Central VT Habitat for Humanity Passive House Build

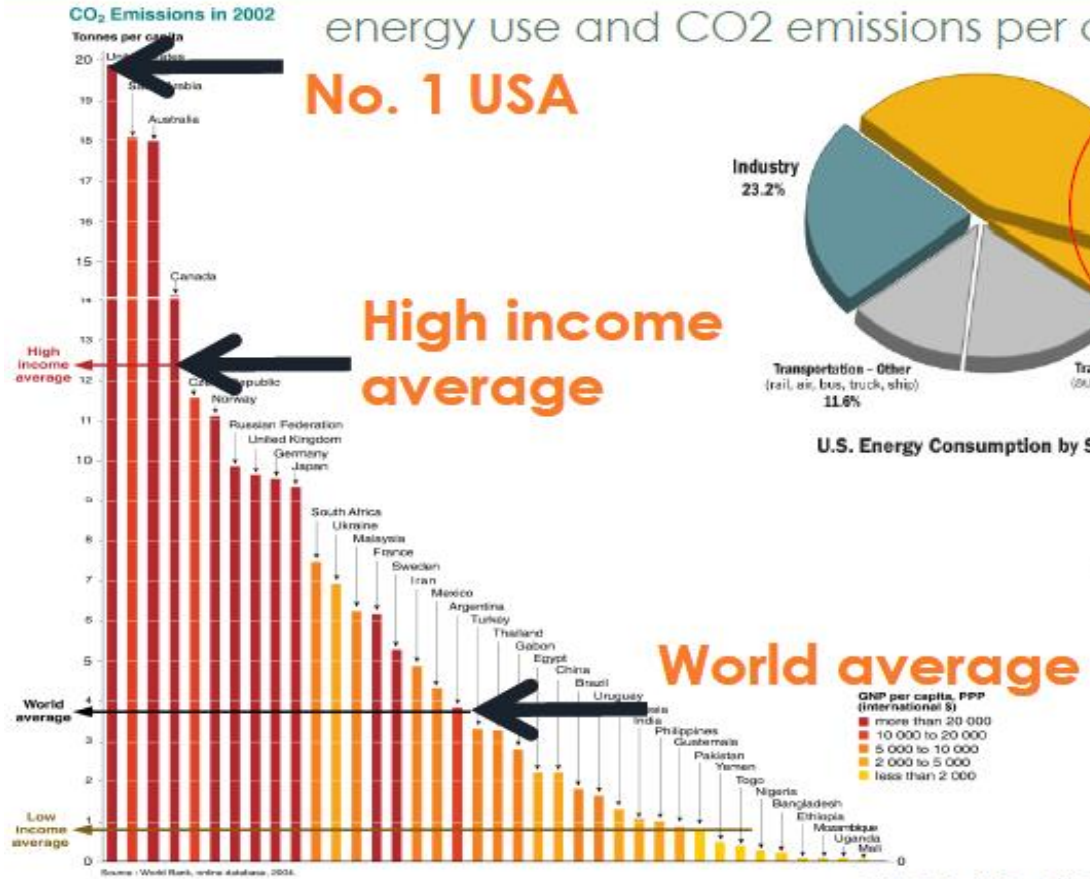
Stonorov Workshop

Norwich University Architecture Class
IRENE FACCIOLO Adjunct Instructor
And Students

Why Design and Build to the PH Standard ?

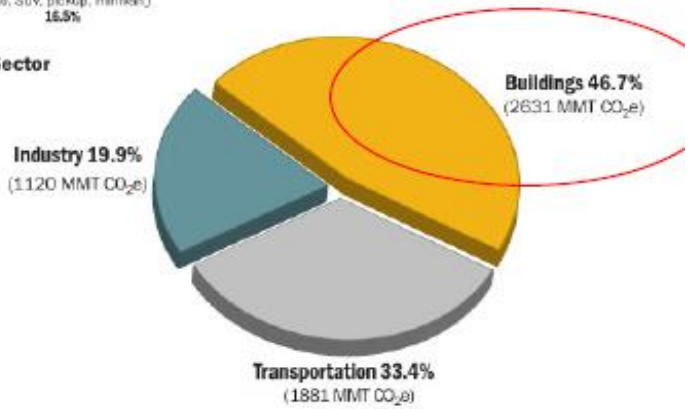
BUILDINGS PLAY A BIG PART

BUILDINGS ACCOUNT FOR ALMOST HALF THE CO_2 EMMISSIONS



energy use and CO2 emissions per capita and by sector

U.S. Energy Consumption by Sector



U.S. CO_2 Emissions by Sector

PASSIVE STANDARDS PERFORM TODAY ARE AT 80% OF THE **2030 CHALLENGE**

U.S. Averages for Site Energy Use and 2030 Challenge Energy Reduction Targets by Space/Building Type[1]

From the Environmental Protection Agency (EPA): Use this chart to find the site fossil-fuel energy targets

Primary Space / Building Type[2]	Available in Target Finder[3]	Average Source EUI[4] (kBtu/Sq.Ft./Yr)	Average Percent Electric	Average Site EUI[4] (kBtu/Sq.Ft./Yr)	2030 Challenge Site EUI Targets (kBtu/Sq.Ft./Yr)				
					50% Target	60% Target	70% Target	80% Target	90% Target
Residential Space / Building Type[6, 7]									
Single-Family Detached		76.6	-	43.8	**21.9**	17.5	13.1	8.8	4.4
Single-Family Attached		70.7	-	43.7	**21.9**	17.5	13.1	8.7	4.4
Multi-Family, 2 to 4 units		93.2	-	58.2	**29.1**	23.3	17.5	11.6	5.8
Multi-Family, 5 or more units		99.4	-	49.5	**24.8**	19.8	14.9	9.9	5.0
Mobile Homes		153.2	-	73.4	**36.7**	29.4	22.0	14.7	7.3

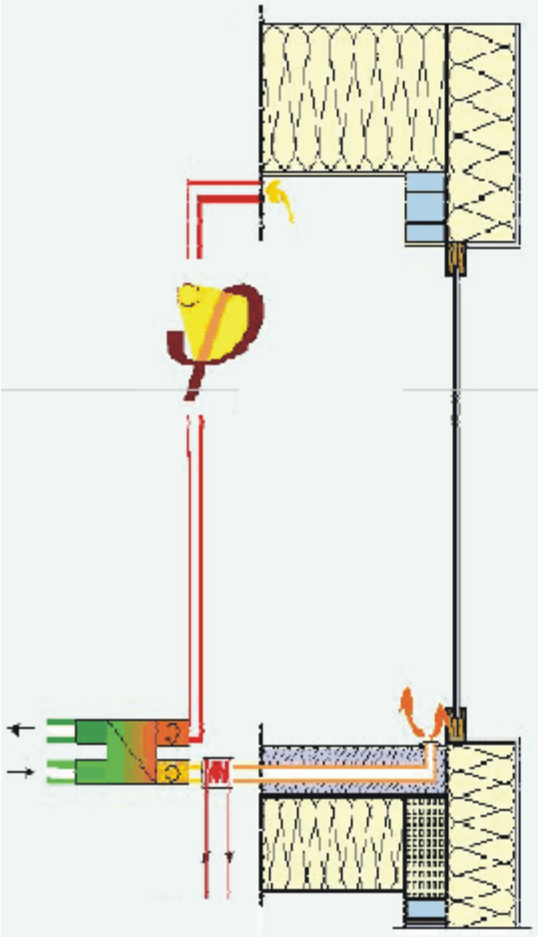
Source: www.architecture2030.org

Passive House Qualities

- Extreme Comfort
- Healthy IAQ
- Pollen, Dust Free
- Heat Recovery Ventilation
- Low Heating Energy
- Low Cooling Energy
- Modeling-Optimize Energy Balance -then function design
- Net Zero-Ready
- Incorporates Building Science Principles
- Energy and Vapor Migration Modeling
- Resilient Assemblies
- Sound
- Long-term Savings
- Stable Energy Bills
- Peace of Mind

EUROPEAN

PASSIVHAUS CRITERIA



Primary Energy	kBTU/ft^2/yr	38
Airtightness	ACH_{50}	0.6
Annual Heat Demand	kBTU/ft^2/yr	4.75
Annual Cooling Demand		
Peak Heat Load	BTU/ft^2.hr	3.14
Peak Cooling Load		2.54
Ventilation	% efficiency	75%
	W/cfm	≤ 0.76
Thermal Envelope	hr. ft^2°F/BTU	≥ R-38.5
	BTU/hr. ft^2 °F	≤ U-0.026
Thermal Bridge Free	BTU/ hr. ft °F	Ψ ≤ 0.006
Windows Installed	BTU/hr. ft^2 °F	Uw-install ≤ 0.15
SHGC	%	≈ 0.50 - 0.55

THE CONCEPT CONTINUES TO DEVELOP
CLIMATE SPECIFIC METRICS

4 PASS/FAIL CRITERIA – 3 HURDLES TO ZERO

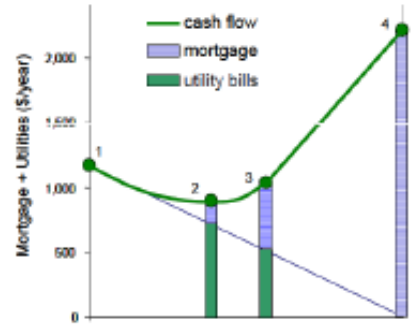
Developed by PHIUS/BSC

Annual Heat & Cooling Demand	• **Varies by climate**	Sliding scale by climate, cold climate example
AND		
Peak Loads	• **Varies by climate**	Sliding scale by climate, cold climate example
Primary Energy Demand	• **≤ 4200 (6200 TEMP) kWh/person**	Change to a per person metric for residential and some PV counts
Airtightness	• **≤ 0.05 cfm^{50}/ft^2 envelope**	ACH50 does not scale for larger buildings

REFINING THE METHODOLOGY

Climate Specific & Cost Optimal Standards

Developed by US Industry



NREL BEopt optimizes upgrade package by climate

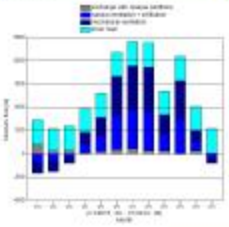
Standards defined as cost optimal/competitive sweetspot between conservation and generation

