TECTONIC EXTREMES OF PASSIVE HOUSE DESIGN

RYALL SHERIDAN ARCHITECTS

PASSIVE HOUSE PRINCIPLES

1. SOLAR ORIENTATION
-Detailed local weather & solar data used to evaluate orientation, shading & window placement to take advantage of solar gains in the winter & minimize them in the summer

2. CONTINUOUS HIGH R-VALUE INSULATION & ELIMINATE THERMAL BRIDGING
-Min. R40 to R50 walls & ceilings (2015 IECC calls for R20, R30)
-Reduce Heat Loss (winter)
-Reduce Heat Gain (summer)
-Comfortable interior surface temps
-Avoid penetration of insulation with conductive materials to reduce heat loss & prevent damage from condensation/mold

3. AIRTIGHTNESS
-Continuous air barrier via smart membranes
-Max .6 air changes per hour @ 50 pa (2015 IECC calls for 3ach)
-Reduce possibility of moisture damage to structure
-Reduce heat loss (winter) & reduce humidity (summer)
-Enhanced performance of insulation layer
-Eliminate drafts

4. HIGH PERFORMANCE WINDOWS
-R7-R8 triple pane thermally broken window assemblies oriented properly add more energy to home than they lose
-Triple gasketing prevents air leaks
-Eliminate need for perimeter heat
-Comfortable interior surface temps & no drafts

5. BALANCED VENTILATION W/ HEAT RECOVERY VENTILATION (HRV/ERV)
-Clean, filtered air continously supplied to sleeping and living areas, exhuasted from kitchens & bathrooms
-Heat and moisture (with ERV) is transfered between stale inside air and fresh outdoor air in winter and sumer w/ minimum 75% efficiency

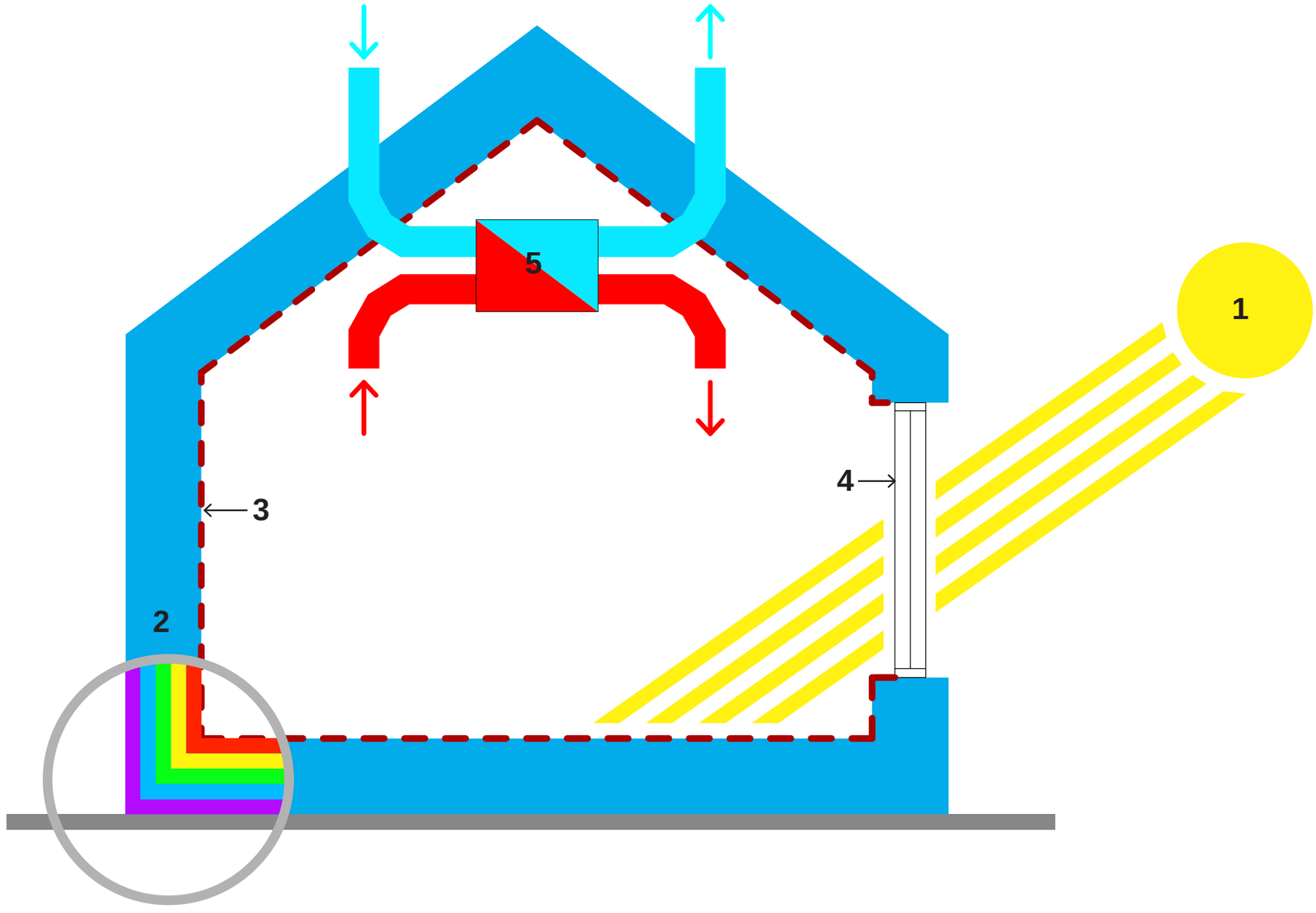

Diagram Source: http://www.passivehouseacademy.com/

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City of Long Branch
Monmouth County, New Jersey
Revised November 14th, 2017

PASSIVE HOUSE EXPLAINED

No Scale

S1

Thermal Transmittance (U-value)

What does this mean?

$$BTU/(hr \cdot ft^2 \cdot F)$$

One BTU ≈ one burned match

How many **BTUs** move .....

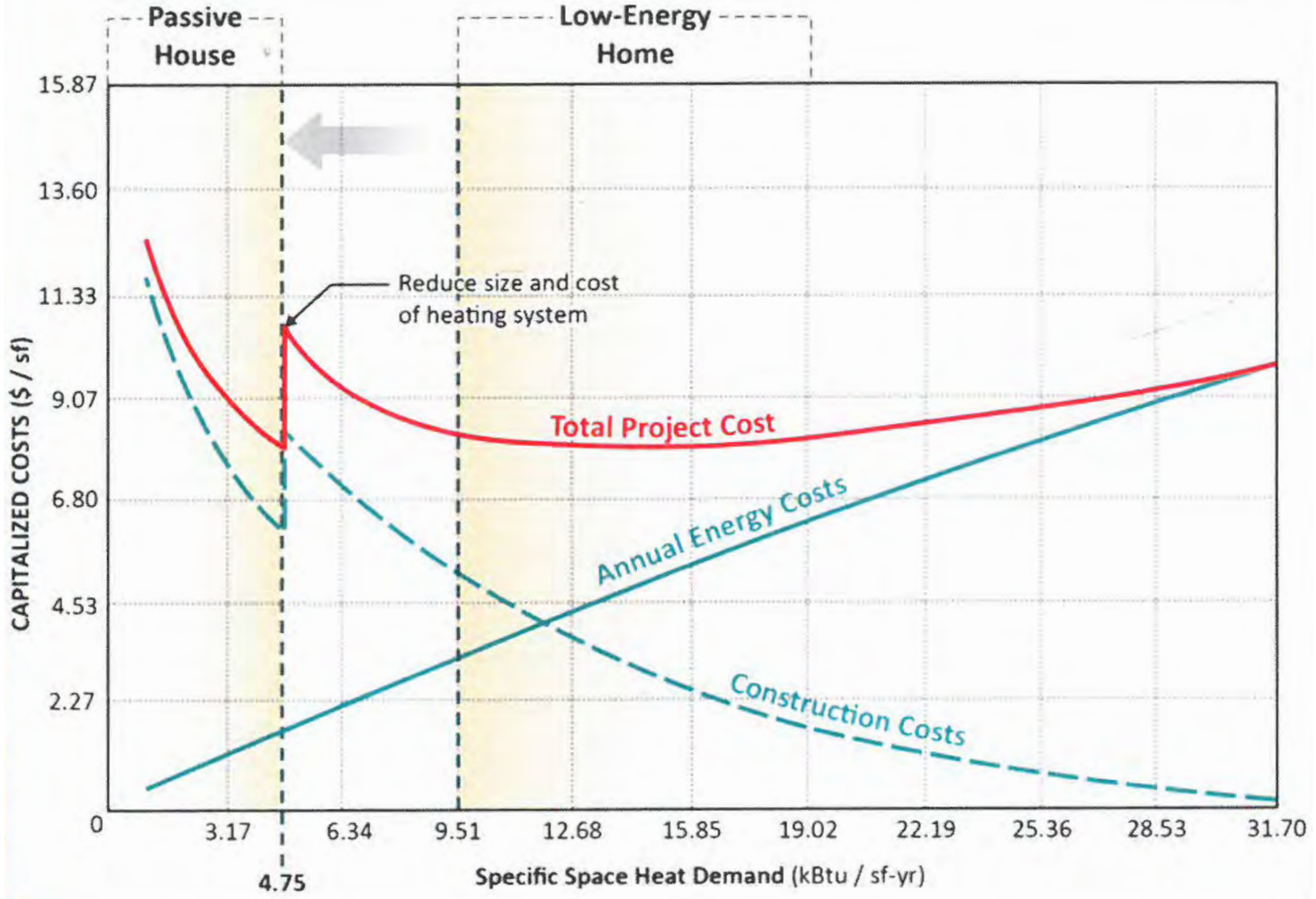
.... in one **hour** ....

.... for one **square foot** of surface area ....

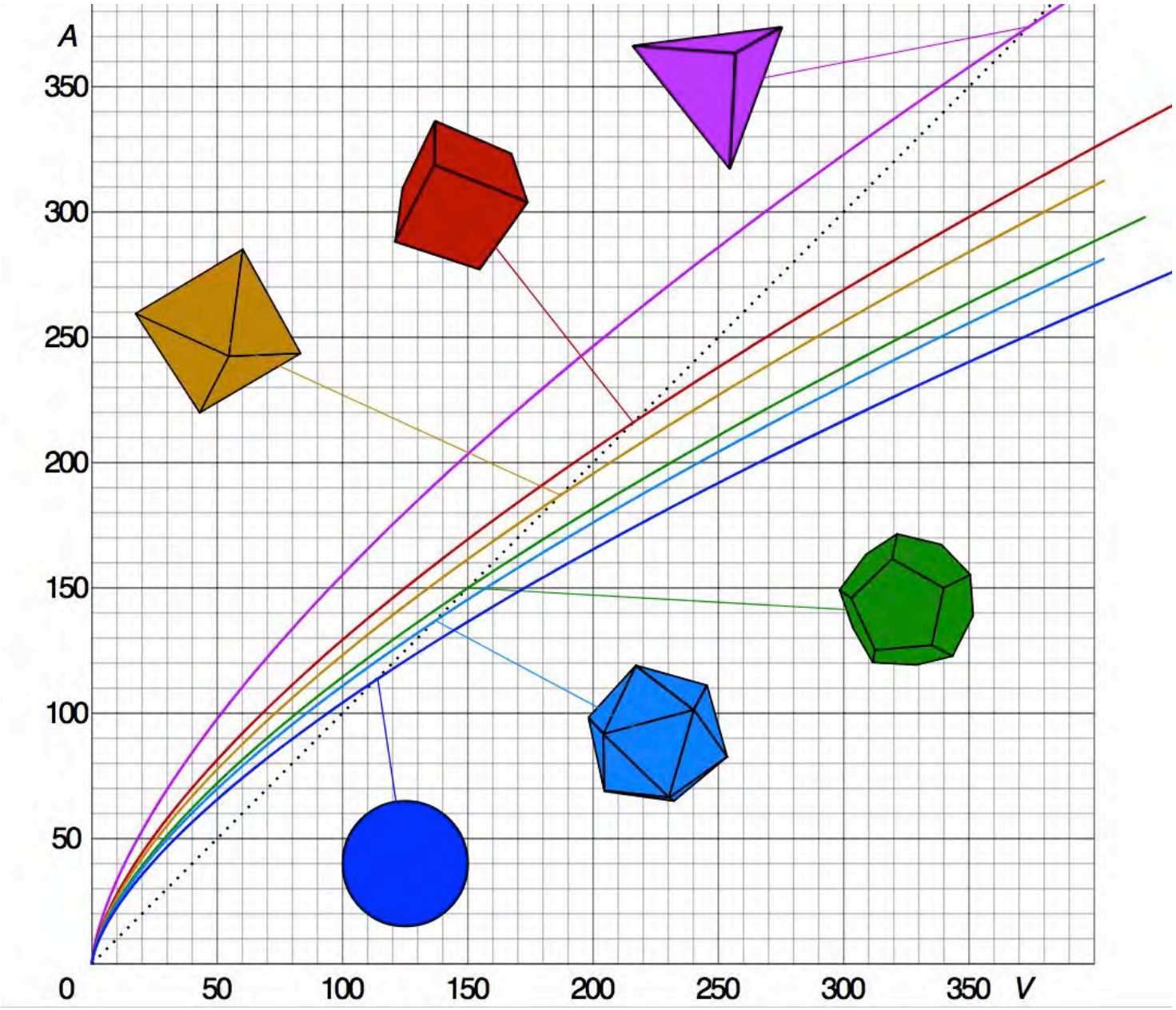
.... for every **degree** of temp. difference between faces.

The **U-Value** is also called the HEAT TRANSFER COEFFICIENT or CONDUCTANCE of the **whole assembly** (not an individual layer!)

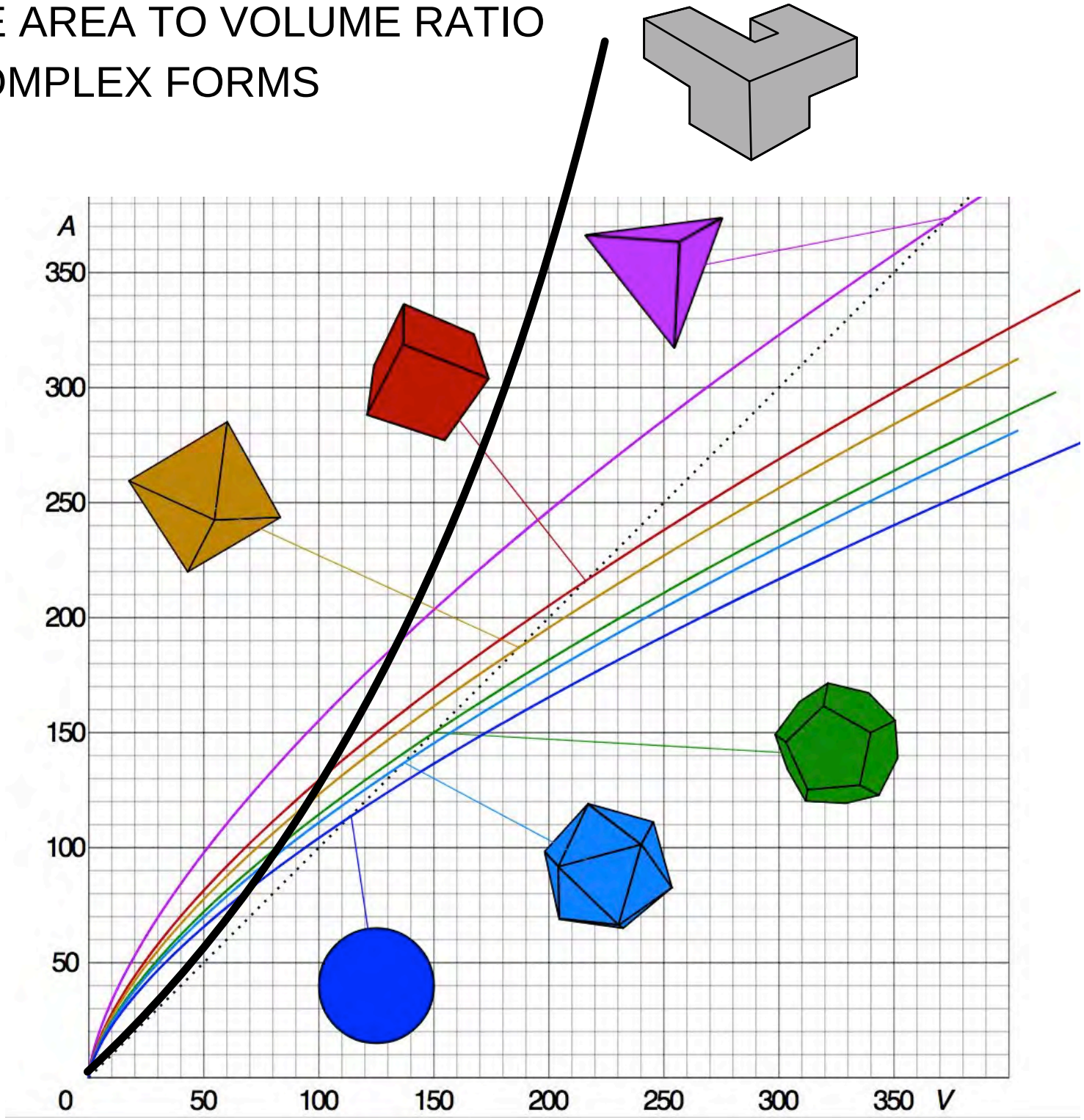
Why < 4.75 kBtu/ft²·yr Heating & Cooling Demand?

