



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

### **1. Design Team**

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Lead Applicant: Fenton Bradley  
Additional Applicants: Shichong Xie, Steven Fallon  
Design Firm Name (If Applicable): D21 Architects  
Contact Info: bradley@d21architects.com

### **2. Design Information**

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EntryID (randomly assigned by HLC for tracking purposes): 3499  
Design Name: Neighborhood -Scaled ADU: A Buildable Prototype  
ADU Gross Floor Area (square footage): 880  
Unit Layout: Two-Bedroom or more  
ADU Height (feet): 14  
Window/Wall Ratio: 20%  
Foundation Type: Concrete Frost Wall

### **3. Project Narrative**

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NEIGHBORHOOD-SCALED ADU: A BUILDABLE PROTOTYPE is a replicable, permit-ready ADU designed for Boston and communities across Massachusetts to deliver predictable cost, schedule, and performance. The prototype prioritizes design clarity, constructability, and durability so homeowners can select a proven option and move from concept to permitting with fewer surprises. A disciplined planning module supports multiple siting scenarios (rear-yard ADU, over-garage, compact cottage) while keeping structure, enclosure, and MEP logic consistent. Affordability comes from compact form, simple massing, conventional framing, common dimensions, and standardized openings; wet areas are consolidated to shorten plumbing runs and reduce penetrations. Comfort and resilience are supported by clear, contractor-friendly envelope details and verified targets: R-49 attic ( $U \leq 0.026$ ), wall  $U \leq 0.045$ , and fenestration  $U \leq 0.30$ , with durable fiber-cement cladding and practical roof detailing.

***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.***

# NEIGHBORHOOD-SCALED ADU: A BUILDABLE PROTOTYPE

This proposal is submitted to the Massachusetts Statewide Accessory Dwelling Unit (ADU) Design Challenge with the goal of delivering a replicable, permit-ready prototype that helps homeowners in Boston and across the Commonwealth add a high-quality, code-aligned dwelling with predictable cost and construction outcomes. The design is grounded in Massachusetts ADU experience, where tight lots, neighborhood context, and contractor availability can make strong concepts difficult to execute. Our approach prioritizes design clarity, constructability, and durability—so a homeowner can select a prototype from a public menu and move from concept to permitting and construction with fewer surprises.

The Challenge goals align directly with this submission: give property owners easy access to high-quality design options, make the design process more accessible and affordable, and unlock more opportunities to explore, design, and build ADUs. We reduce predevelopment cost by minimizing custom detailing, standardizing assemblies, and presenting coordinated drawings and notes that are straightforward to adapt. The prototype is intended to fit within diverse zoning contexts, including the constrained urban conditions common in Boston neighborhoods, while remaining compatible with residential scale and character. The design demonstrates how compact spaces can still feel comfortable, flexible, and dignified.

Replicability is achieved through a disciplined planning module that supports multiple siting scenarios—rear-yard detached ADUs, additions over existing garages, and compact cottages where permissible—while maintaining consistent structure, enclosure, and MEP logic. The exterior expression is intentionally straightforward, using familiar proportions and durable cladding systems to reduce review friction and support neighborhood acceptance. Owners can select from a range of finish palettes and minor façade variations without changing the core performance or construction approach.

Affordability begins with reducing complexity. The plan uses compact form, efficient spans, conventional framing, and repeatable dimensions that align with common material sizes and typical subcontractor workflows. Wet areas are consolidated to shorten plumbing runs, reduce penetrations, and improve long-term reliability. Standard window sizes, simplified trim conditions, and coordinated openings reduce field decisions and change orders. The goal is not “cheap,” but cost-responsible: a design local builders can price confidently and execute efficiently.

Long-term value is equally important. ADUs often serve changing family needs: a young adult returning home, a caregiver suite, rental income, or a downsizing option that lets households remain in their community. The prototype therefore supports adaptability. The layout includes a defined sleeping zone, a flexible living/dining area sized for daily use, and kitchen/bath placements that preserve privacy and support multiple furniture arrangements. Storage is integrated to keep small rooms functional and uncluttered. Daylight and cross-ventilation are emphasized to make compact living feel healthy and generous.

An accessible and adaptable design approach is integrated to support aging in place and accommodate a range of abilities without forcing costly, one-size-fits-all solutions. Circulation is direct and legible, bathrooms are planned to allow future grab bars and mobility accommodations, and the kitchen can be adapted for seated use if needed. Entries prioritize safe winter performance with lighting, slip resistance, and intuitive wayfinding. The intent is an adaptable baseline with optional upgrade paths that homeowners can select based on household needs.

Sustainability and resilience are embedded through durable assemblies, right-sized systems, and verified envelope performance. This design confirms compliance with the Challenge’s minimum energy performance thresholds: ceiling/attic insulation at R-49 ( $U \leq 0.026$ ); above-grade walls meeting R-20 + R-5 ci (or equivalent) with  $U \leq 0.045$ ; and fenestration with whole-unit  $U \leq 0.30$ . To translate these targets into buildable reality, the prototype includes clear, contractor-friendly assembly notes:

For a vented attic batt option, the roof uses prefab wood trusses with a continuous ceiling air barrier at gypsum board; top plates, penetrations, recessed fixtures (IC/AT), and attic access are air-sealed. Vent baffles at eaves maintain a continuous soffit-to-ridge ventilation path, with continuous soffit and ridge vents sized per code. R-49 minimum insulation is achieved with unfaced fiberglass batts (e.g., two layers—R-30 + R-19—with the second layer perpendicular to reduce thermal bridging), meeting  $U \leq 0.026$ , and an insulated/weatherstripped attic hatch.