on the path to zero

REFINING THE METHODOLOGY

Climate Specific Components/Tools

Developed by European & US Industry

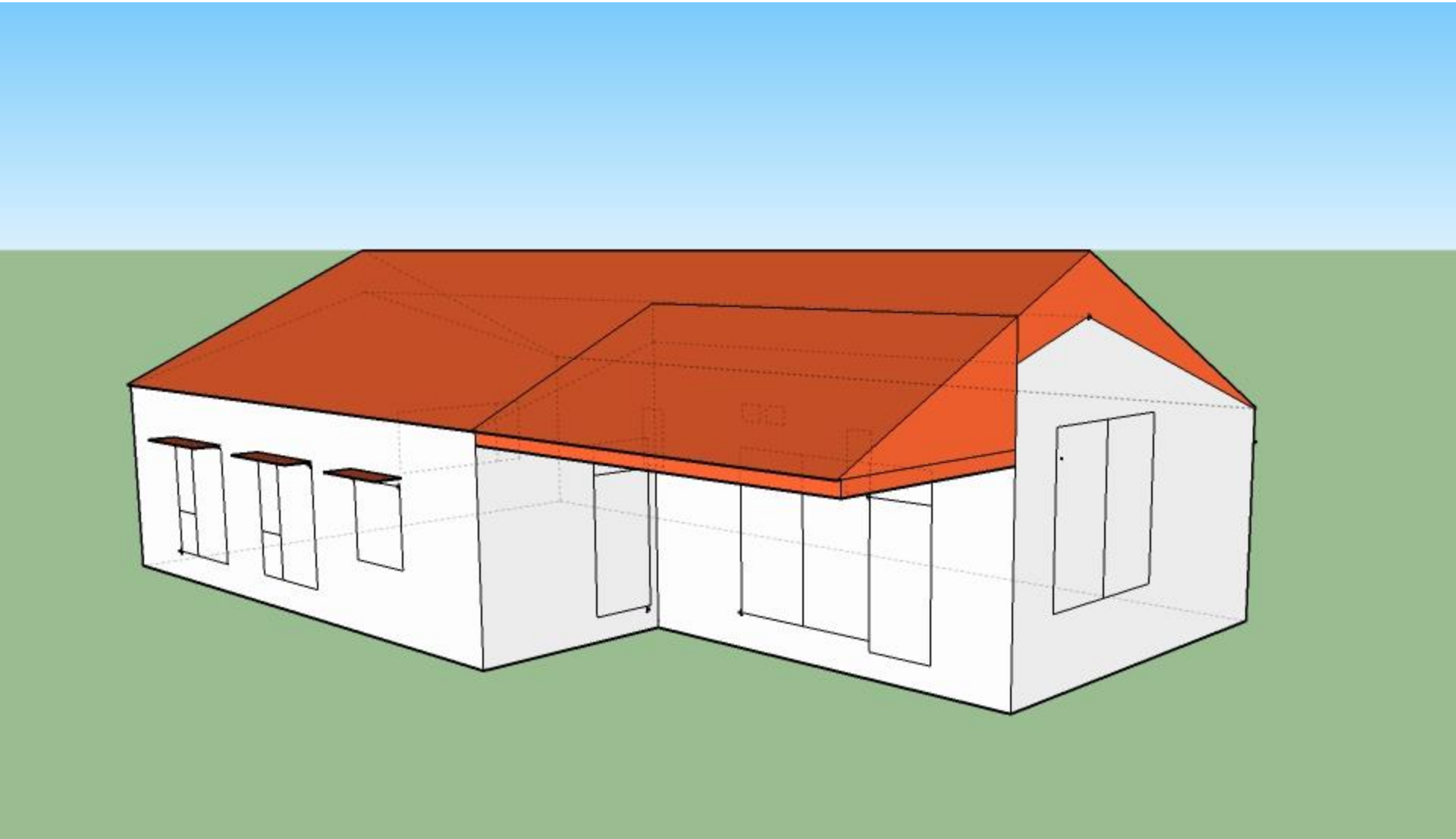


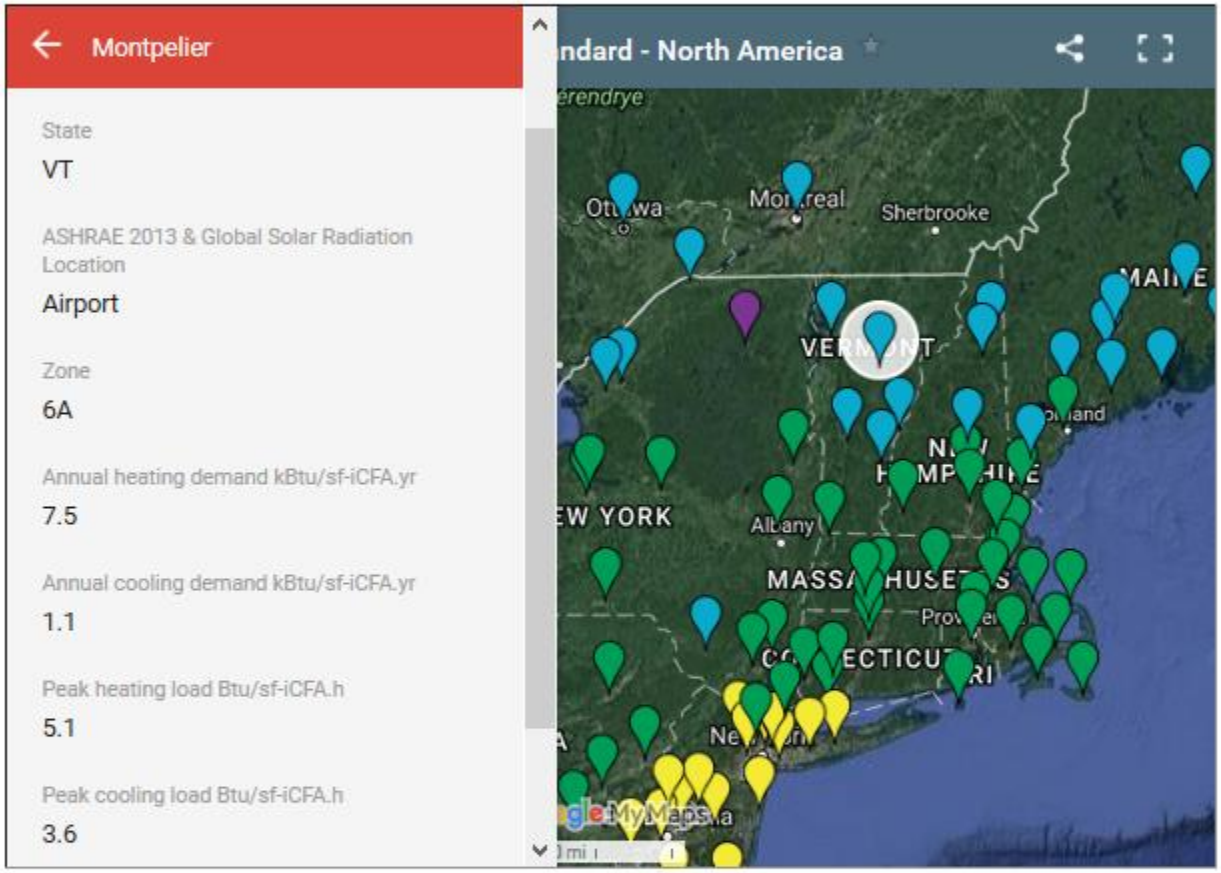
- High performance window performance rating by climate
- Dynamic Design&Verification Tool **WUFI Passive**
- On demand integrated ventilation & space conditioning systems

PHIUS+ 2015 PASSIVE BUILDING CRITERIA

Primary Energy	kBTU/ft^2/yr	(Bedrooms+1 * (6200 kWh *3.412 kBTU/kWh))/iCFA
Airtightness	cfm/ft^2	0.05 cfm/gross ft^2 shell @ 50 pa
		0.08 cfm/gross ft^2 shell @ 75 pa
Annual Heat Demand	kBTU/ft^2/yr	1.0 - 12.0
Annual Cooling Demand		1.0 - 21.4
Peak Heat Load	BTU/ft^2.hr	0.8 - 5.4
Peak Cooling Load		1.8 - 8.9
Ventilation	% efficiency	53% - 95%
	W/cfm	0.27 - 2.23
Thermal Envelope	hr. ft^2°F/BTU	≈ R-25 - R-80
	BTU/hr. ft^2 °F	≈ U-0.04 - U-0.0125
Thermal Bridge Free	BTU/ hr. ft °F	$\Psi \leq 0.006$
Windows Installed	BTU/hr. ft^2 °F	Uw-install 0.41 - 0.08
SHGC	%	≈ 0.27 - 0.61

SketchUP Model Drawn to exterior of Insulation Envelope





Each point on the map lists the following criteria:
City State Location of climate station (when available) ASHRAE Climate Zone Annual Heating Demand (kBTU/sf-iCFA.yr) Annual Cooling Demand (kBTU/sf-iCFA.yr) Peak Heating Load (BTU/sf-iCFA.hr) Peak Cooling Load (BTU/sf-iCFA.hr) Manual J Peak Heating Load (BTU/sf-iCFA.hr) Manual J Peak Cooling Load (BTU/sf-iCFA.hr) (iCFA= Interior Conditioned Floor Area)

Find your PHIUS+ 2015 climate specific performance targets

PHIUS + 2015 provides the climate-specific the sweet spot where aggressive energy and carbon reduction overlap with cost effectiveness. It accounts for a full range of variables including climate zone, source energy, and costs.

Use the clickable map above to find the PHIUS+ 2015 performance metric for your climate. The map includes more than 1000 locations for which performance metrics were calculated based on TMY3 locations. Use the nearest point available. In some cases, when there are no nearby or similar locations mapped, it may be worthwhile to have a custom climate data set generated.

WUFI® Passive V.3.0.3.0 C:\Users\Valued Customer\Desktop\Projects 2016\HFH Project\WufiPassiveModel\CV HfH Round 2nd .wps.mwp

File Input Options Database Help

Scope **Passive house verification** | English/IP/Outer dimensions | Assign data | **Project/Case 1: Central VT Habitat PH Build- static case 1 /Localization/Climate: MONTPELIER AP VT**

- Project
  - **Case 1: Central VT Habitat PH Build- static case 1**
    - Localization/Climate: MONTPELIER AP VT
    - Building
      - PH case: Passive house: Residential
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            - Component 5: East wH fixed mulled left
            - Component 6: West wC T&T mulled right
            - Component 7: East dr 2 mulled top
            - Component 8: East Awning mulled bottom
            - Component 9: South wI fixed mulled right and left
            - Component 10: South Awning mulled left and bottom
            - Component 11: East wH fixed mulled right
            - Component 12: South wI fixed mulled right
            - Component 13: South wA fixed
            - Component 14: South dr1 mulled left and top
            - Component 15: South wC fixed mulled left
            - Component 16: South wB T&T mulled right and bottom
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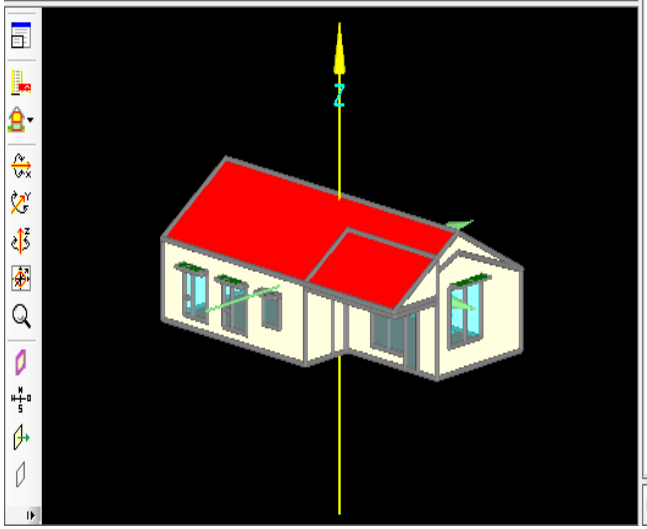
            - Component 19: South wC fixed mulled right and top
            - Component 20: West wD fixed mulled left
            - Component 21: North wG T&T
            - Component 22: North w E T&T

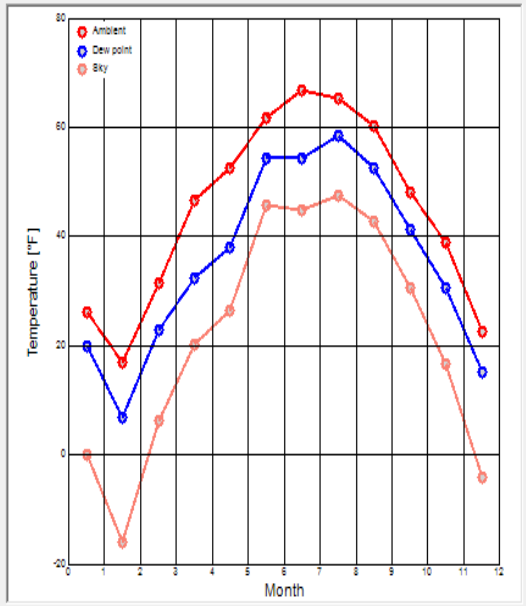


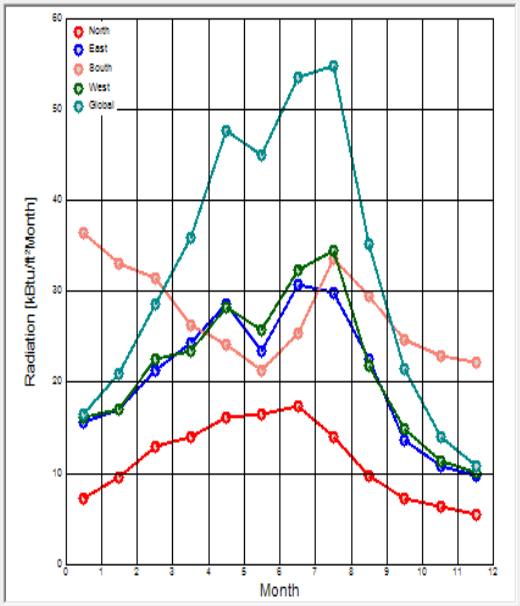
Localization | Climate | Primary energy/CO2-factor

Data: MONTPELIER AP VT

Specification	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Heating W. 1	Heating W. 2	Cooling W. 1	Cooling W. 2
Temperature [°F]																
Ambient	26.1	17.06	31.64	46.76	52.7	61.88	66.92	65.48	60.26	48.02	39.02	22.46	-0.58	27.32	75.38	
Dew point	19.94	6.8	22.82	32.54	37.94	54.32	54.32	58.46	52.52	41.36	30.56	15.26				
Sky*	0.14	-16.06	6.26	20.3	26.6	45.68	44.78	47.66	42.8	30.56	16.7	-4				
Ground*																
Solar radiation [kBtu/ft²Month]													Solar radiation [Btu/hr ft²]			
North	7.291	9.5099	12.9969	13.9479	16.1669	16.4839	17.4349	13.9479	9.8269	7.291	6.34	5.389	12.6799	5.706	22.8239	
East	15.5329	17.1179	21.2389	24.4089	28.5298	23.4579	30.7488	29.7978	22.5069	13.6309	10.7779	9.8269	23.1409	9.193	42.1608	
South	36.4548	32.9678	31.3828	26.3109	24.0919	21.2389	25.3599	33.6018	29.4808	24.7259	22.8239	22.1899	58.6447	13.9479	37.4058	
West	16.1669	17.1179	22.5069	23.4579	28.2128	25.6769	32.3338	34.5528	21.8729	14.8989	11.4119	10.1439	29.1638	8.559	46.5988	
Global	16.4839	20.9219	28.5298	35.8208	47.5497	45.0138	53.5727	54.8407	35.1868	21.5559	13.9479	10.7779	31.3828	9.8269	77.9816	

*Optional input, Sky/Ground: if not defined, temperatures will be estimated)





Data state/results | Show warnings

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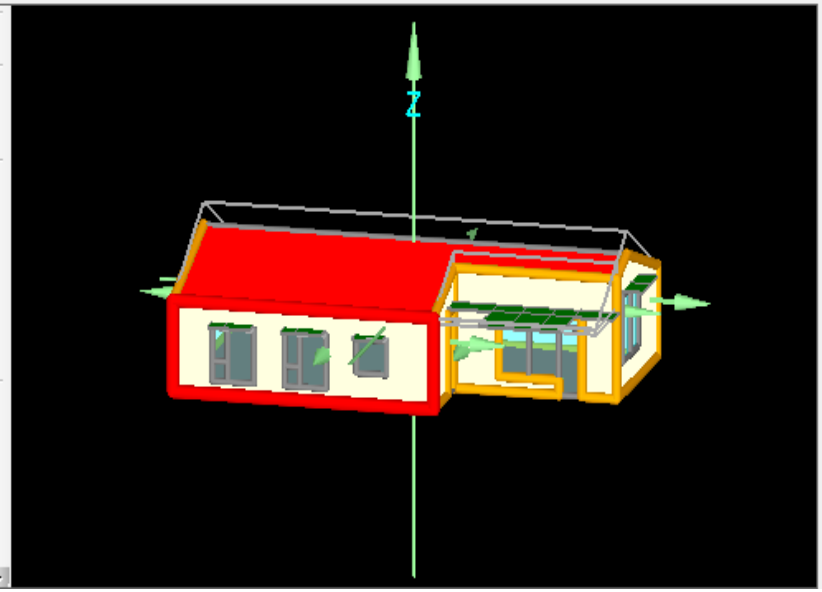

General | Assembly | Surface

Assigned assembly

Name	R [hr ft² °F/Btu]
HfH Wall 10" Iarson Truss DP Cell over 2x6 service Roxul	60.823

Select from database

Available assemblies

HfH - 5" Concrete over 10" EPS	40.589
HfH 24" LF Cell over 3.5" service	92.847

New
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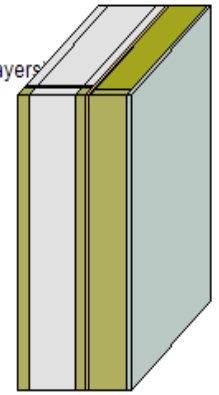
after

Inhomogenous layers

Thermal resistance: 60.823 / 43.765 hr ft² °F/Btu (EN ISO 6946 / homogenous layers)