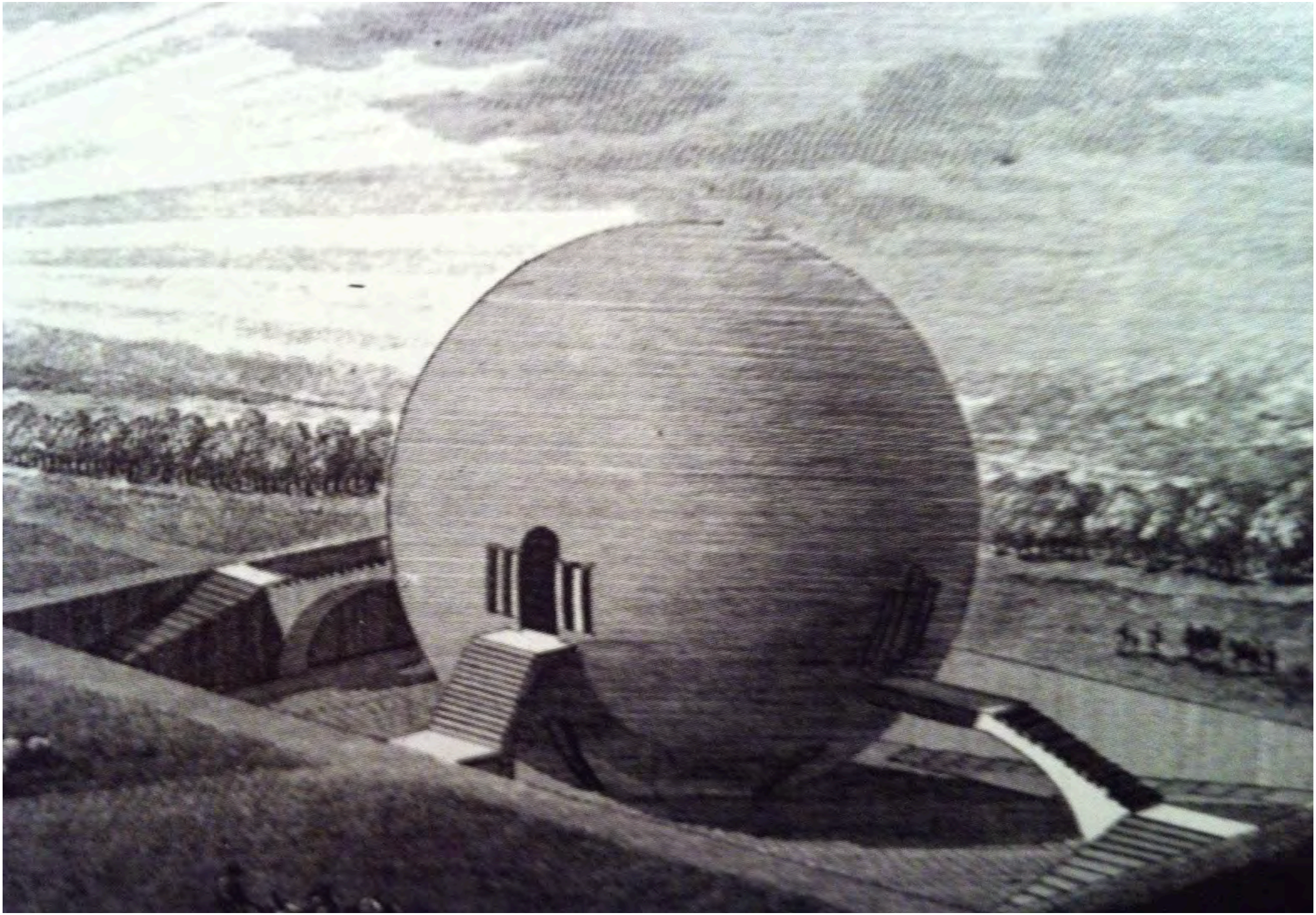


SURFACE AREA TO VOLUME RATIO
PLATONIC SOLIDS



SURFACE AREA TO VOLUME RATIO
MORE COMPLEX FORMS

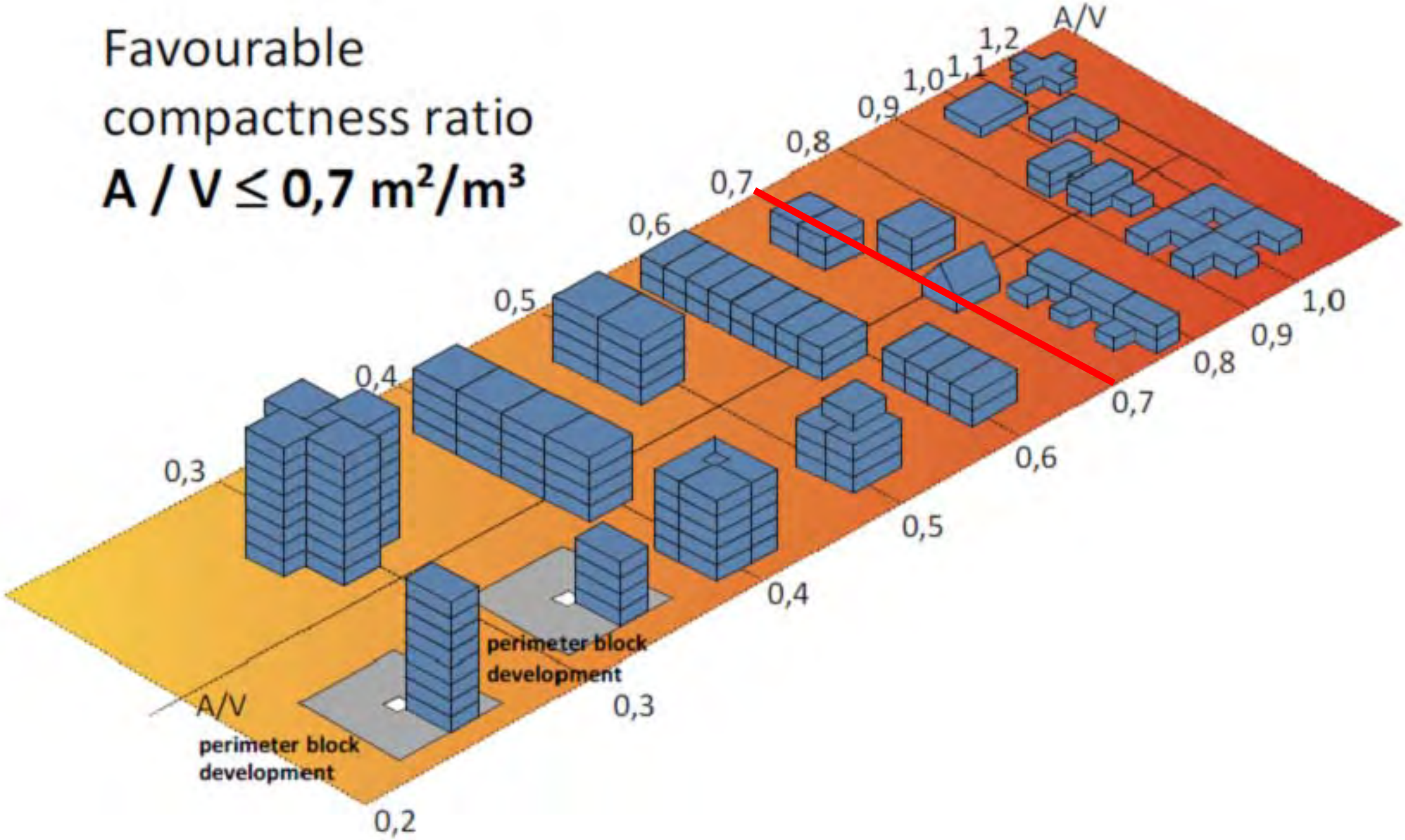




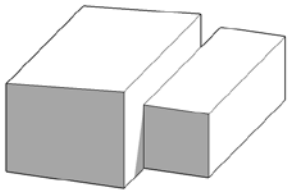
CLAUDE-NICOLAS LEDOUX
GARDENER HOUSE PROJECT FOR THE IDEAL CITY OF CHAUX, 1784

Favourable compactness ratio

A / V ≤ 0,7 m²/m³



ARTIST'S STUDIO
ORIENT, NY



R VALUES

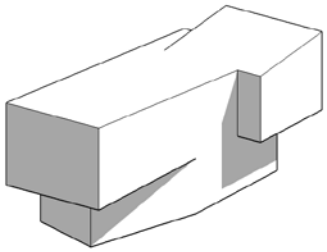
Wall	49
Roof	76
Floor	56

A = 1,080 ft²
(plan area)

V = 15,175 ft³
(volume)

SA = 4,320 ft²
(exterior surface area)

GUEST HOUSE
SHELTER ISLAND, NY



R VALUES

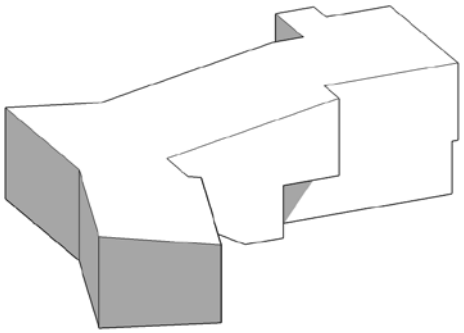
Wall	38
Roof	62
Floor	62

A = 1,750 ft²
(plan area)

V = 19,875 ft³
(volume)

SA = 5,180 ft²
(exterior surface area)

WETLANDS HOUSE
ORIENT, NY



R VALUES

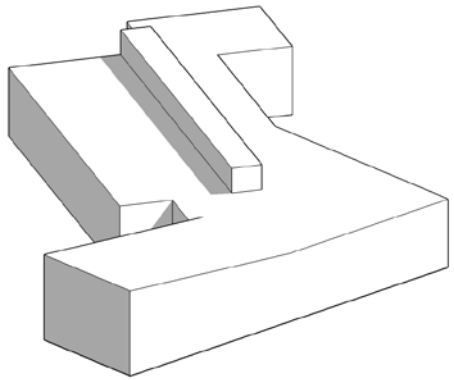
Wall	46
Roof	57
Floor	74/42

A = 3,360 ft²
(plan area)

V = 41,040 ft³
(volume)

SA = 10,440 ft²
(exterior surface area)

ARTISTS RESIDENCE
GUILFORD, VT



R VALUES

Wall	52
Roof	145
Floor	40

A = 4,000 ft²
(plan area)

V = 64,660 ft³
(volume)

SA = 14,350 ft²
(exterior surface area)


N

ARTIST'S RESIDENCE
GUILFORD, VT

R VALUES

Wall	52
Roof	145
Floor	40

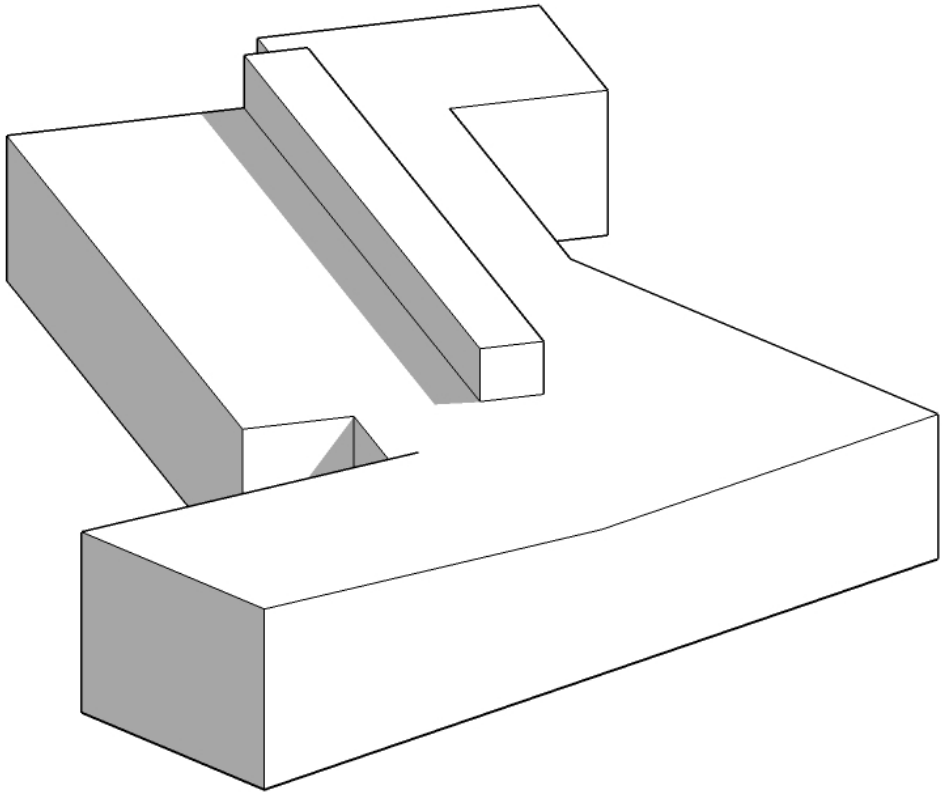
A = 4,000 ft²
(plan area)

V = 64,660 ft³
(volume)

SA = 14,350 ft²
(exterior surface area)

SA/V = .22
(compactness ratio)

CUBE = .15
(comparable area)



GUILFORD - BRATTLEBORO // VERMONT

ARTS CAMPUS // SITE MAP

VPL / GUILFORD SOUND ARTS CAMPUS // ENERGY SYSTEM SCHEMATIC

10.5 cords X +/- 20 trees = 1300 cubic feet

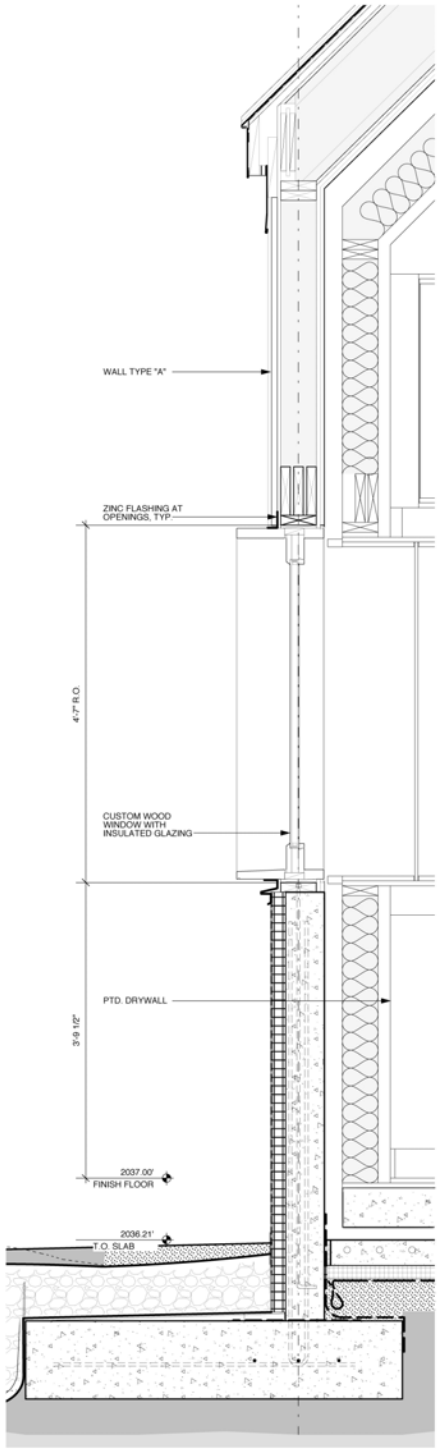
LEGEND

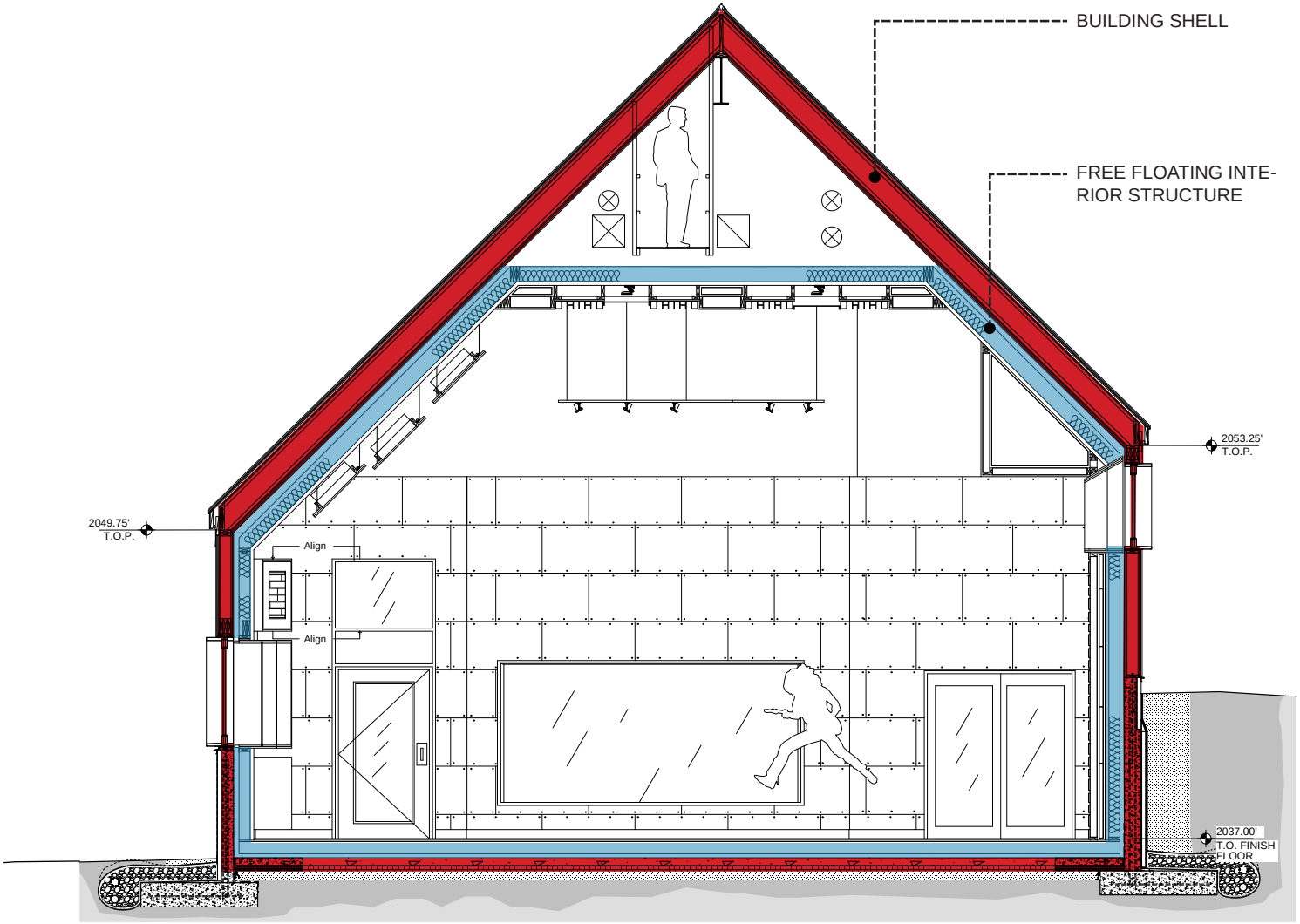
= ROVANCO RHINOFLEX 1.5" INSULATED PEX 4.45" SHELL