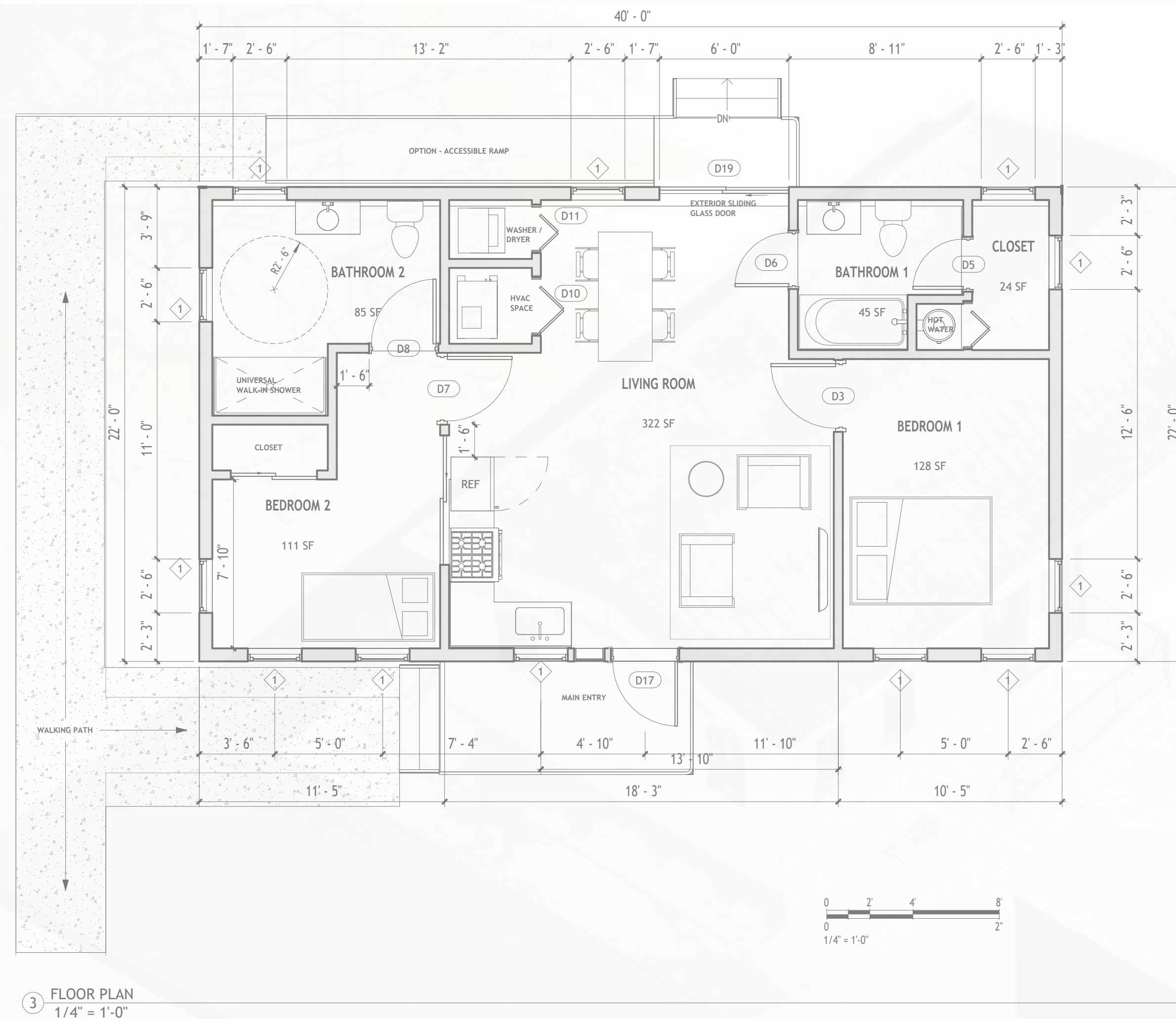
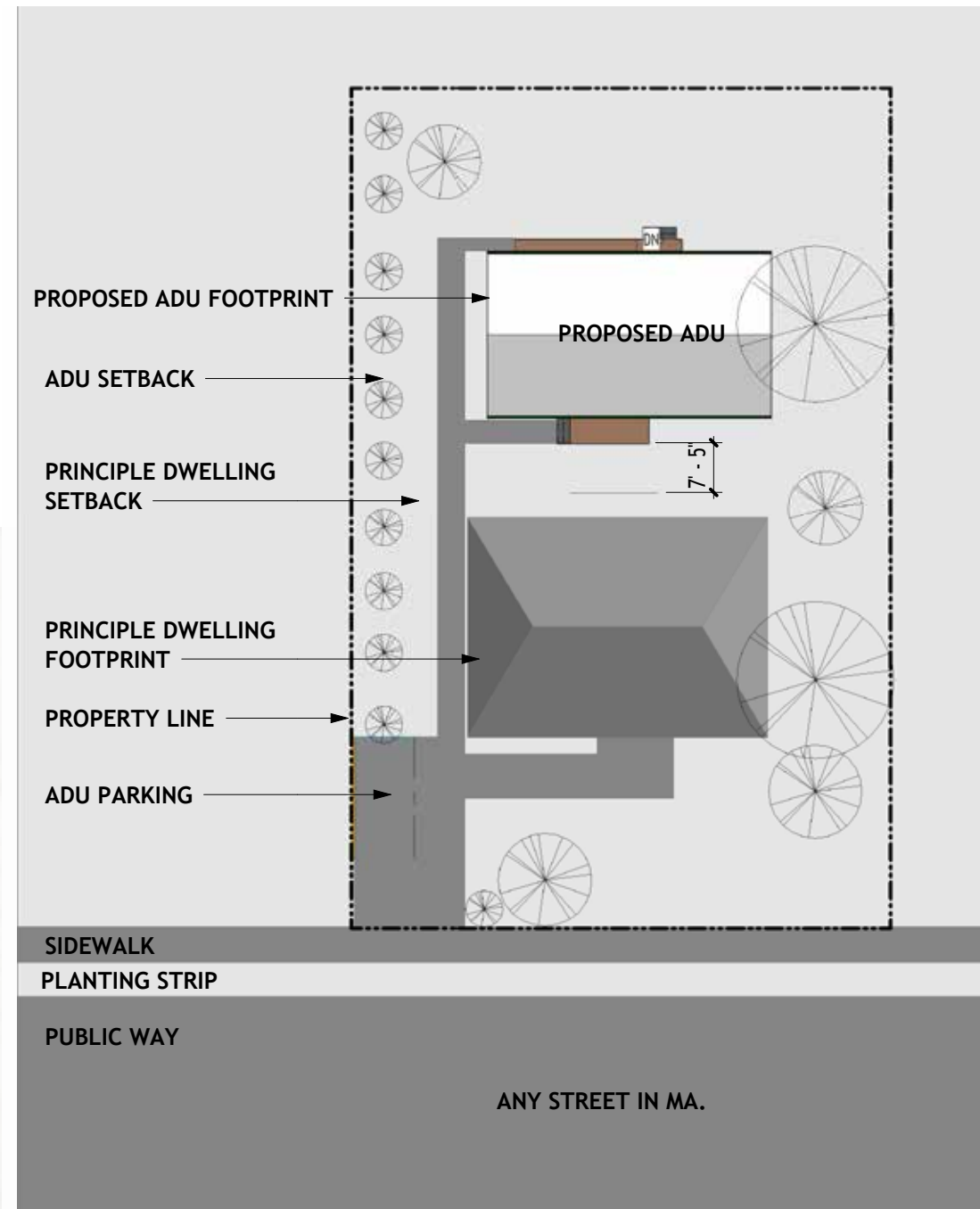
For the typical low-cost above-grade wall assembly, the design uses 2x6 studs at 16" o.c. with R-21 fiberglass batt cavity insulation and 1" continuous rigid insulation (min. R-5ci) over 7/16" OSB sheathing with WRB. Interior 1/2" GWB (latex paint) and exterior cladding complete the assembly; sheathing seams and penetrations are taped/sealed to maintain continuous air barrier and thermal continuity, achieving  $U \leq 0.045$ .