Heat transfer coefficient(U-value): 0.02 Btu/hr ft² °F

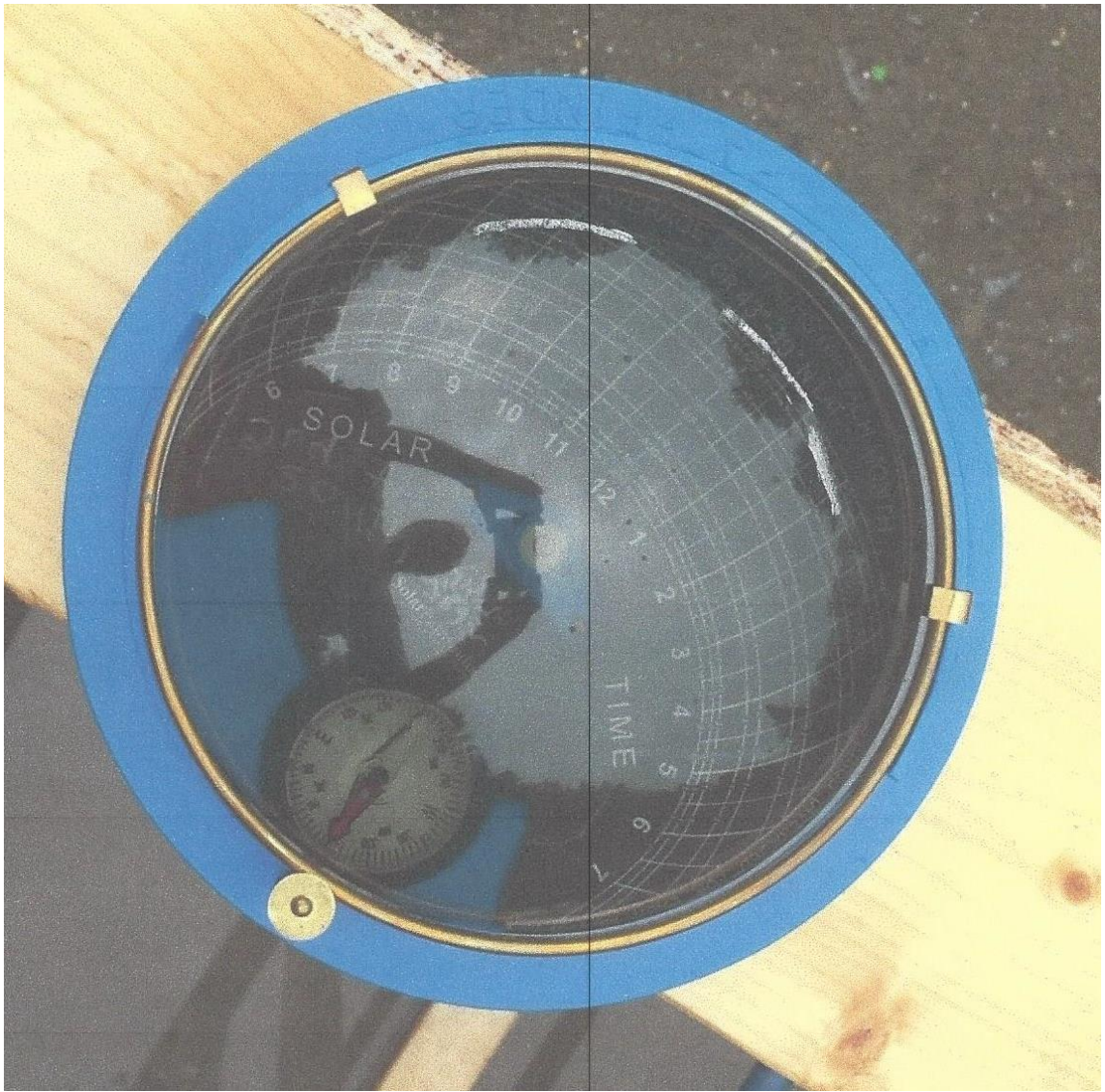
Thickness: 16.617 in



Nr.	Material/Layer (from outside to inside)	ρ [lb/ft³]	c [Btu/lb°F]	λ [Btu/hr ft °F]	Thickness [in]
1	Spruce	24.97	0.45	0.0497	1.5
2	Cellulose Insulation	3.43	0.61	0.0206	7
3	Spruce	24.97	0.45	0.0497	1.5
4	OSB 3 (oriented strand board)	37.14	0.41	0.0606	0.492
5	Spruce	24.97	0.45	0.0497	5.5
6	Gypsum Board (USA)	53.06	0.21	0.0942	0.625

Data state/results | Show warnings

Solar pathfinder- 53% solar gain in Winter and 95% in Summer



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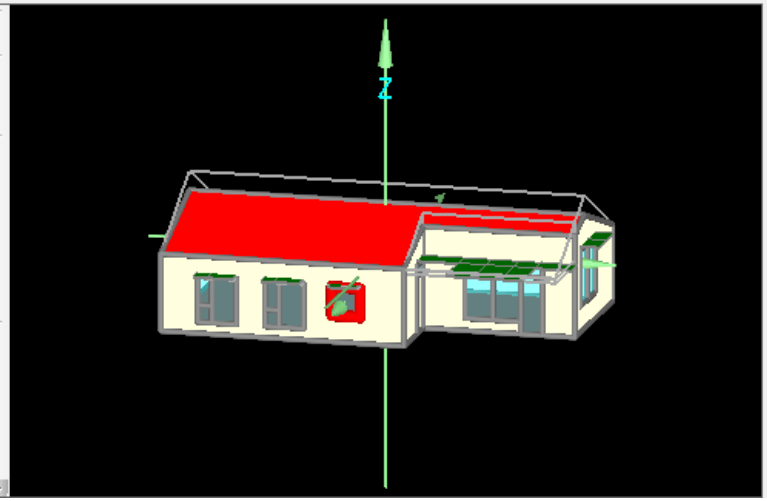


General | Window parameters | Solar protection

Assigned window type

Name	Uw [Btu/hr ft² °F]
KW uPVC PassiV FP- fixed	0.1446

Select from database | Edit

Available window types

KW uPVC PassiV FP- fixed mulled left	0.1389
KW uPVC PassiV FP T&T mulled right	0.1411
KW uPVC PassiV FP Full Glazed Dr mulled top	0.1751
KW uPVC PassiV FP Awning mulled bottom	0.1477
KW uPVC PassiV FP- fixed mulled left and right	0.1332
KW uPVC PassiV FP Awning mulled left and bottom	0.142
KW uPVC PassiV FP- fixed mulled right	0.1389
KW uPVC PassiV FP- fixed mulled right	0.1389

New | Delete | Copy | Insert

New/Insert: after

Assign

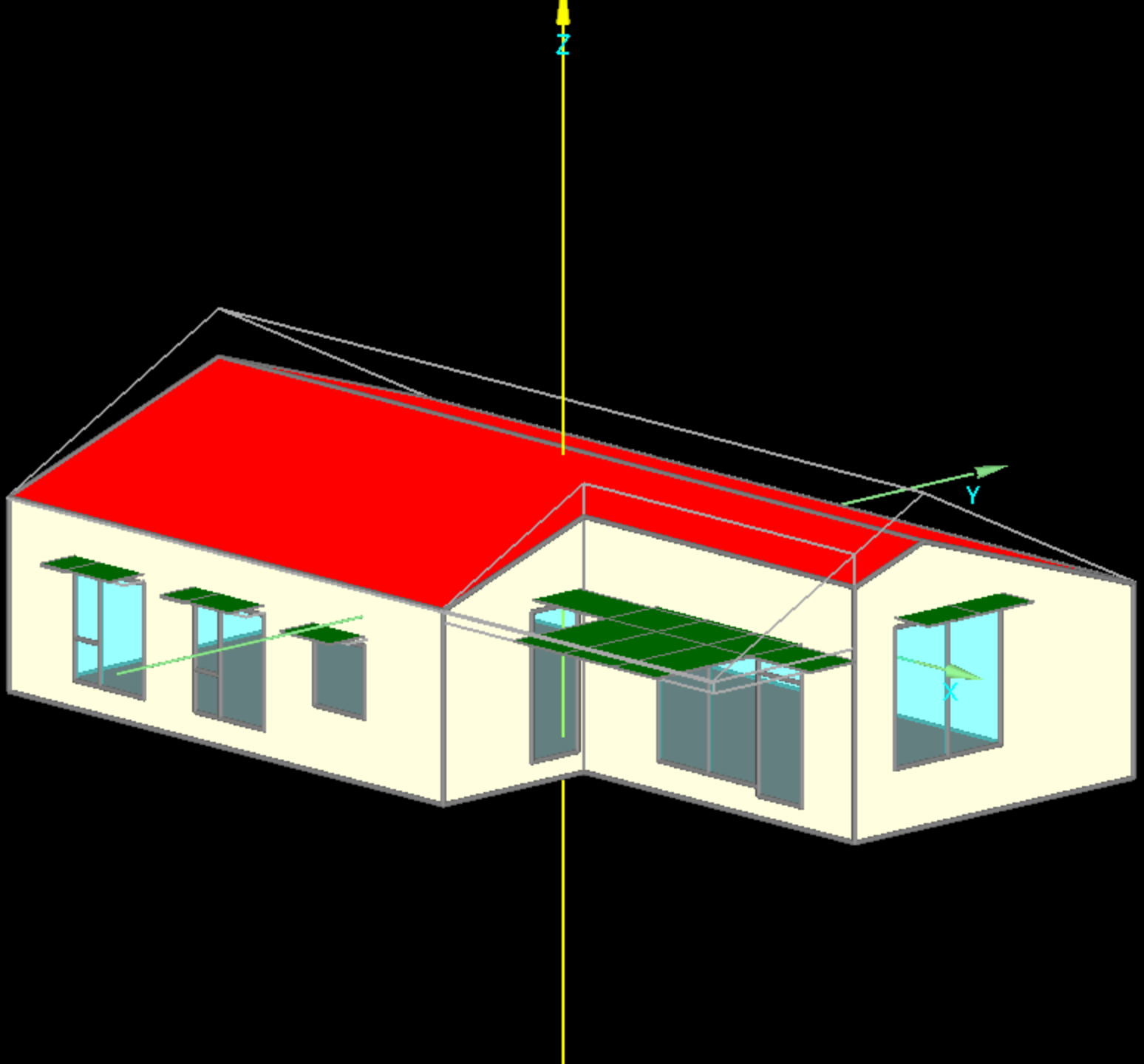
Main parameters

Uw-mounted	[Btu/hr ft² °F]	0.1446
Frame factor	[-]	0.7767
Thermal conductivity of glazing	[Btu/hr ft² °F]	0.11
Solar energy transmittance (perpendicular)	[-]	0.61

Frame data

Specification		Left	Right	Top	Bottom
Frame width	[in]	2.953	2.953	2.953	2.953
Frame U-value	[Btu/hr ft² °F]	0.11	0.11	0.11	0.11
Glazing-to-frame psi-value	[Btu/hr ft °F]	0.017	0.017	0.017	0.017
Frame-to-Wall psi-value	[Btu/hr ft °F]	0.023	0.023	0.023	0.023

Data state/results | Show warnings


Z
Y
X

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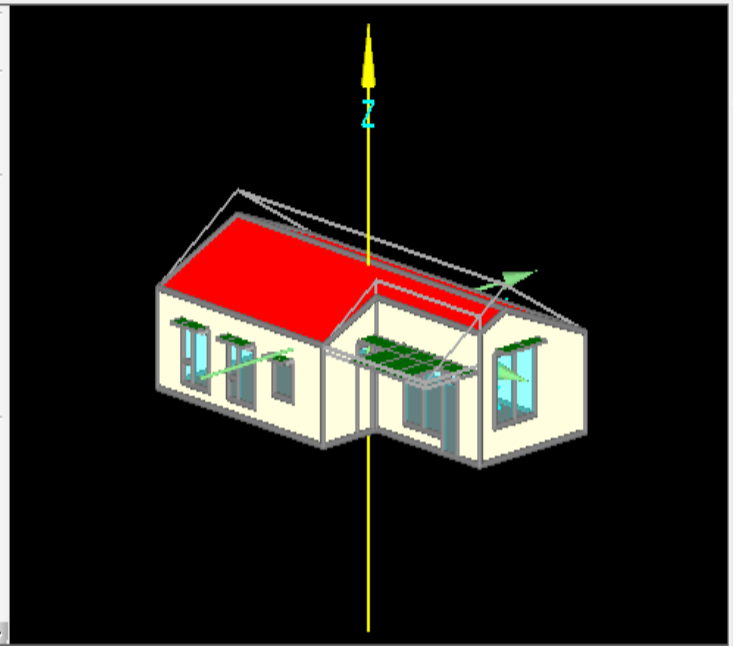
- Component 22: North w E T&T
- Component 23: North wFb fixed
- Component 24: North wFa fixed
- Not visualized components
- Internal Loads/Occupancy
- Ventilation/Rooms
- Thermal bridges
- Attached zones
- Remaining elements
  - Component 1: Vented attic roof
  - Component 2: Vented Attic Gable ends
  - Component 3: Vented wall to attic and other overhangs
- Systems
  - System 1 (User defined): HVAC
    - Device 1 (Mechanical ventilation: Ventilation): Zehnder CA350 HRV
    - Device 2 (Heat pump: Heating, Cooling): Mitsubish MSZ-FH09NA
    - Device 3 (User defined: DHW): GE Geospring Hybrid-Heat Pump
    - Device 4 (Electric heating / DHW: DHW): DHW resistance heating backup



Humidity sources [lb/(ft²hr)]	4.096E-4

Device list

Set standard dataset

Device/End use	Reference quantity	Quantity	In conditioned space	Additional info
Laundry - washer	PH case occupants		☑	DHW connection; Utilization factor 1 ; energ
Laundry - dryer	PH case occupants		☑	Condensation dryer; Remaining dampness 0
Kitchen fridge/freeze combo	PH case Units	1	☑	energy star fridge over freezer combo
Kitchen dishwasher	PH case occupants		☑	DHW connection
Kitchen cooktop	PH case occupants		☑	Cooking with electricity; Indution top/elec co
PHIUS+ 2015 MELS	Bedroooms	3	☑	
PHIUS+ 2015 Interior lighting	PH case floor area	1317.6	☑	Fraction of high efficiency 1
PHIUS+ 2015 Exterior lighting	PH case floor area	1317.6	☐	Fraction of high efficiency 1

New
Delete
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after

Additional data: Laundry - washer

Choice	DHW connection
Energy demand (norm) [kWh/Use]	0.27
Utilization factor [-]	1
Comment	energy star washer, hi rpm spin cycle