HX = HEAT EXCHANGER

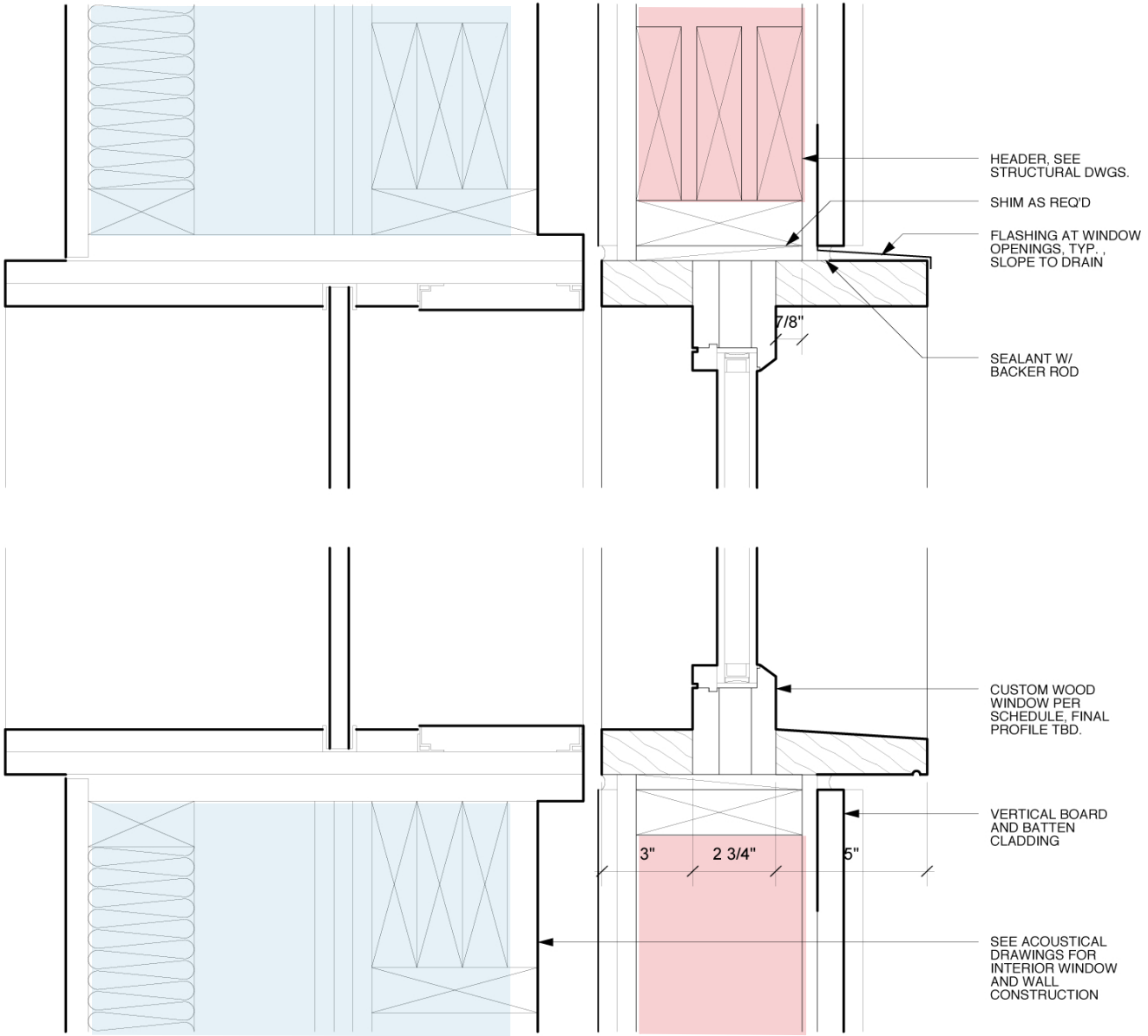
MB = MUNCHKIN BOILER

BUILDING SECTION // SOUND STUDIO

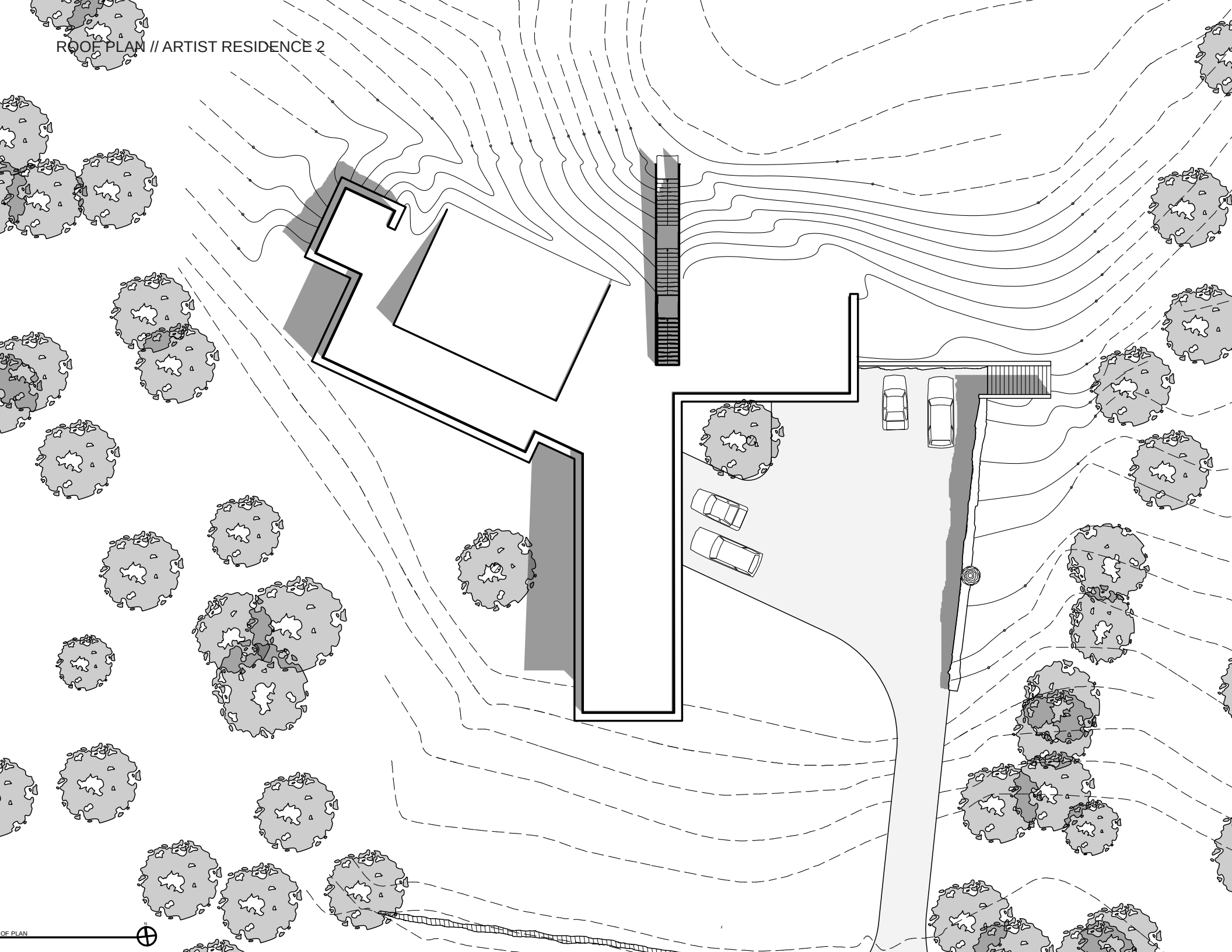




WINDOW DETAIL // SOUND STUDIO

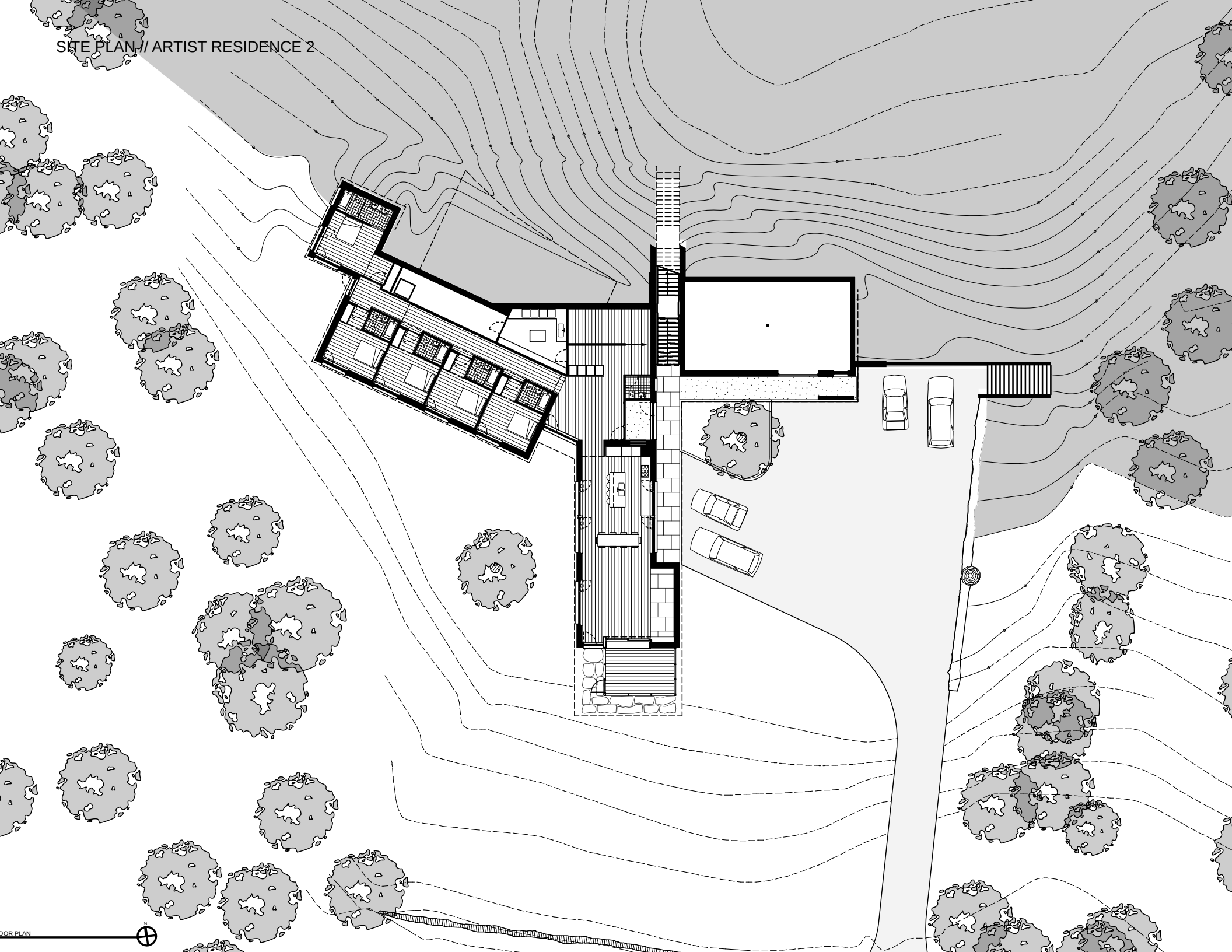


ROOF PLAN // ARTIST RESIDENCE 2

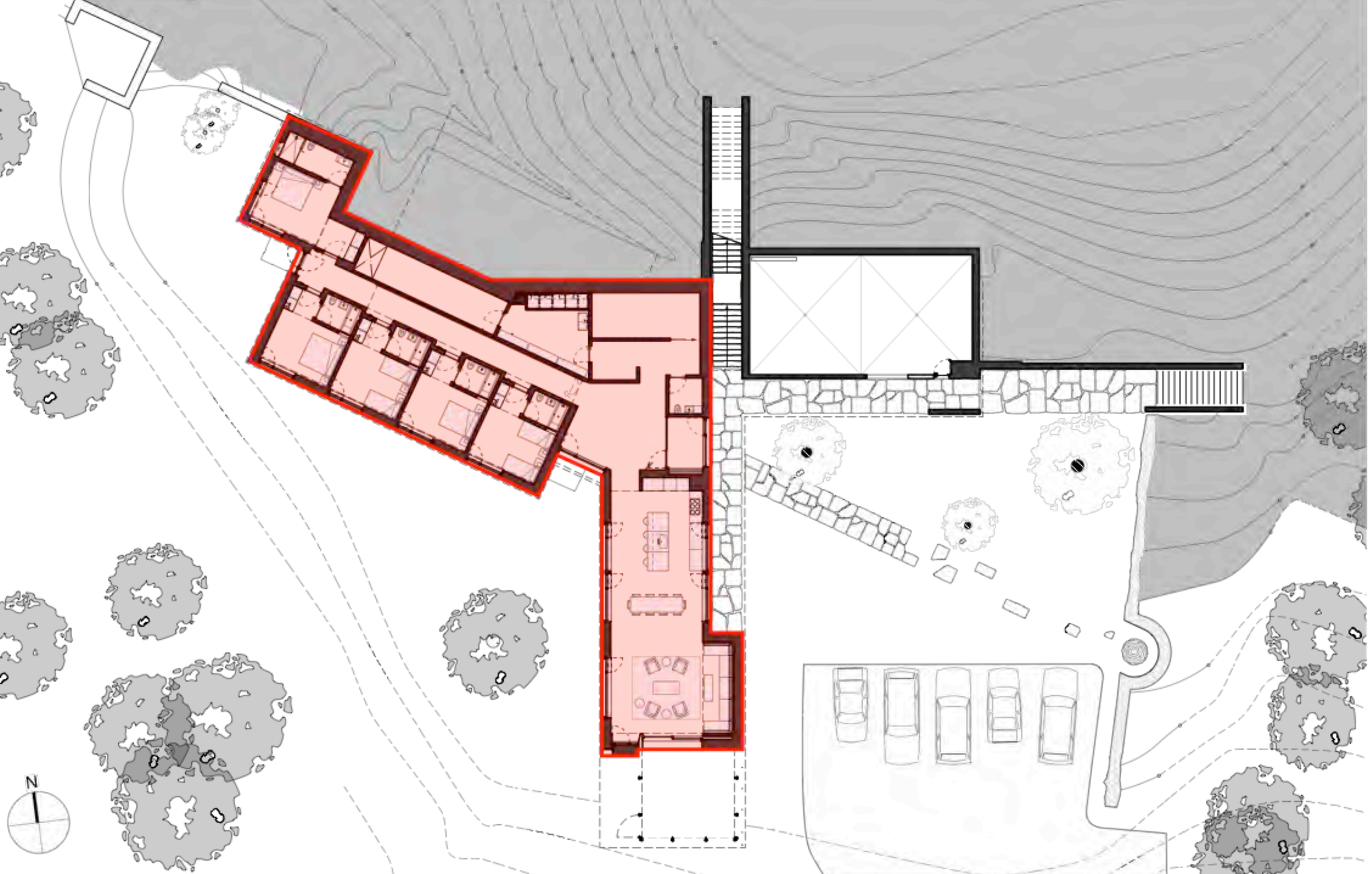


OF PLAN

SITE PLAN // ARTIST RESIDENCE 2

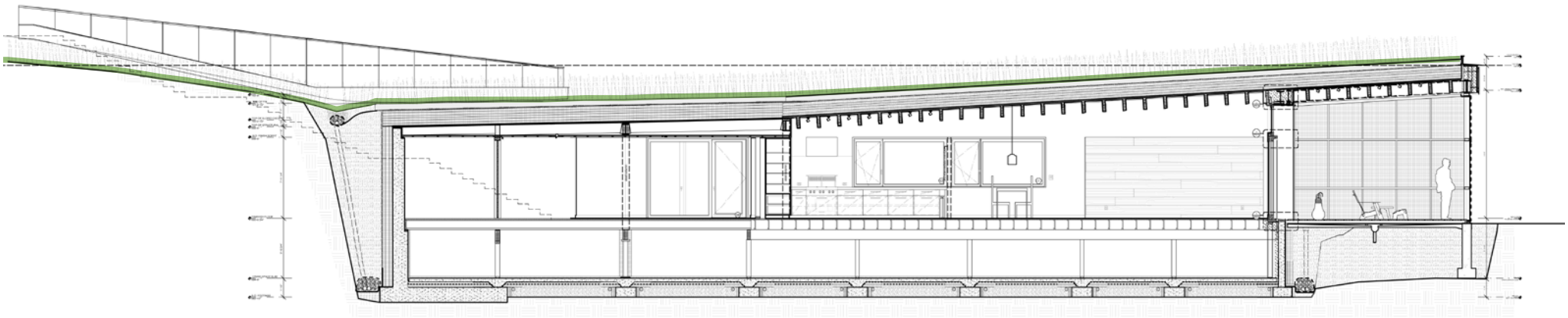


OOR PLAN

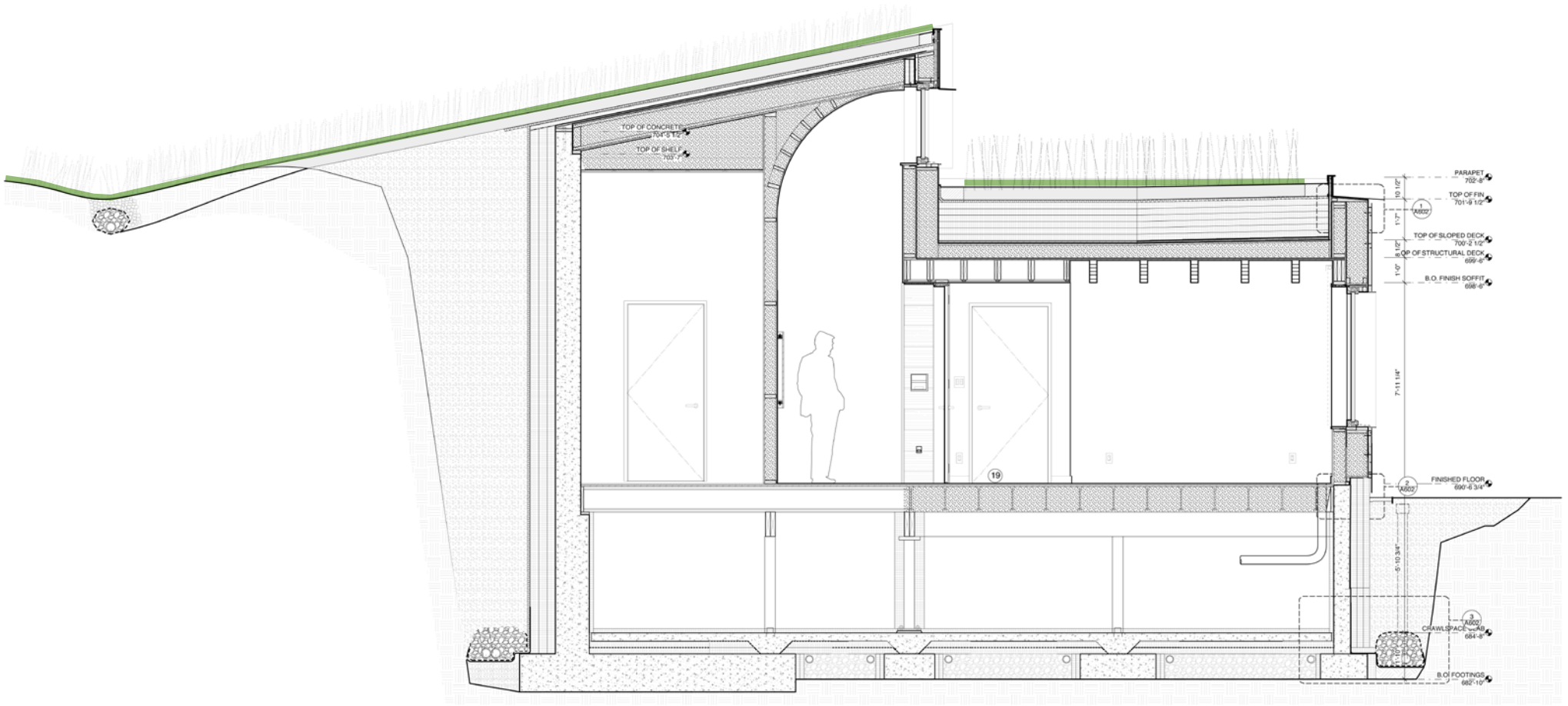

N

ARTIST RESIDENCE 2

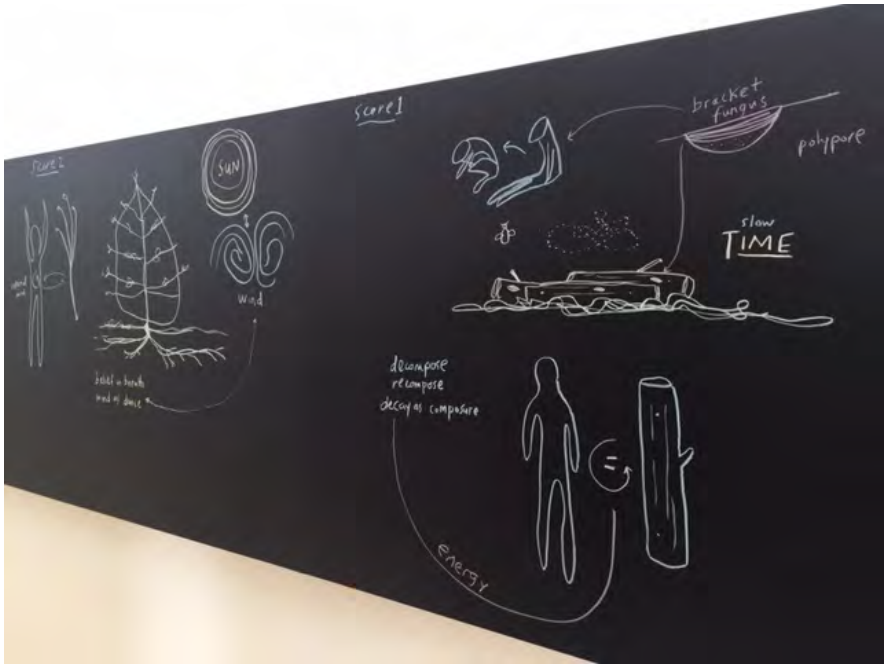
LONGITUDINAL SECTION // ENTRY, KITCHEN + PORCH

