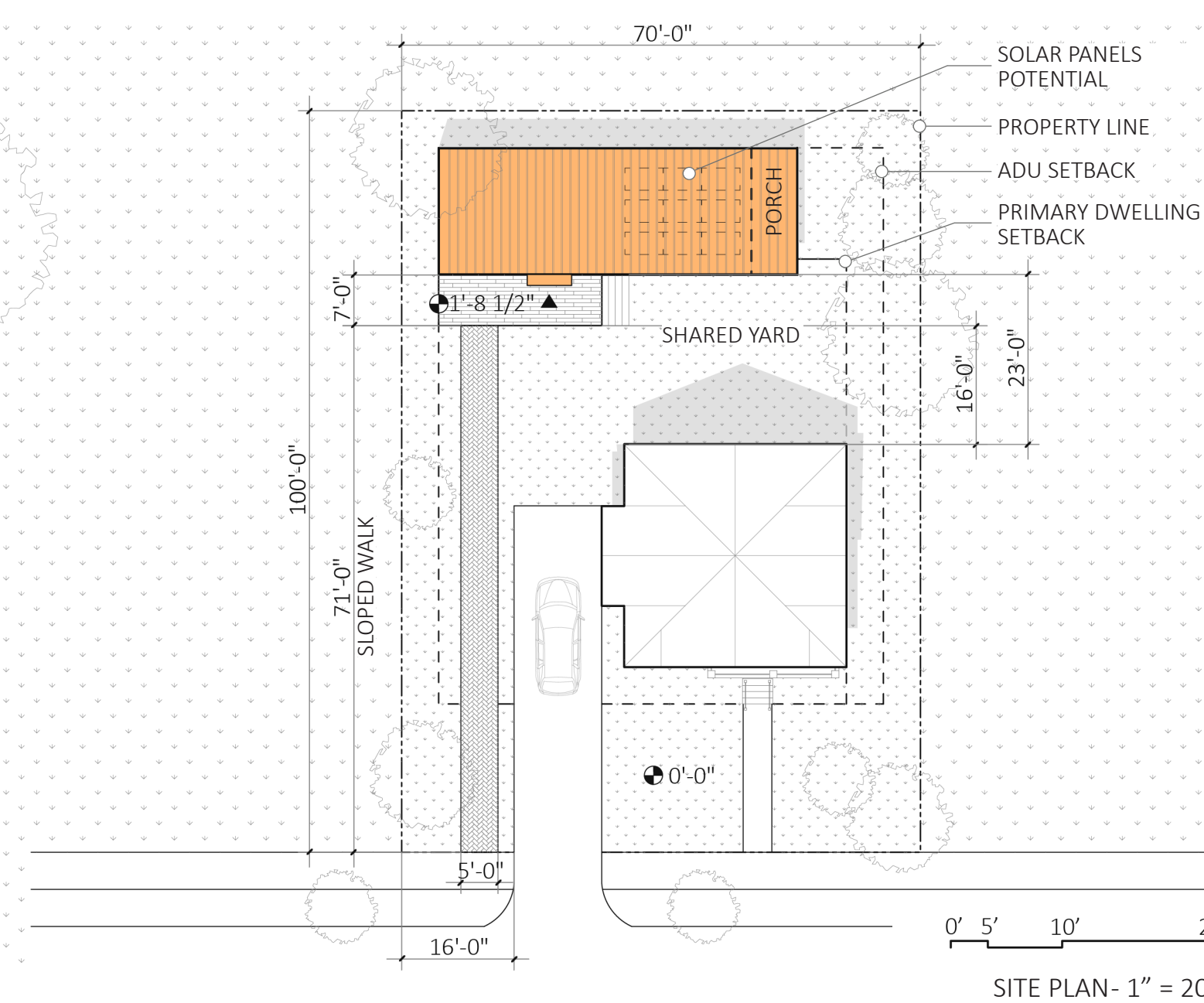
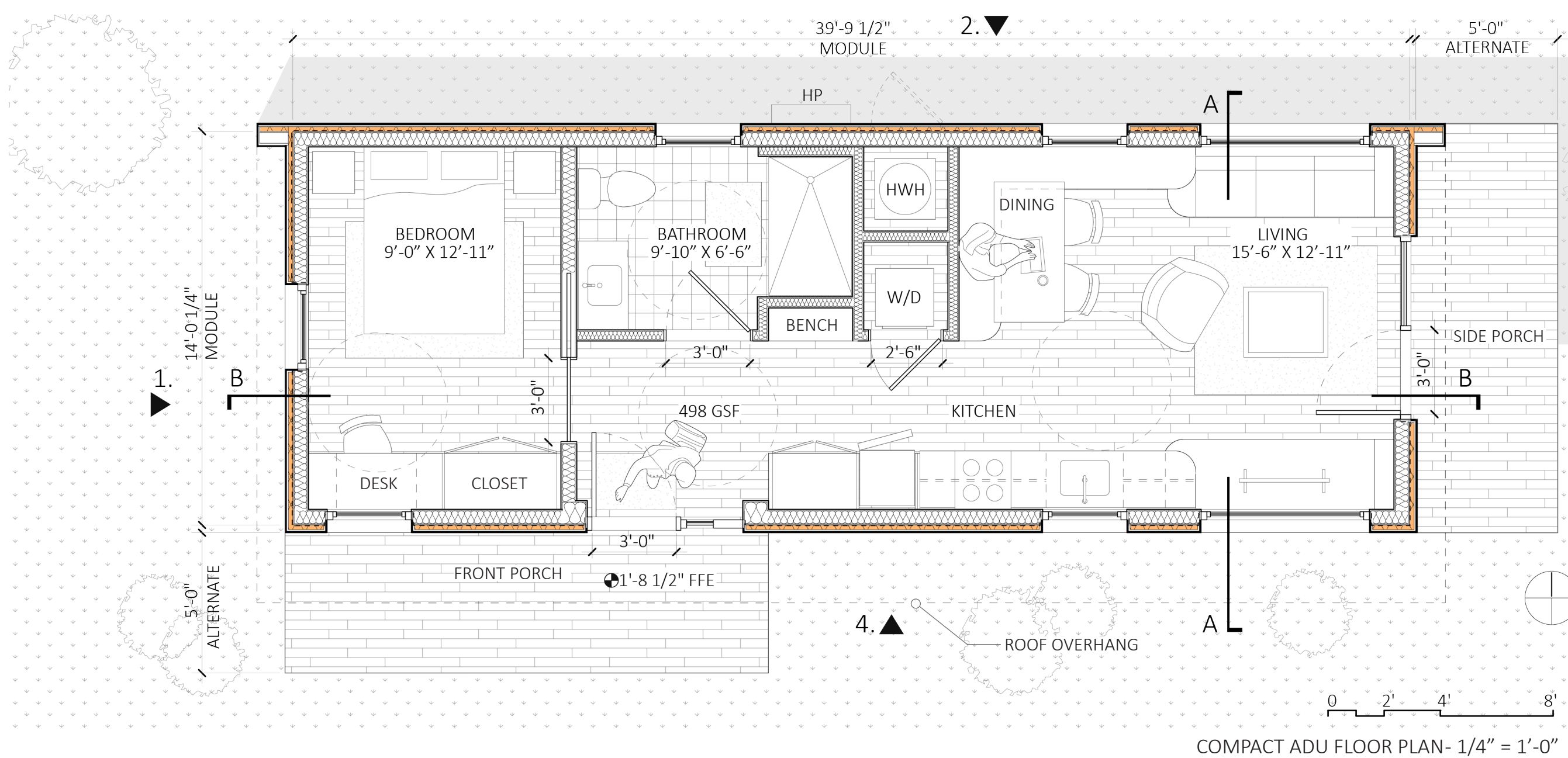
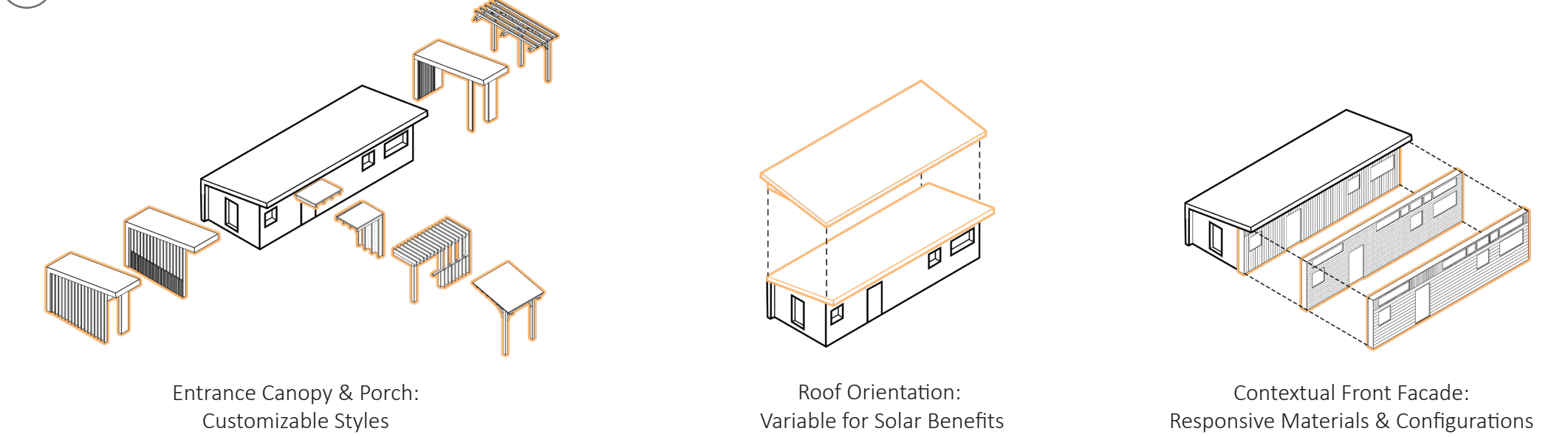
### 2 SITE EVALUATION



The design responds to site specific conditions via a kit of parts based on the owner's preferences:

- Porch and Canopy and Style
- Roof Slope Orientation
- Cladding Material and Style