Data state/results | Show warnings

Heating demand:	5.6	kBtu/ft²yr
Cooling demand:	0.88	kBtu/ft²yr
Heating load:	5.01	Btu/hr ft²
Cooling load:	2.74	Btu/hr ft²
Primary energy:	4776	kWh/Person yr
Site energy:	16.52	kBtu/ft²yr

BUILDING INFORMATION

Category:	**Residential**
Status:	**Under construction**
Building type:	**New construction**
Year of construction:	**2016**
Units:	**1**
Number of occupants:	**4 (Design)**

Boundary conditions

Climate:	**MONTPELIER AP VT**	
Internal heat gains:	**1.2**	Btu/hr ft²
Interior temperature:	**68**	°F
Overheat temperature:	**77**	°F

Building geometry

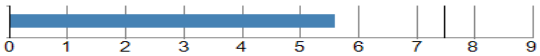
Enclosed volume:	**21371.1**	ft³
Total area envelope:	**5390**	ft²
AV ratio:	**0.3**	1/ft
Floor area:	**1317.6**	ft²

PASSIVEHOUSE REQUIREMENTS

Certificate criteria: **PHIUS+ 2015 Standard**

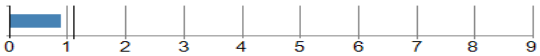
Heating demand

specific:	**5.6**	kBtu/ft²yr
target:	**7.5**	kBtu/ft²yr
total:	7374.42	kBtu/yr



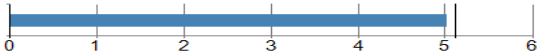
Cooling demand

specific:	**0.88**	kBtu/ft²yr
target:	**1.1**	kBtu/ft²yr
total:	1161.99	kBtu/yr
latent:	0.02	kBtu/ft²yr



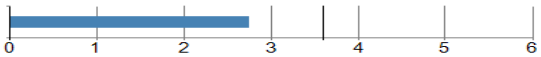
Heating load

specific:	**5.01**	Btu/hr ft²
target:	**5.1**	Btu/hr ft²
total:	6598.07	Btu/hr



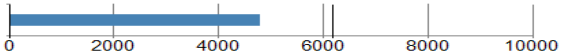
Cooling load

specific:	**2.74**	Btu/hr ft²
target:	**3.6**	Btu/hr ft²
total:	3610.39	Btu/hr



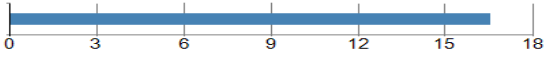
Primary energy

specific:	**4776**	kWh/Person yr
target:	**6200**	kWh/Person yr
total:	65175.5	kBtu/yr



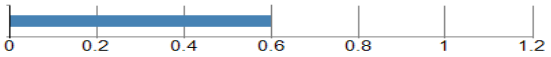
Site energy

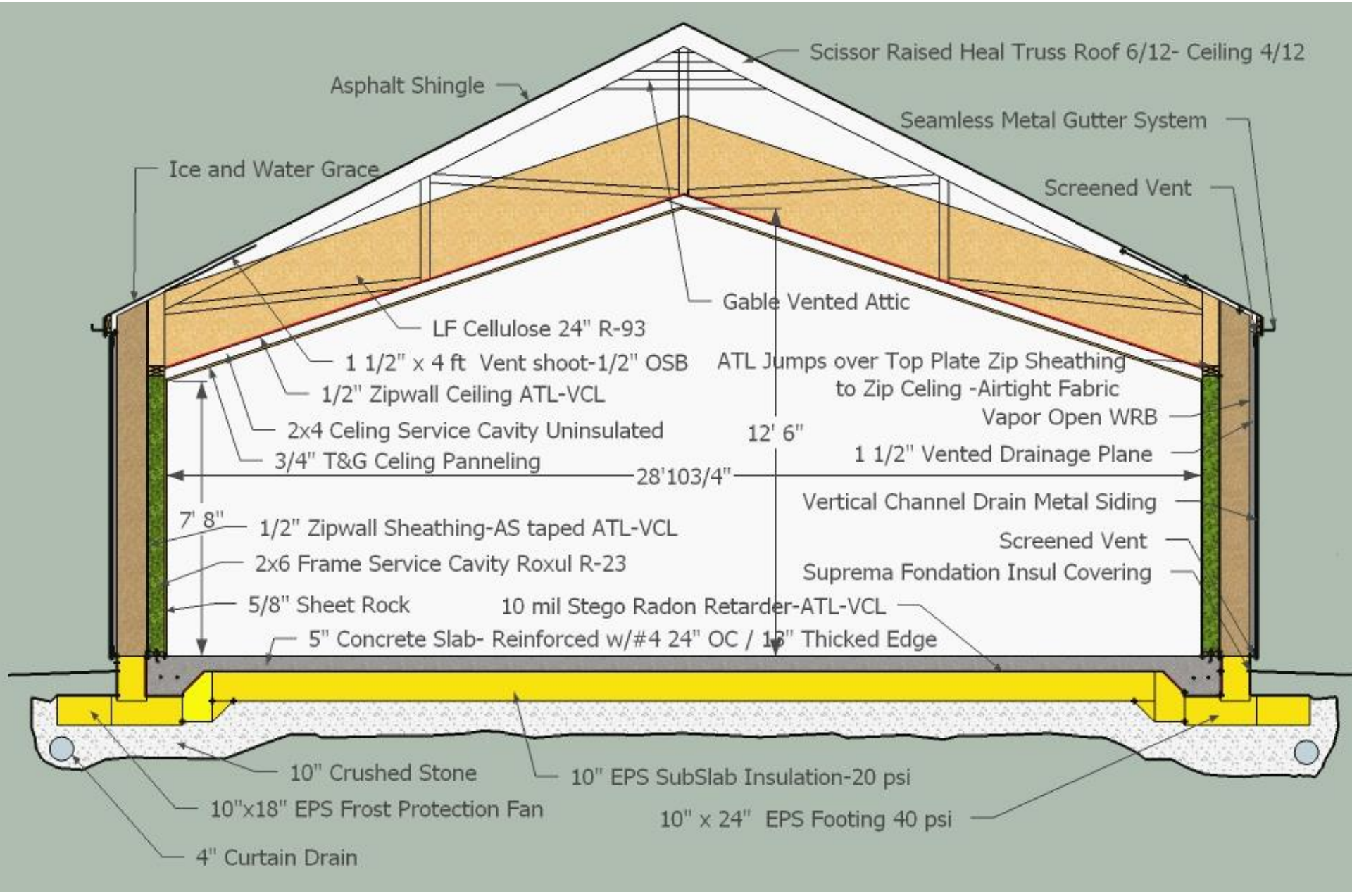
total:	16.52	kBtu/ft²yr
building systems:	53.26	kBtu/yr
photovoltaic savings:	0	kBtu/ft²yr



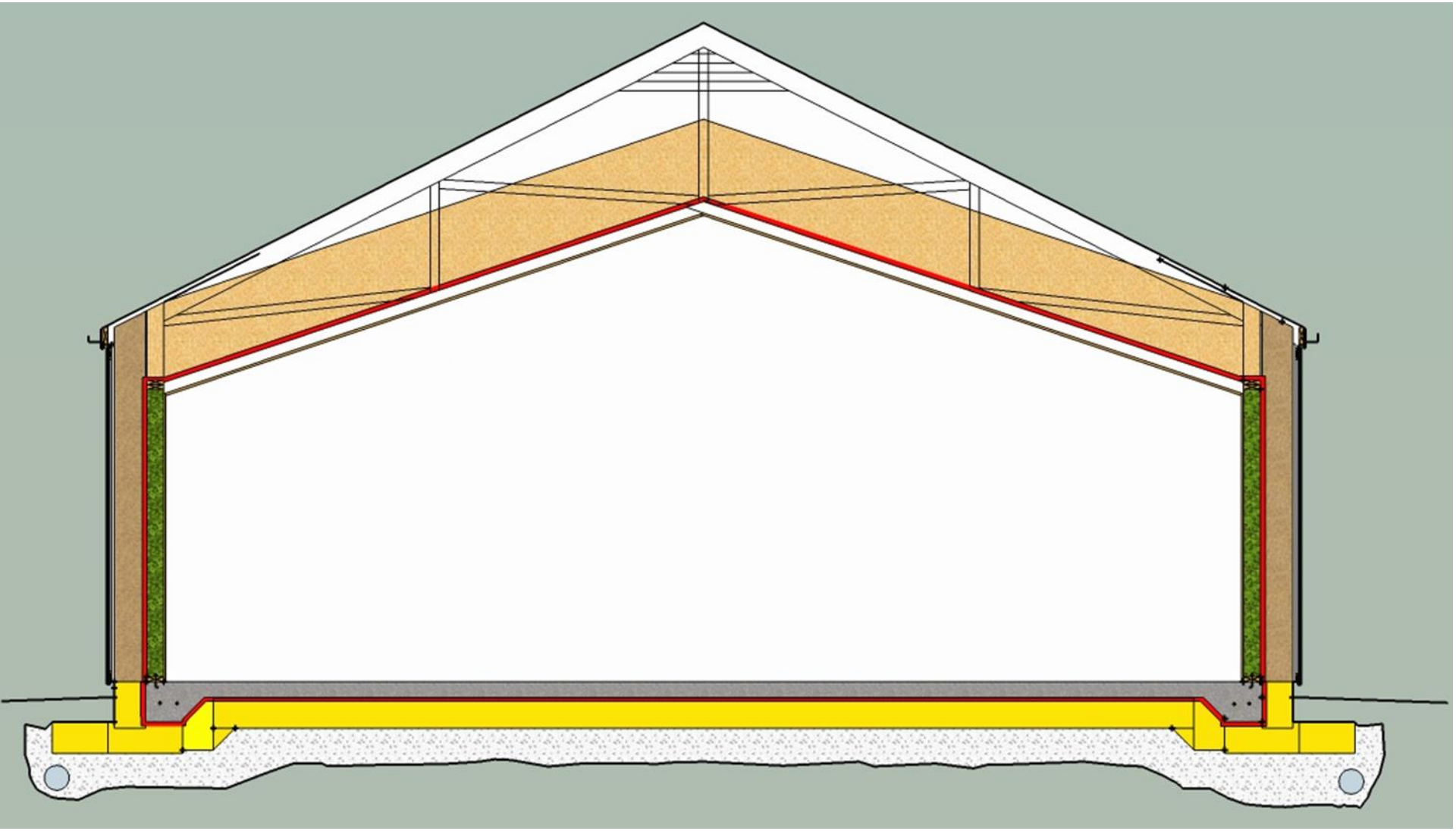
Air tightness

ACH50:	**0.6**	1/hr
target:	**1.24**	1/hr
CFM50 per envelope area:	**0.02**	cfm/ft²
target:	**0.05**	cfm/ft²

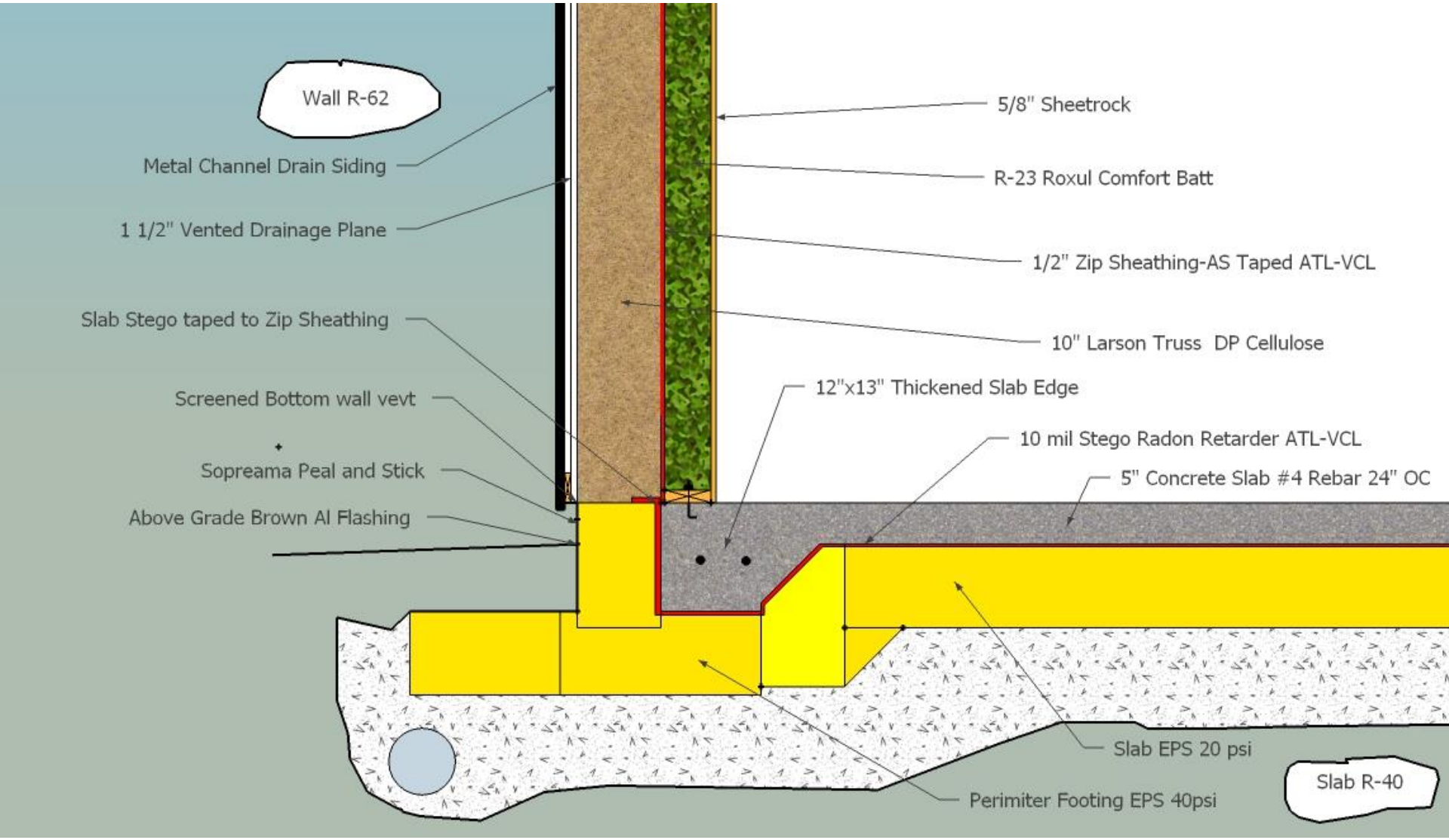



Scissor Raised Heal Truss Roof 6/12- Ceiling 4/12
Asphalt Shingle
Seamless Metal Gutter System
Ice and Water Grace
Screened Vent
Gable Vented Attic
LF Cellulose 24" R-93
1 1/2" x 4 ft Vent shoot-1/2" OSB
ATL Jumps over Top Plate Zip Sheathing
to Zip Celing -Airtight Fabric
1/2" Zipwall Ceiling ATL-VCL
Vapor Open WRB
2x4 Celing Service Cavity Uninsulated
12' 6"
3/4" T&G Celing Panneling
1 1/2" Vented Drainage Plane
28'103/4"
Vertical Channel Drain Metal Siding
7' 8"
1/2" Zipwall Sheathing-AS taped ATL-VCL
Screened Vent
2x6 Frame Service Cavity Roxul R-23
Suprema Fondation Insul Covering
5/8" Sheet Rock
10 mil Stego Radon Retarder-ATL-VCL
5" Concrete Slab- Reinforced w/#4 24" OC / 12" Thicked Edge
10" Crushed Stone
10" EPS SubSlab Insulation-20 psi
10"x18" EPS Frost Protection Fan
10" x 24" EPS Footing 40 psi
4" Curtain Drain