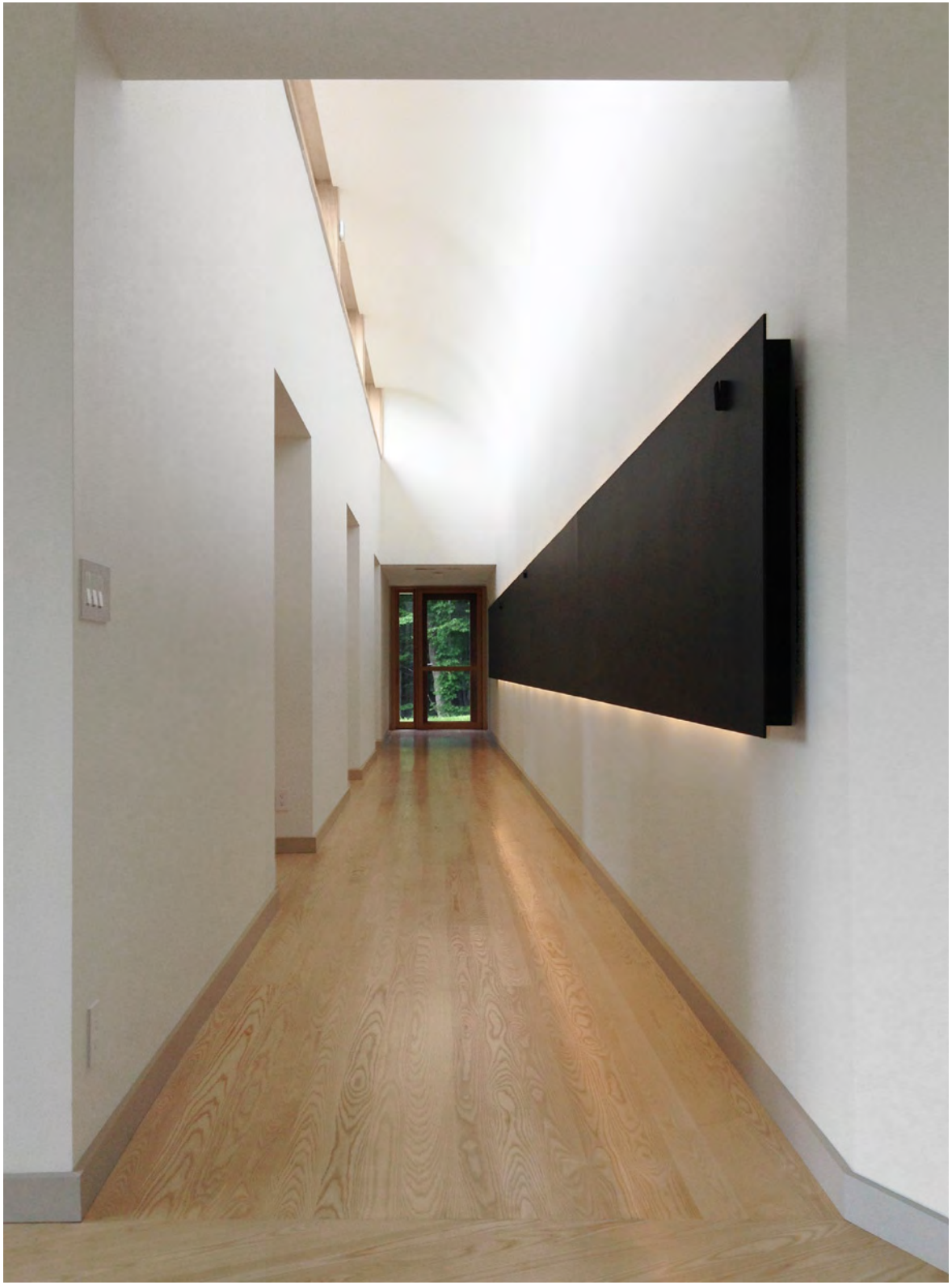


CROSS SECTION // CLERESTORY + BEDROOM

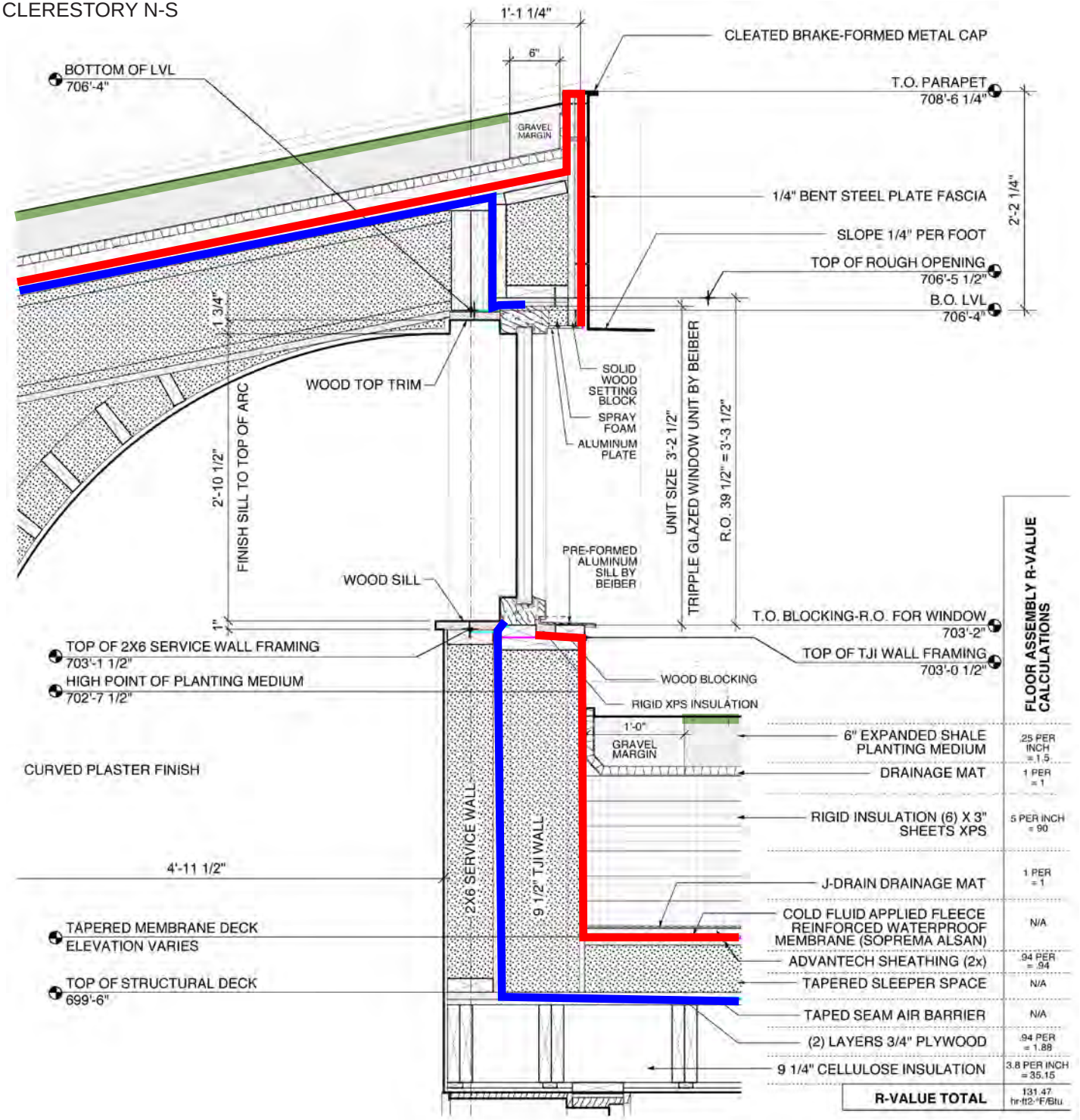


CLERESTORY + WINDOW

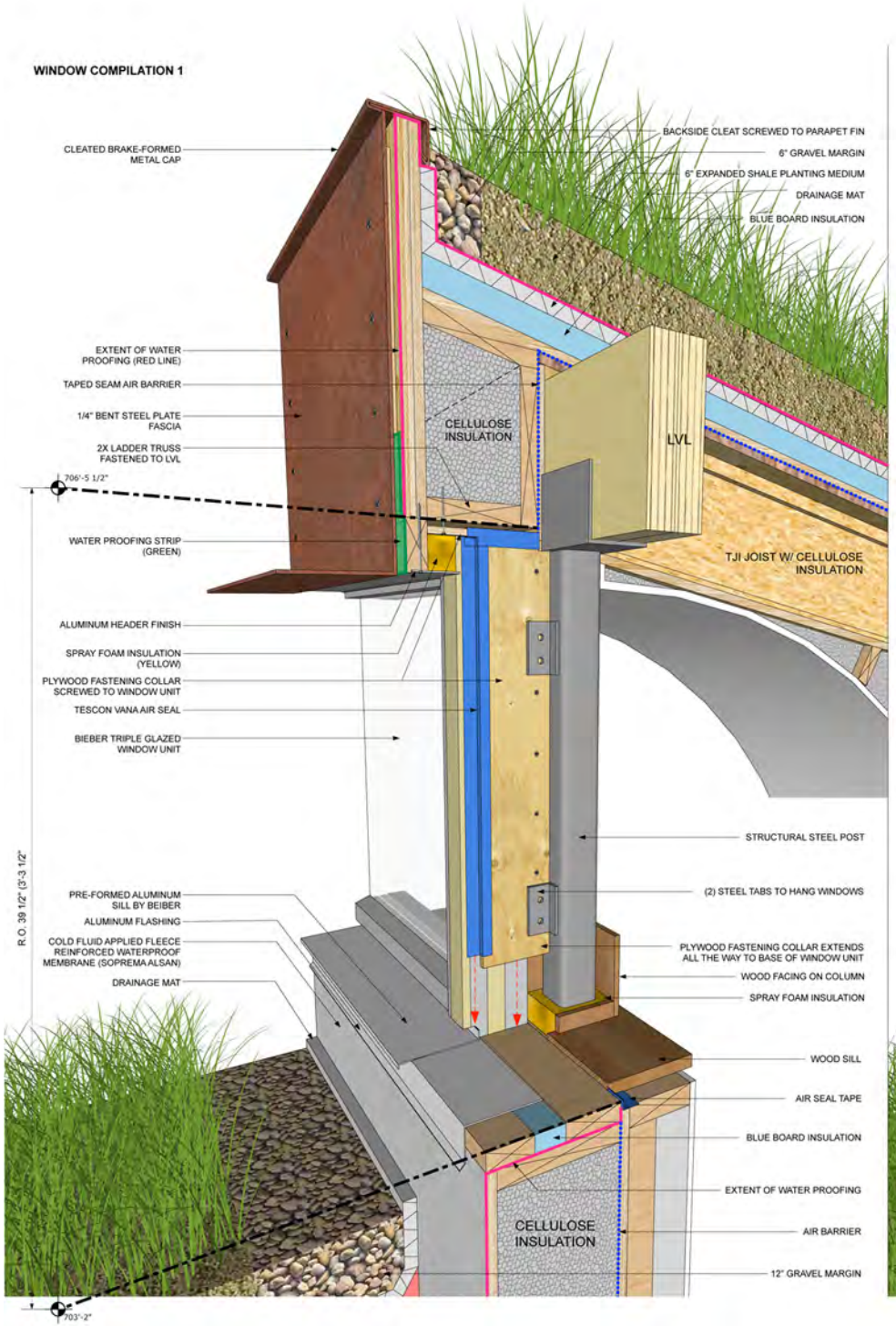


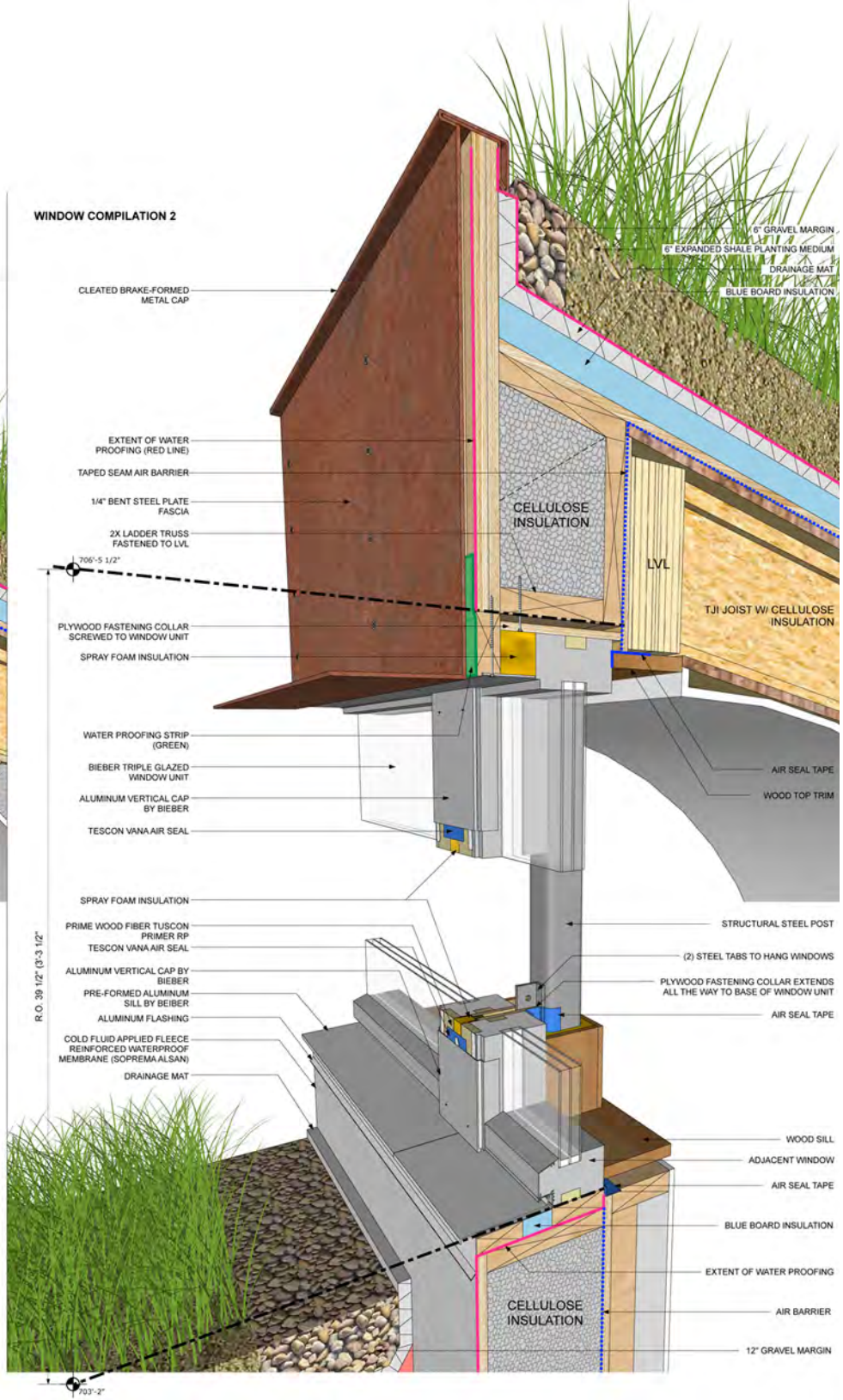


DETAIL SECTION // CLERESTORY N-S



DETAILS // CLERESTORY + WINDOW






ROXUL

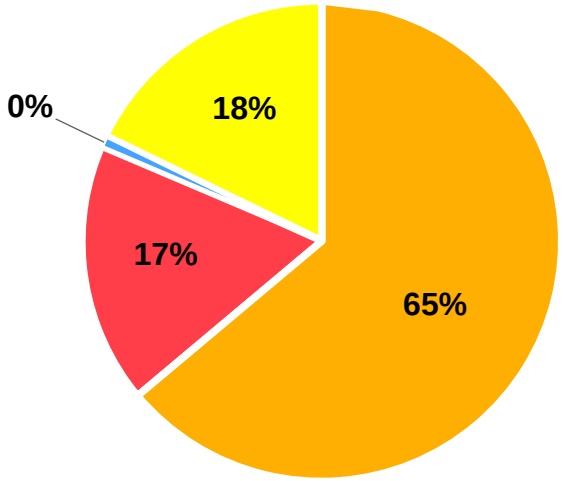
VPL / GUILFORD SOUND ARTS CAMPUS // PROPORTIONAL ENERGY USE

= HOT WATER

= HEATING/COOKING

= AIR CONDITIONING

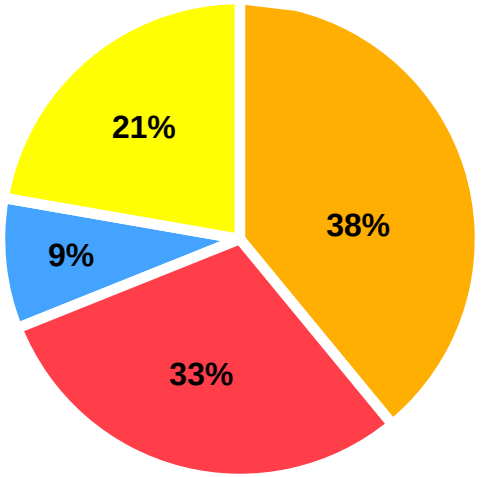
= EQUIPMENT, PLUG AND LIGHTING LOADS



(HISTORICAL)

ARTISTS RESIDENCE 1

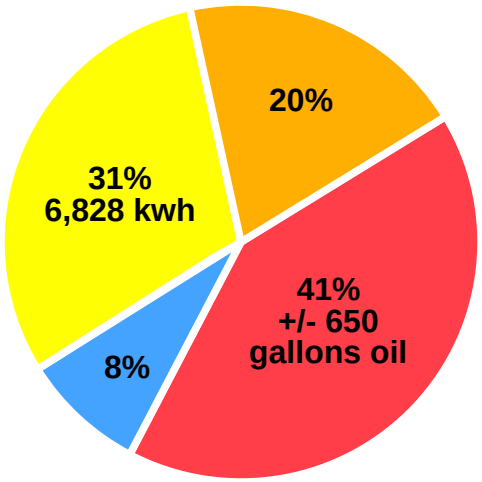
2,542 SF



(NEW)

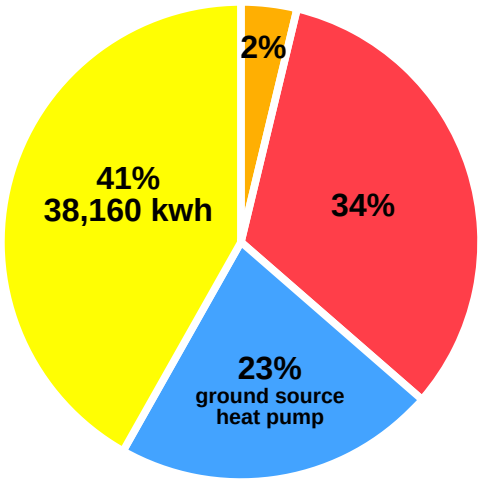
ARTISTS RESIDENCE 2

4,280 SF



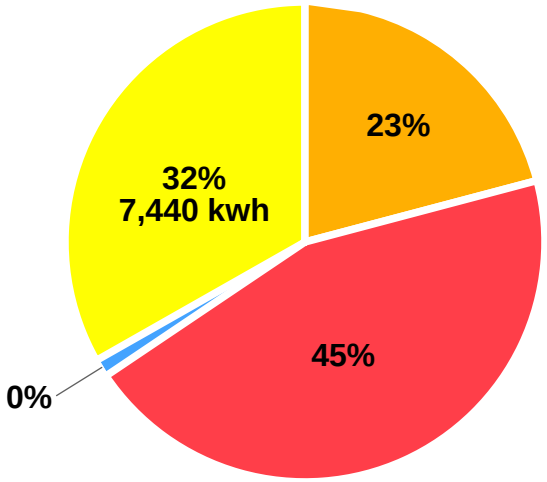
AVERAGE RESIDENTIAL, VT

US ENERGY INFORMATION ADMINISTRATION



RECORDING STUDIO

5,065 SF



MAIN RESIDENCE

6,104 SF

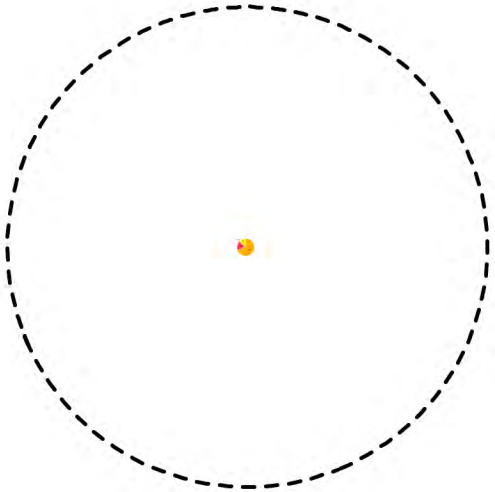
VPL / GUILFORD SOUND ARTS CAMPUS // ABSOLUTE ENERGY USE

= HOT WATER

= HEATING/COOKING

= AIR CONDITIONING

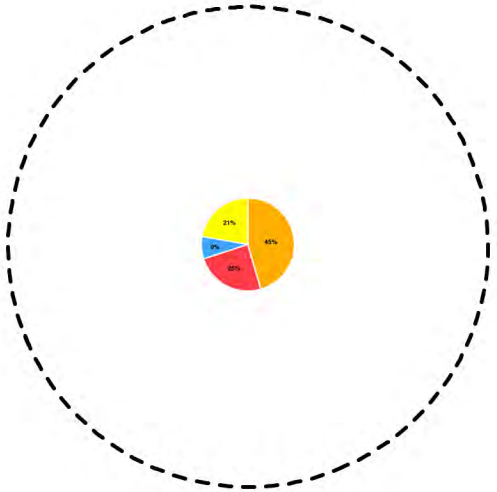
= EQUIPMENT, PLUG AND LIGHTING LOADS



(HISTORICAL)

ARTISTS RESIDENCE 1

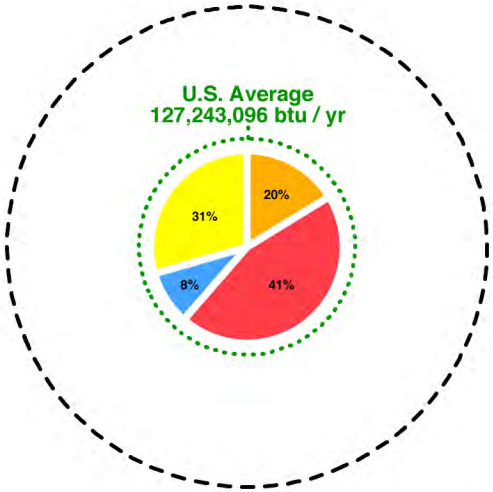
10,236,000 BTU / yr



(NEW)

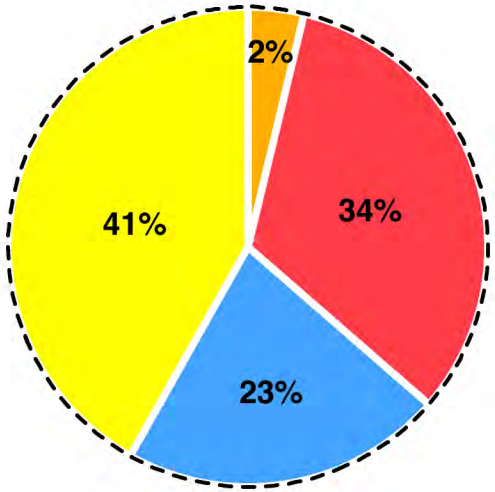
ARTISTS RESIDENCE 2

35,078,000 BTU / yr



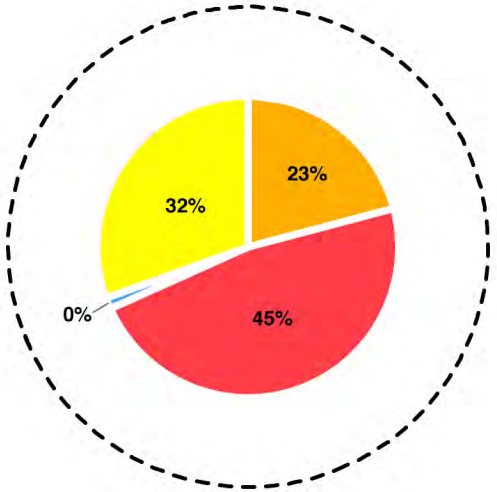
AVERAGE RESIDENTIAL, VT

113,322,136 BTU / yr



RECORDING STUDIO

282,201,920 BTU / yr



MAIN RESIDENCE

177,385,280 BTU / yr

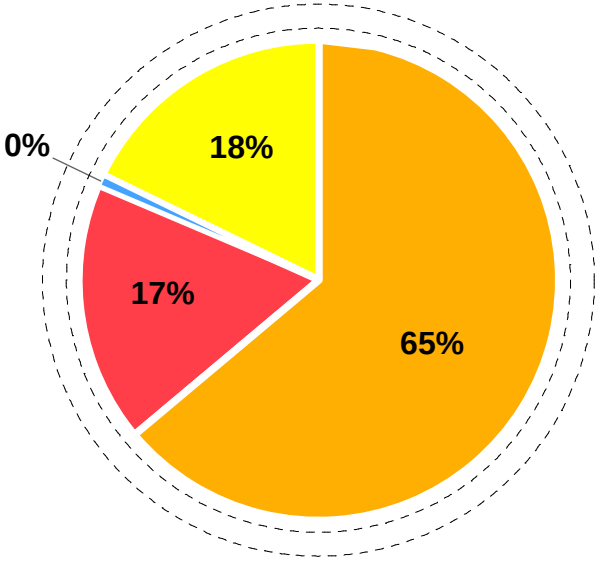
VPL / GUILFORD SOUND ARTS CAMPUS // PROPORTIONAL ENERGY/ SITE SOURCED ENERGY USE

= HOT WATER

= HEATING/COOKING

= AIR CONDITIONING

= EQUIPMENT, PLUG AND LIGHTING LOADS



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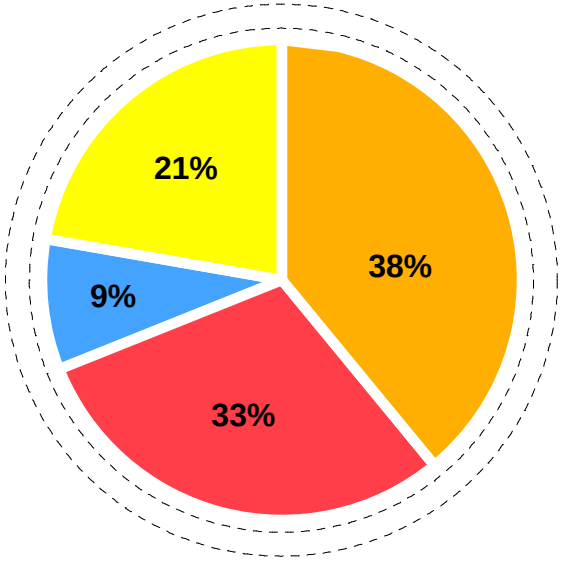
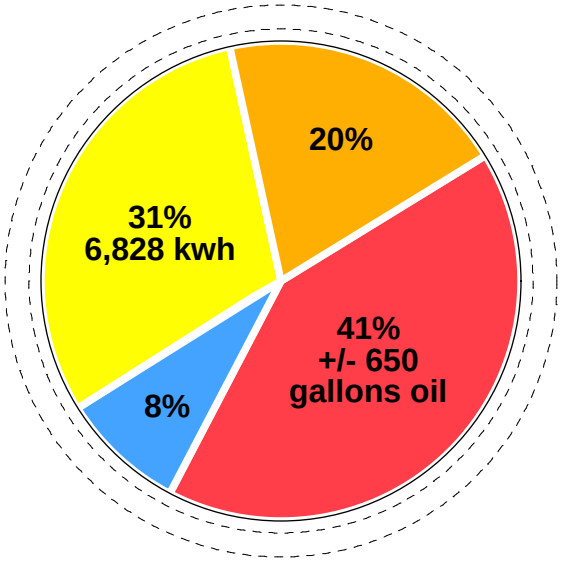


(NEW)

ARTISTS RESIDENCE 2

4,280 SF



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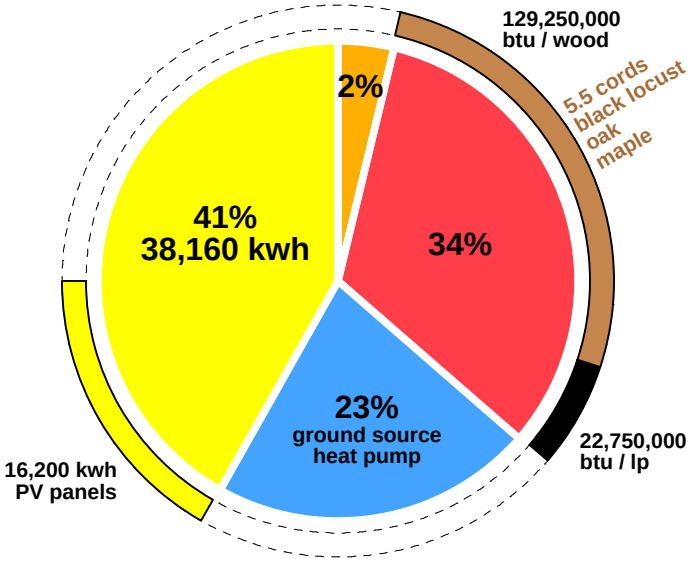