For fiber-cement cladding, the design specifies fiber-cement lap siding (or panels where indicated) installed per manufacturer requirements over continuous WRB with a drainage plane (rainscreen mat or furring where detailed). Corrosion-resistant fasteners are used; penetrations and openings are flashed; clearances to roofing, grade, and hard surfaces are maintained; and primer/finish coats are applied per manufacturer, with all flashings integrated shingle-style with the WRB to shed water.

For fenestration, Energy Star-qualified windows and exterior doors are specified with NFRC-rated overall U-factor  $\leq 0.30$ . Installation includes continuous flashing integrated with WRB, perimeter air-sealing at rough openings, and insulated frames/low-E glazing as required to maintain thermal and air barrier continuity.

Boston’s ADU context demands attention to privacy, neighbor relationships, and scale. The prototype supports strategic window placement and optional screening elements to maximize daylight while limiting direct sightlines. Roof forms are calibrated for Massachusetts snow and ice management, with drainage and durable transitions prioritized. Mechanical equipment locations are considered early to minimize noise, simplify service access, and reduce visual impact.

This submission advances the Challenge’s public-facing goals by offering a practical tool: a sustainable, equitable, buildable ADU prototype that reduces design and permitting friction and helps households add gentle density without sacrificing livability. By pairing compact design excellence with clear construction notes and verified energy targets, the prototype supports homeowners, contractors, and communities in delivering ADUs that are efficient, durable, and adaptable for decades.



3 FLOOR PLAN  
1/4" = 1'-0"

# NEIGHBORHOOD-SCALED ADU: A BUILDABLE PROTOTYPE

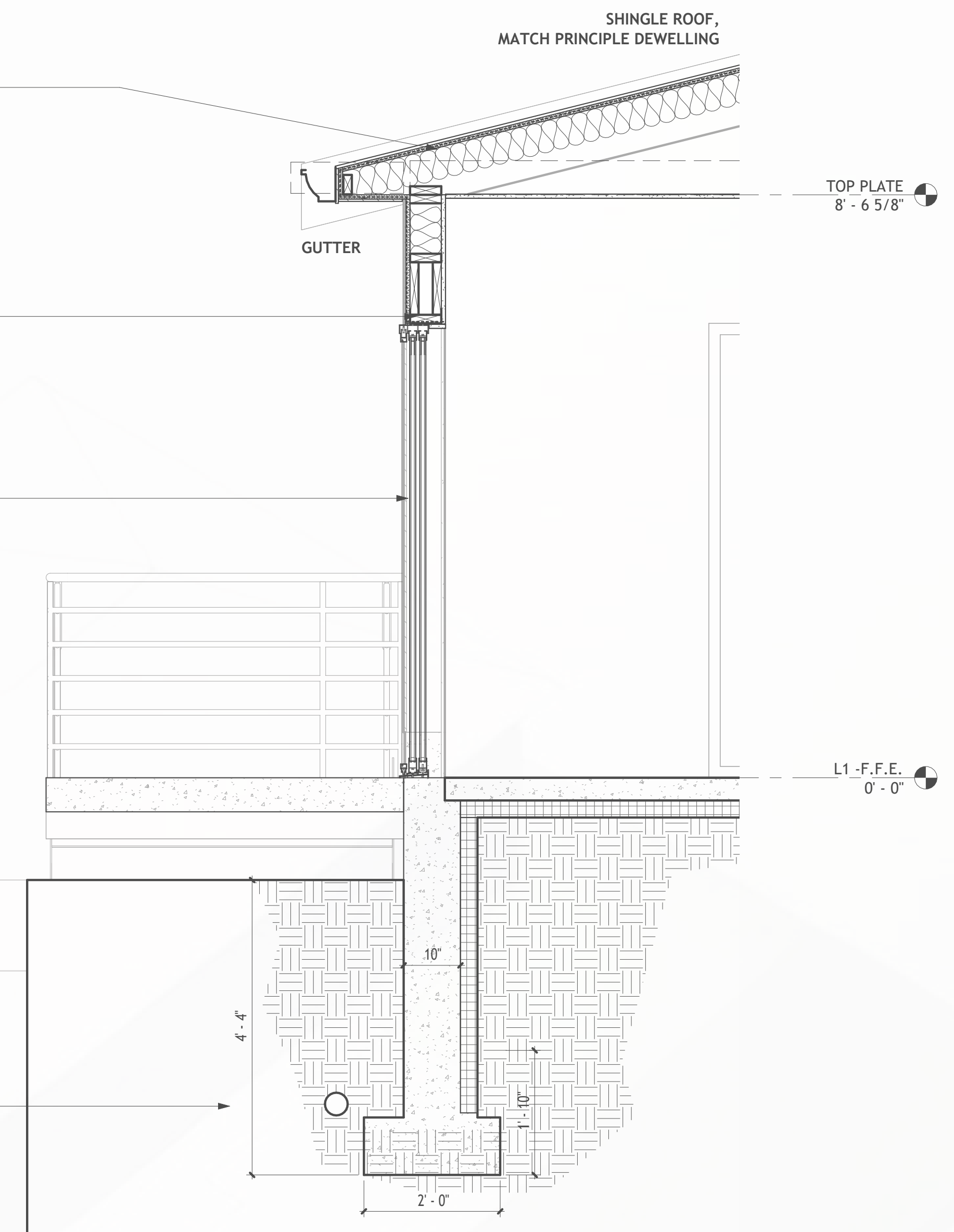


ROOF/CEILING FRAMING NOTE (2X10): PROVIDE 2X10 WOOD ROOF/CEILING FRAMING (RAFTERS OR JOISTS AS INDICATED) @ SPACING PER STRUCTURAL; PROVIDE SHEATHING (MIN. 1/2" CDX OR 7/16" OSB) WITH UNDERLAYMENT AND ROOFING AS SPECIFIED; WHERE CEILING INSULATION IS AT ROOF/CEILING PLANE, PROVIDE INSULATION TO REQUIRED R-VALUE AND MAINTAIN CONTINUOUS AIR BARRIER, INCLUDING AIR-SEALING AT ALL PENETRATIONS AND TOP PLATES; PROVIDE VENTILATION BAFFLES AT EAVES AND CONTINUOUS SOFFIT/RIDGE VENTING WHERE ROOF IS VENTED.