Air-tightness layer - ATL
Vapor Control Layer - VCL



Slab R-40 to Wall R-62



Excavation

And the foam cutting starts

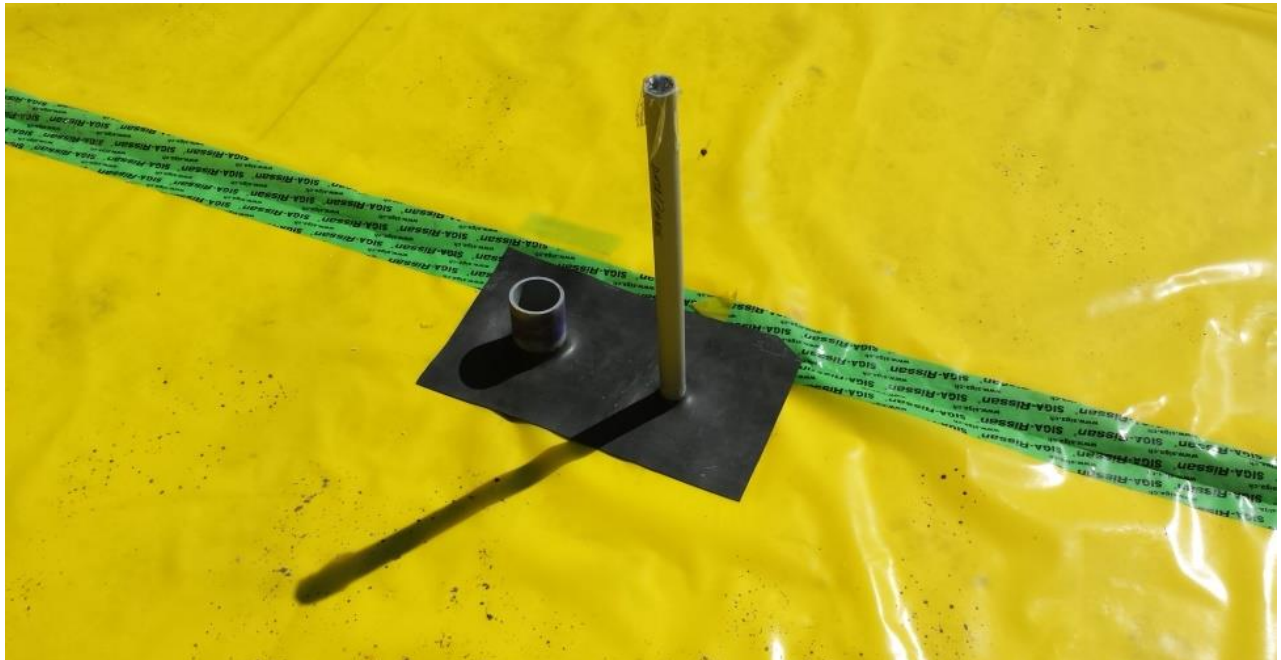
Thickened Slab Edge Assembly

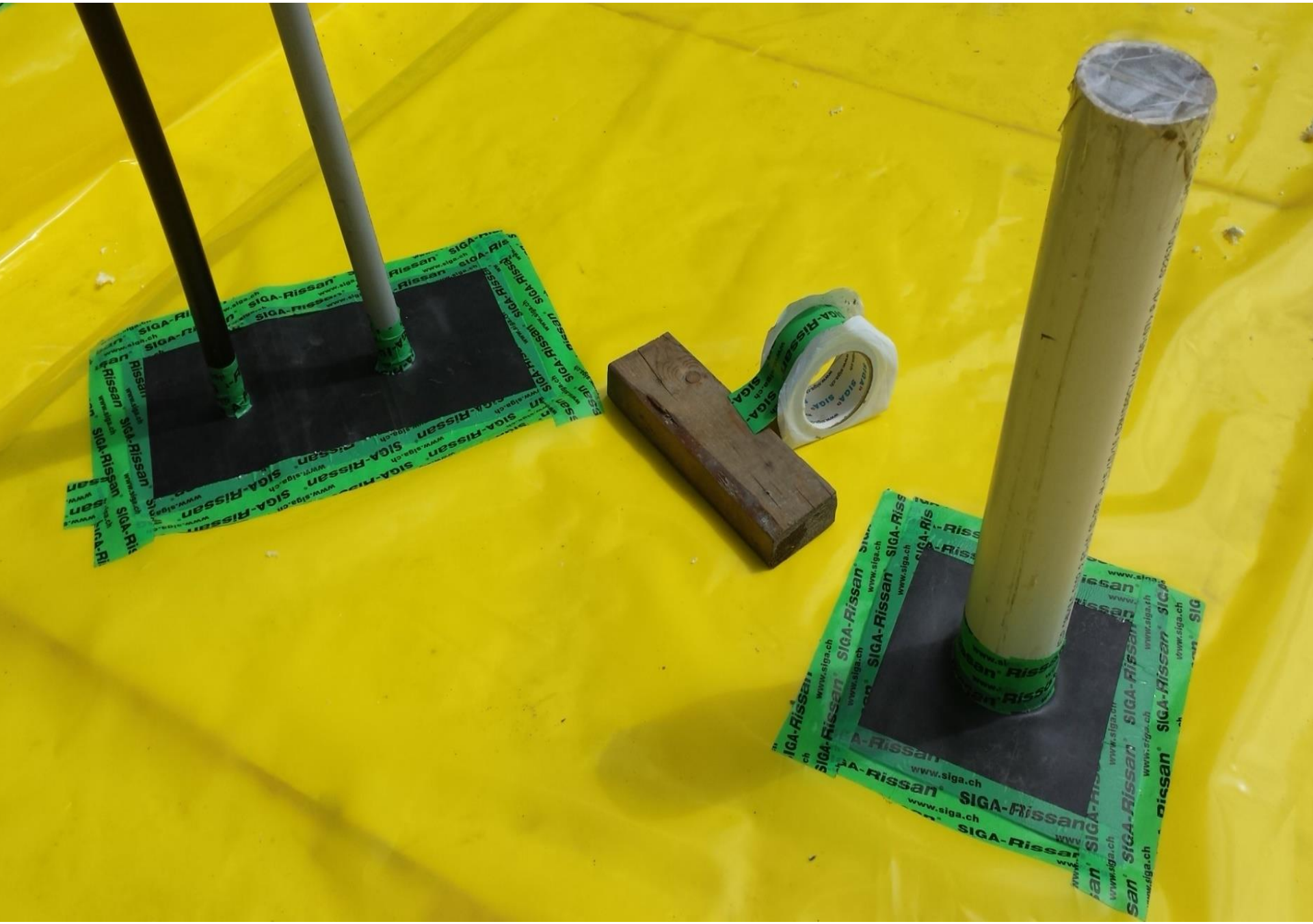
EPS Perimeter Insulation 40 psi

Slab R-40 – 20 psi

Stego 10 mil

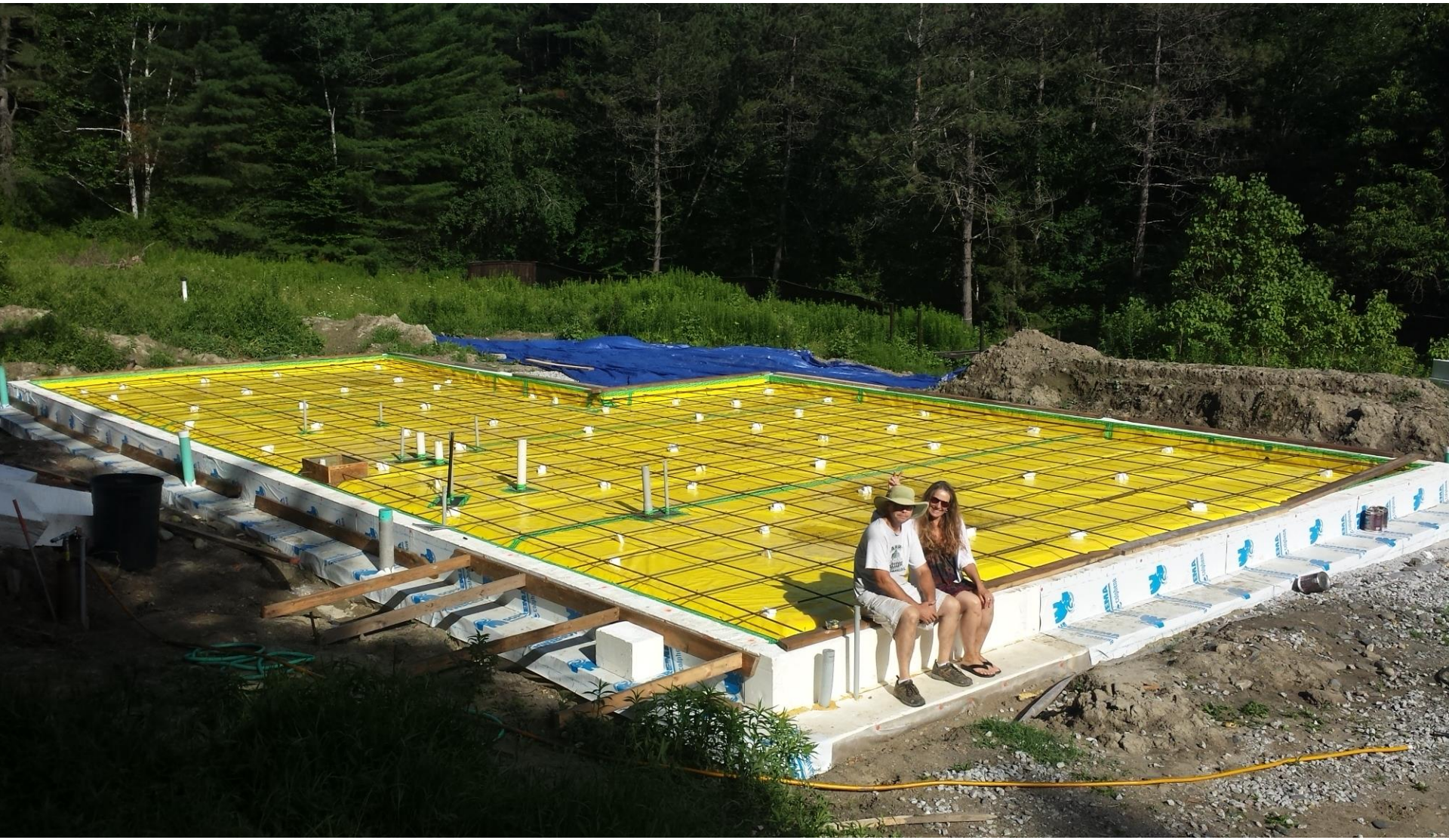
Salvaged EPDM Rubber Gaskets




SIGA-Rissan
www.siga.ch

Air Barrier slab to wall transition

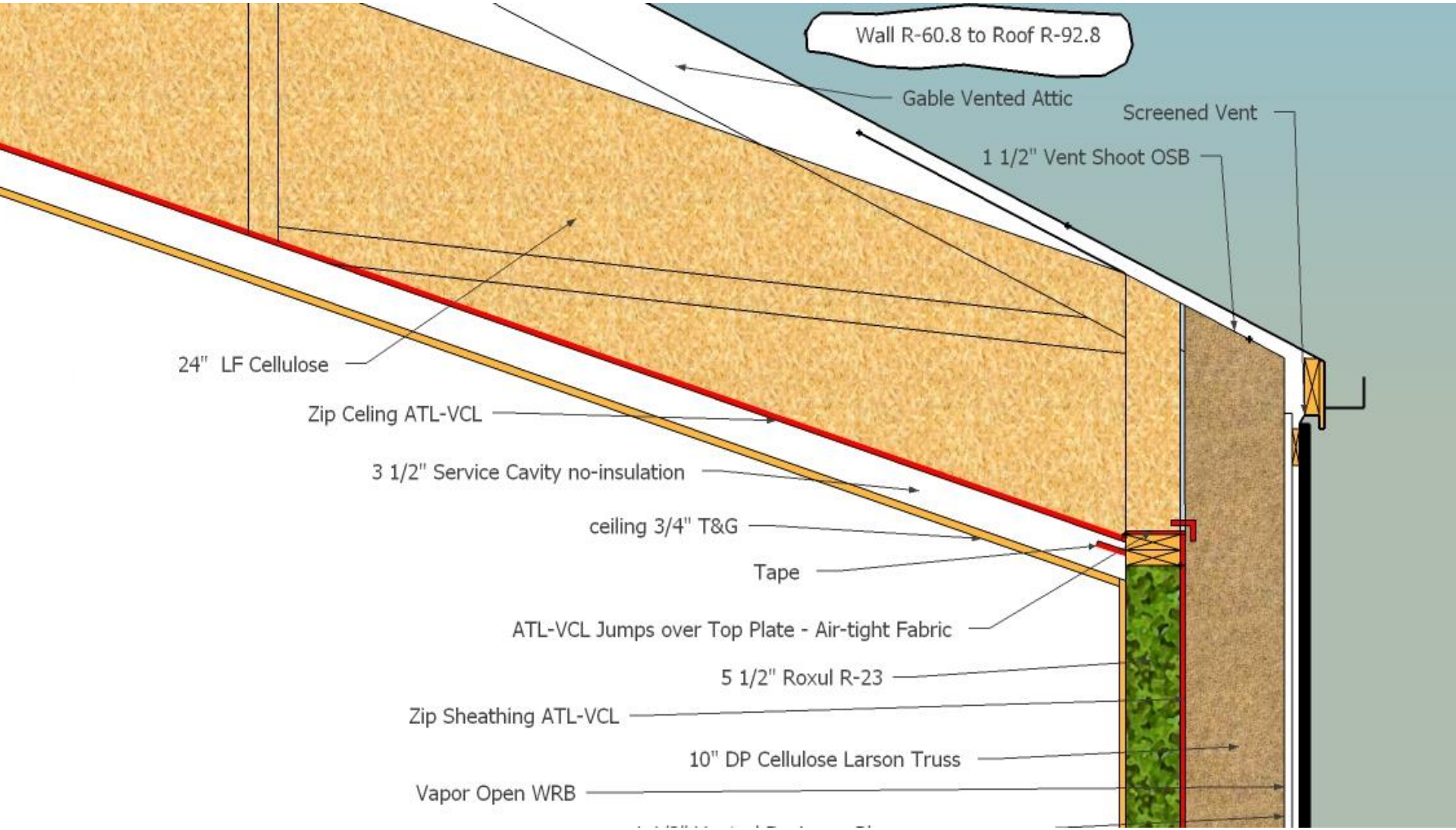
Ready for Pour




SIGA-Rissan
www.siga.ch


SIGA-Rissan
www.siga.ch

2x6 - Service Cavity Frame



Wall to Roof

Wall R-62 to 4/12 - Ceiling R-92.8