### 3 OWNER'S PREFERENCES



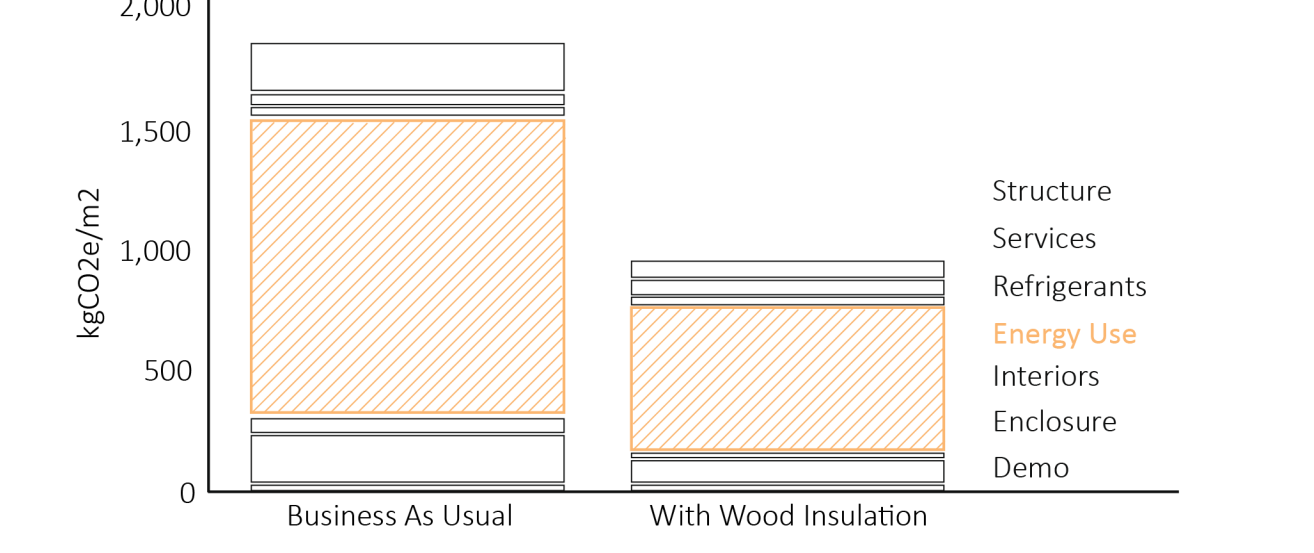
**SUSTAINABLE: PASSIVE AND ACTIVE**

Carefully located operable windows provide daylight, ventilation, and a sense of openness without imposing on the primary structure or adjacent properties. Passive design strategies including cross-ventilation, solar control with a singular sloping roof, and a high-performance envelope are incorporated to improve environmental performance while directly enhancing occupant comfort.

The design team utilized a Passive House Feasibility Study, using a WUFI energy model to ensure that the envelope can meet its rigorous requirements. With attention to airtightness and thermal continuity, the projected energy use is substantially lower than baseline targets. This is especially true for the heating and cooling demand, with yearly projected bills at roughly \$250. The chart below shows the overall reduction in operational carbon.

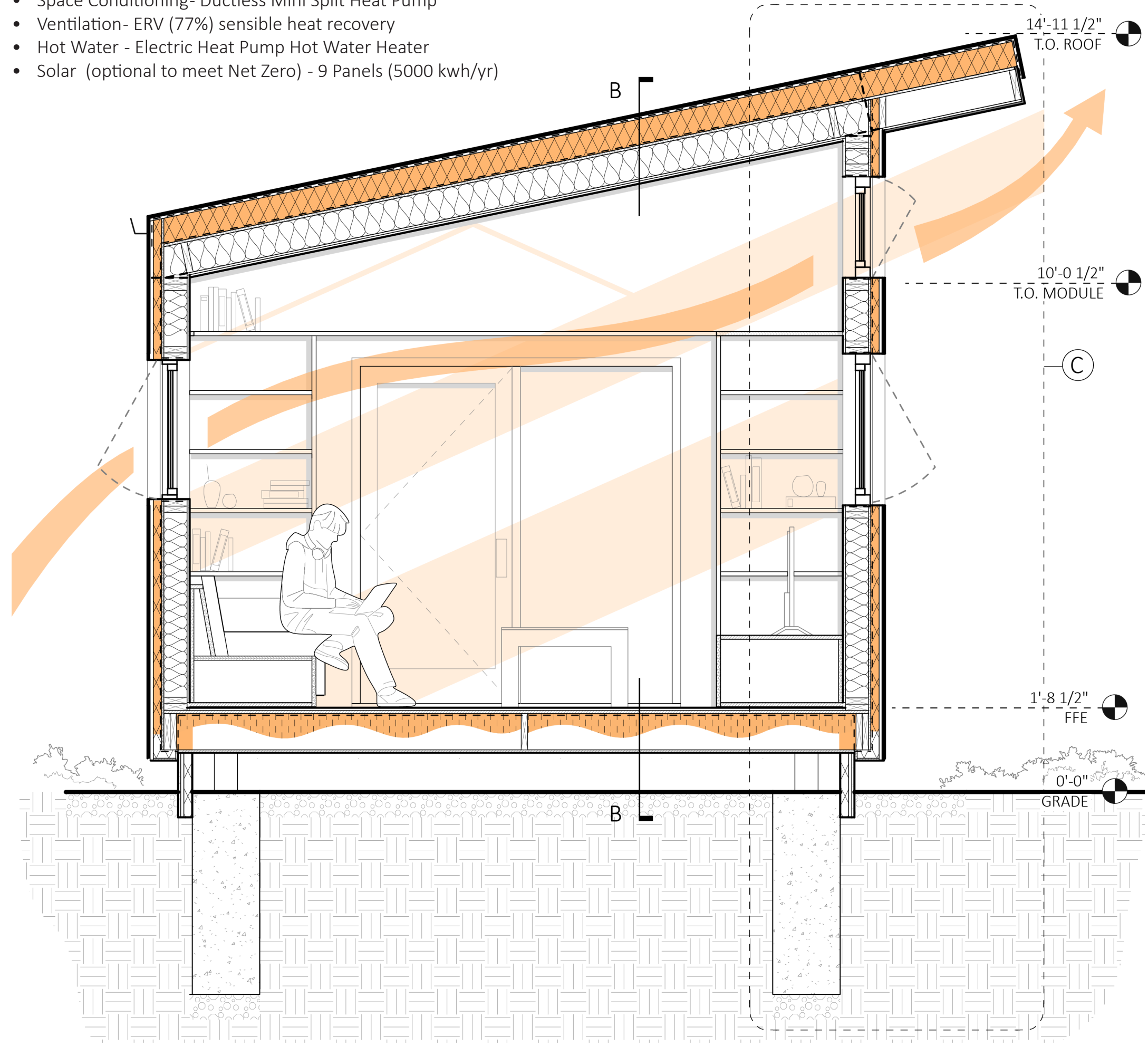
Materials used prioritize biogenic, low global warming potential, and high recycled content. The structure and insulation, exclusive of areas in contact with the ground, are biogenic wood-based products. Off-site fabrication also helps to reduce overall waste and enhance quality for the project.

With the addition of solar panels, net zero operational energy can be achieved by covering roughly 50% of the roof area. Embodied carbon for these panels are included in the graph, meaning that if the full roof was covered, the operational and embodied carbon would be completely offset within 1 year of construction.

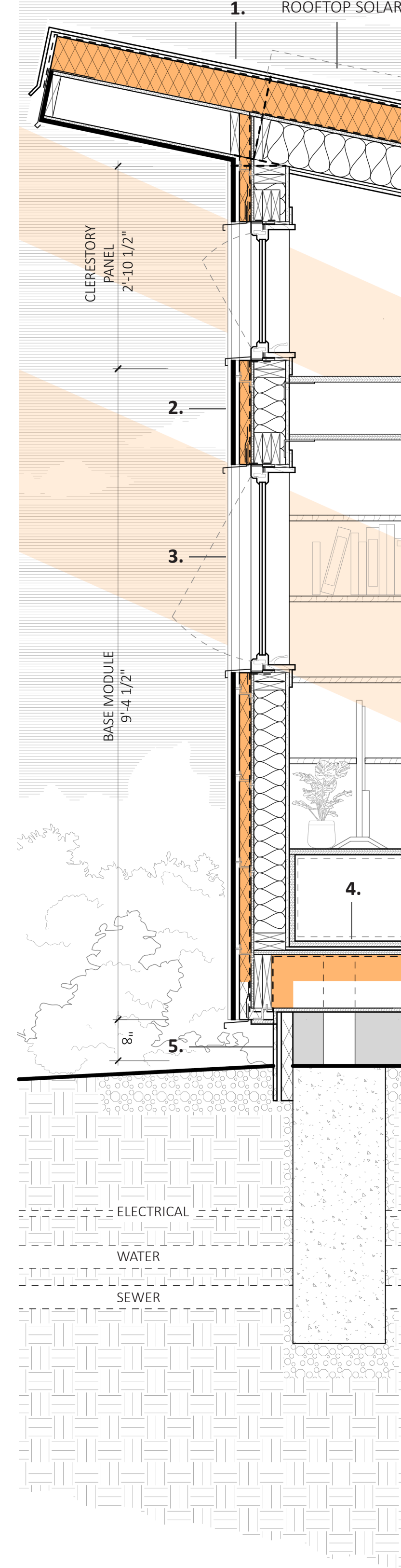


- MEP Systems (All Electric):**
- Space Conditioning- Ductless Mini Split Heat Pump
  - Ventilation- ERV (77%) sensible heat recovery
  - Hot Water - Electric Heat Pump Hot Water Heater
  - Solar (optional to meet Net Zero) - 9 Panels (5000 kwh/yr)