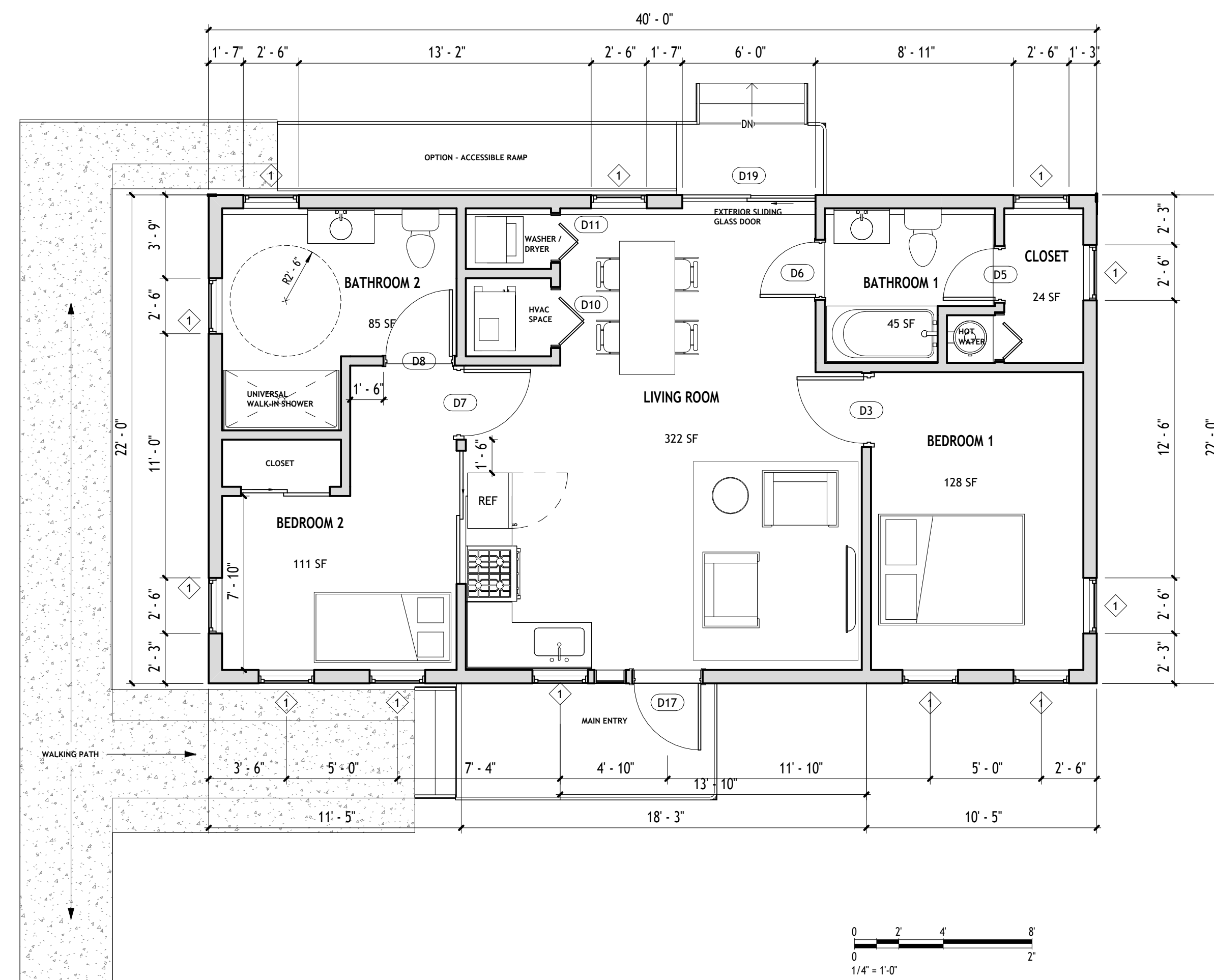
TYPICAL LOW-COST ABOVE-GRADE WOOD WALL ASSEMBLY NOTE: 2X6 STUD WALL @ 16" O.C. WITH R-21 FIBERGLASS BATT CAVITY INSULATION AND 1" CONTINUOUS RIGID INSULATION BOARD (MIN. R-5 ci) OVER 7/16" OSB SHEATHING WITH WRB; PROVIDE INTERIOR 1/2" GWB (LATEX PAINT) AND EXTERIOR CLADDING AS SCHEDULED; TAPE/SEAL SHEATHING AND ALL PENETRATIONS TO MAINTAIN CONTINUOUS AIR BARRIER AND THERMAL CONTINUITY; ASSEMBLY TO MEET  $U \leq 0.045$ .

GLASS SLIDING DOOR: PROVIDE ENERGY STAR-QUALIFIED WINDOWS AND EXTERIOR DOORS WITH OVERALL ASSEMBLY U-FACTOR  $\leq 0.30$  (NFRC-RATED); INSTALL PER MANUFACTURER WITH CONTINUOUS FLASHING/WRB INTEGRATION, AIR-SEAL PERIMETERS AT ROUGH OPENINGS, AND PROVIDE INSULATED FRAMES/LOW-E GLAZING AS REQUIRED TO MAINTAIN THERMAL AND AIR BARRIER CONTINUITY.

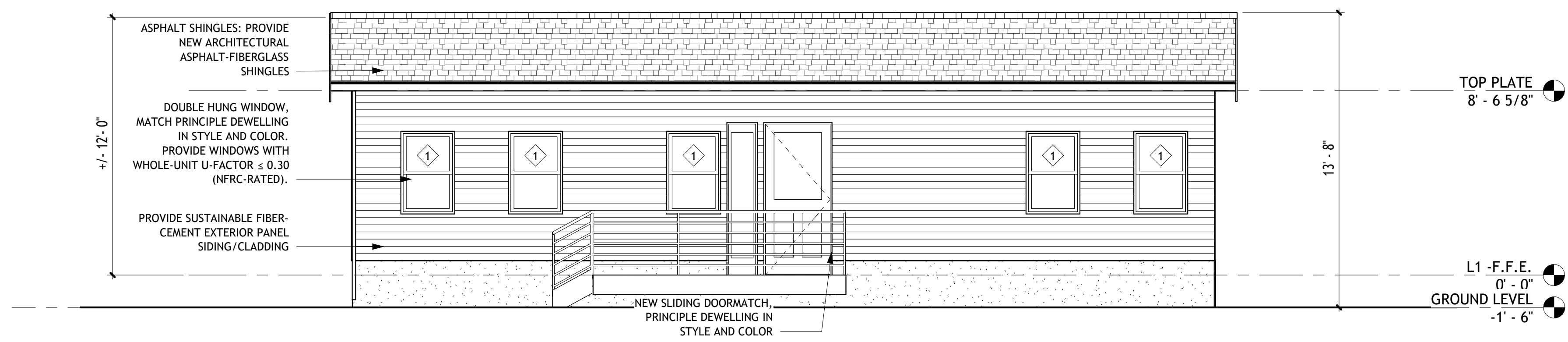
FOUNDATION: PROVIDE CAST-IN-PLACE CONCRETE CONTINUOUS FOOTINGS AND FOUNDATION WALLS WITH CRAWL SPACE AND/OR SLAB-ON-GRADE AS INDICATED; MINIMUM CONCRETE STRENGTH  $f'c = 2,500$  PSI (INTERIOR FOOTINGS/WALLS/SLABS NOT EXPOSED), 3,000 PSI AIR-ENTRAINED (CONCRETE EXPOSED TO WEATHER), AND 3,500 PSI AIR-ENTRAINED (EXTERIOR FLATWORK/AREAS SUBJECT TO DEICING); PROVIDE 4" MIN. GRANULAR BASE AND VAPOR RETARDER UNDER SLABS, DAMPPROOF/WATERPROOF FOUNDATION WALLS AS REQUIRED, SLOPE FINISH GRADE AWAY FROM FOUNDATION, AND INSULATE CRAWL SPACE WALLS TO R-19 OR R-13+R-5ci OR R-15ci ( $U \leq 0.055$ ).