ZIPsystem

Roof Vent Shoots

Wall to Ceiling ATL


ZIPsystem
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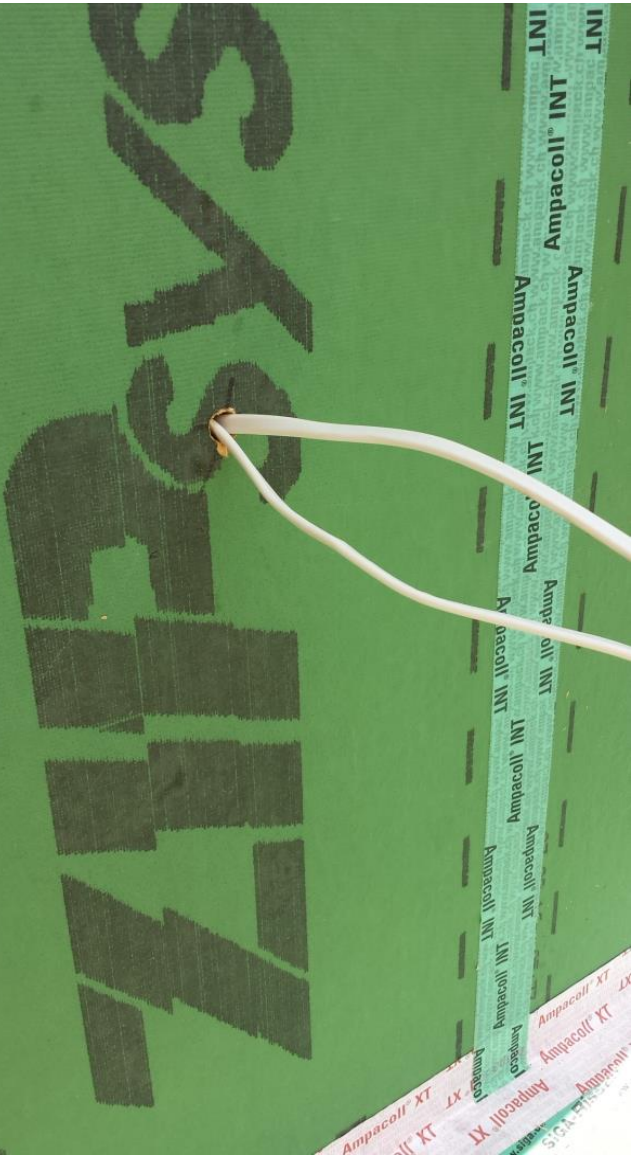
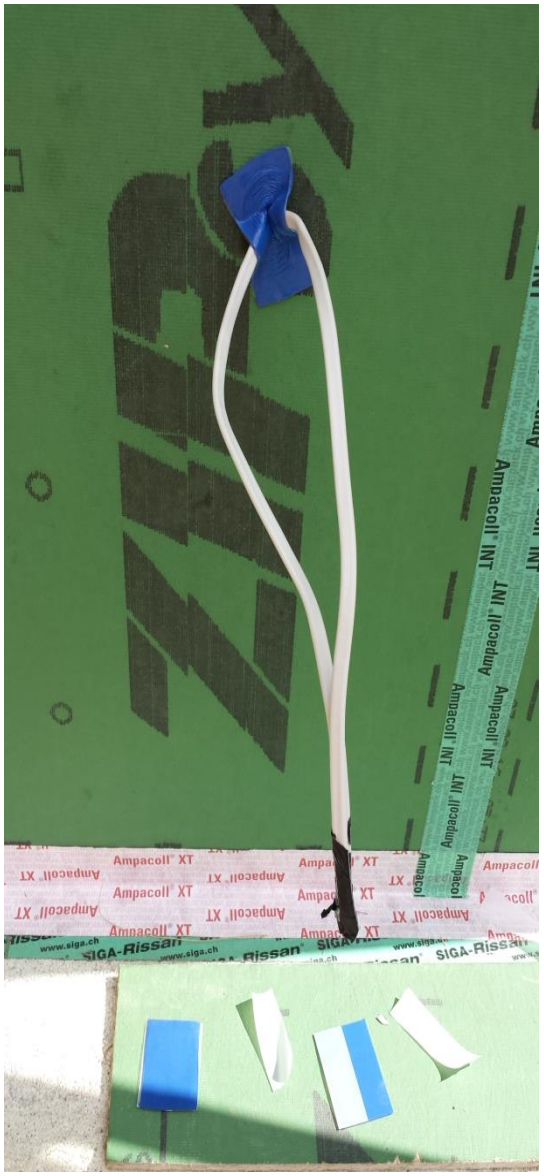
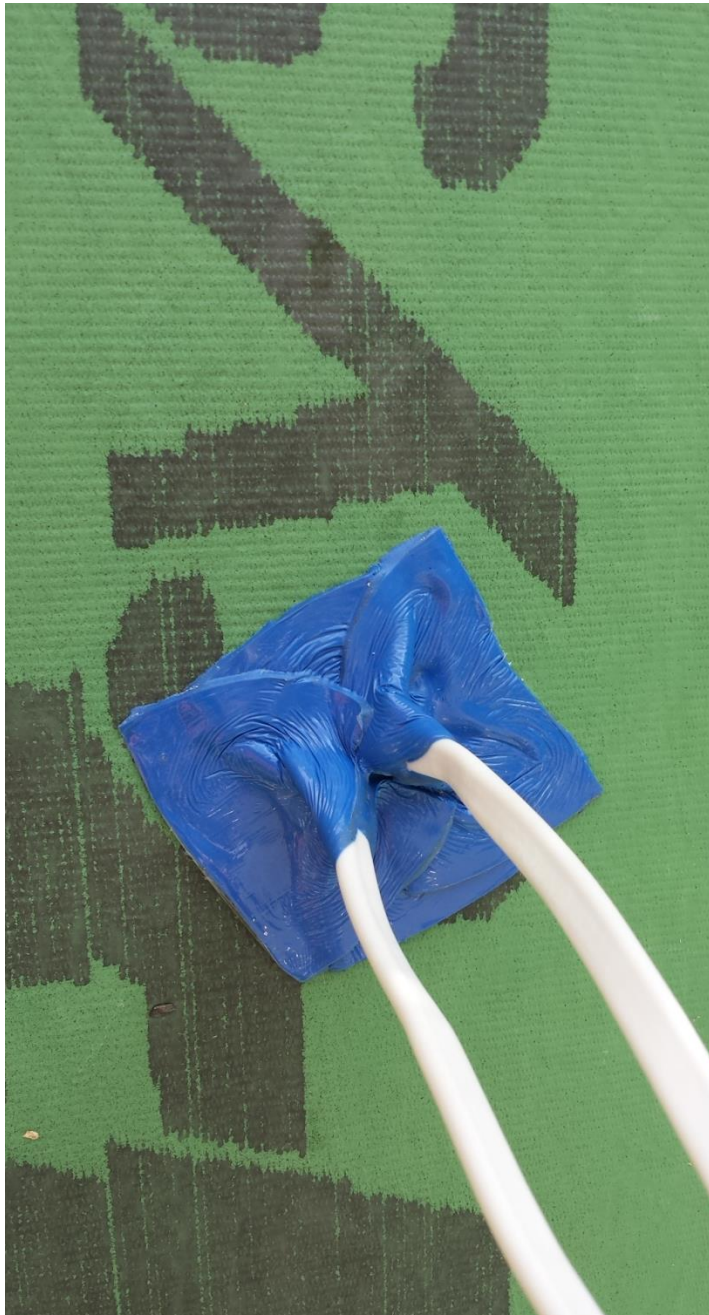
ZIPsystem
ZIPsystem
AdvanTech Flooring

Taping Zip Sheathing ATL-VCL

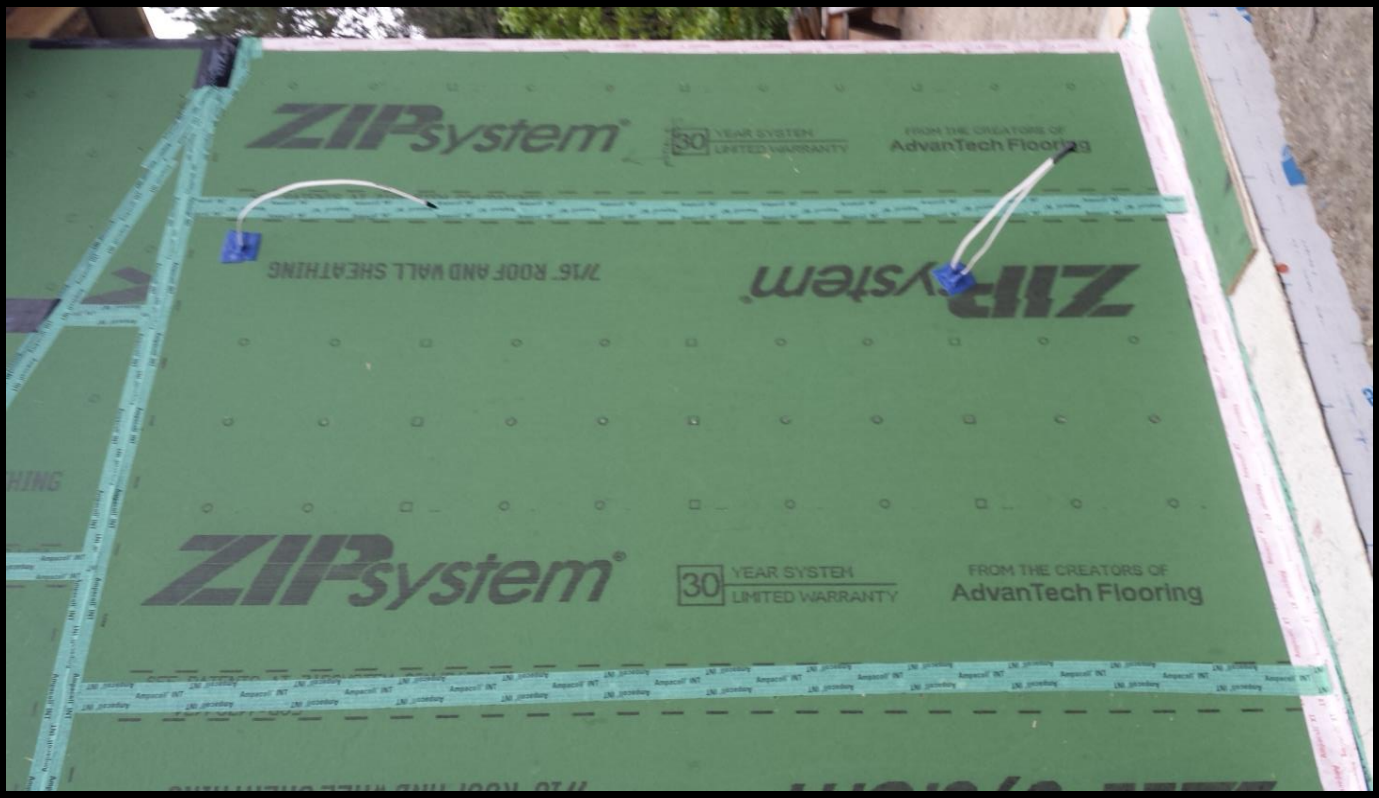
Butyl Rubber Tape







Septic stack vented


ZIPsystem
30 YEAR SYSTEM LIMITED WARRANTY
FROM THE CREATORS OF AdvanTech Flooring
7/16" ROOF AND WALL SHEATHING


ZIPsystem
30 YEAR SYSTEM LIMITED WARRANTY
FROM THE CREATORS OF AdvanTech Flooring
Ampacoll XT
Ampacoll INT