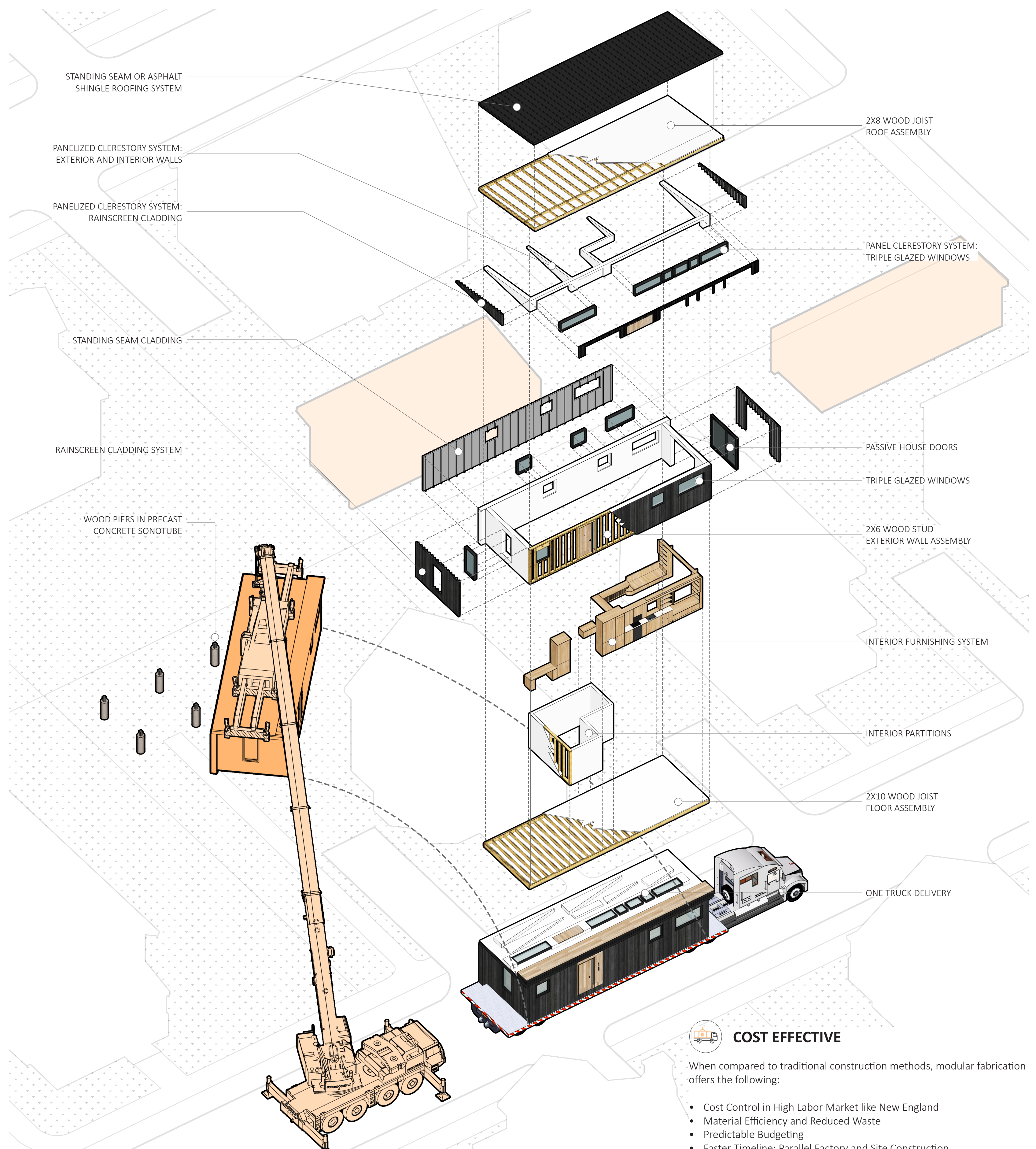
- 1. Roof Assembly (Top to Bottom):**
- Standing Seam Roofing System
  - Overlayment Board
  - 6" TimberBoard Exterior Insulation (R21 Min)
  - Vapor Barrier
  - Exterior Grade Sheathing
  - 2x8 Wood Roof Joists @ 16" O.C.
  - 7.25" TimberBatt Cavity Insulation (R29 Min)
  - Resilient Sound Isolation Clips @ 16" O.C.
  - 5/8" Type C GWB
- 2. Wall Assembly (Out to In):**
- Rainscreen Siding Wall System
  - 2" TimberBoard Exterior Insulation (R7 Min)
  - Vapor Permeable Air Barrier
  - Exterior Grade Sheathing
  - 2x6 Wood Stud
  - 5.5" TimberBatt Cavity Insulation (R22 Min)
  - 5/8" Type C GWB
- 3. Triple Glazed Tilt-Turn Windows**
- 4. Floor Assembly (Top to Bottom):**
- Finish Flooring
  - 3/4" Gypsum Cement Underlayment
  - 1/4" Acoustical Underlayment
  - Subfloor
  - 2x10 Wood Floor Joists @ 16" O.C.
  - 6" Low GWP Closed Cell Spray Foam (R42 Min)
  - 3/4" PT Wood Soffit
- 5. Foundation:**
- 6x6 Wood Piers in Precast Concrete Sonotube (4' depth)
  - Insulated Panel at Perimeter



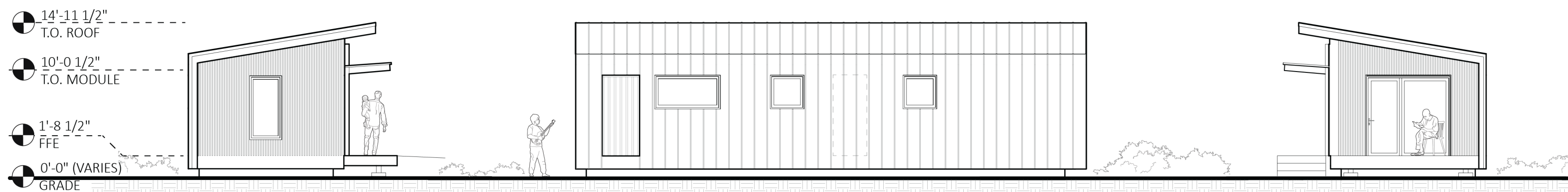
BUILDING SECTION A-A - 1/2" = 1'-0"



DETAIL SECTION C - 3/4" = 1'-0"



ONE TRUCK DELIVERY EXPLODED AXON



ELEVATIONS 1/8" = 1'-0"

**COST EFFECTIVE**

- When compared to traditional construction methods, modular fabrication offers the following:
- Cost Control in High Labor Market like New England
  - Material Efficiency and Reduced Waste
  - Predictable Budgeting
  - Faster Timeline: Parallel Factory and Site Construction



### DESIGN FOR ALL

The unit is designed to be **easily inhabited by individuals across ages, abilities, and household types without relying on a prescriptive lifestyle.** The interiors are designed to orient living and sleeping spaces towards the outdoors- incorporating significant glazing and openings at either end to connect to the garden spaces. Integrated built-in kitchen, furniture, and cabinetry reduce the need for loose furnishings, support flexible use over time, and allow the space to adapt to a wide range of occupants and living arrangements.

### CONTEXTUAL FACADE

The exterior expression is intentionally contextual, drawing from the language of existing accessory structures common to New England neighborhoods. **A wood rainscreen system provides warmth, durability, and human-scale texture,** allowing the building to recede visually while aging naturally over time.



CEDAR SHINGLE OPTION



GREEN WALL OPTION



SQUARE CHANNEL SIDING OPTION



LIVING SPACE AND KITCHEN



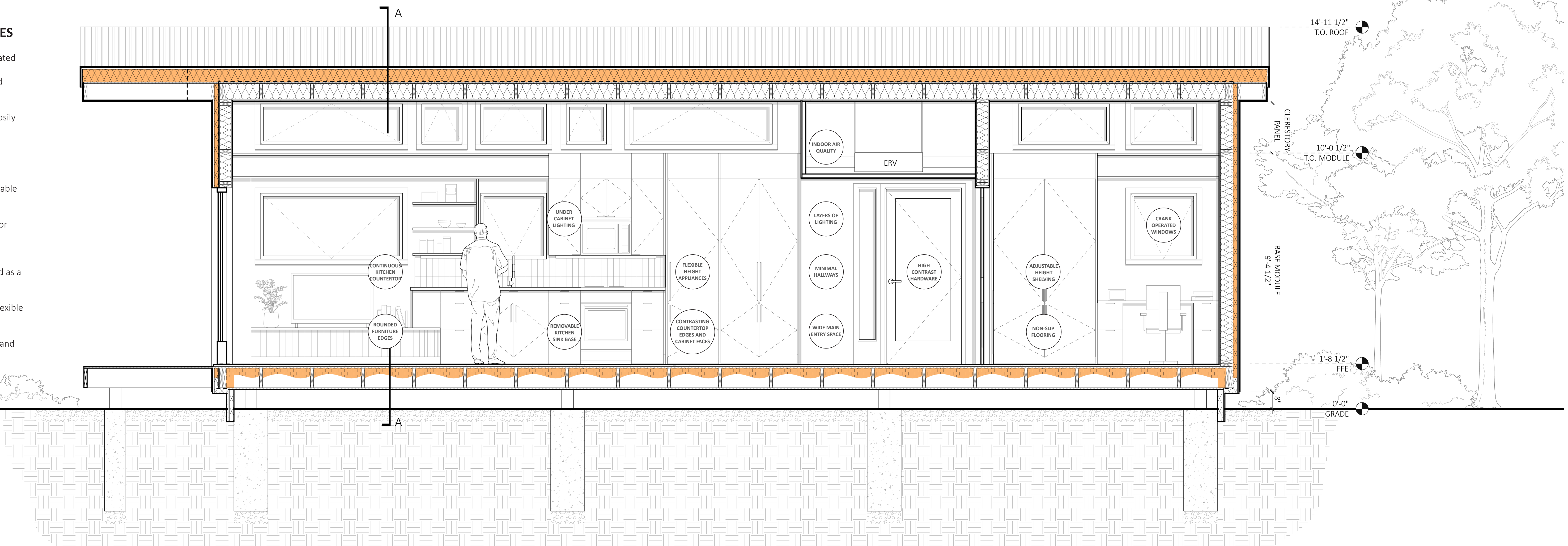
### UNIVERSAL DESIGN PRINCIPLES

Universal design principles and solutions are integrated into every element. Each bubble on the section addresses and element of the core tenets described below:

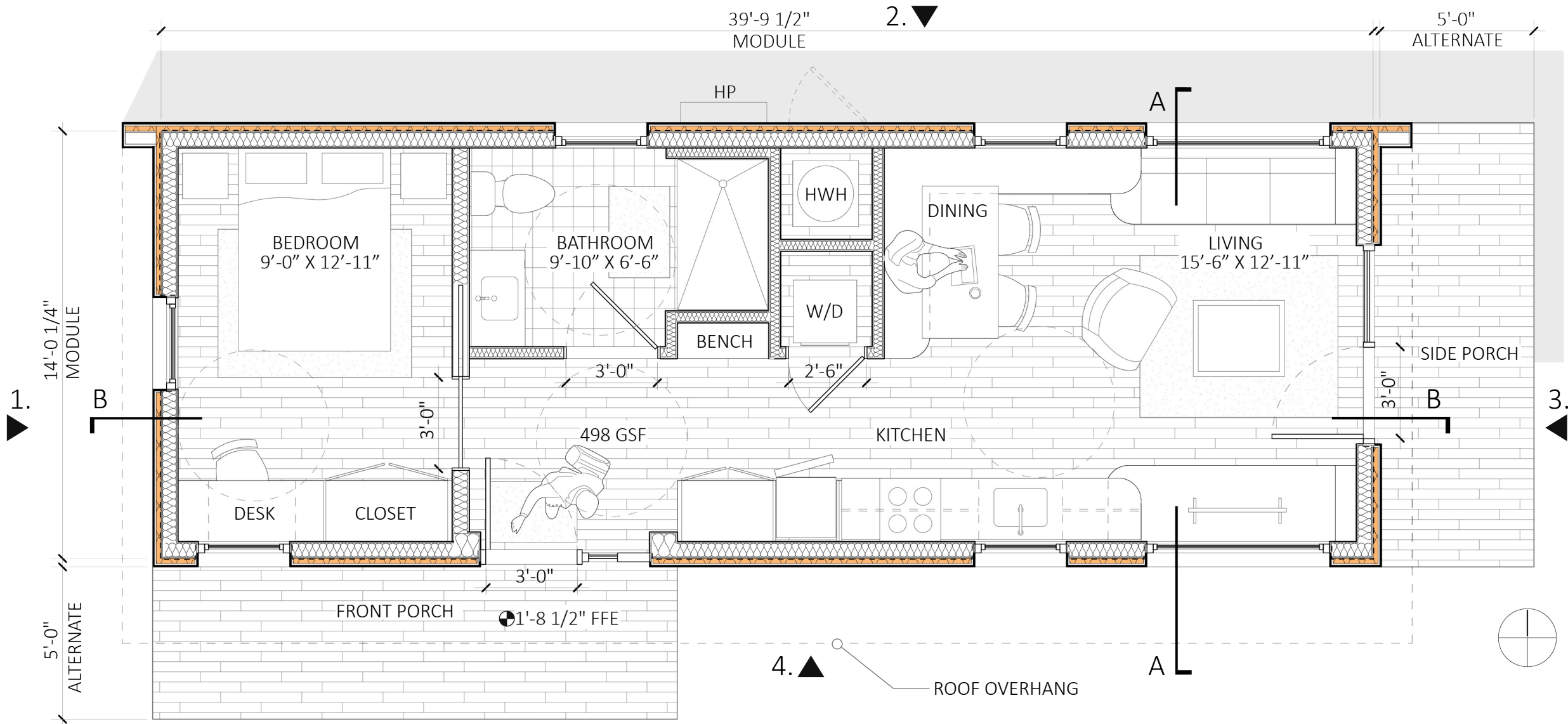
- **Simple and Intuitive:** The layout is logical and easily navigable.
- **Flexibility in Use:** Elements are adjustable and adaptable for individual needs.
- **Equitable Use:** Entrances and windows are operable for individuals of all abilities.
- **Size and Space for Approach and Use:** Clear floor space and turning radius is accounted for in all spaces.
- **Low Physical Effort:** Entry is thoughtfully curated as a transition space.
- **Tolerance for Error:** Furniture and finishes are flexible and reduce risk of injury.
- **Perceptible Information:** High contrast finishes and lighting assist in legibility.

0 1' 2' 4'

BUILDING SECTION B-B - 1/2" = 1'-0"



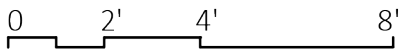
**Fabricated Module, Local Dwelling: A New England ADU**



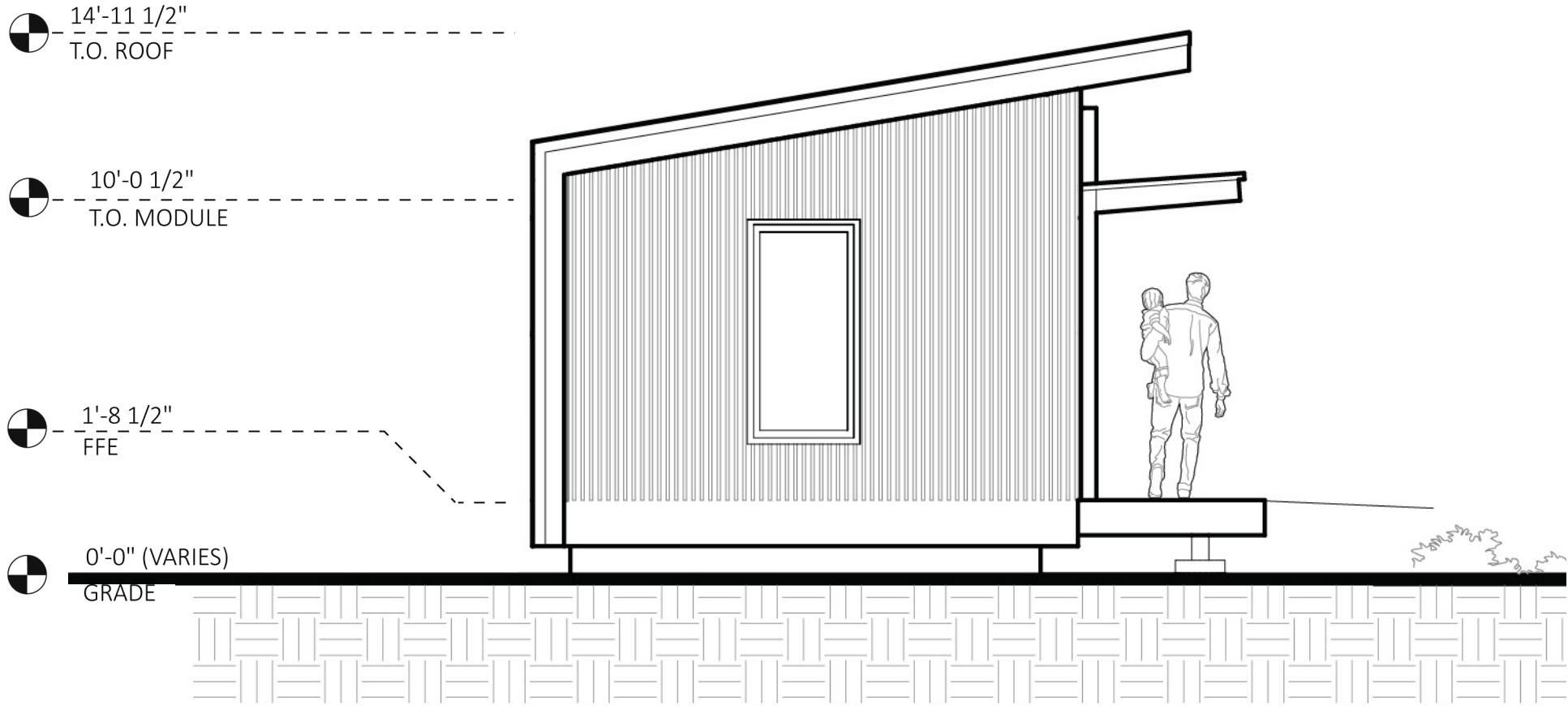
This plan shows a Compact ADU organized in a long rectangular layout, approximately forty-two feet long and fourteen feet wide for the purposes of modular construction. Overall, the plan is organized with living spaces on one end and private spaces on the other, all connected by a single linear circulation path with built-in casework to promote universal design.

The main front entry entry includes a covered front porch located along the bottom edge of the plan. In addition to the front porch, there is a small side porch located off the living room on the right side of the ADU.

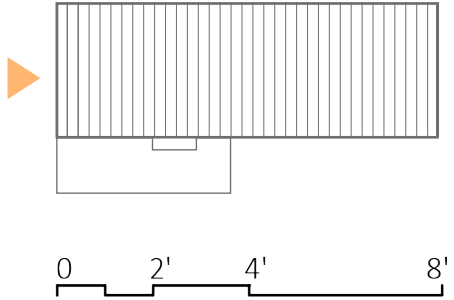
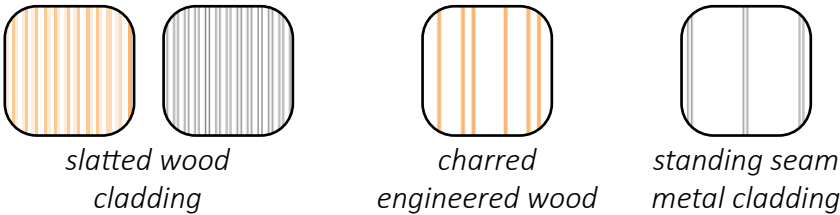
At the far left end of the plan is the bedroom. Further to the right is the bathroom. Moving further right, there are two closets - one with a combined washer and dryer and a small mechanical closet. At the far right is the living room with built-in seating. It connects to a dining area. Adjacent to the dining space is the kitchen which lines the lower wall with a continuous counter.