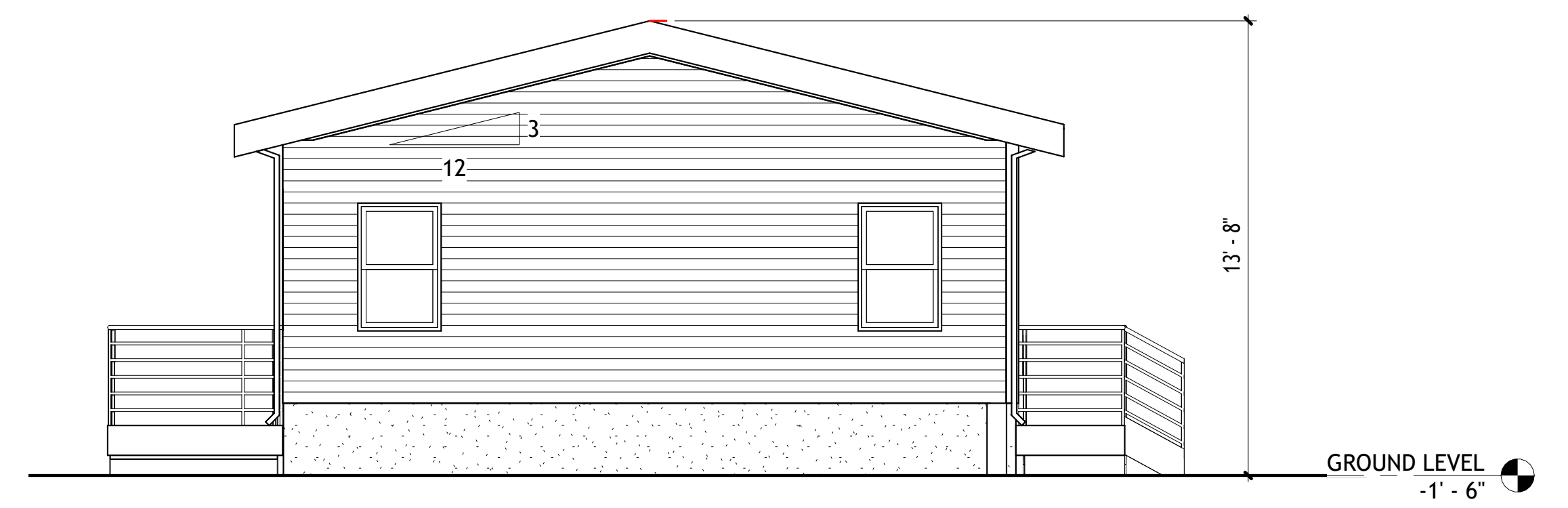
1 WALL SECTION AT DOOR  
3/4" = 1'-0"