RECORDING STUDIO

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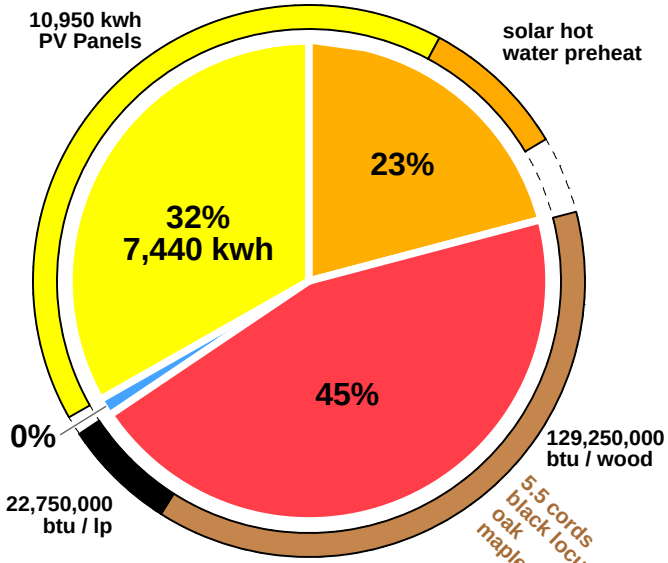

MAIN RESIDENCE

6,104 SF

WETLANDS HOUSE
ORIENT, NY

R VALUES

Wall	46
Roof	57
Floor	74/42

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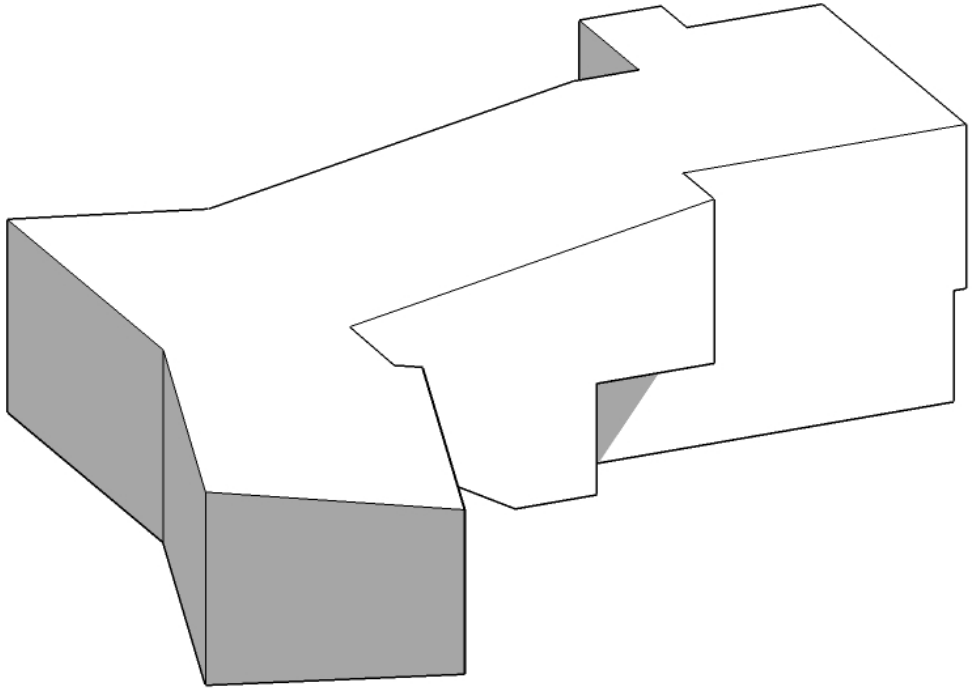
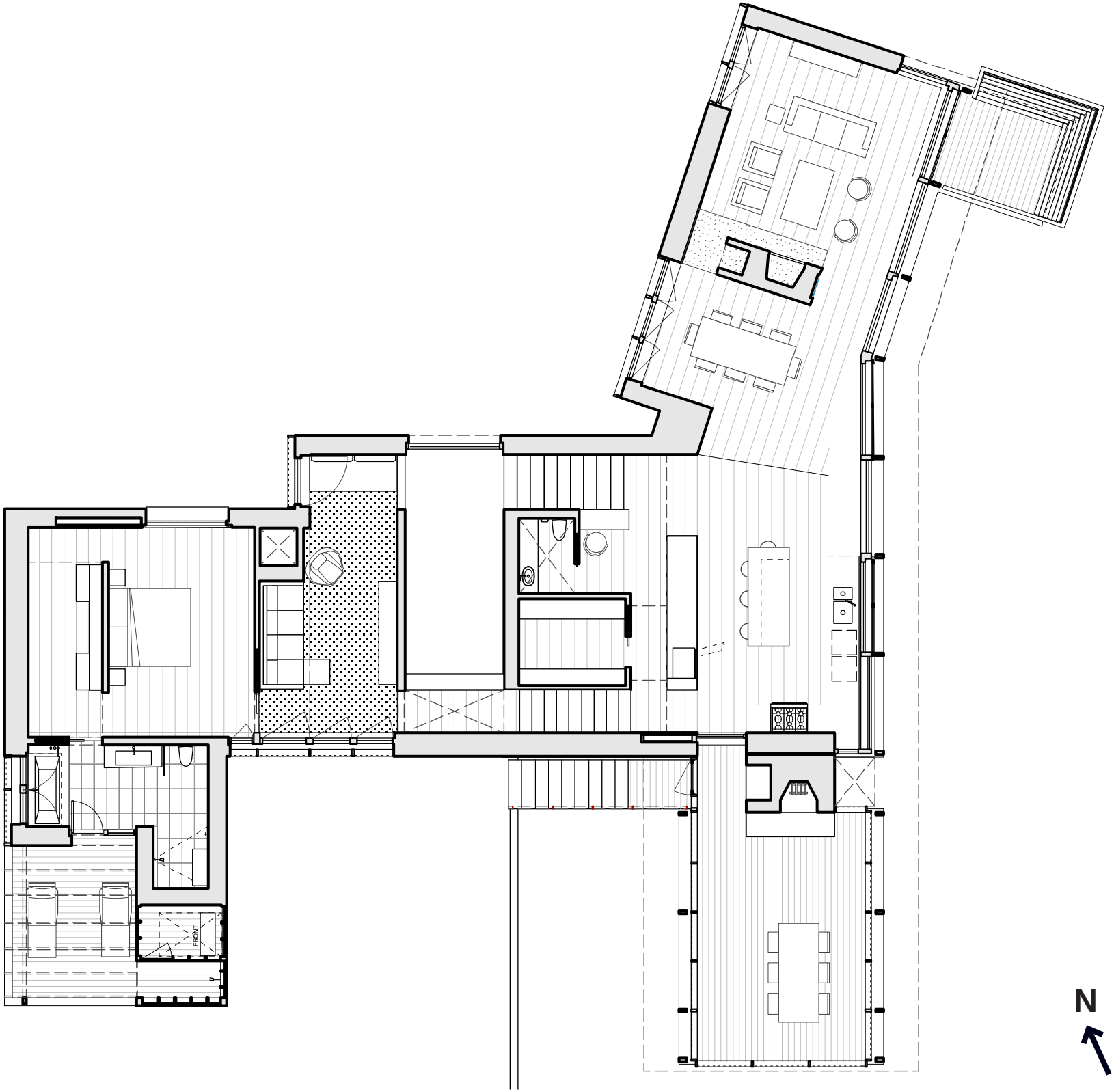
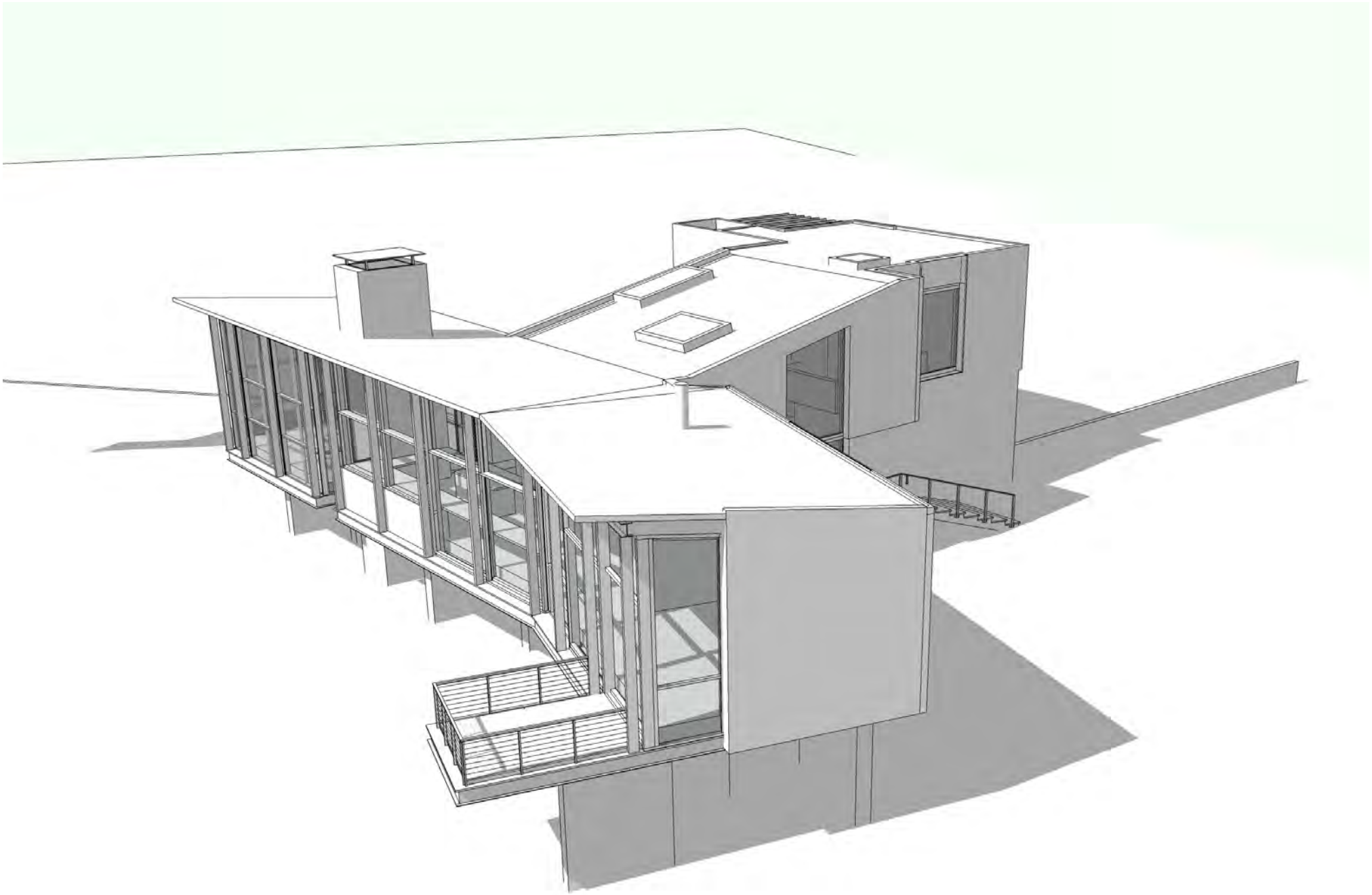
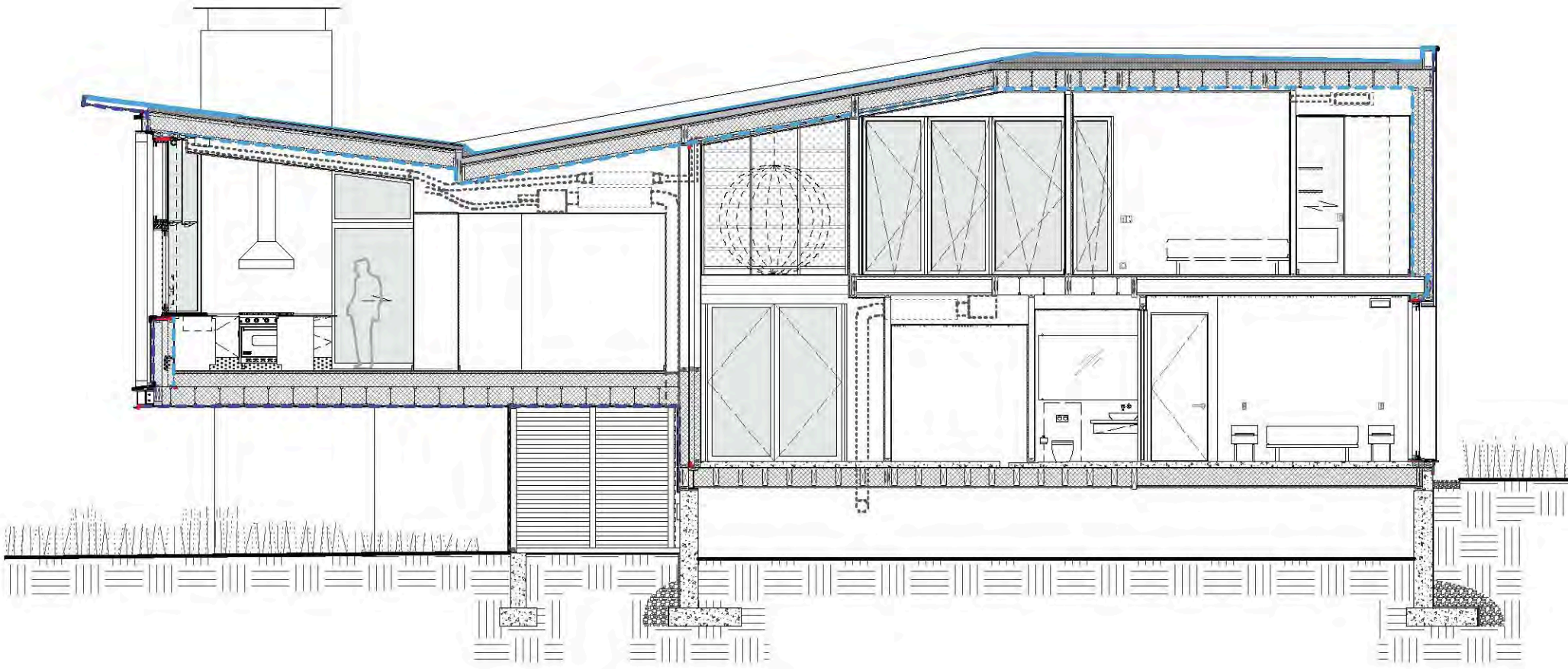
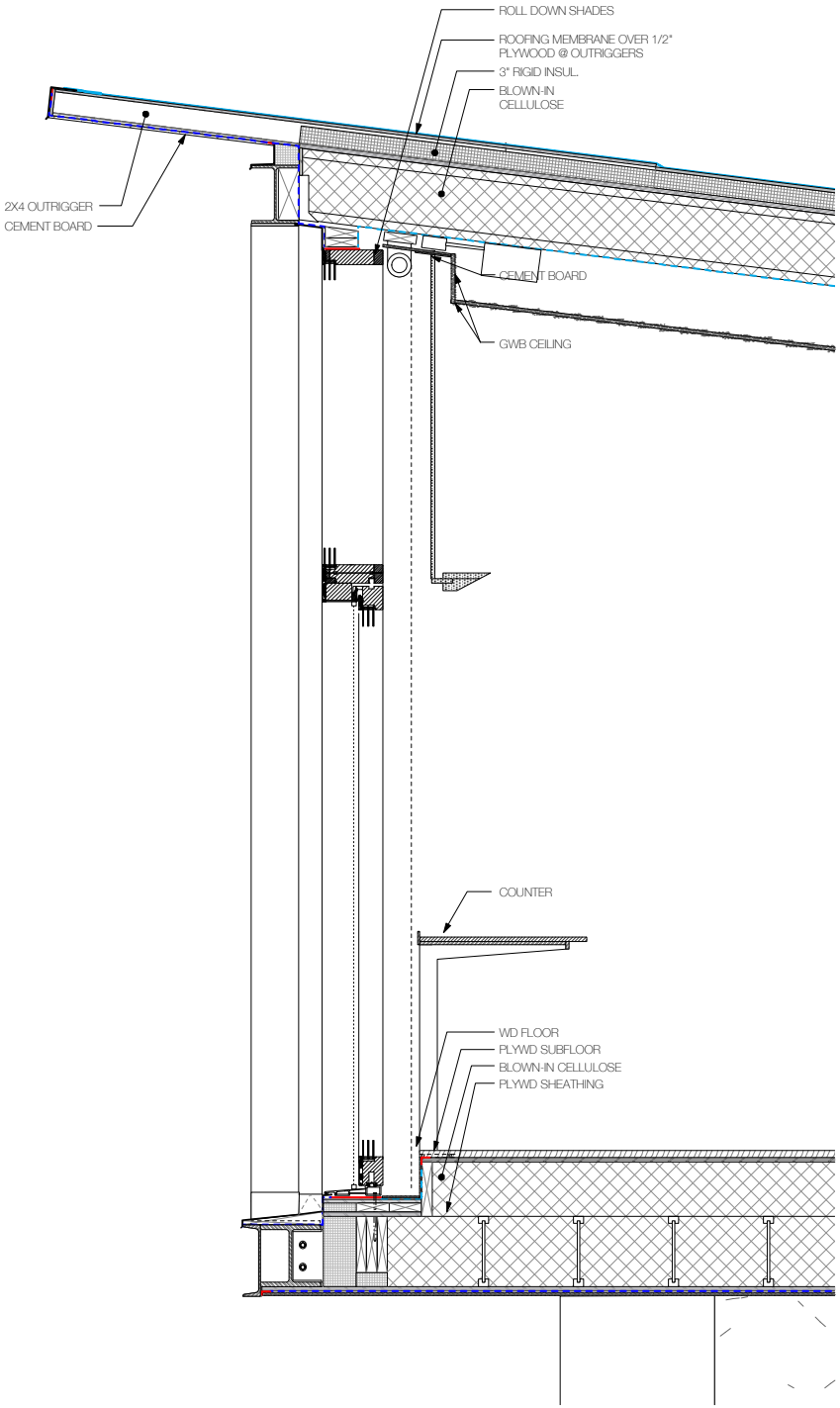
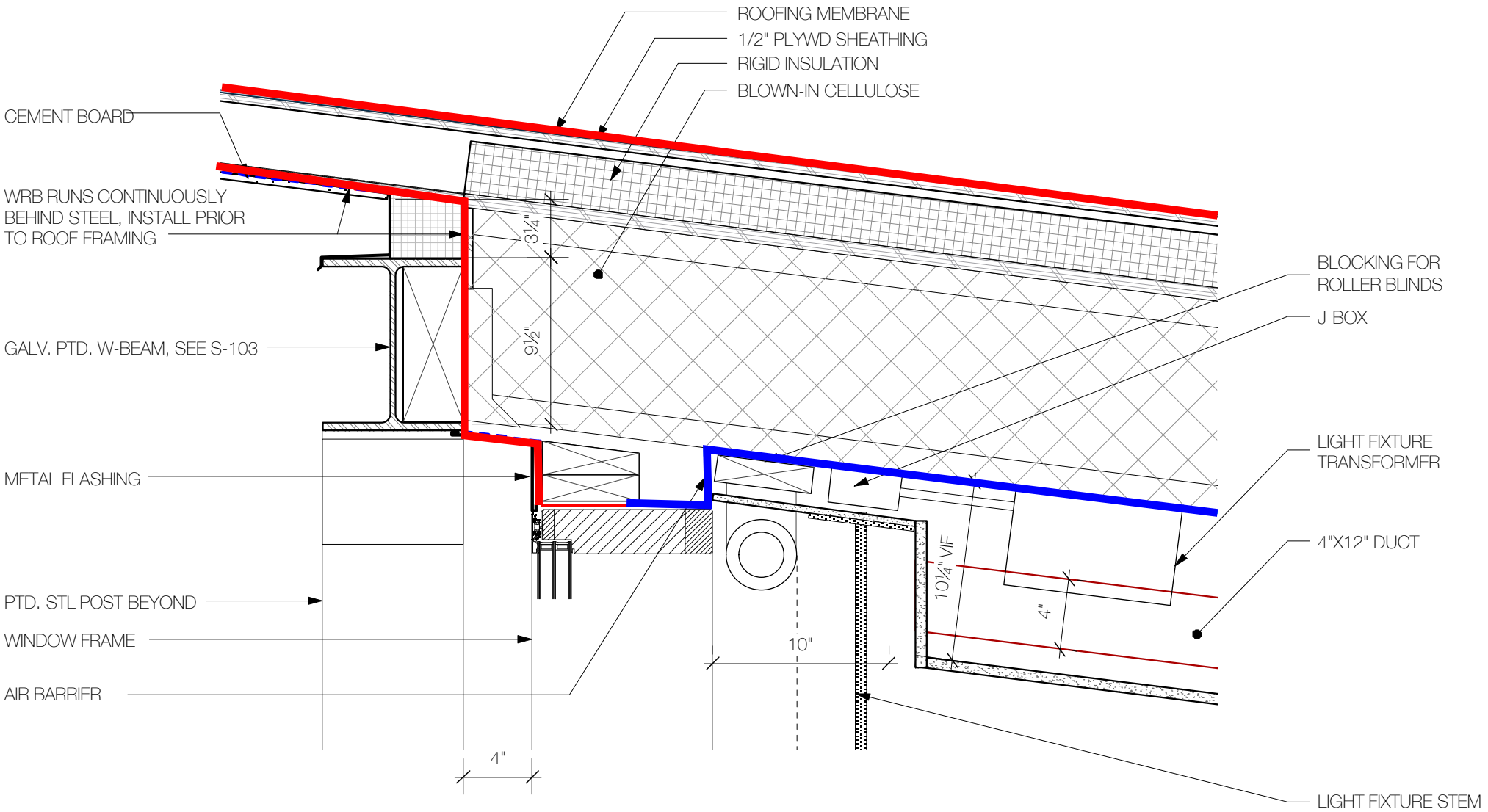