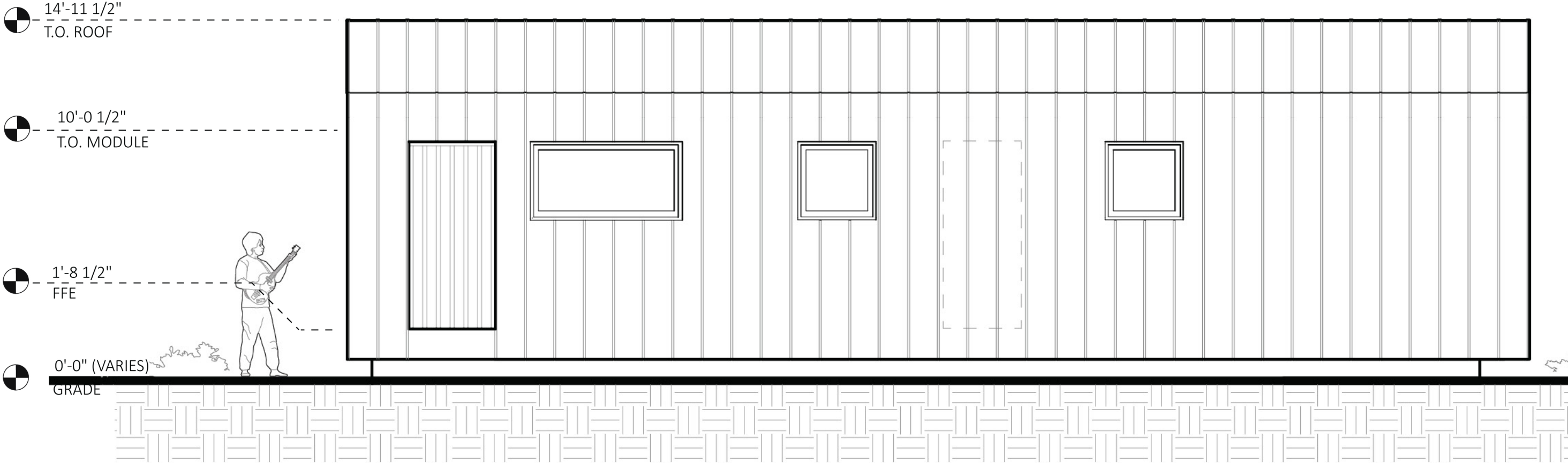
**ATTACHMENT C: FLOOR PLAN- 1/4" = 1'-0"**



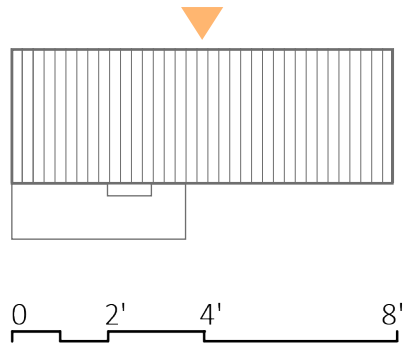
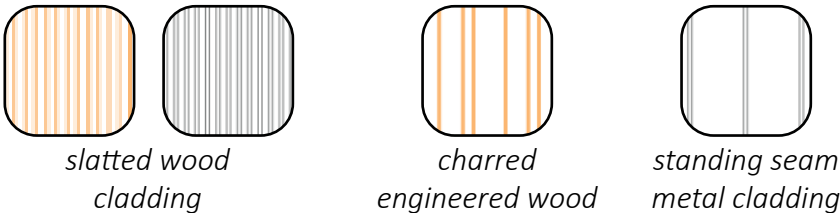
*This side elevation is along the bedroom face of the ADU. The building has a simple sloped shed roof that rises from left to right and provides an overhang for shading. A small porch projects outward with a smaller entry roof over it. A sloped walkway rises up to the finished floor elevation for accessibility.*



**ATTACHMENT D:** EXTERIOR SIDE ELEVATION 1 - 1/4" = 1'-0"

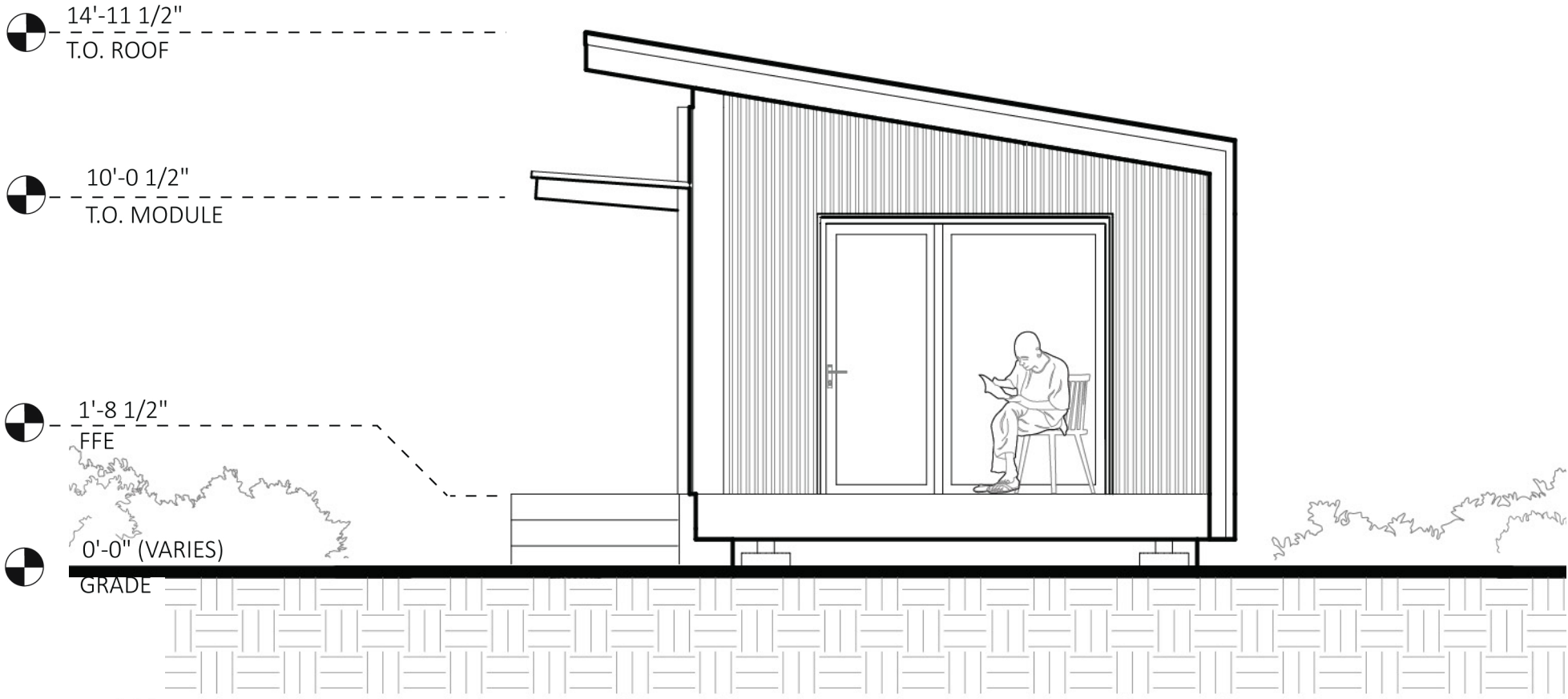


*This back elevation is along the rear face of the ADU. The material of the sloped roof extends to the rear elevation for a seamless appearance of the building's shell. A utility door provides access to the hot water heater. An optional small end porch projects outward to the left with the sloped roof extended over it.*

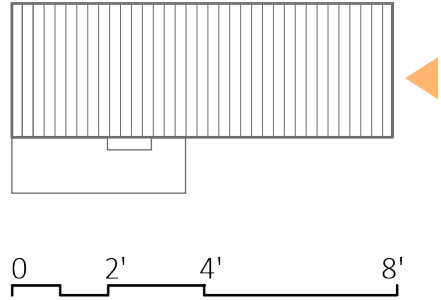
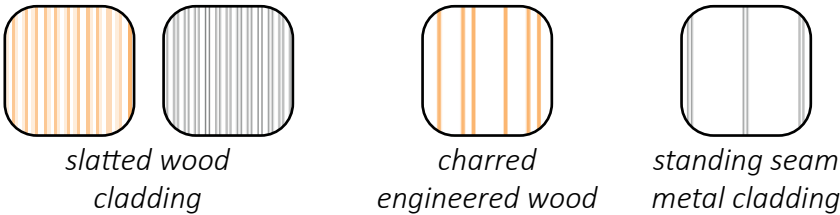


**ATTACHMENT D: EXTERIOR BACK ELEVATION 2 - 1/4" = 1'-0"**

**Fabricated Module, Local Dwelling: A New England ADU**

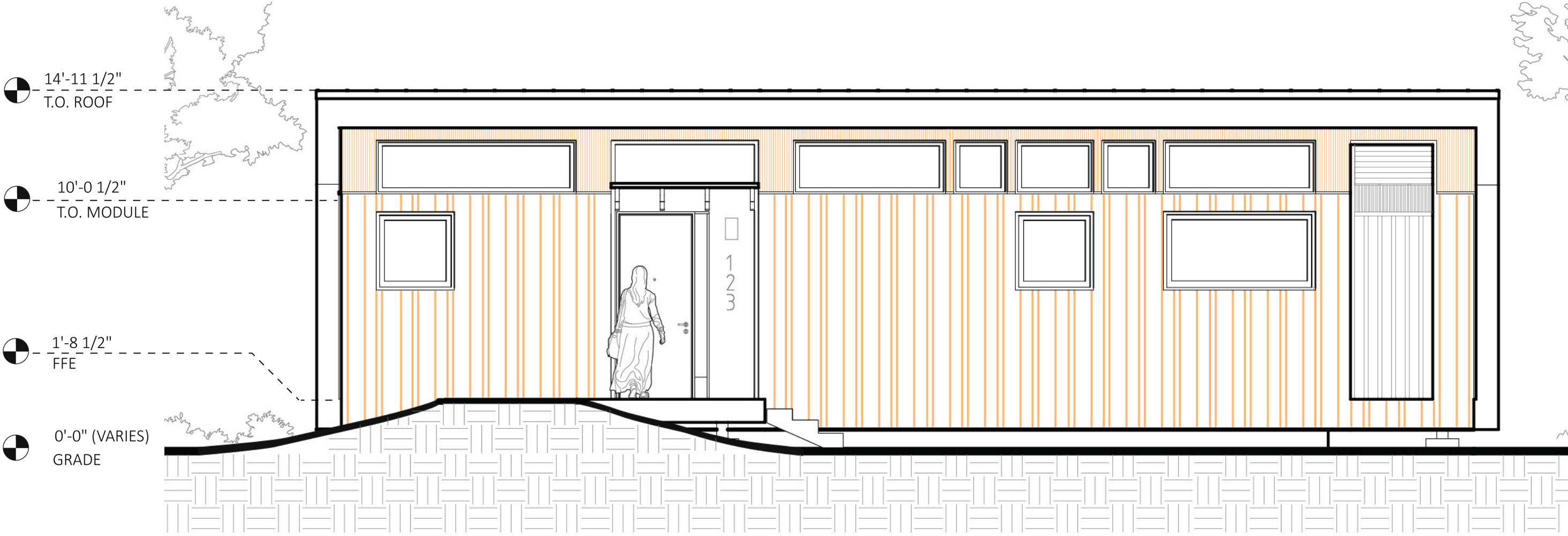


*This side elevation is along the living room face of the ADU. The building has a simple sloped shed roof that rises from right to left and provides an overhang for shading. An optional small end porch projects outward with the sloped roof extended over it.*