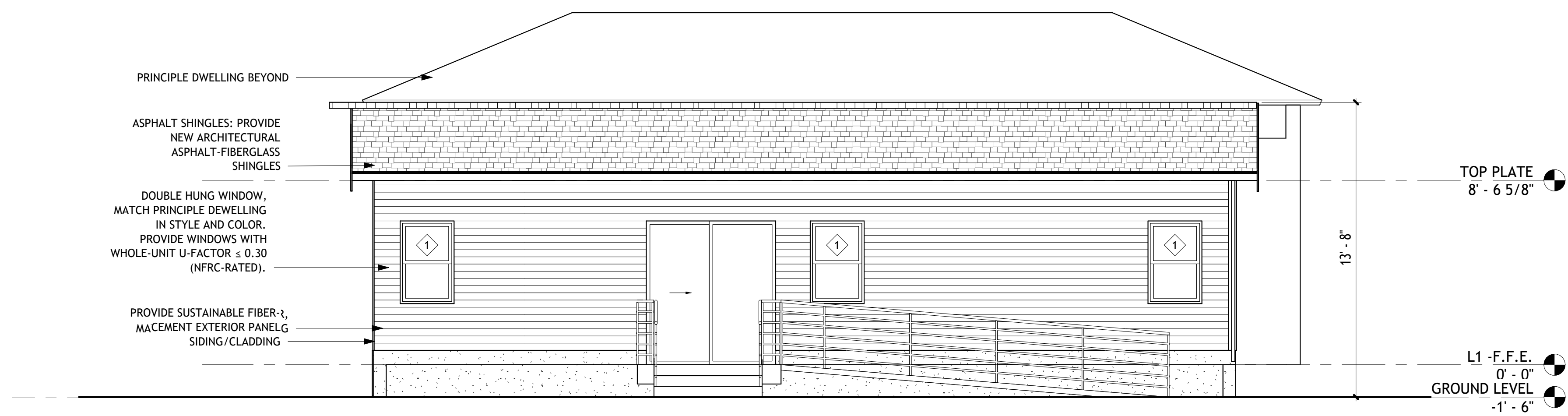




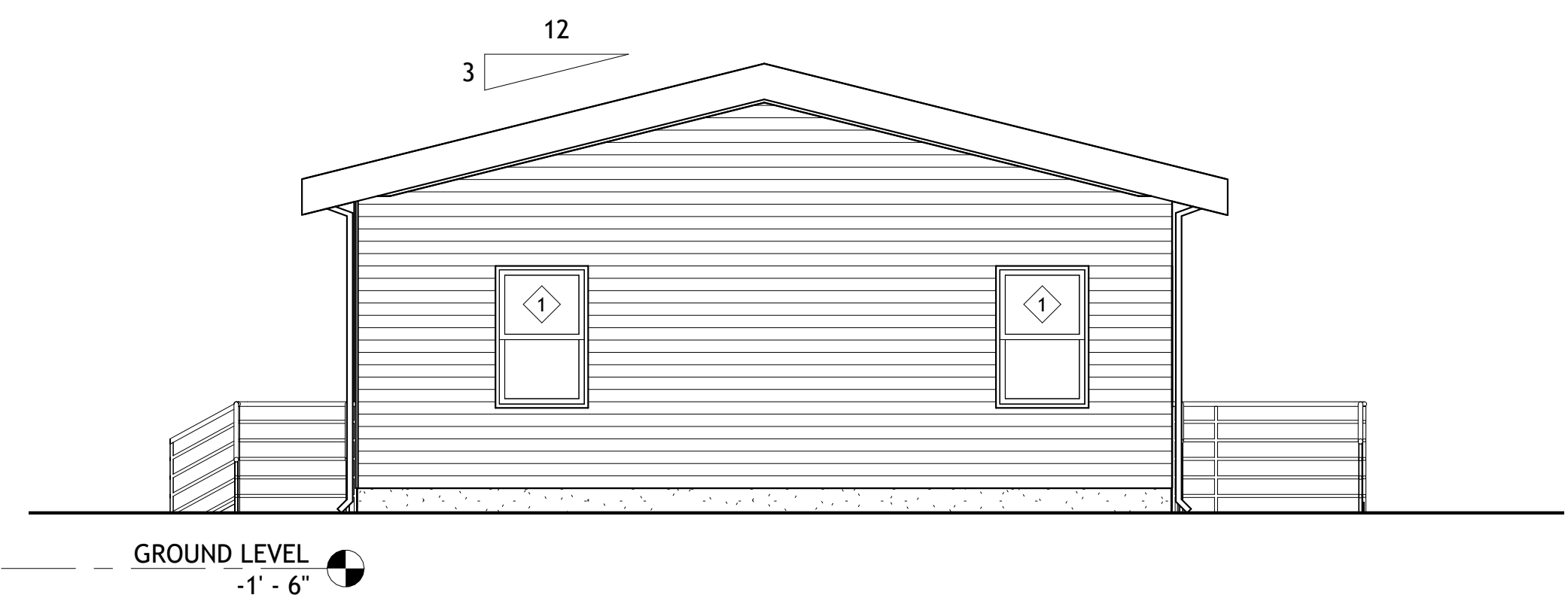
① FRONT ELEVATION  
1/4" = 1'-0"



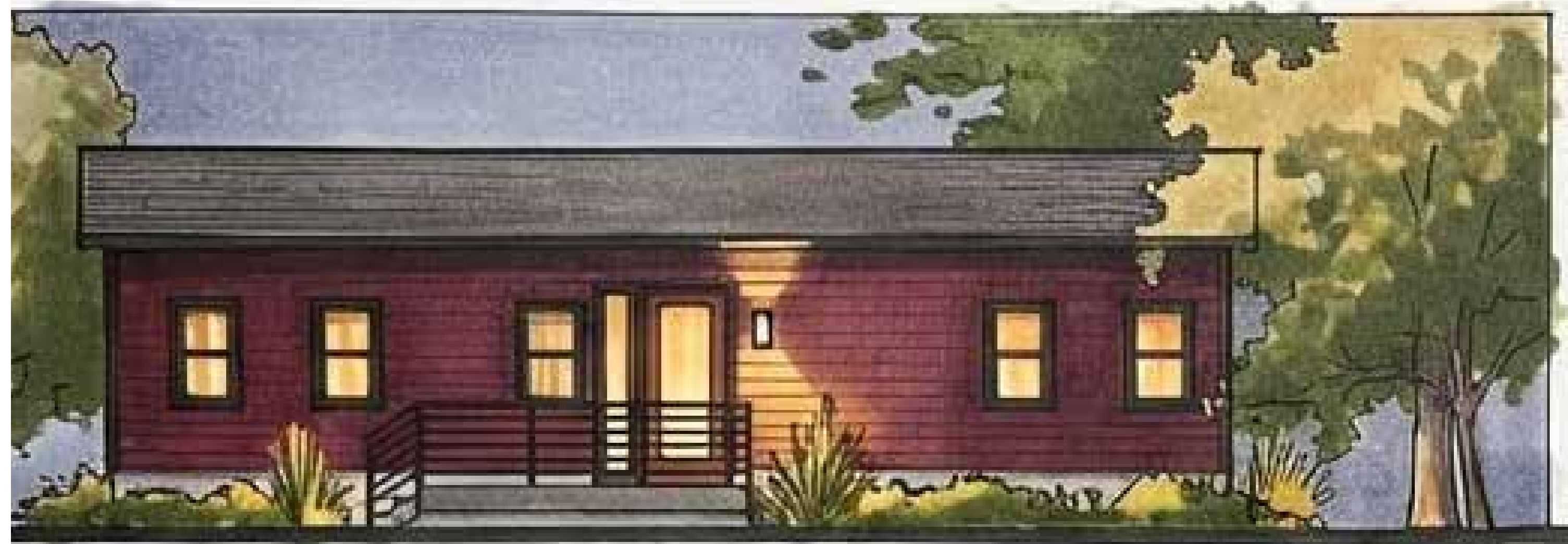
② LEFT SIDE ELEVATION  
1/4" = 1'-0"