FRONT
N



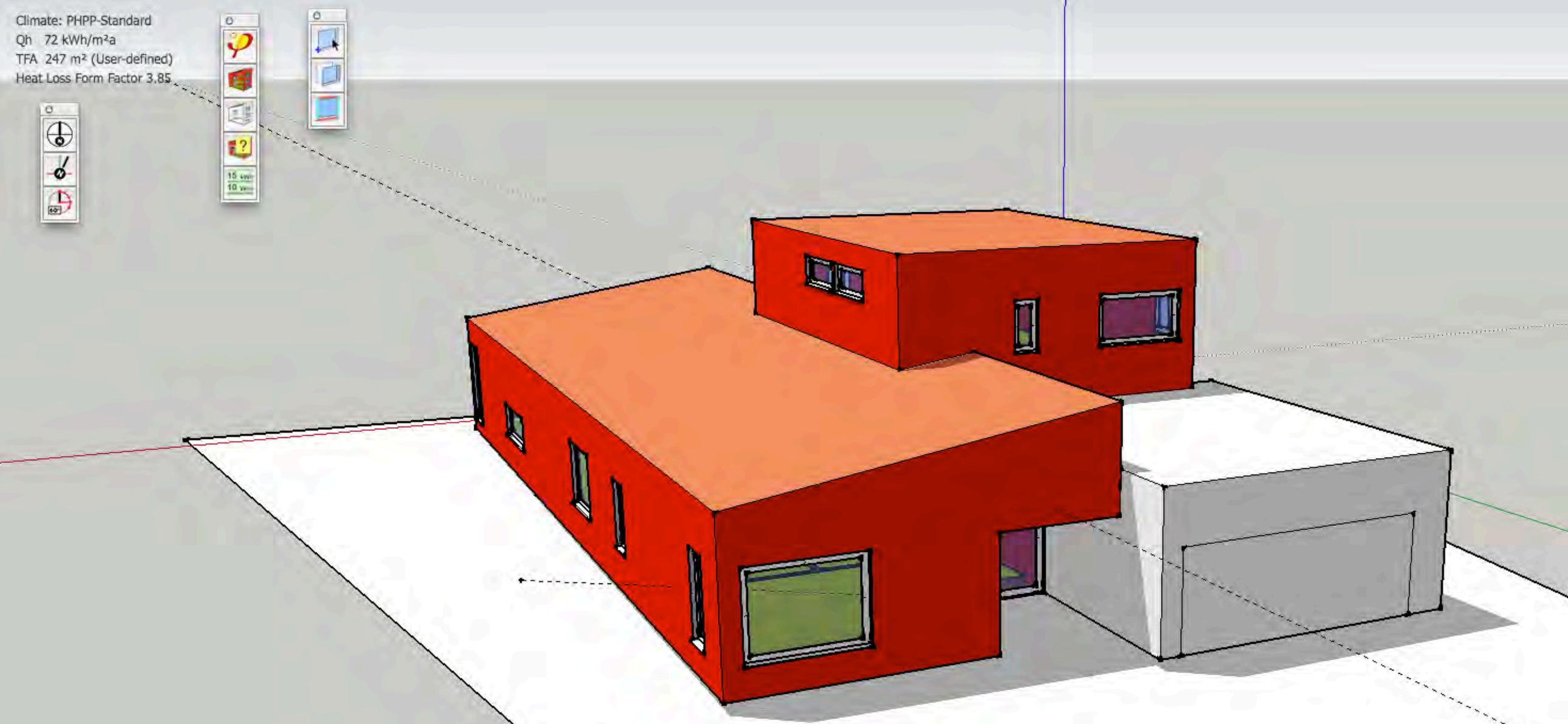


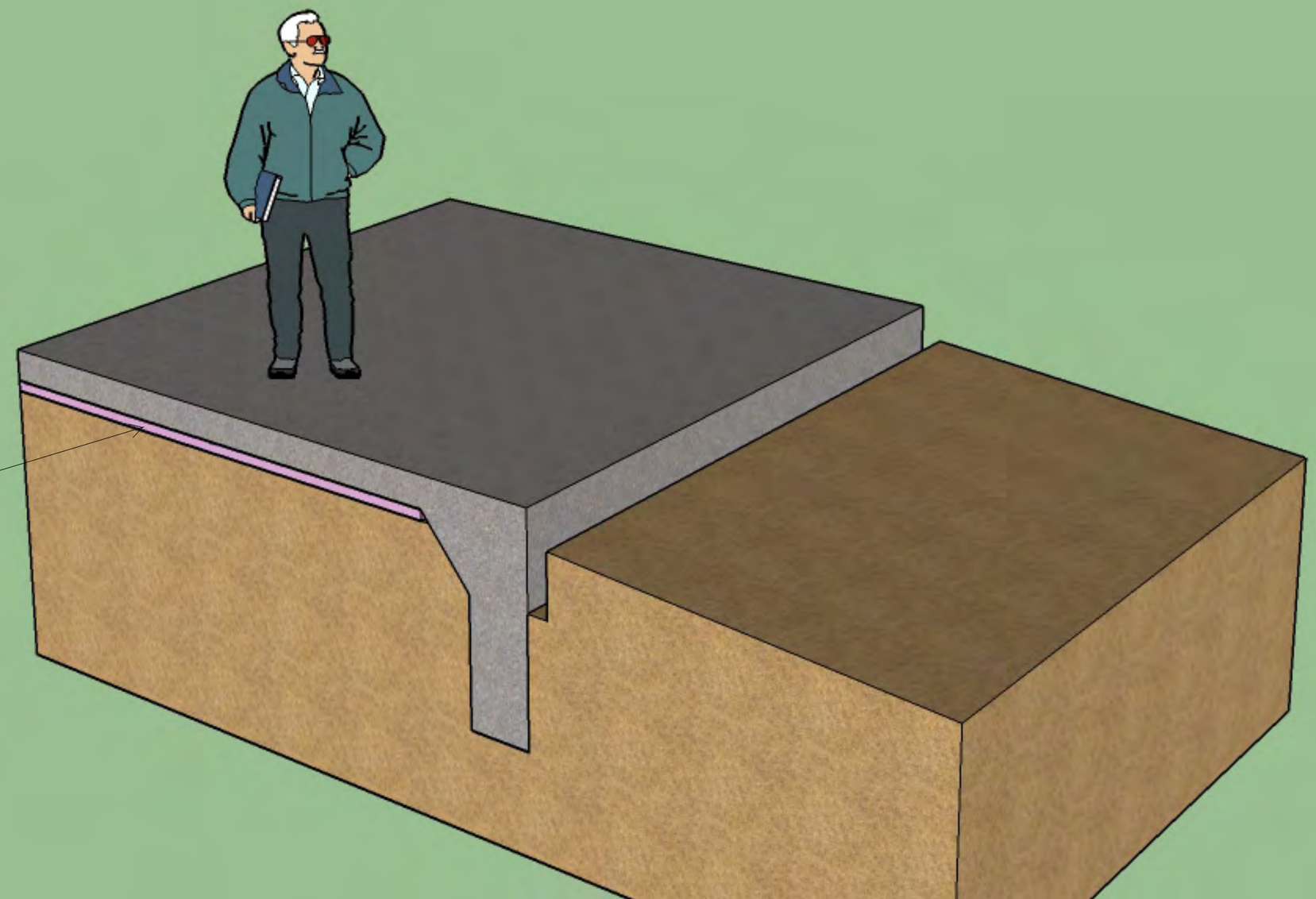

ROLL DOWN SHADES
ROOFING MEMBRANE OVER 1/2" PLYWOOD @ OUTRIGGERS
3" RIGID INSUL.
BLOWN-IN CELLULOSE
2X4 OUTRIGGER
CEMENT BOARD
CEMENT BOARD
GWB CEILING
COUNTER
WD FLOOR
PLYWD SUBFLOOR
BLOWN-IN CELLULOSE
PLYWD SHEATHING

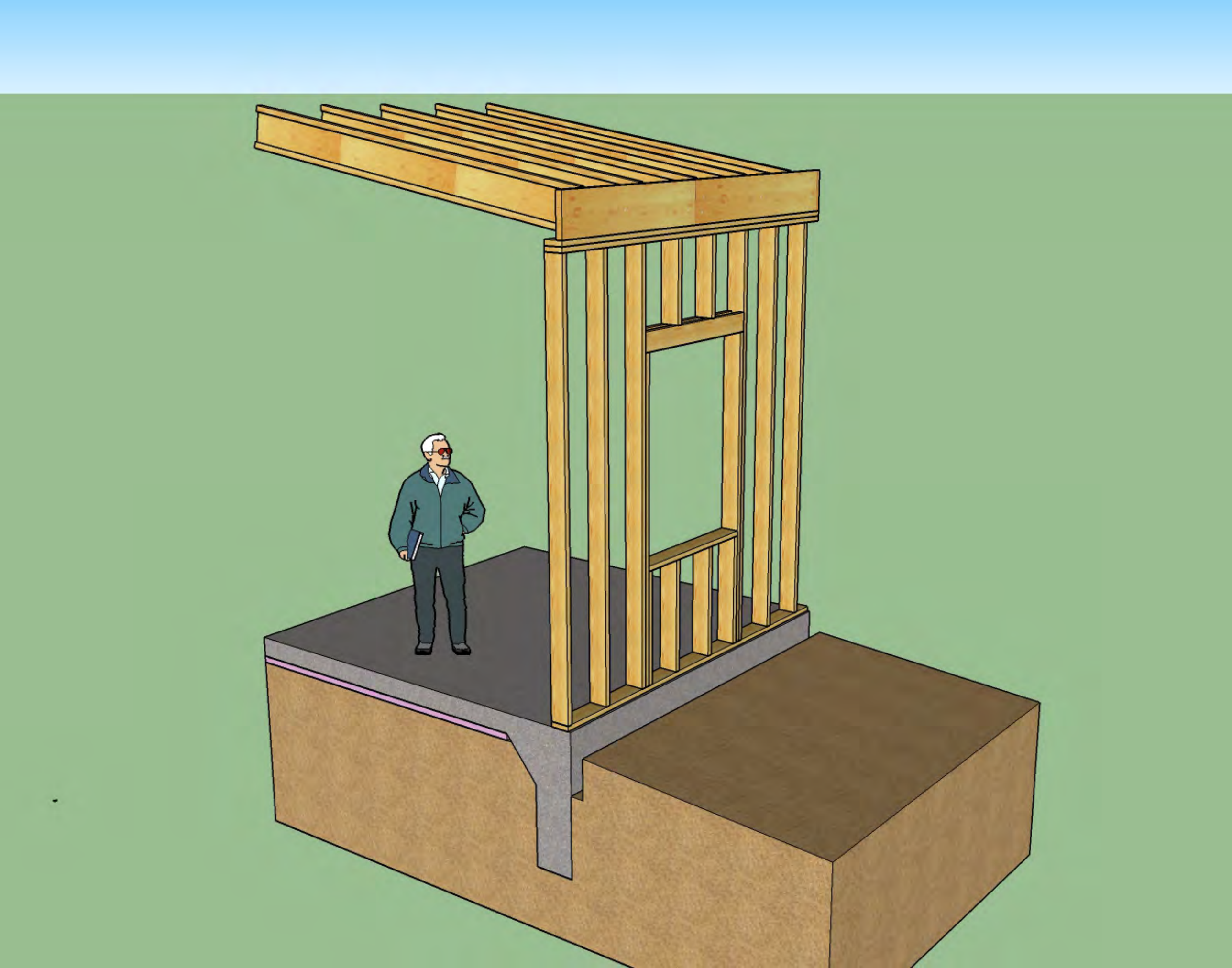

ROOFING MEMBRANE
1/2" PLYWD SHEATHING
RIGID INSULATION
BLOWN-IN CELLULOSE
CEMENT BOARD
WRB RUNS CONTINUOUSLY
BEHIND STEEL, INSTALL PRIOR
TO ROOF FRAMING
GALV. PTD. W-BEAM, SEE S-103
METAL FLASHING
PTD. STL POST BEYOND
WINDOW FRAME
AIR BARRIER
3¼"
9½"
4"
BLOCKING FOR
ROLLER BLINDS
J-BOX
LIGHT FIXTURE
TRANSFORMER
4"X12" DUCT
10¼" VIF
4"
10"
LIGHT FIXTURE STEM

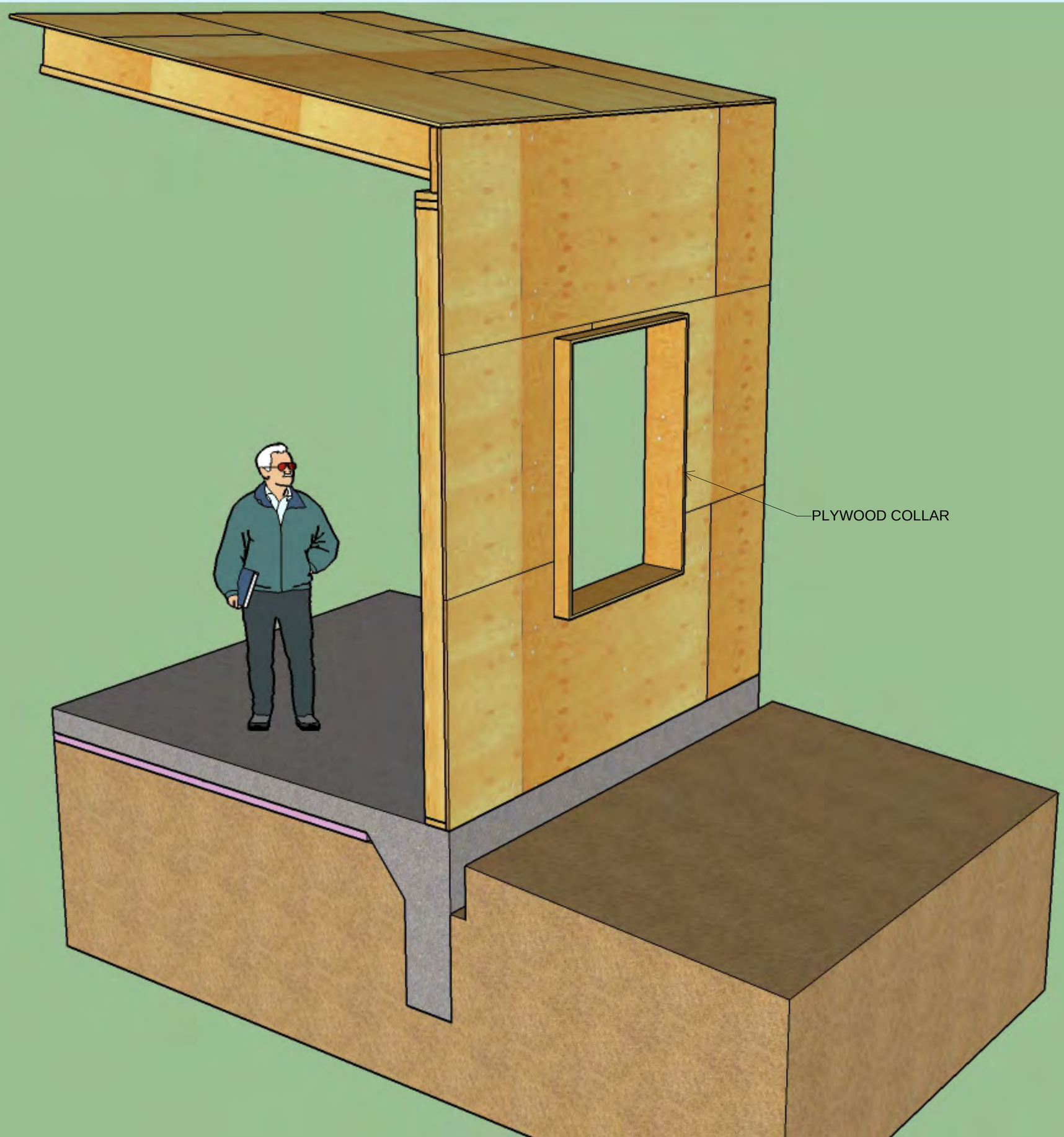

INTELLO
INTELLO
INTELLO
INTELLO

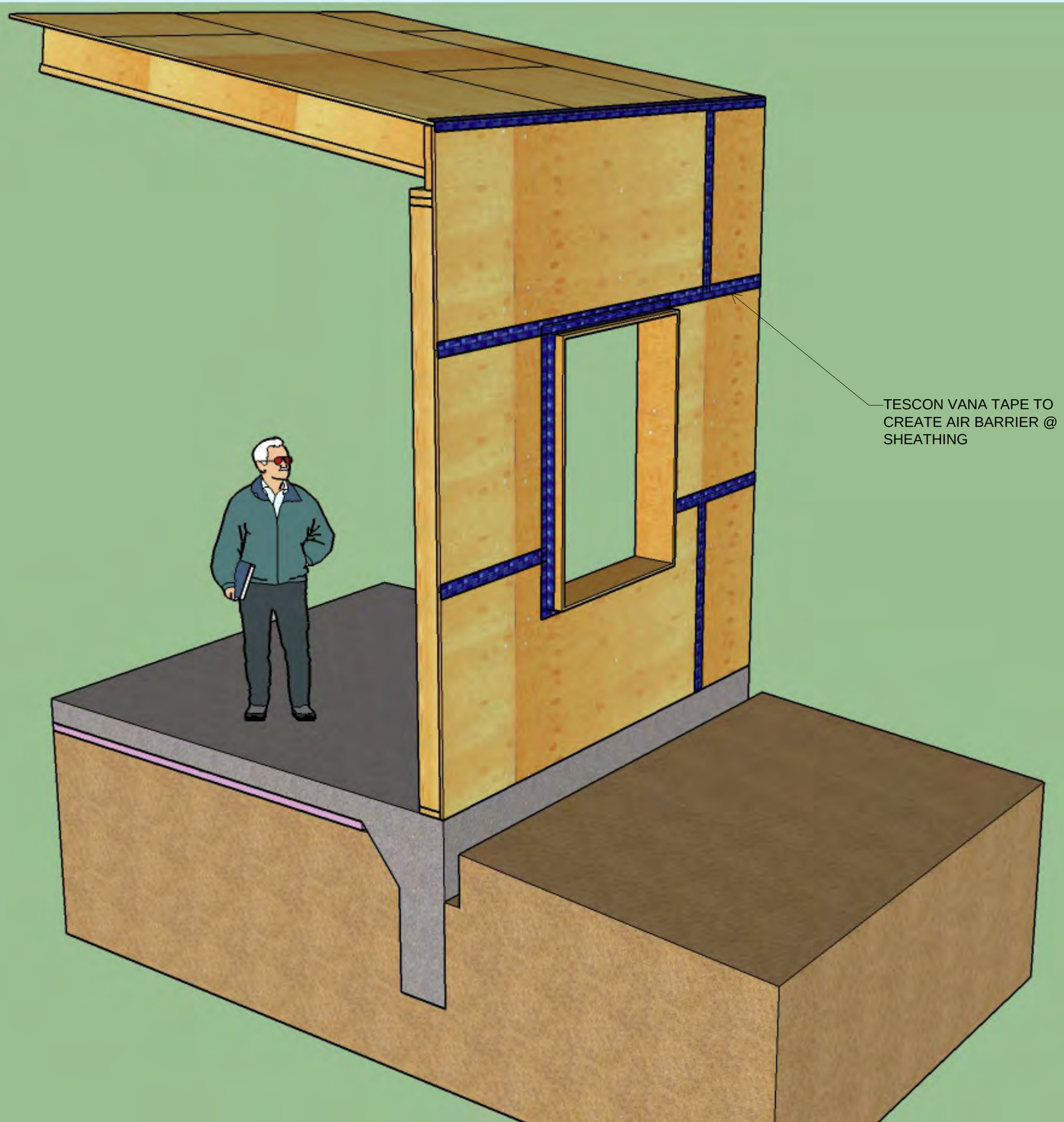
Climate: PHPP-Standard
Qh 72 kWh/m²a
TFA 247 m² (User-defined)
Heat Loss Form Factor 3,85