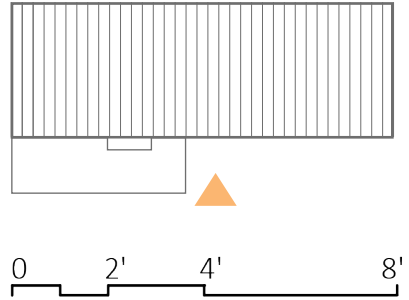
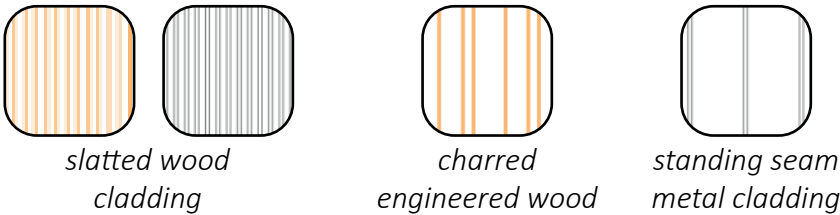


**ATTACHMENT D: EXTERIOR SIDE ELEVATION 3 - 1/4" = 1'-0"**

Fabricated Module, Local Dwelling: A New England ADU



*This front elevation is along the front face of the ADU. This face highlights the contextual facade that is flexible to the owner's preferences. Clerestory windows are strategically placed along the upper panel. The entrance is clearly identified with a small porch projecting outward with a smaller entry roof over it, an entry scone, and building number. A sloped walkway rises up to the finished floor elevation for accessibility. An optional small end porch projects outward to the right with the sloped roof extended over it.*



**ATTACHMENT D:** EXTERIOR FRONT ELEVATION 4 - 1/4" = 1'-0"

# Fabricated Module, Local Dwelling: A New England ADU

## 1. Roof Assembly (Top to Bottom):

- Standing Seam Roofing System
- Overlayment Board
- 6" TimberBoard Exterior Insulation (R21 Min)
- Vapor Barrier
- Exterior Grade Sheathing
- 2x8 Wood Roof Joists @ 16" O.C.
- 7.25" TimberBatt Cavity Insulation (R29 Min)
- Resilient Sound Isolation Clips @ 16" O.C.
- 5/8" Type C GWB

## 2. Wall Assembly (Out to In):

- Rainscreen Siding Wall System
- 2" TimberBoard Exterior Insulation (R7 Min)
- Vapor Permeable Air Barrier
- Exterior Grade Sheathing
- 2x6 Wood Stud
- 5.5" TimberBatt Cavity Insulation (R22 Min)
- 5/8" Type C GWB

## 3. Triple Glazed Tilt-Turn Windows

## 4. Floor Assembly (Top to Bottom):

- Finish Flooring
- 3/4" Gypsum Cement Underlayment
- 1/4" Acoustical Underlayment
- Subfloor
- 2x10 Wood Floor Joists @ 16" O.C.
- 6" Low GWP Closed Cell Spray Foam (R42 Min)
- 3/4" PT Wood Soffit

## 5. Foundation:

- 6x6 Wood Piers in Precast Concrete Sonotube (4' depth)
- Insulated Panel at Perimeter

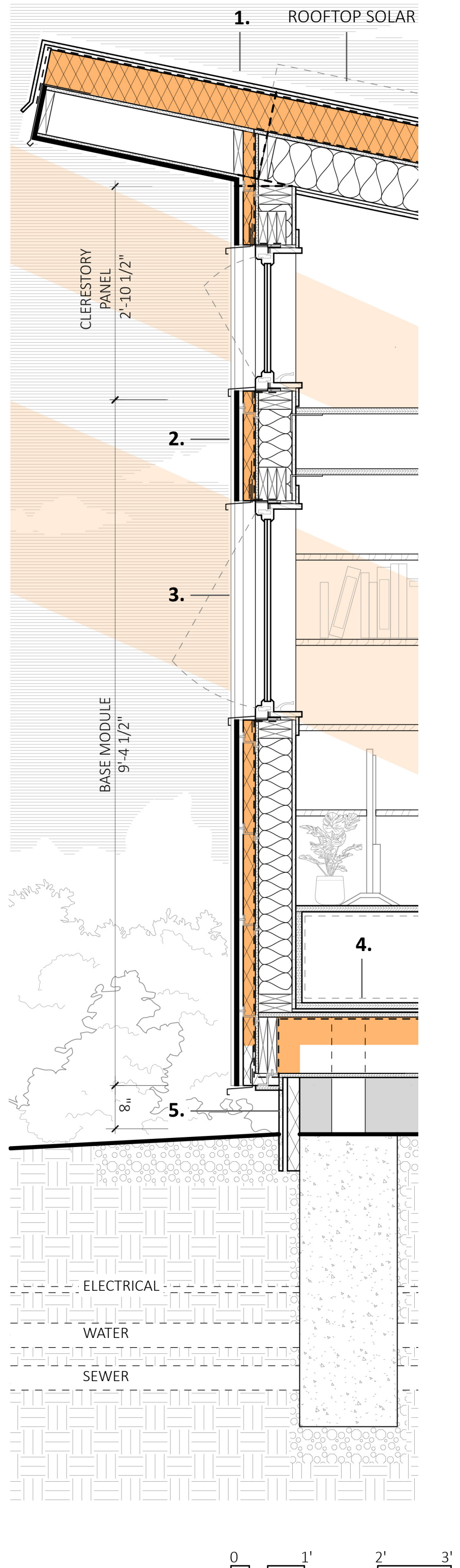
*This drawing shows a building section through the living space to highlight the construction and performance of the envelope.*

*At the top, the roof assembly is identified with the option of rooftop solar. It depicts the components of the assembly including roofing, structure, insulation, and the points at which it folds for transportation to the site as a module.*

*Further down, the clerestory panel is identified. It depicts the panelized portion of the assembly with a clerestory window.*

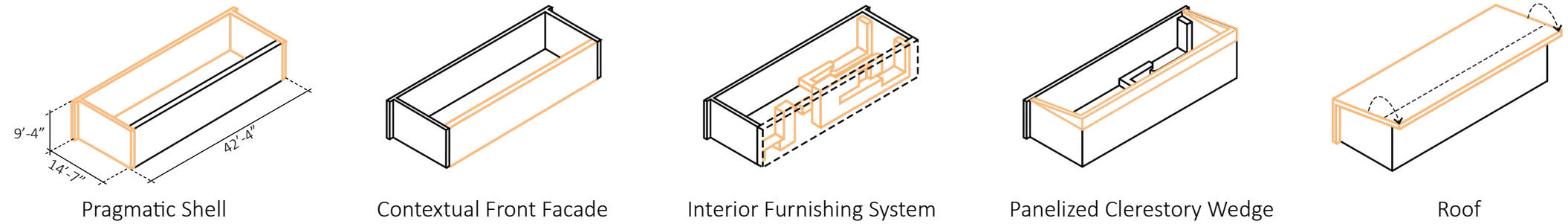
*Then, below is the base module wall assembly. It depicts the components of the assembly including triple-glazed windows, rainscreen assembly, structure, and insulation. At the interior the built-in case-work is shown.*

*At the bottom, is the floor assembly. It depicts the components of the assembly including finish floor, structure, and insulation. An insulated panel is located at the perimeter. A precast foundation system grounds the ADU. Electric, water, and sewer utilities connect to the module.*

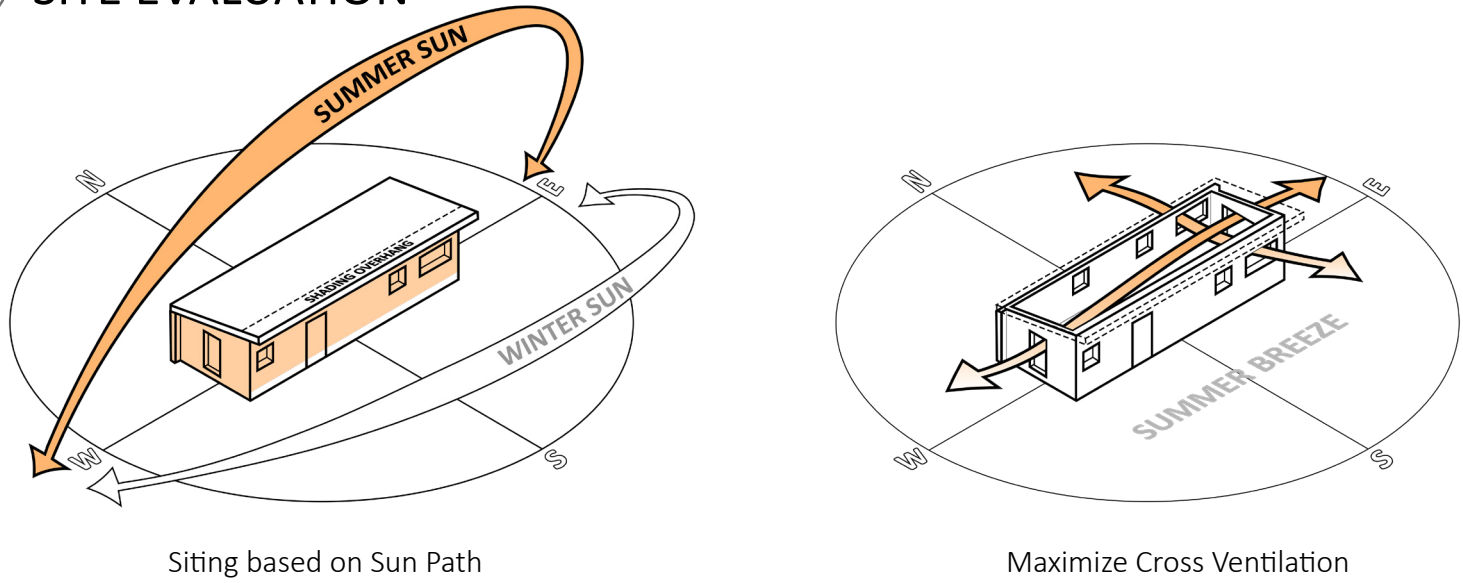


ATTACHMENT E: DETAIL WALL SECTION C - 3/4" = 1'-0"