ZIP System
ROOF AND WALL SHEATHING


ZIPsystem


Ampacoll® INT
www.ampack.ch

Zip Ceiling Taping

¾” Fir Ply Window Bucks

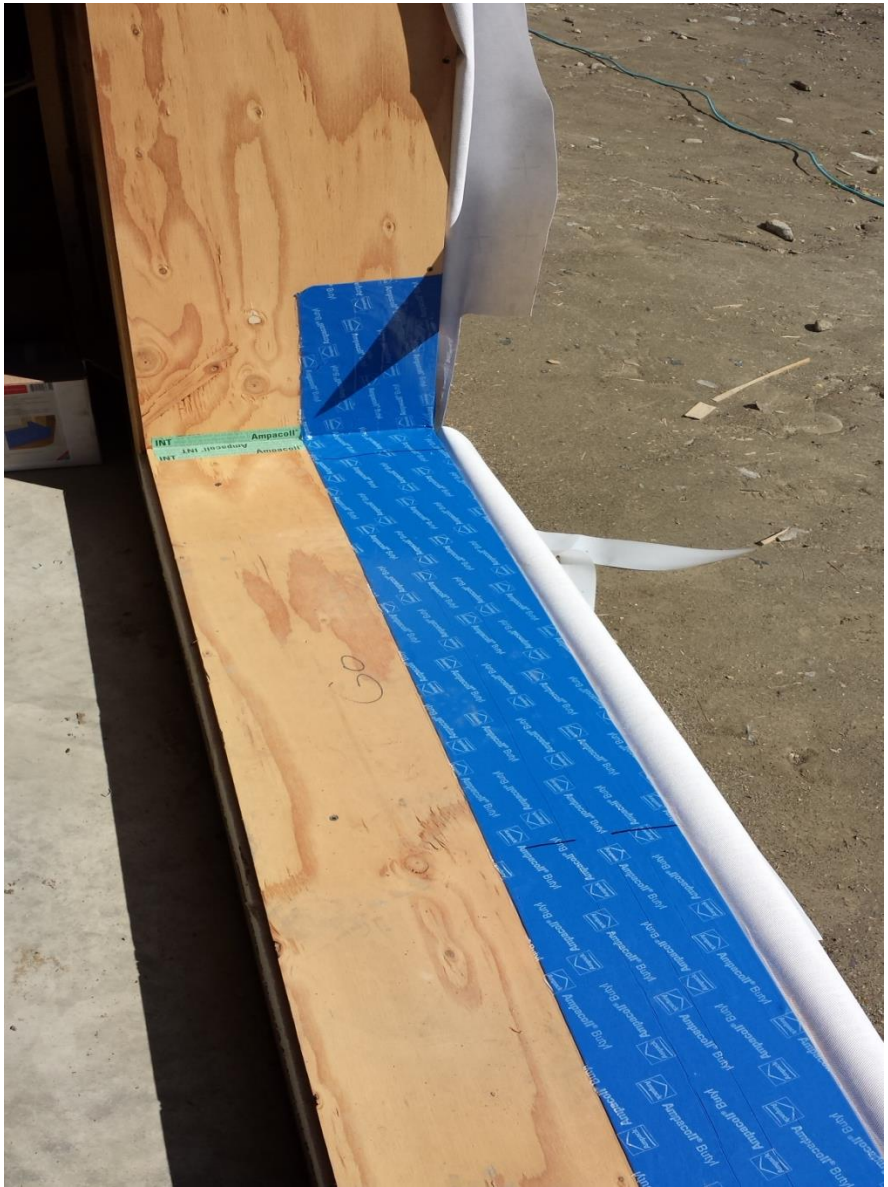
5’6”x6’6” South Windows

Bucks taped to Zip

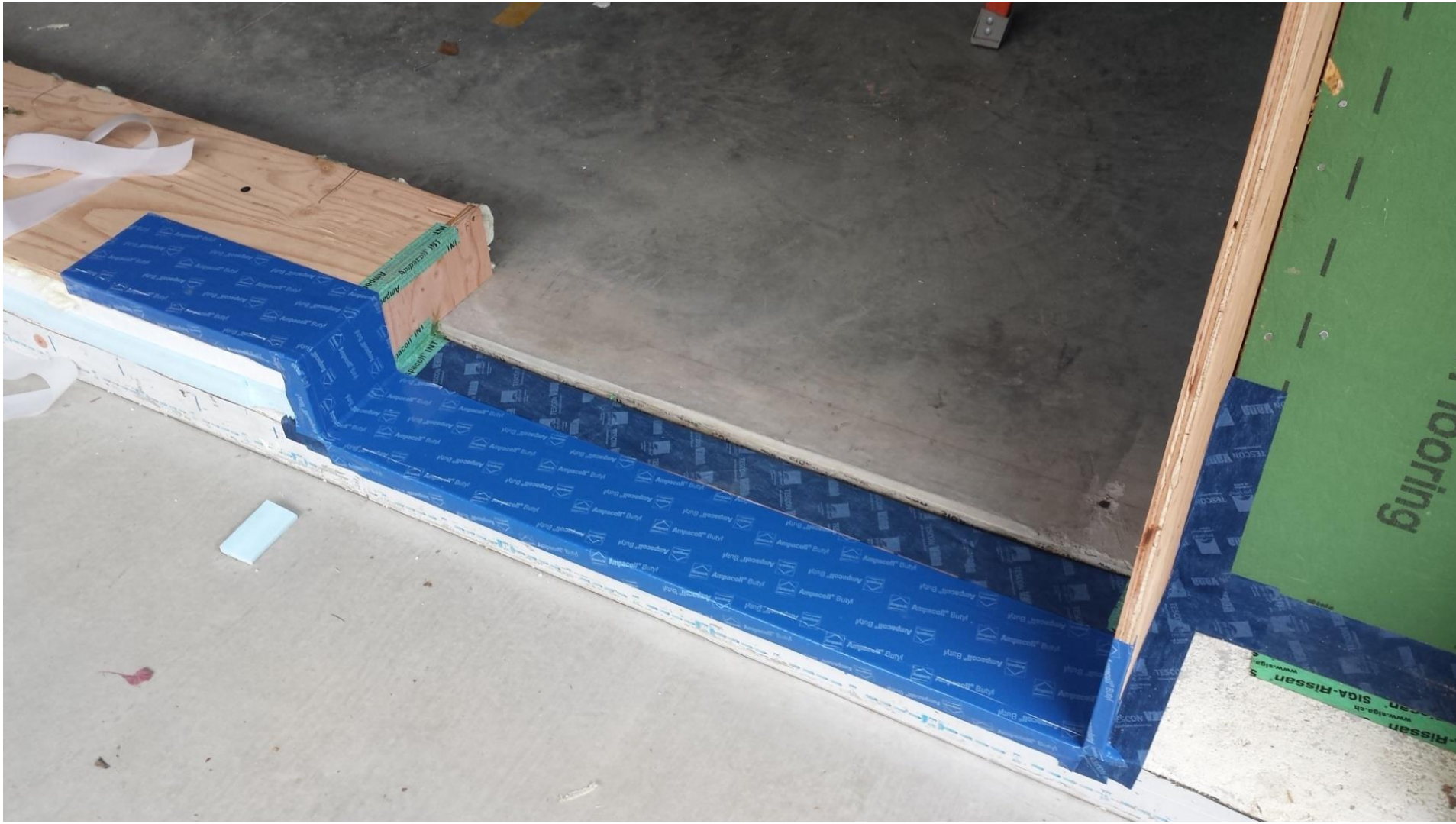

ZIPSystem


SEE PATENTS AT ZIPSYSTEM.COM/PATENTS
Ampacoll INT
AND WALL SHEATHING

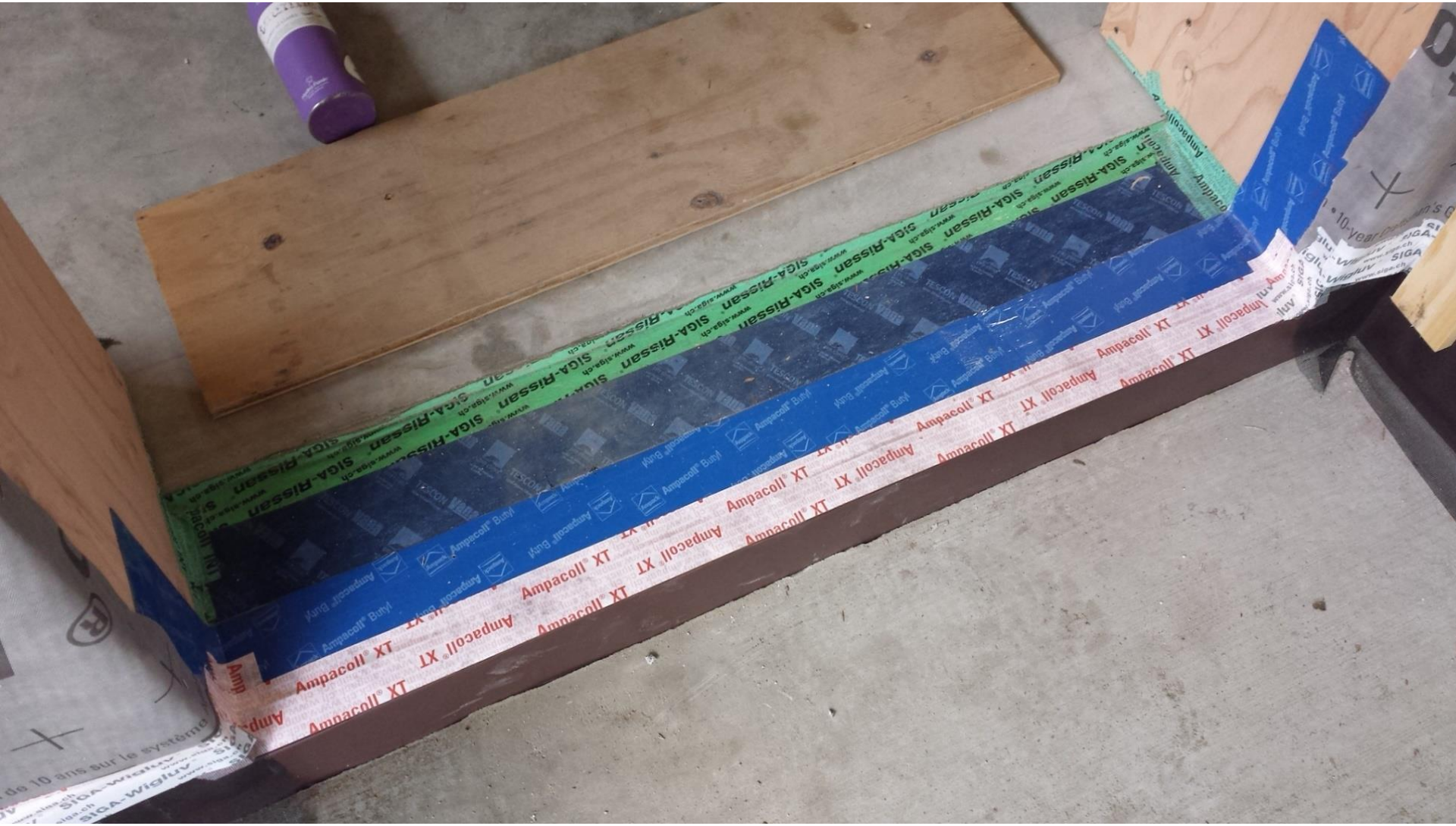
Butyl Sill seal



South Win/Inswing Dr Assembly

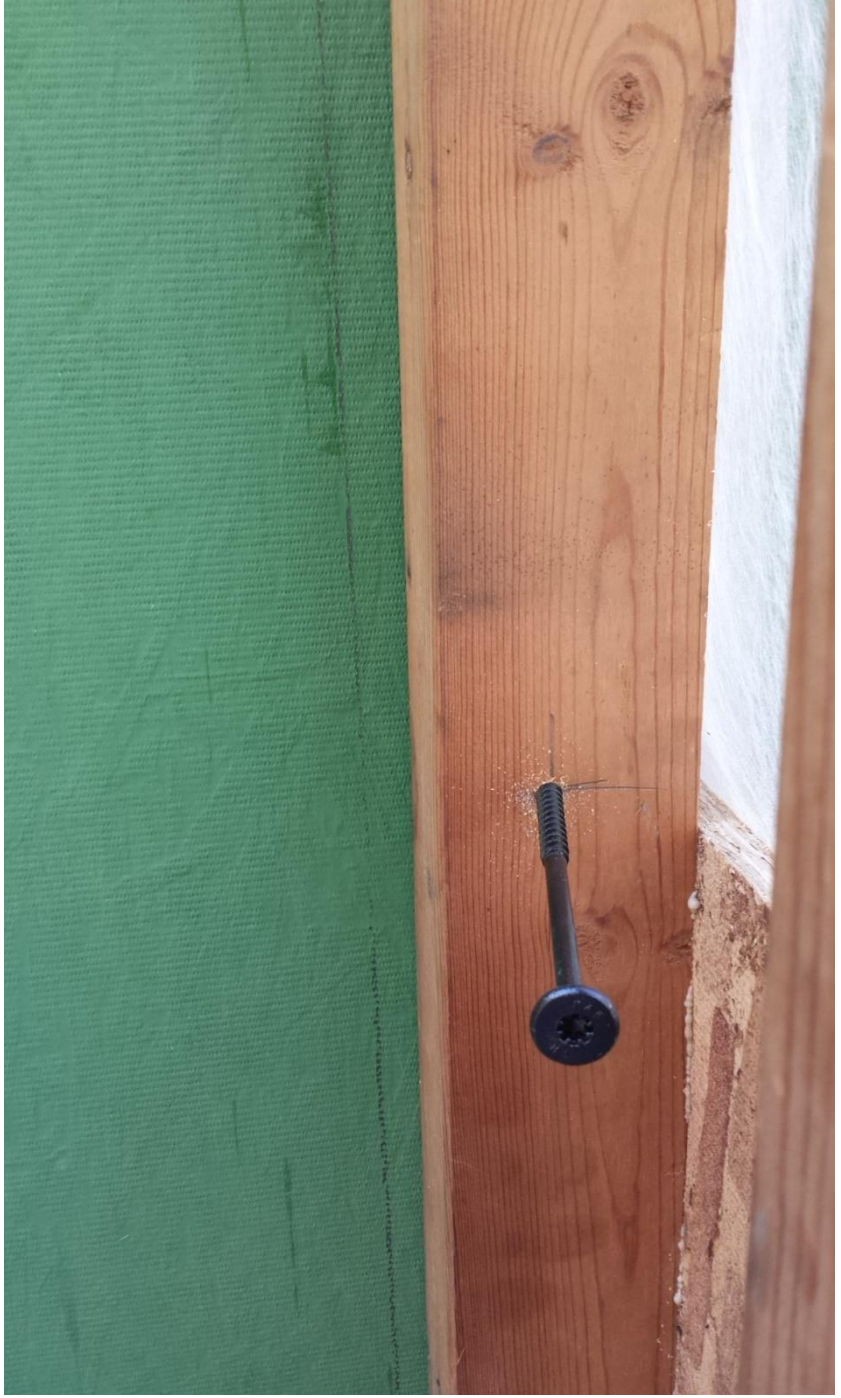

Ampacoll Butyl
SIGA-Rissan

East Deck Outswing Door


SIGA-Rissan
Ampacoll XT
Ampacoll Butyl
TESCON VANA

10 “ Larson Truss


ORCON F



Larson Truss Corner


ZIPsystem
Ampatop Aero TR2
Aero TR2
TR2

WRB Install

WRB

24” x 10” DP Cellulose Cavity

Cellulose Bags per Cavity Calc.