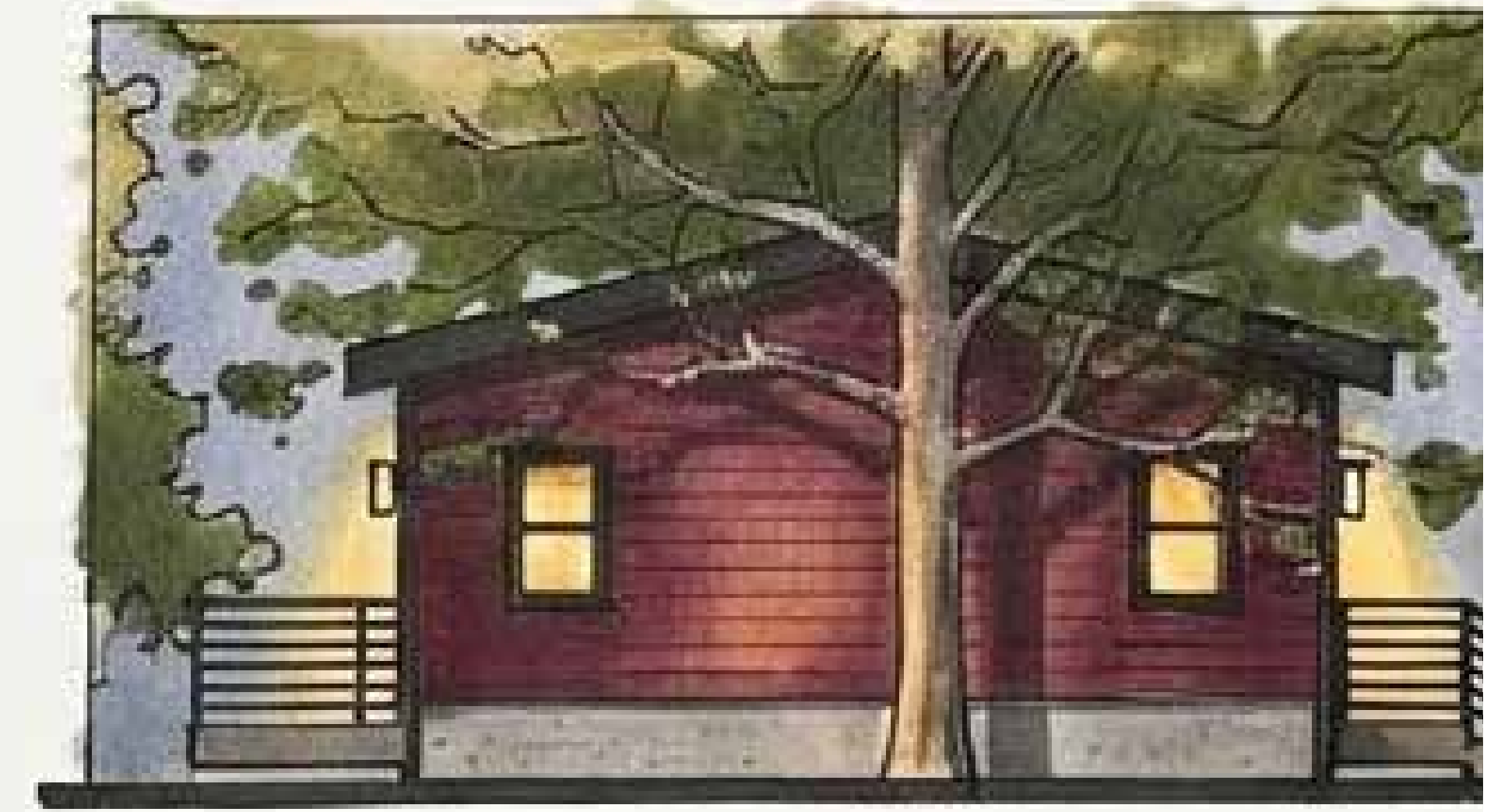
④ REAR ELEVATION  
1/4" = 1'-0"



③ RIGHT SIDE BUILDING ELEVATION  
1/4" = 1'-0"



ATION



LEFT SIDE ELEVATION  
1/4" x 1-2"



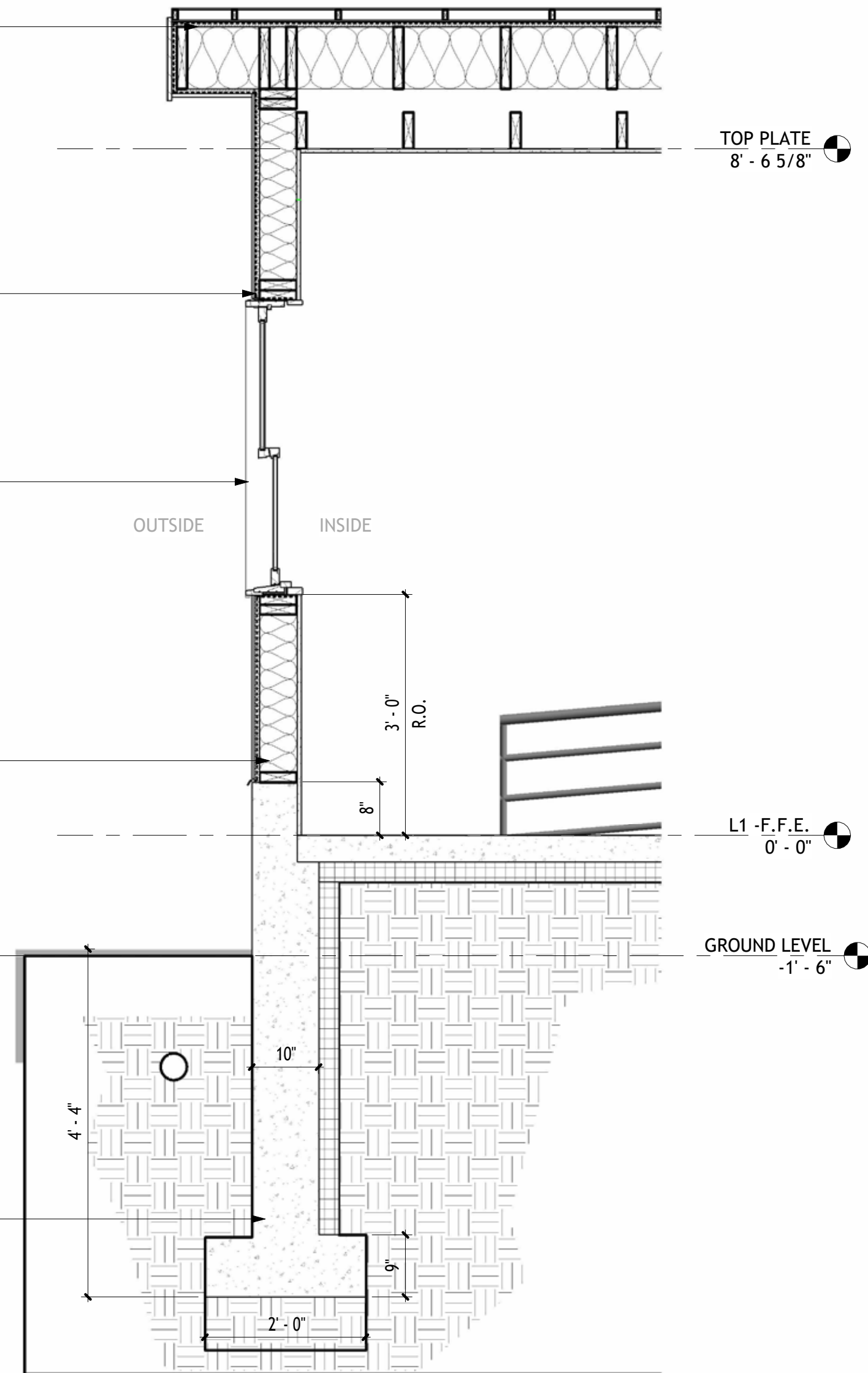
CEILING / ATTIC INSULATION NOTE (VENTED ATTIC - BATT OPTION): PROVIDE PREFAB WOOD ROOF TRUSSES WITH CONTINUOUS CEILING AIR BARRIER AT GWB; AIR-SEAL ALL TOP-PLATE JOINTS, PENETRATIONS, RECESSED FIXTURES (IC/AT), AND ATTIC ACCESS; INSTALL VENT BAFFLES AT EAVES TO MAINTAIN CLEAR SOFFIT-TO-RIDGE VENTILATION PATH; PROVIDE R-49 MIN. INSULATION USING UNFACED FIBERGLASS BATTS (E.G., TWO LAYERS—R-30 + R-19—WITH SECOND LAYER PERPENDICULAR TO FIRST TO REDUCE THERMAL BRIDGING) OR APPROVED EQUIVALENT TO ACHIEVE  $U \leq 0.026$ ; PROVIDE CONTINUOUS SOFFIT AND RIDGE VENTS (NET FREE AREA PER CODE) AND INSULATED/WEATHERSTRIPPED ATTIC HATCH.