1 FORM DEVELOPMENT



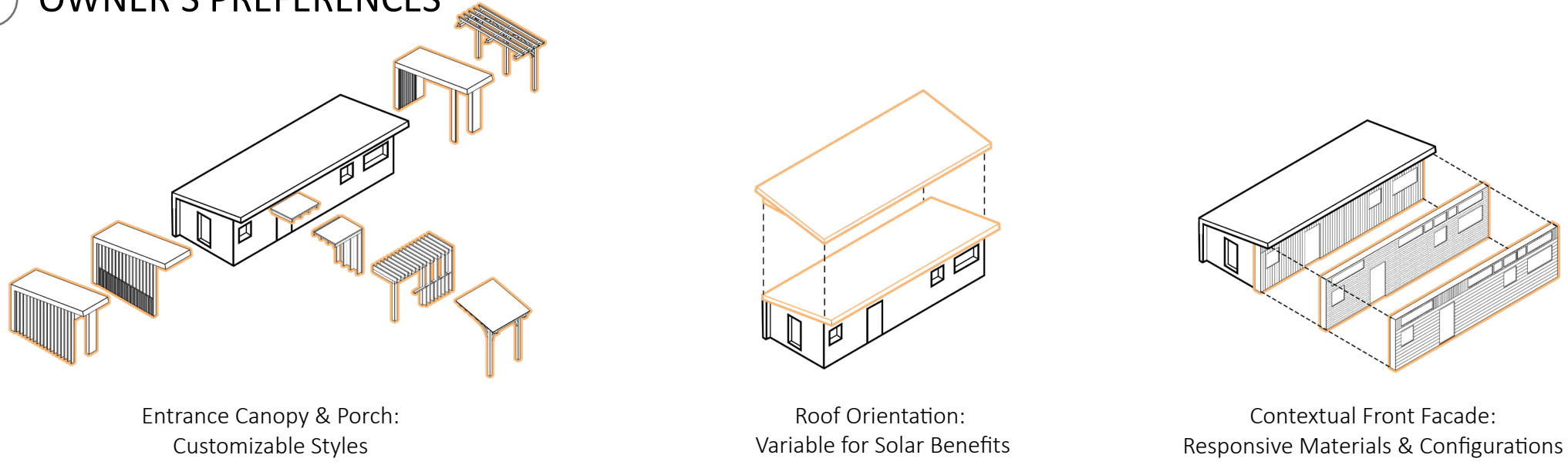
2 SITE EVALUATION



The design responds to site specific conditions via a kit of parts based on the owner's preferences:

- Porch and Canopy and Style
- Roof Slope Orientation
- Cladding Material and Style

3 OWNER'S PREFERENCES



This series of diagrams narrate the concept development of the compact ADU, showcasing module form, site evaluation factors and customizable owner's preferences. The diagram as a whole illustrates the main narrative: a fabricated module measured to the truck, shaped by the site for local dwelling, reflecting the New England style: practical and responsive of climate and material realities.