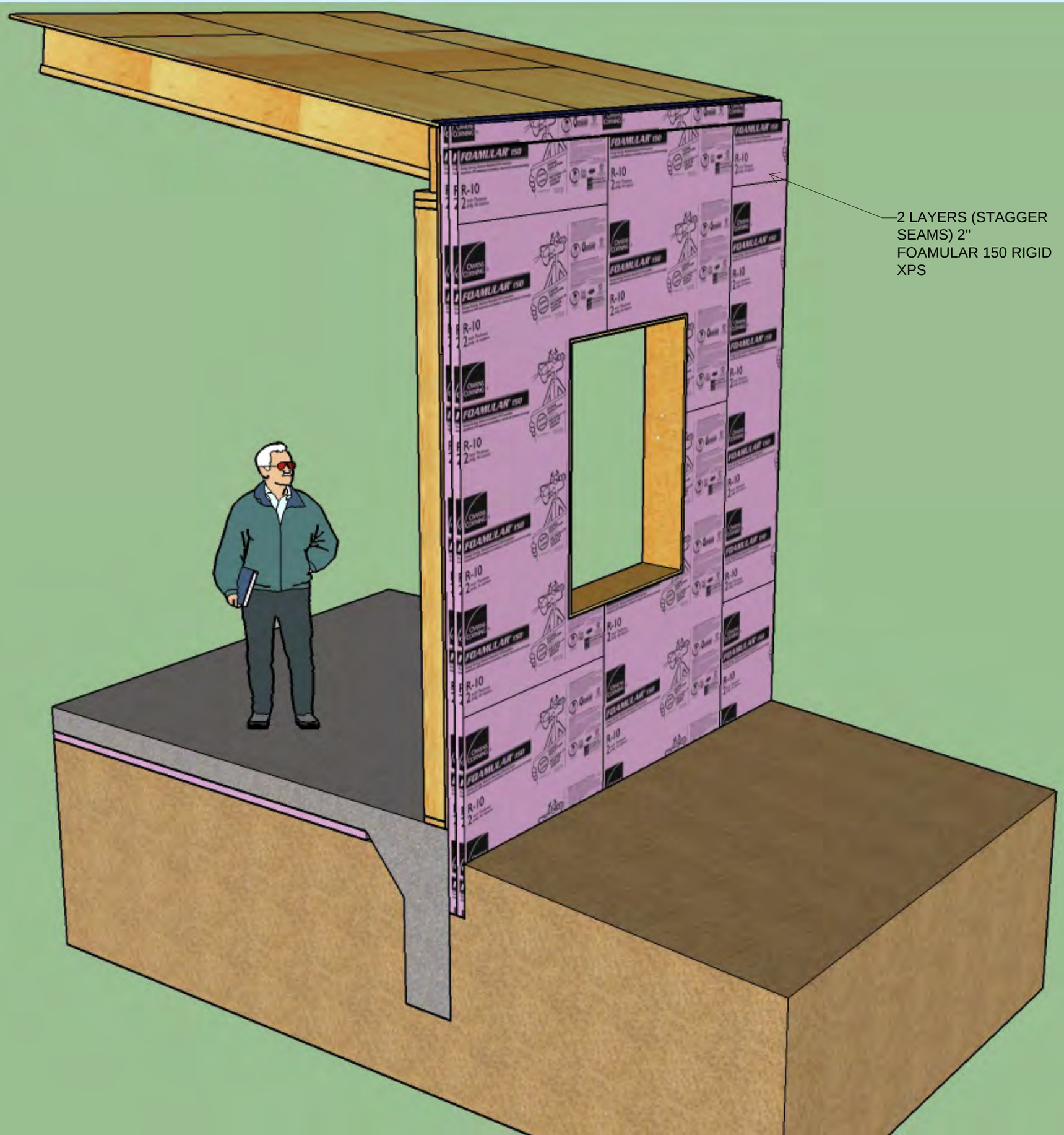


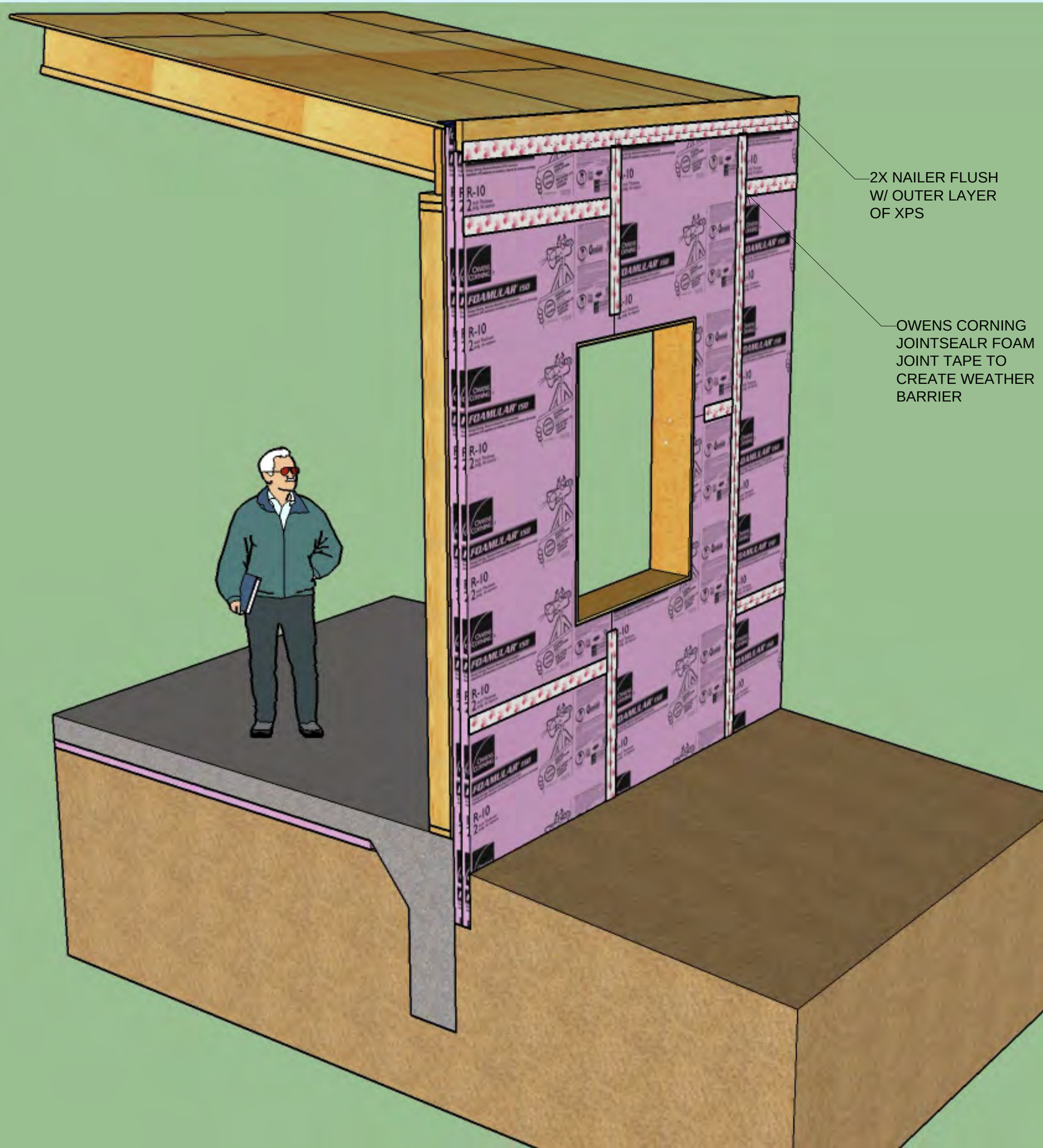

FOAMULAR 250
UNDERASLAB
INSULATION

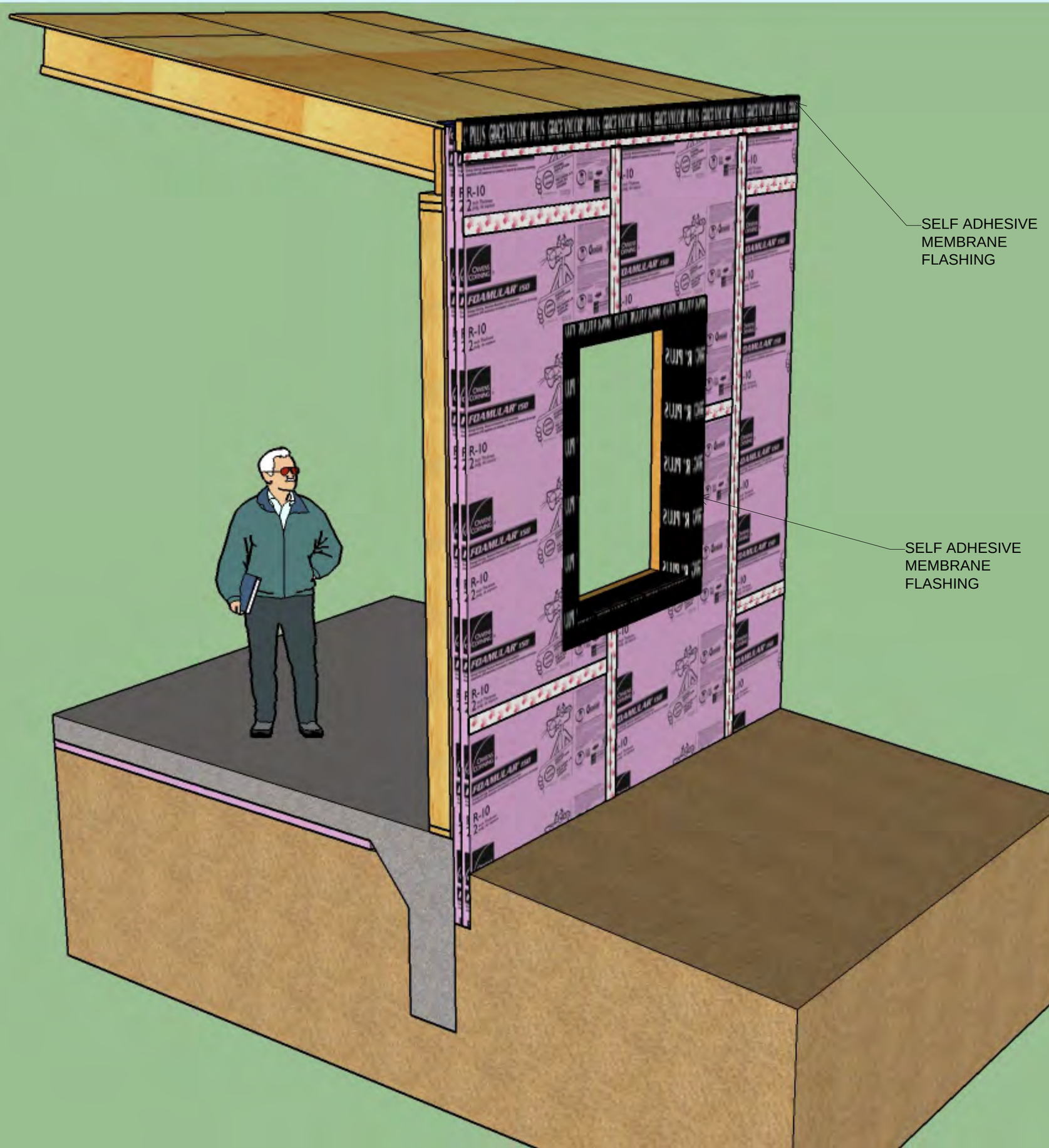


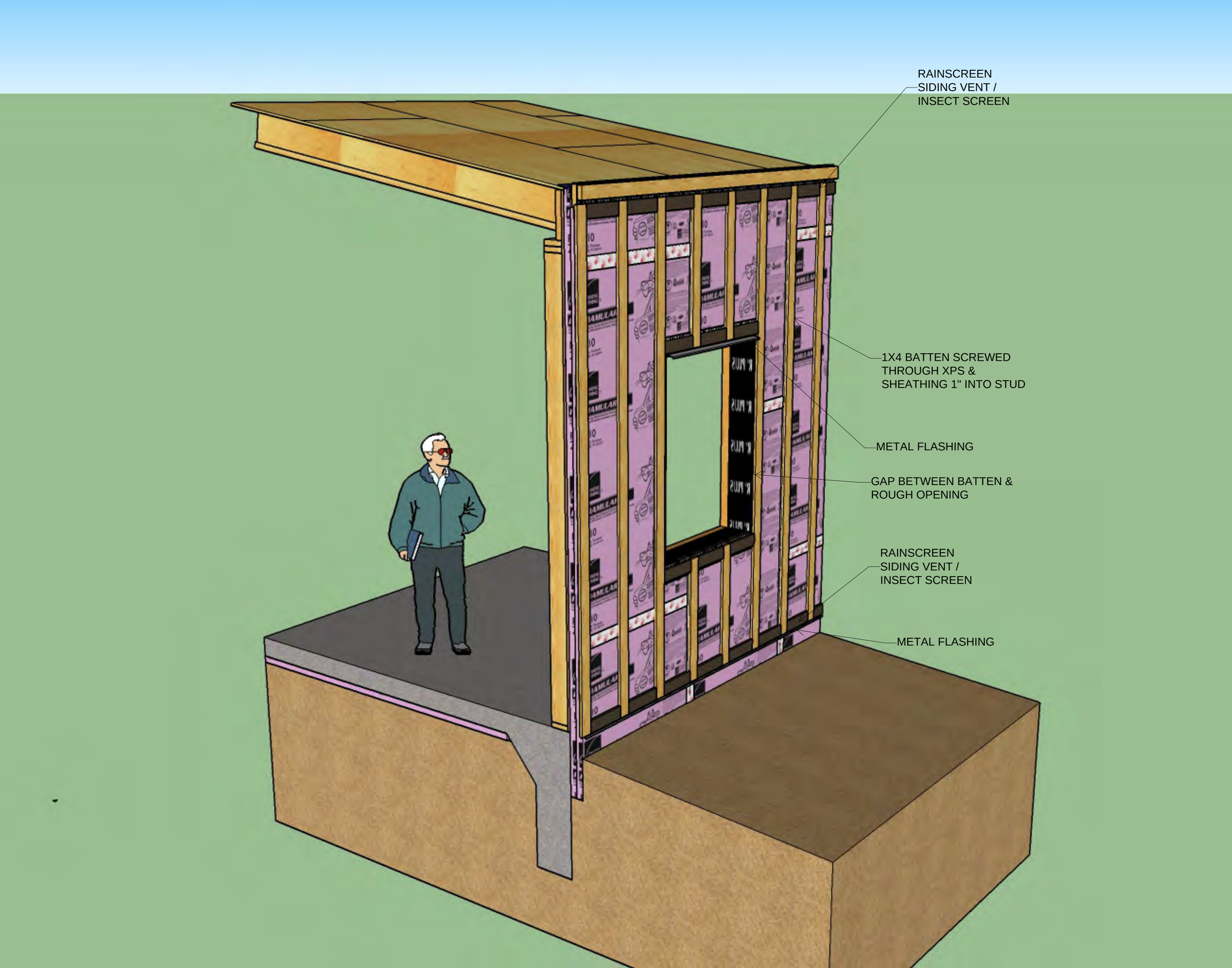

PLYWOOD COLLAR

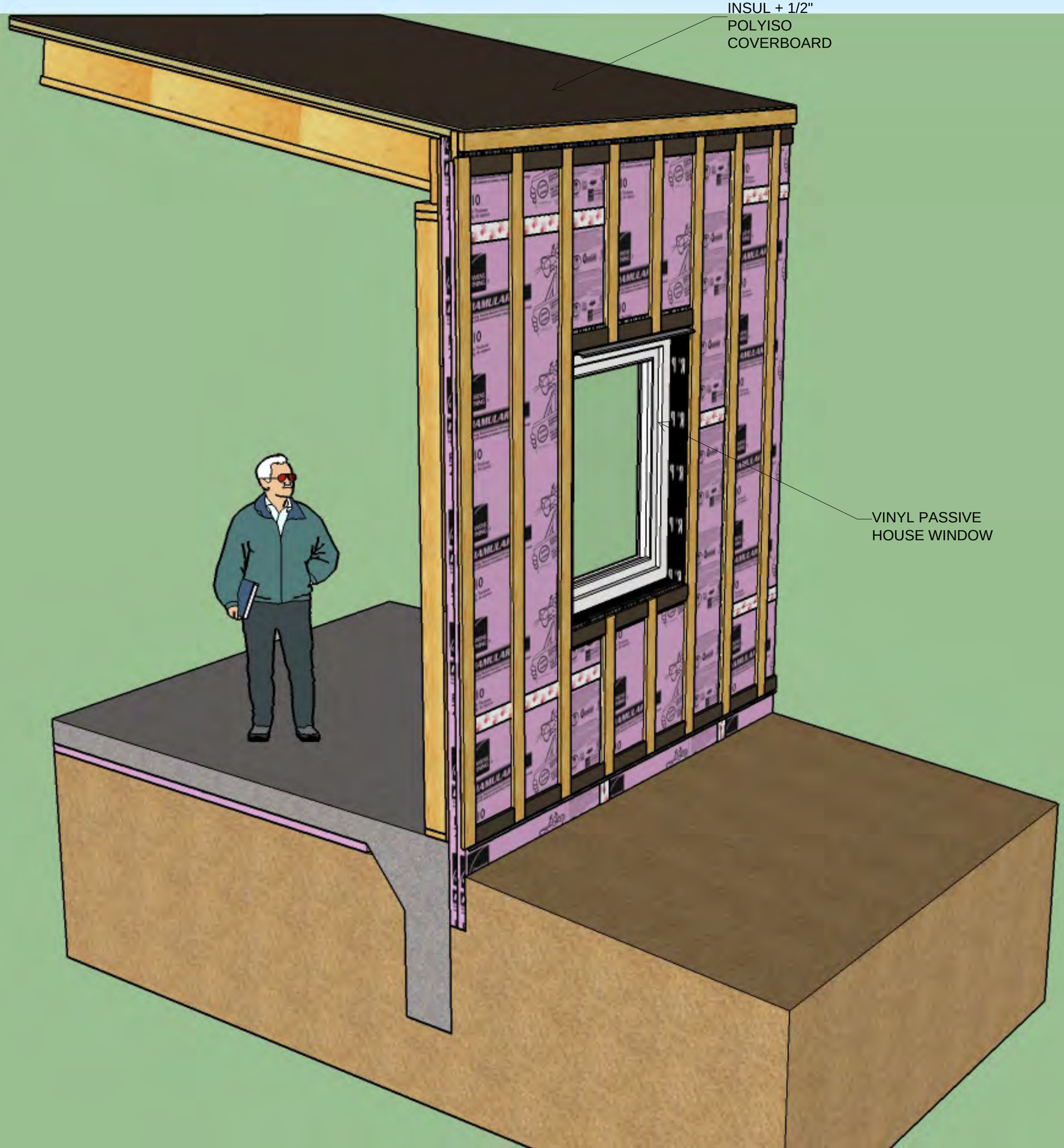

TESCON VANA TAPE TO
CREATE AIR BARRIER @
SHEATHING

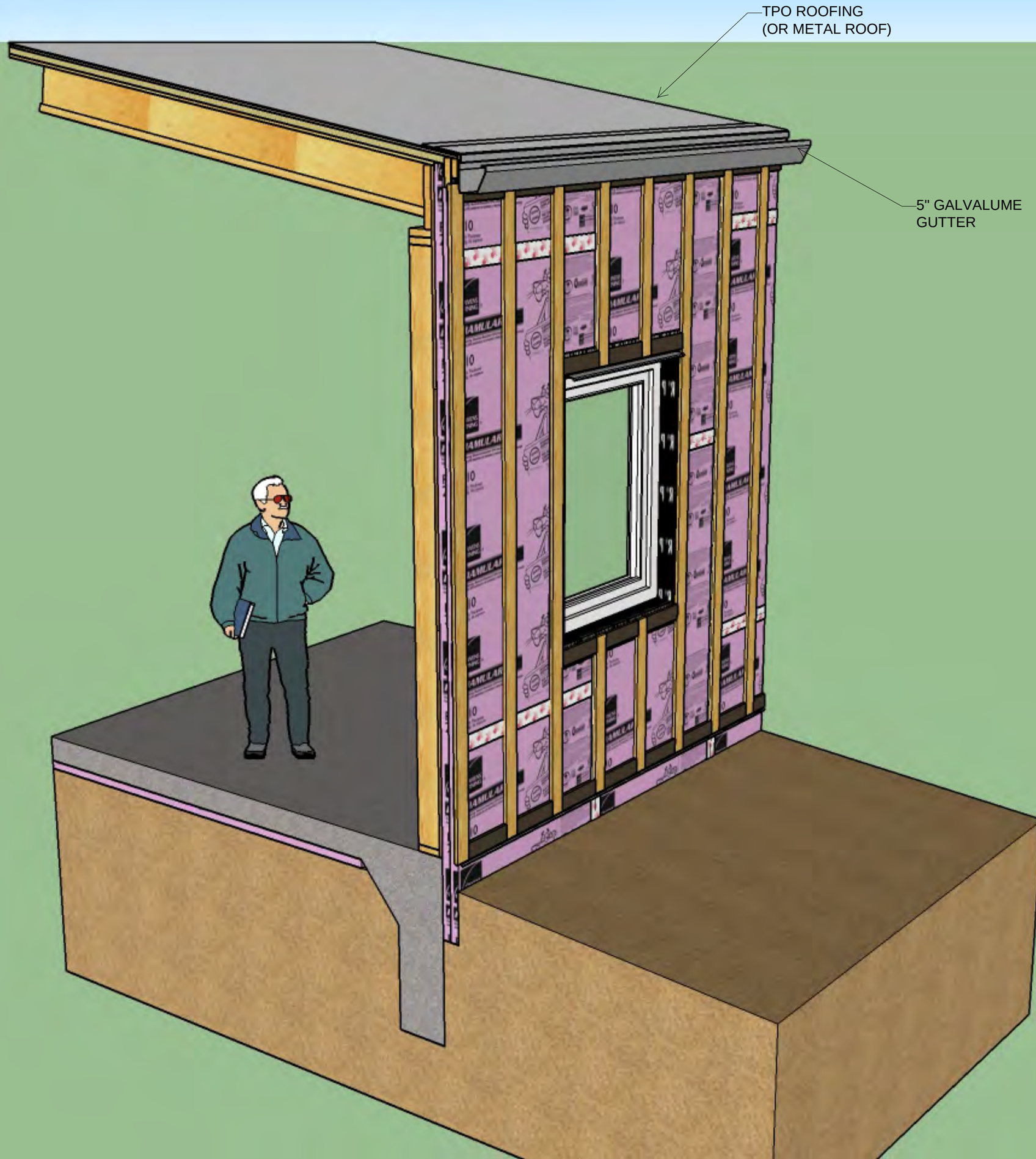

2 LAYERS (STAGGER SEAMS) 2" FOAMULAR 150 RIGID XPS
FOAMULAR 150
R-10
OWENS CORNING

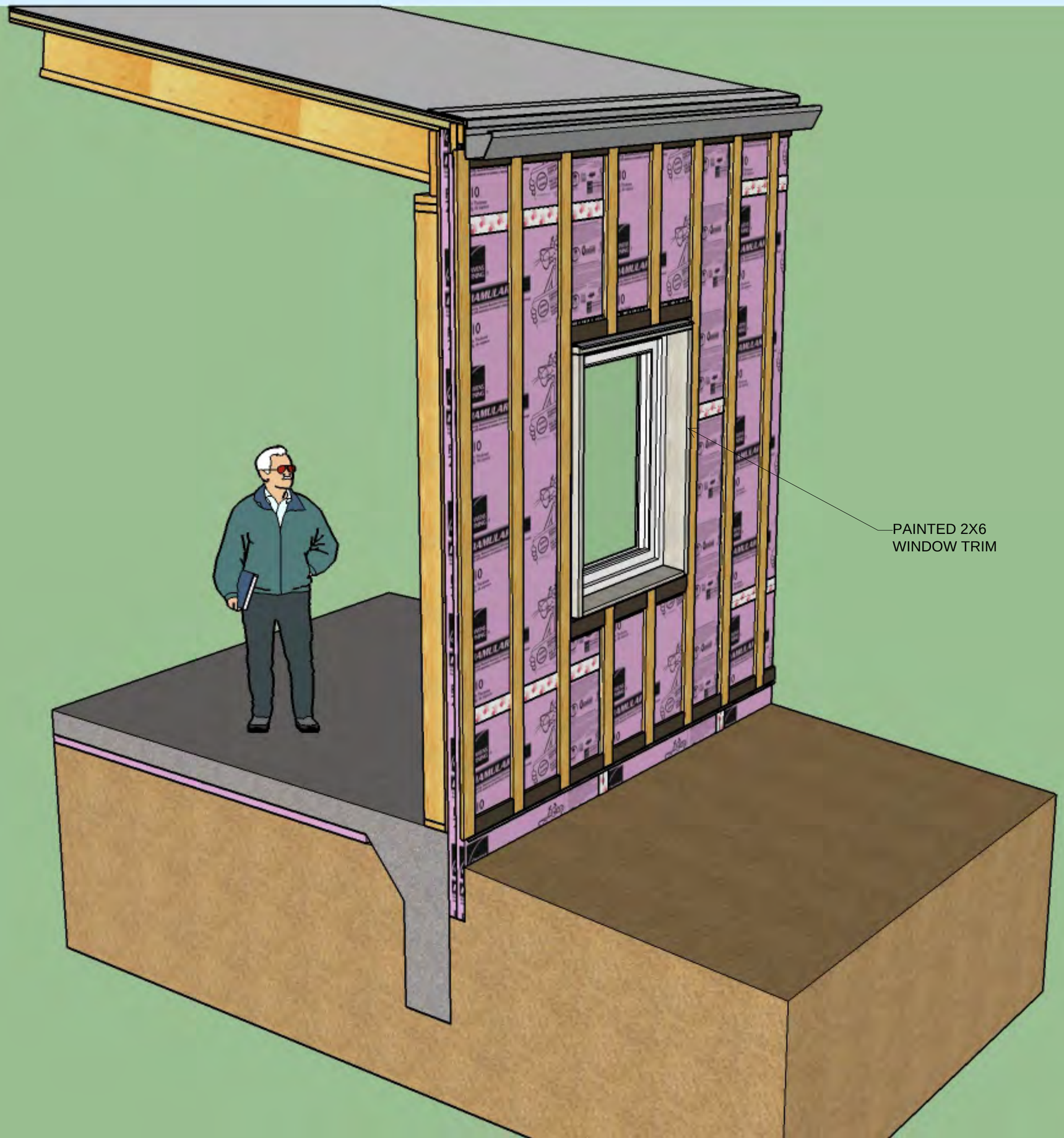

2X NAILER FLUSH W/ OUTER LAYER OF XPS
OWENS CORNING JOINTSEALR FOAM JOINT TAPE TO CREATE WEATHER BARRIER
R-10
FOAMULAR

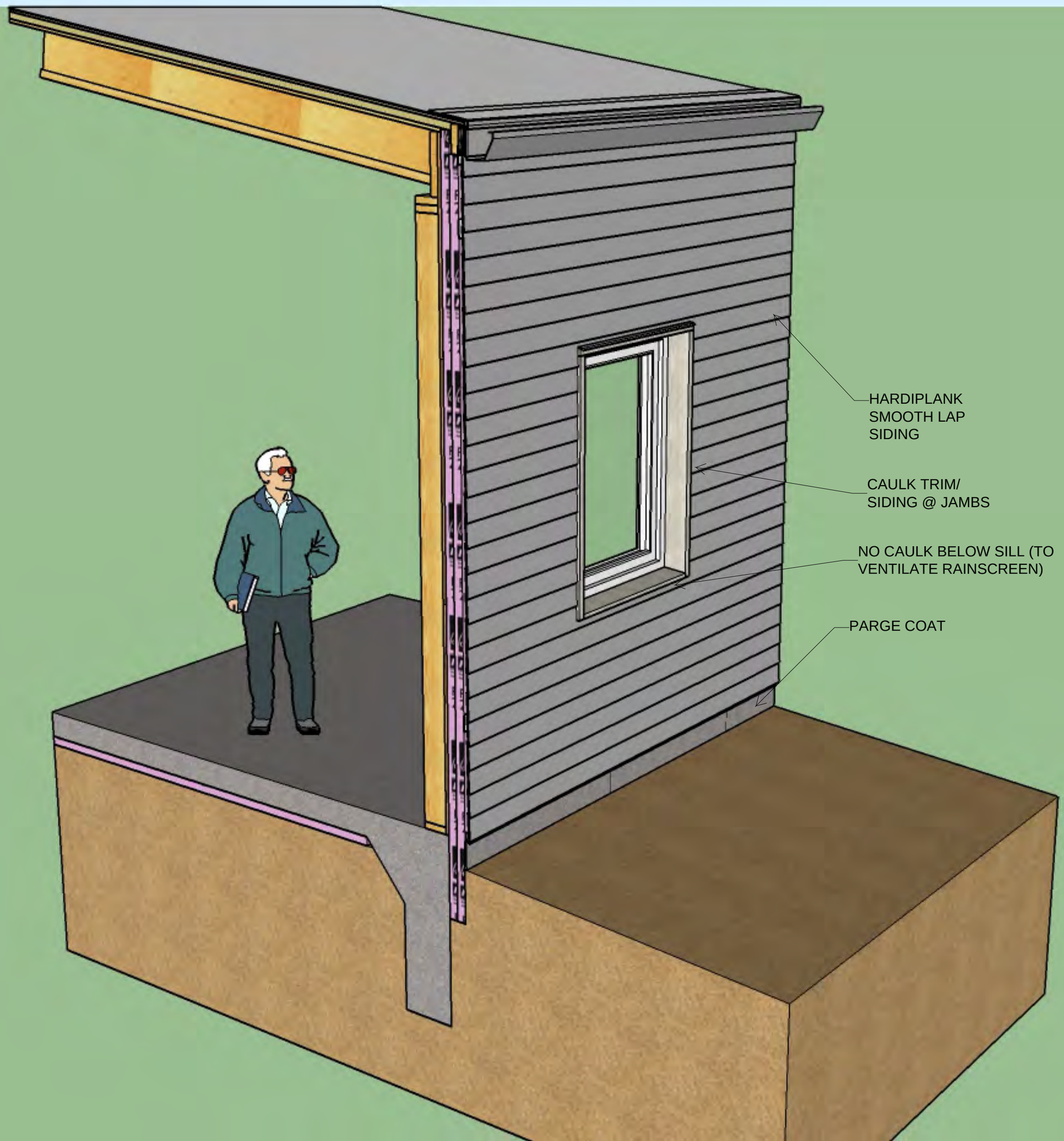

SELF ADHESIVE
MEMBRANE
FLASHING
SELF ADHESIVE
MEMBRANE
FLASHING

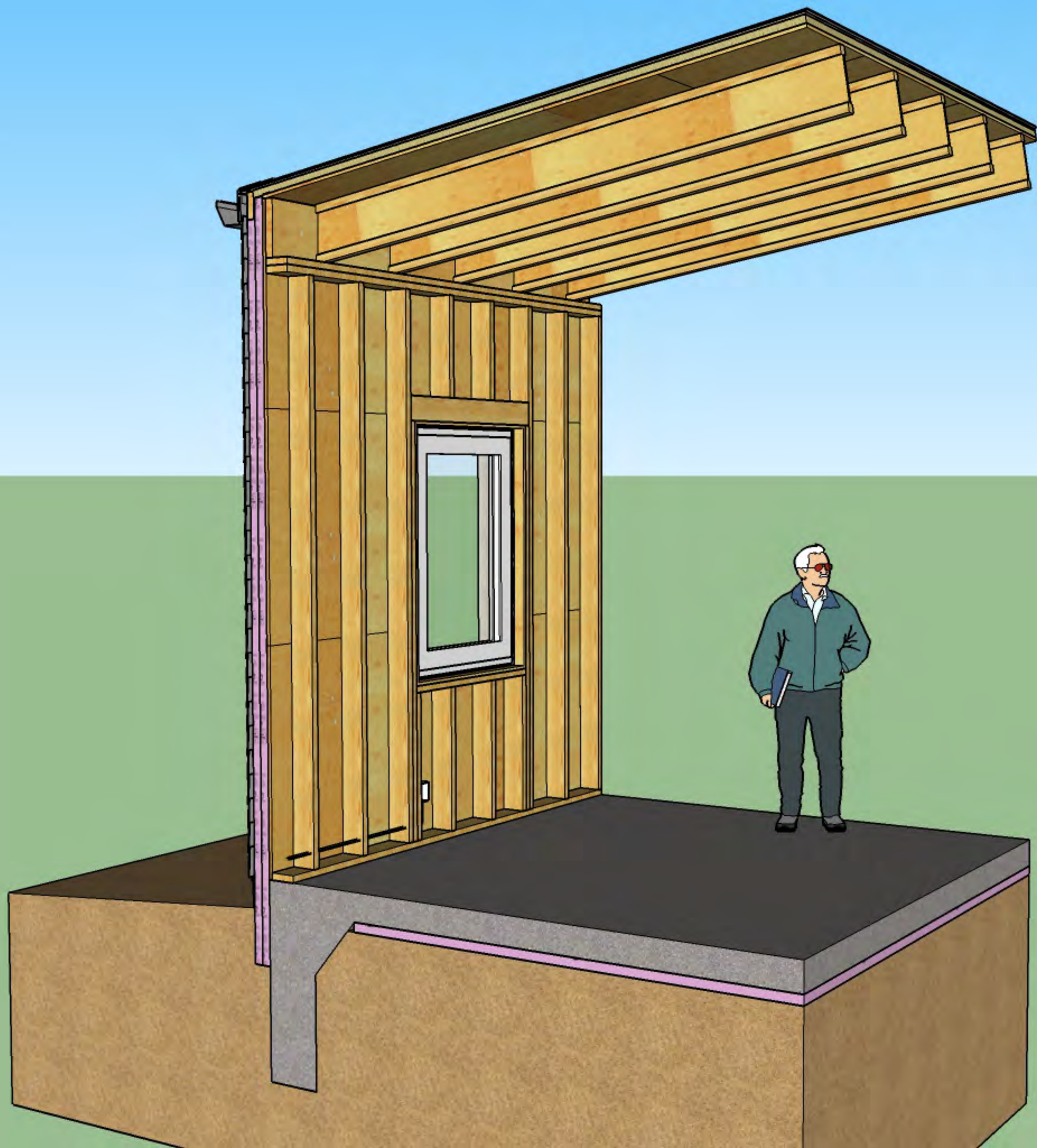

RAINSCREEN
SIDING VENT /
INSECT SCREEN
1X4 BATTEN SCREWED
THROUGH XPS &