FIBER-CEMENT SIDING CLADDING NOTE: PROVIDE FIBER-CEMENT LAP SIDING (OR PANELS WHERE INDICATED) INSTALLED PER MANUFACTURER REQUIREMENTS OVER CONTINUOUS WRB ON SHEATHING WITH A DRAINAGE PLANE (RAINSCREEN MAT OR FURRING STRIPS WHERE DETAILED); PROVIDE CORROSION-RESISTANT FASTENERS, FLASH ALL PENETRATIONS AND OPENINGS, MAINTAIN REQUIRED CLEARANCES TO ROOFING/GRADES/HARD SURFACES, AND PRIME/FINISH-COAT PER MANUFACTURER; INTEGRATE ALL FLASHINGS WITH WRB TO SHED WATER TO EXTERIOR.

FENESTRATION NOTE: PROVIDE ENERGY STAR-QUALIFIED WINDOWS AND EXTERIOR DOORS WITH OVERALL ASSEMBLY U-FACTOR  $\leq 0.30$  (NFRC-RATED); INSTALL PER MANUFACTURER WITH CONTINUOUS FLASHING/WRB INTEGRATION, AIR-SEAL PERIMETERS AT ROUGH OPENINGS, AND PROVIDE INSULATED FRAMES/LOW-E GLAZING AS REQUIRED TO MAINTAIN THERMAL AND AIR BARRIER CONTINUITY.

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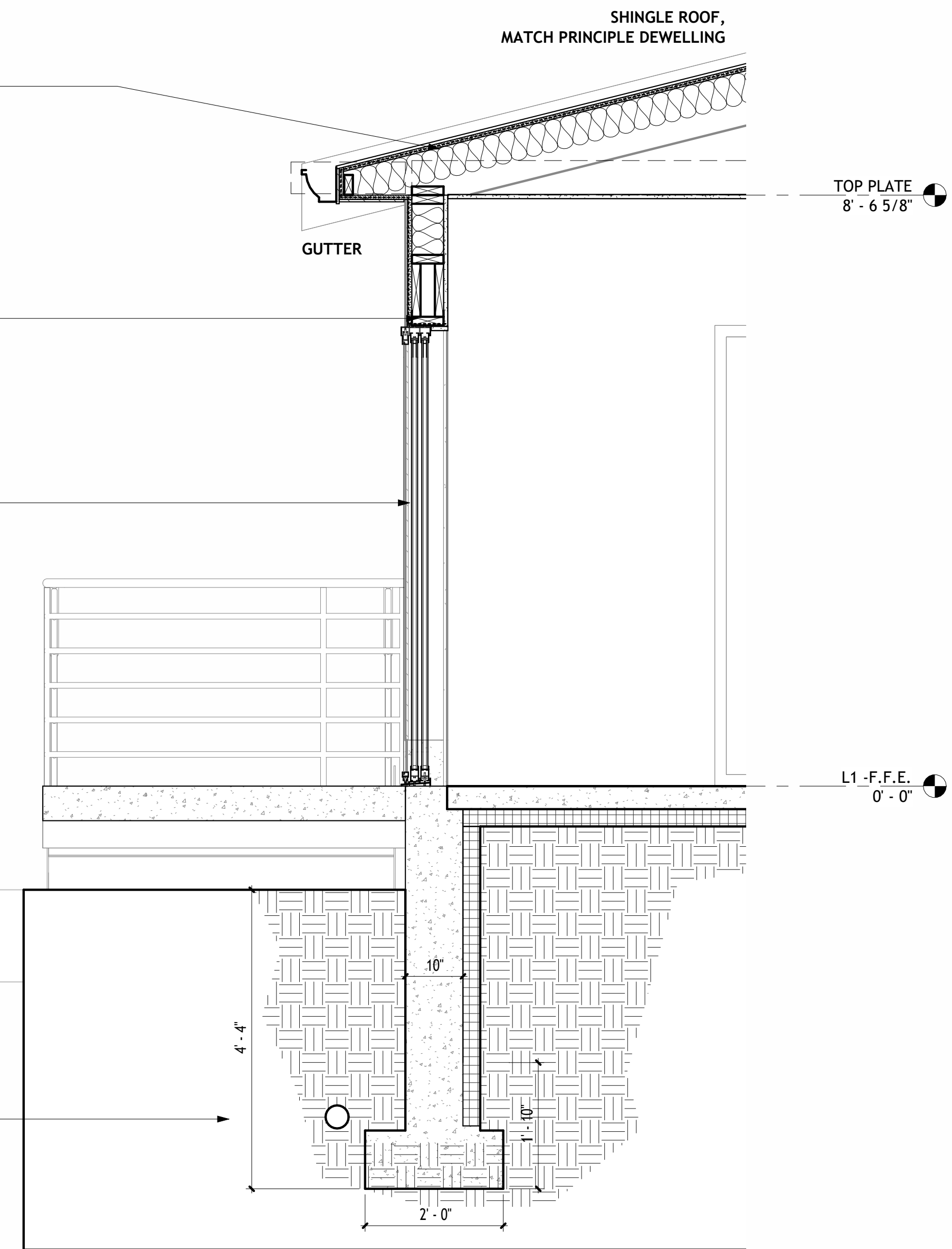
2 WALL SECTION AT WINDOW  
3/4" = 1'-0"

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1 WALL SECTION AT DOOR  
3/4" = 1'-0"







