**Fabricated Module, Local Dwelling: A New England ADU**



An Independent Space to Age in Place

An Opportunity for a Multigenerational Immigrant Household Lot

An Opportunity to Downsize and Stay in the Neighborhood

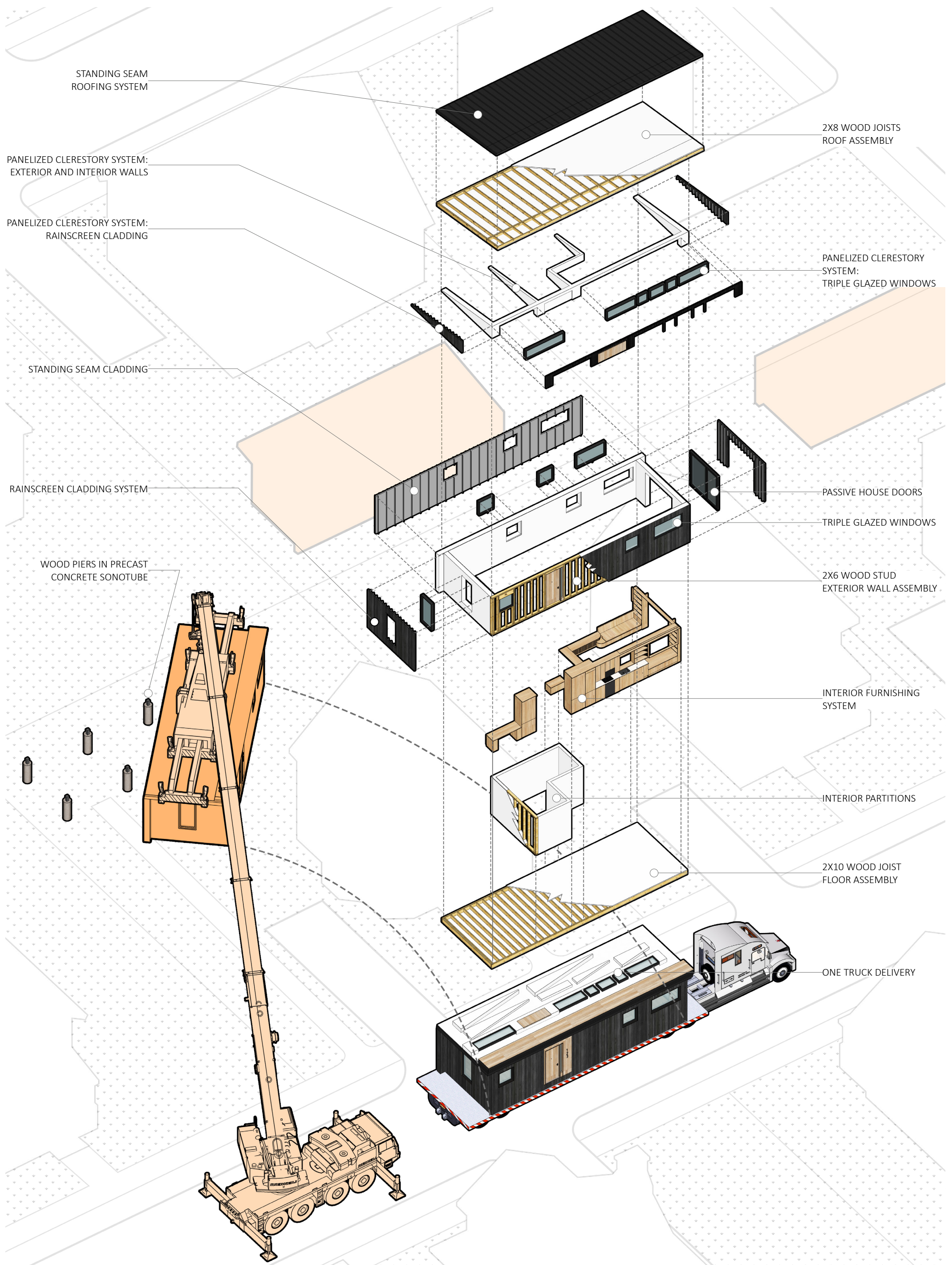
A Home for a Young Professional

A Flexible Live-Work Space for a Local Artist

A Unit for a Live-In Caregiver

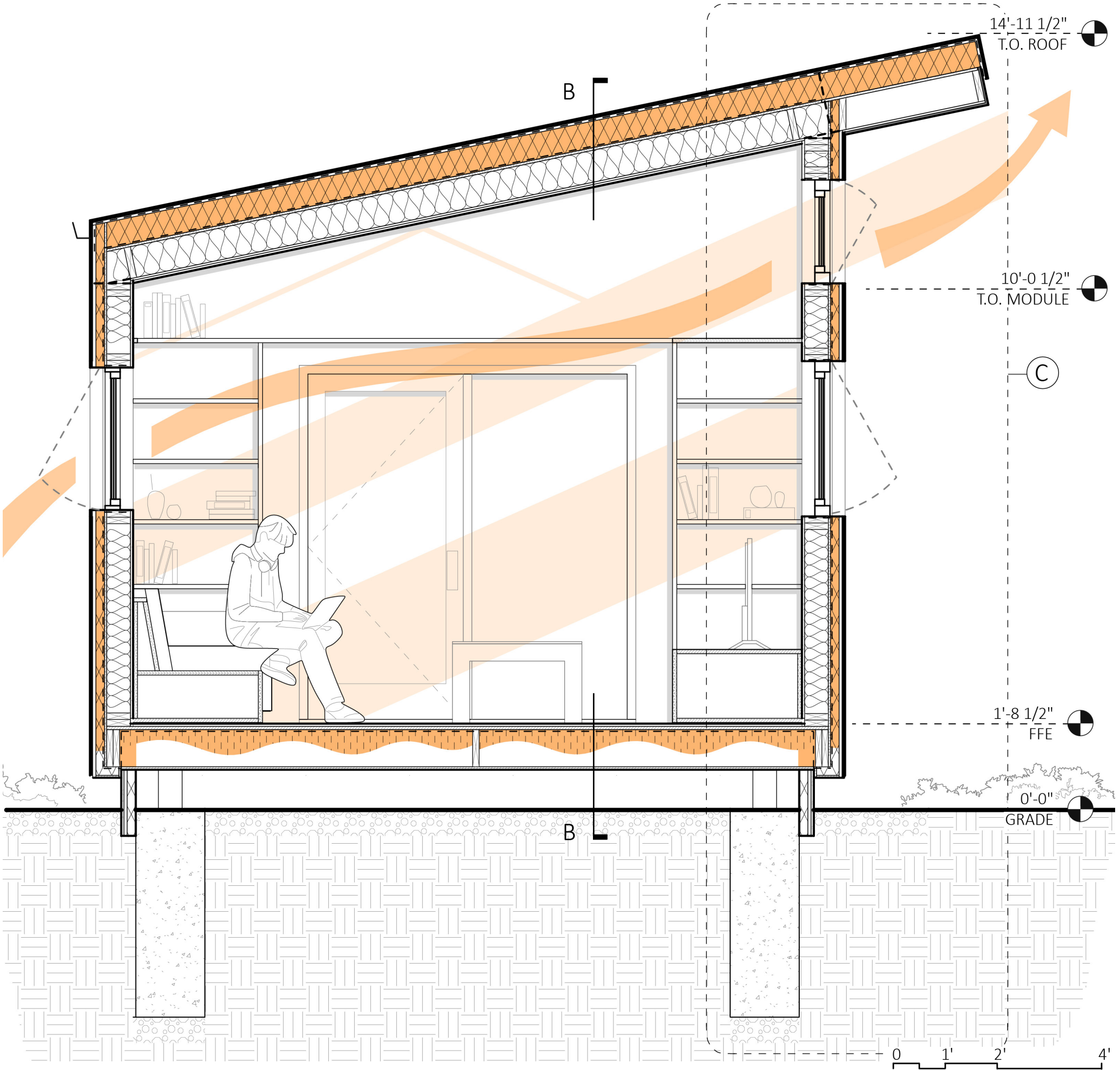
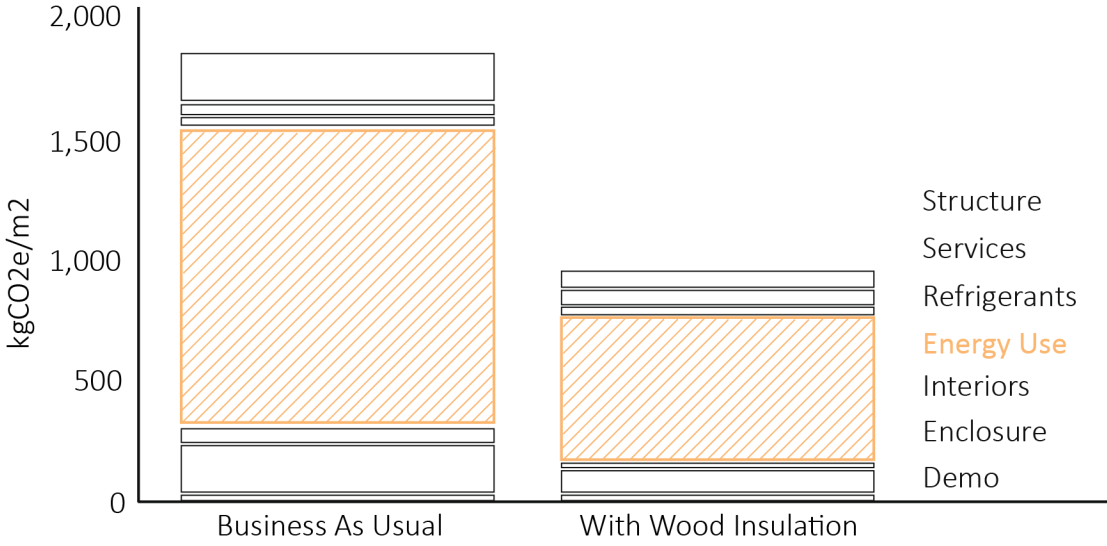
*This diagram illustrates a neighborhood community where many homeowners have added modular ADUs to their properties, along with the diverse individuals who may live in them. It also highlights the delivery and construction process, as well as the range of cladding options available to primary dwelling owners.*

# Fabricated Module, Local Dwelling: A New England ADU



*This axonometric illustrates the one-truck single delivery and placement by crane of the ADU in the context of a residential neighborhood, referencing the cost effective nature of this innovative construction method. The ADU is exploded to show the elements assembled in factory.*

**Fabricated Module, Local Dwelling: A New England ADU**



*This drawing shows a building section through the living space to highlight the construction and performance of the envelope.*

*The assemblies are detailed to show exterior or interior finish, insulation, and structure. It extends down to show the foundation system.*

*This section highlights the passive sustainable strategies in place. The wintertime sun is shown projecting deep into the space and bouncing off of the light shelf. The windows are shown as operable for passive ventilation in the summer from the back of the living space to the front out of the clerestory window.*

*The additional graph depicts energy use and highlights the lower embodied carbon of wood insulation used at the wall and roof assemblies.*

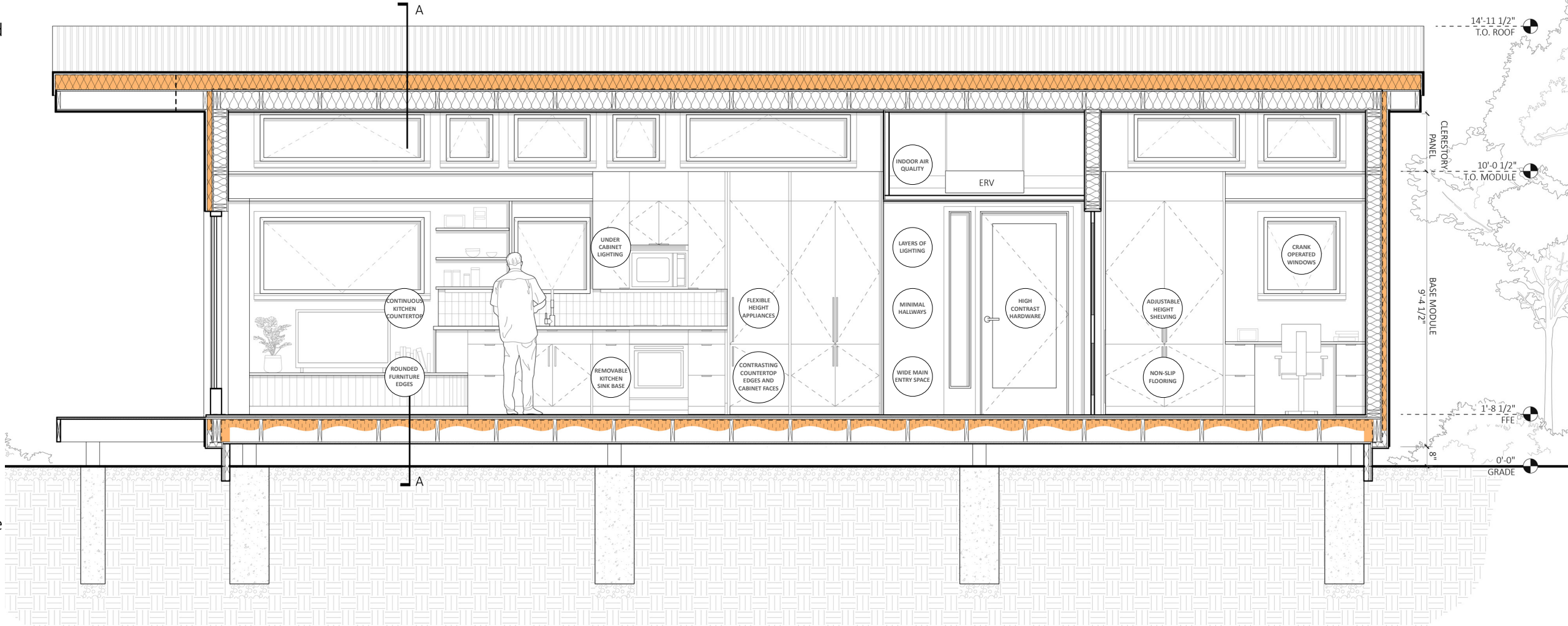
BUILDING SECTION A-A - 1/2" = 1'-0"

**ATTACHMENT G: PASSIVE AND ACTIVE SUSTAINABILITY DIAGRAM**

**UNIVERSAL DESIGN PRINCIPLES**

Universal design principles and solutions are integrated into every element. Each bubble on the section addresses and element of the core tenets described below:

- Simple and Intuitive: The layout is logical and easily navigable.
- Flexibility in Use: Elements are adjustable and adaptable for individual needs.
- Equitable Use: Entrances and windows are operable for individuals of all abilities.
- Size and Space for Approach and Use: Clear floor space and turning radius is accounted for in all spaces.
- Low Physical Effort: Entry is thoughtfully curated as a transition space.
- Tolerance for Error: Furniture and finishes are flexible and reduce risk of injury.
- Perceptible Information: High contrast finishes and lighting assist in legibility.

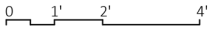


*This drawing shows a building section through the living space to highlight the circulation and universal design elements of the ADU.*

*The assemblies are detailed to show exterior or interior finish, insulation, and structure. It extends down to show the foundation system.*

*This section highlights the universal design elements carefully considered for intuitive, flexible, and equitable use. For example, a clear circulation path, adjustable shelving, and operable doors and windows.*

*Additionally, the size and space for approach and use is respected, low physical effort and tolerance for error are accounted for, and high contrast finishes provide legibility.*





01: PROPOSED ENGINEERED WOOD OPTION

**CONTEXTUAL FACADE VARIATIONS**

The exterior expression is intentionally contextual, drawing from the language of existing accessory structures common to Boston neighborhoods. A wood rainscreen system provides warmth, durability, and human-scale texture, allowing the building to recede visually while aging naturally over time.



02: CEDAR SHINGLE OPTION



03: GREEN WALL OPTION



04: SQUARE CHANNEL SIDING OPTION

*This diagram presents four ways a Primary Dwelling owner might choose to contextualize their ADU to New England materiality. The proposed design features charred engineered wood, while the other options include cedar shingles, a living plant wall, and square channel siding.*



*This rendering shows a woman using the built-in entry bench to retrieve a dog leash and store everyday items like a coat and bags. The easily accessible entry with a turning radius is called out as part of the logical universal layout. The easy-pull hardware and layered lighting highlight the universal design integrated into the custom millwork throughout the intuitively planned and flexible unit.*



*This rendering captures a couple relaxing on the built-in sofa within the flexible, open-plan living, dining, and kitchen area. The room is oriented toward a large window and glass door that open onto a covered patio, seamlessly extending the interior into a private green space.*



*This rendering showcases the kitchen and flexible living space, where three senior women gather for cards and conversation. It highlights the daylighting strategies, ease of use kitchen, and the unit's flexible, non-prescriptive design, welcoming residents of all lifestyles.*