SHEATHING 1" INTO STUD
METAL FLASHING
GAP BETWEEN BATTEN &
ROUGH OPENING
RAINSCREEN
SIDING VENT /
INSECT SCREEN
METAL FLASHING

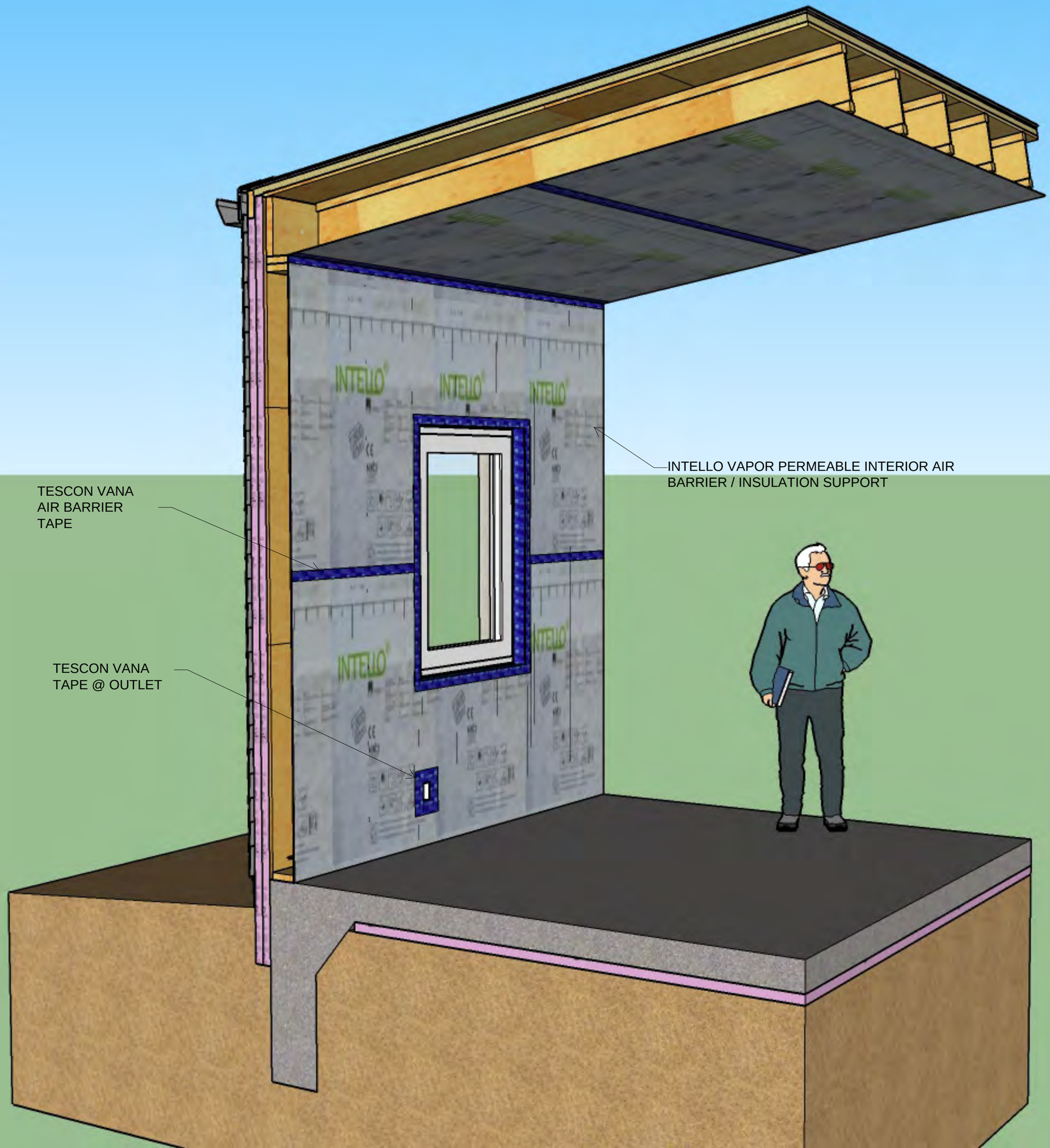

1 1/2" POLYISO INSUL + 1/2" POLYISO COVERBOARD
VINYL PASSIVE HOUSE WINDOW

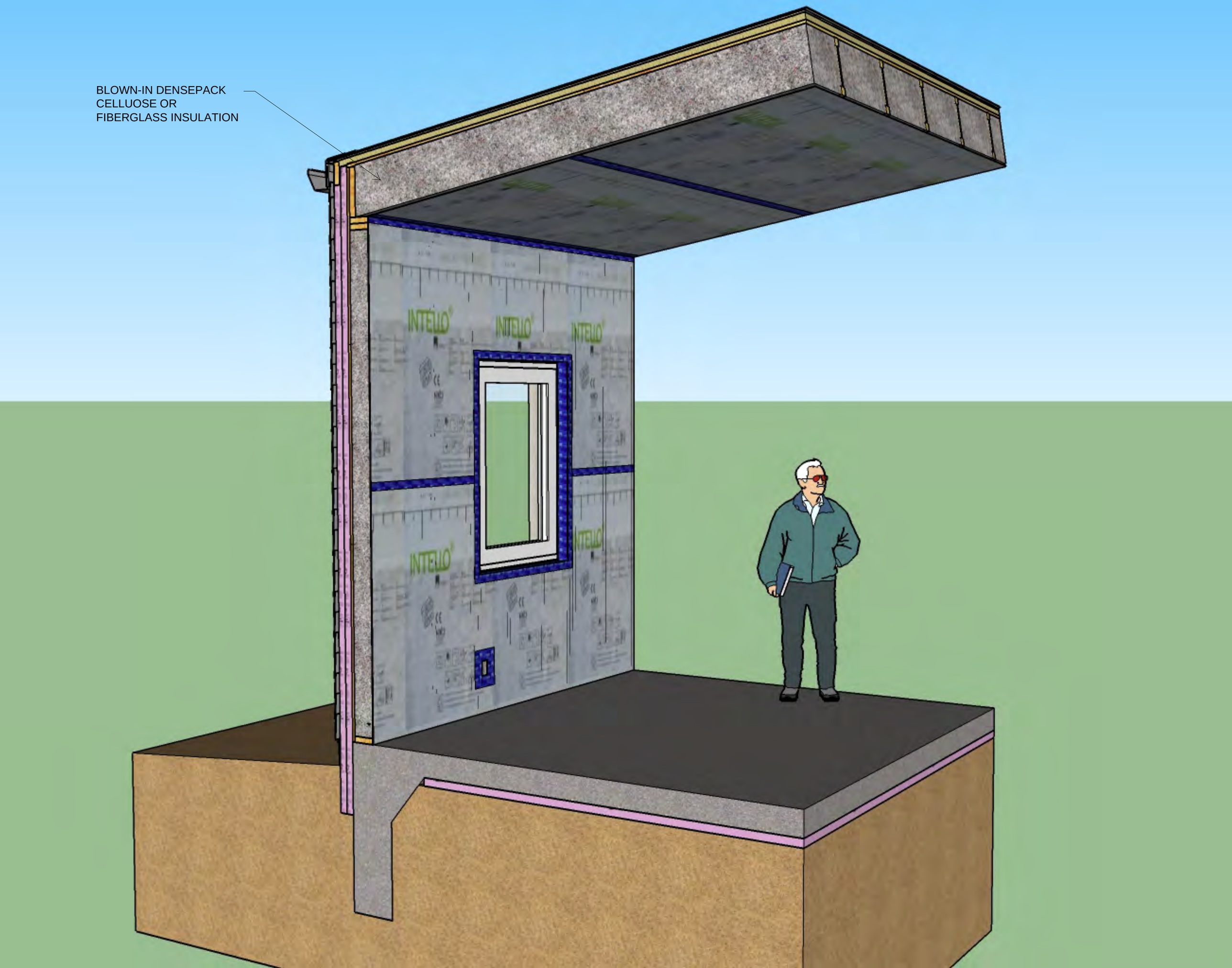

TPO ROOFING
(OR METAL ROOF)
5" GALVALUME
GUTTER

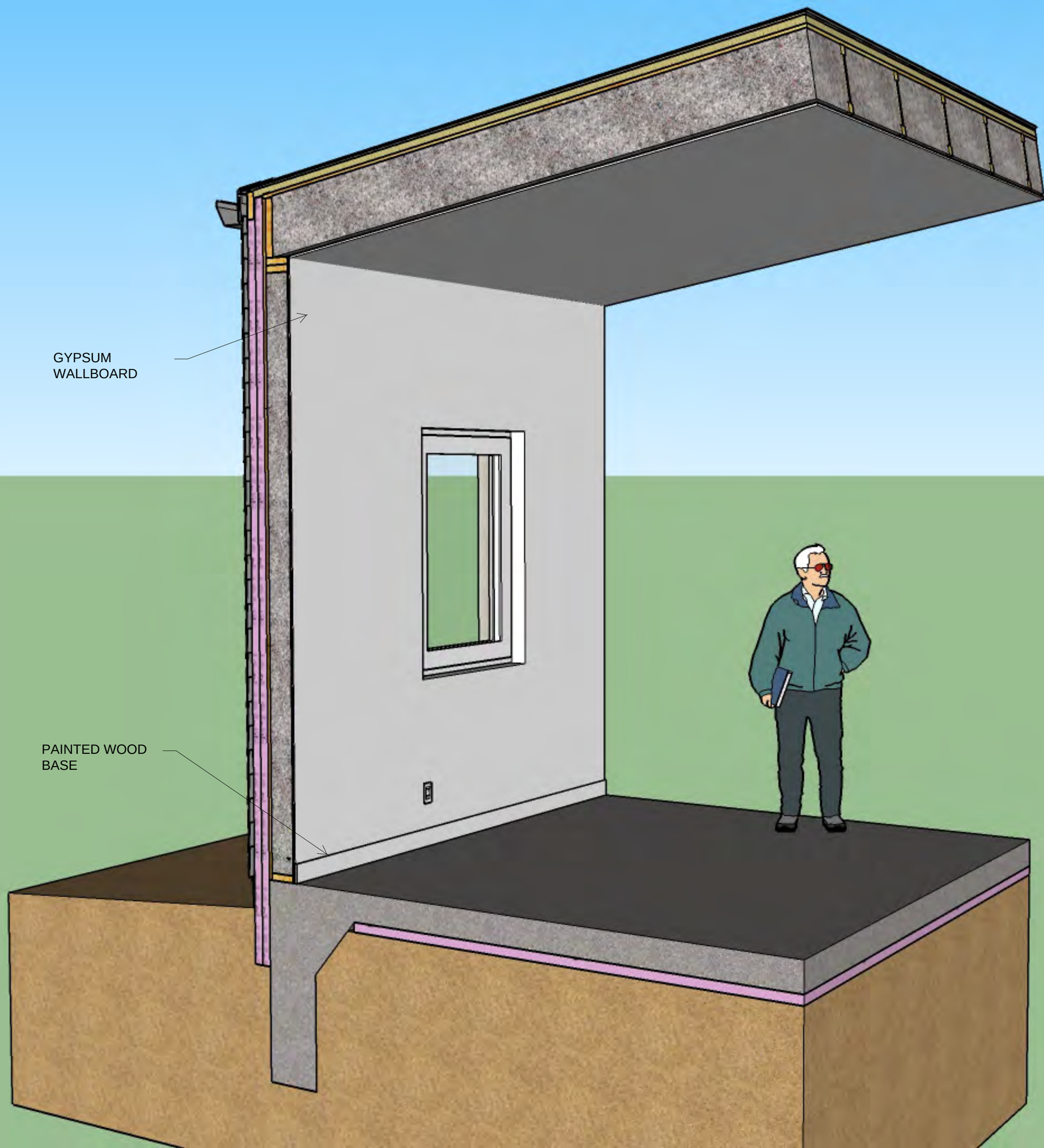

PAINTED 2X6
WINDOW TRIM


HARDIPLANK
SMOOTH LAP
SIDING
CAULK TRIM/
SIDING @ JAMBS
NO CAULK BELOW SILL (TO
VENTILATE RAINSCREEN)
PARGE COAT




INTELLO VAPOR PERMEABLE INTERIOR AIR BARRIER / INSULATION SUPPORT
TESCON VANA AIR BARRIER TAPE
TESCON VANA TAPE @ OUTLET
INTELLO
INTELLO
INTELLO
INTELLO
INTELLO


BLOWN-IN DENSEPACK
CELLUOSE OR
FIBERGLASS INSULATION
INTELLO
INTELLO
INTELLO
INTELLO
INTELLO


GYPSUM
WALLBOARD
PAINTED WOOD
BASE


3846


3846