10" DP Cell Larson Truss Cavities		Igloo Brand 25lbs/Bag				
Corner Cavities	Dimentions	Vol cf	lbs/cf	lbs / cavity	bags/cavity	
CC1-NW	10' x .833' x .833'	6.93889	3.8	26.367782	1.05	
CC2-NE	10' x .833' x .833'	6.93889	3.8	26.367782	1.05	
CC3-SE	13.75' x .833' x .833'	9.54097375	3.8	36.2557003	1.45	
CC4-SW	10' x .833' x .833'	6.93889	3.8	26.367782	1.05	
CC5- Inside Corner	L cavity 13.75 ' tall	15.2529714	3.8	57.9612912	2.32	
North Wall- West to East		cf	lbs/cf	lbs	bags	
N1	10' x .833' x 2'	16.66	3.8	63.308	2.53	
N2	10' x .833' x 2'	16.66	3.8	63.308	2.53	
N3	10' x .833' x 2'	16.66	3.8	63.308	2.53	
N4	10' x .833' x 2'	16.66	3.8	63.308	2.53	
N5	L Cavity 10'tall	11.5	3.8	43.7	1.75	
N6	L Cavity 10'tall	13.77	3.8	52.326	2.09	
N7	10' x .833' x 2'	16.66	3.8	63.308	2.53	
N8	10' x .833' x 2'	16.66	3.8	63.308	2.53	
N9	10' x .833' x 2'	16.66	3.8	63.308	2.53	
N10	10' x .833' x 2'	16.66	3.8	63.308	2.53	
N11	Under Window Fa	14.58	3.8	55.404	2.22	
N12	Under Window Fb	14.58	3.8	55.404	2.22	
N13	10' x .833' x 2'	16.66	3.8	63.308	2.53	
N14	10' x .833' x 2'	16.66	3.8	63.308	2.53	
N15	10' x .833' x 2'	16.66	3.8	63.308	2.53	
N16	L Cavity 10'tall	15.749	3.8	59.8462	2.39	
N17	L Cavity 10'tall	9.532	3.8	36.1874	1.45	

- Drainage Plane Venting

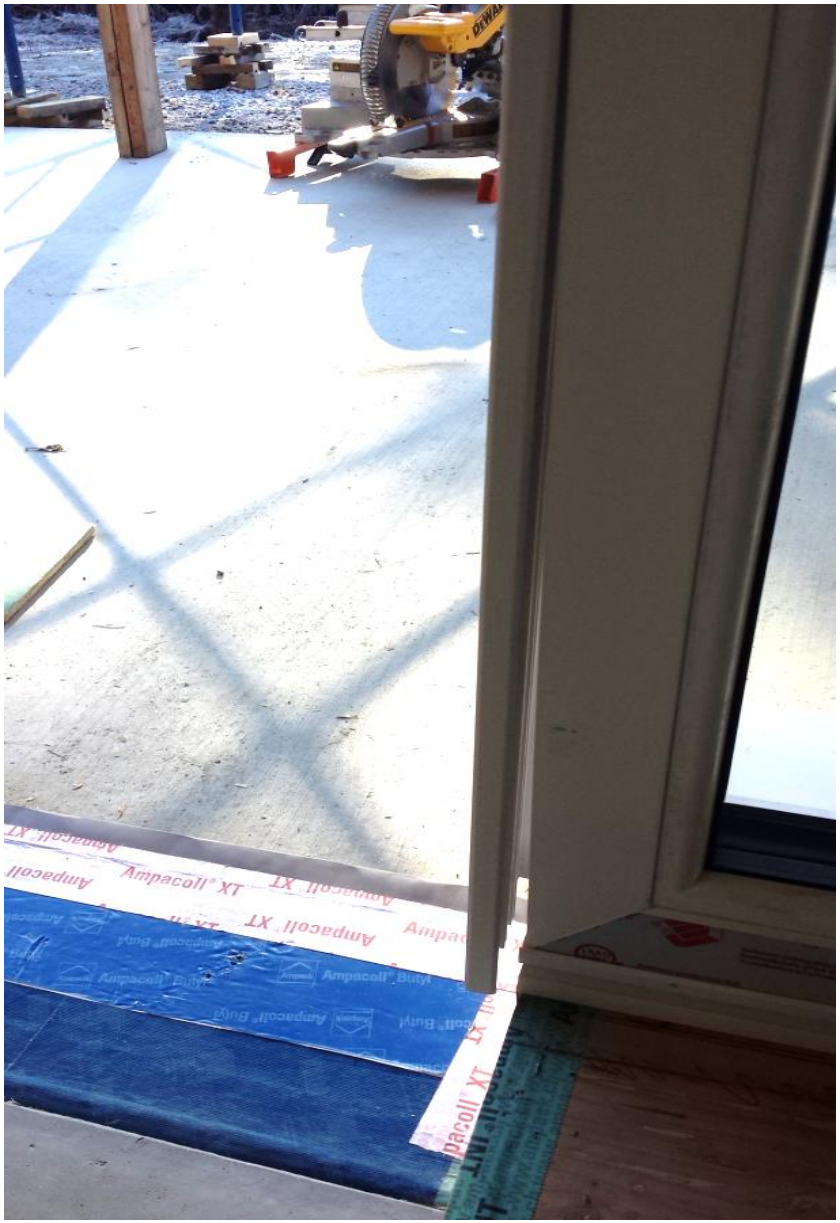

Ampacoll INT

Bottom Screening


USA

Midway Window Install

Door to Window Mull

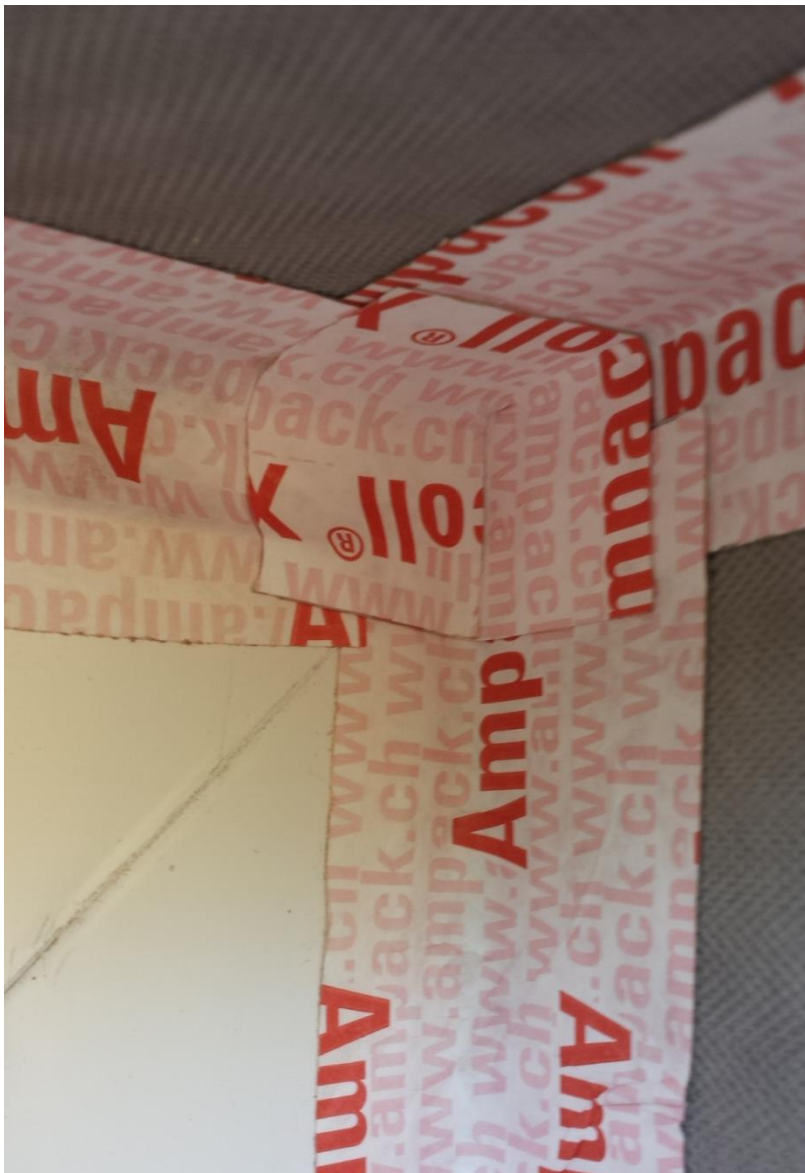


West 4’ x 10’ window

Airtight and U-.11 Glass , .61 SHGC

Window Mounting straps

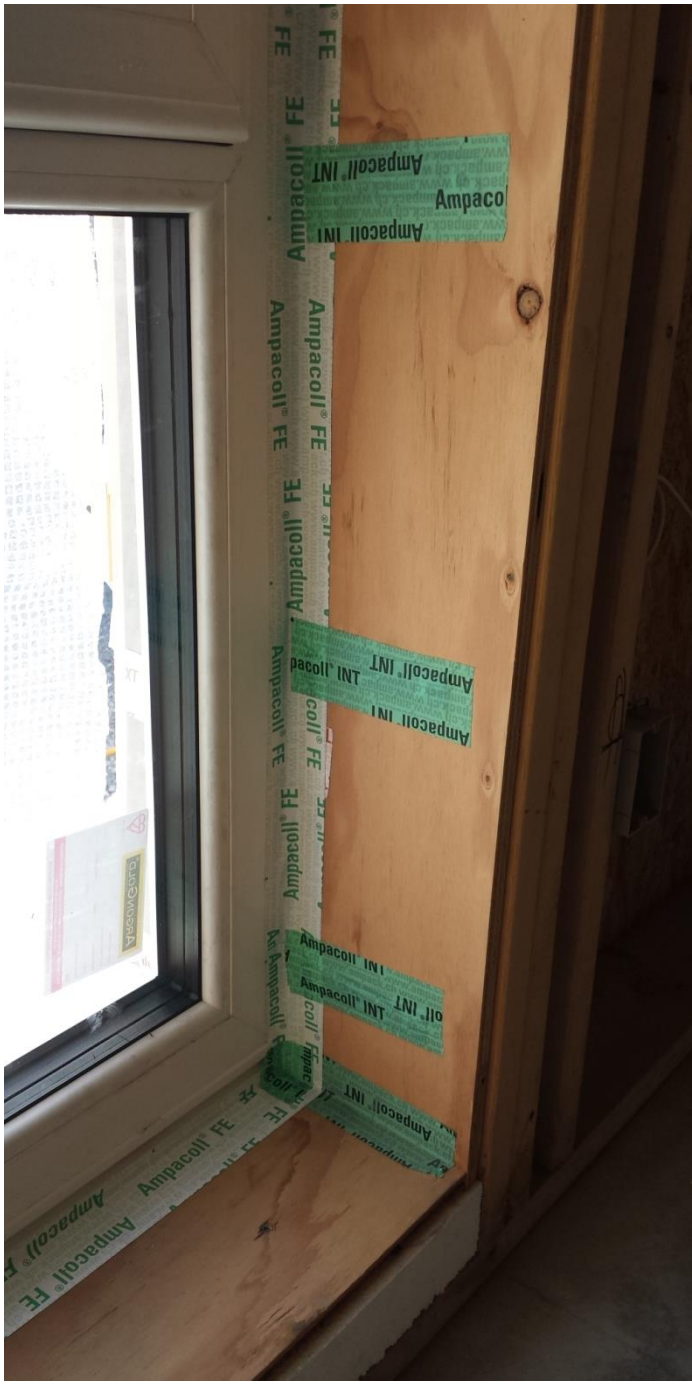
Exterior Vapor Open




Ampacoll® XT
Ampacoll® XT
Ampacoll® XT


Ampacoll® INT
Ampacoll® XT

Interior Vapor Closed



Ampacoll® FE
Ampacoll® INT

Ampacoll® FE
Ampacoll® INT

Outwing Door

37 cfm@50 / .17ACH50

BUILDING INFORMATION

Category:	**Residential**
Status:	**Under construction**
Building type:	**New construction**
Year of construction:	**2016**
Units:	**1**
Number of occupants:	**4 (Design)**

Boundary conditions

Climate:	**MONTPELIER AP VT**	
Internal heat gains:	**1.2**	Btu/hr ft²
Interior temperature:	**68**	°F
Overheat temperature:	**77**	°F

Building geometry

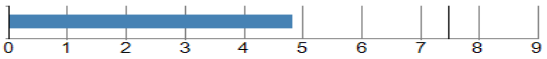
Enclosed volume:	**21371.1**	ft³
Total area envelope:	**5390**	ft²
AV ratio:	**0.3**	1/ft
Floor area:	**1317.6**	ft²

PASSIVEHOUSE REQUIREMENTS

Certificate criteria: PHIUS+ 2015 Standard

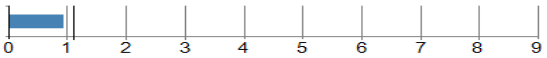
Heating demand

specific:	**4.82**	kBtu/ft²yr
target:	**7.5**	kBtu/ft²yr
total:	6348.12	kBtu/yr



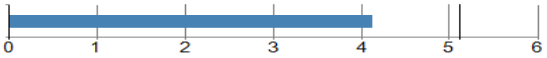
Cooling demand

specific:	**0.92**	kBtu/ft²yr
target:	**1.1**	kBtu/ft²yr
total:	1209.22	kBtu/yr
latent:	0.01	kBtu/ft²yr



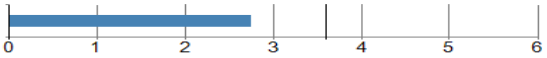
Heating load

specific:	**4.12**	Btu/hr ft²
target:	**5.1**	Btu/hr ft²
total:	5426.93	Btu/hr



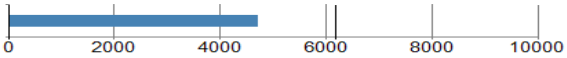
Cooling load

specific:	**2.74**	Btu/hr ft²
target:	**3.6**	Btu/hr ft²
total:	3611.35	Btu/hr



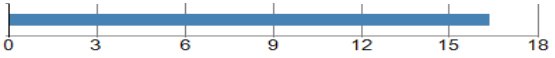
Primary energy

specific:	**4718**	kWh/Person yr
target:	**6200**	kWh/Person yr
total:	64386.71	kBtu/yr



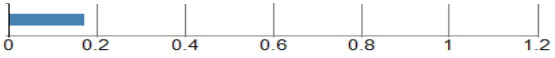
Site energy

total:	16.34	kBtu/ft²yr
building systems:	51.11	kBtu/yr
photovoltaic savings:	0	kBtu/ft²yr



Air tightness

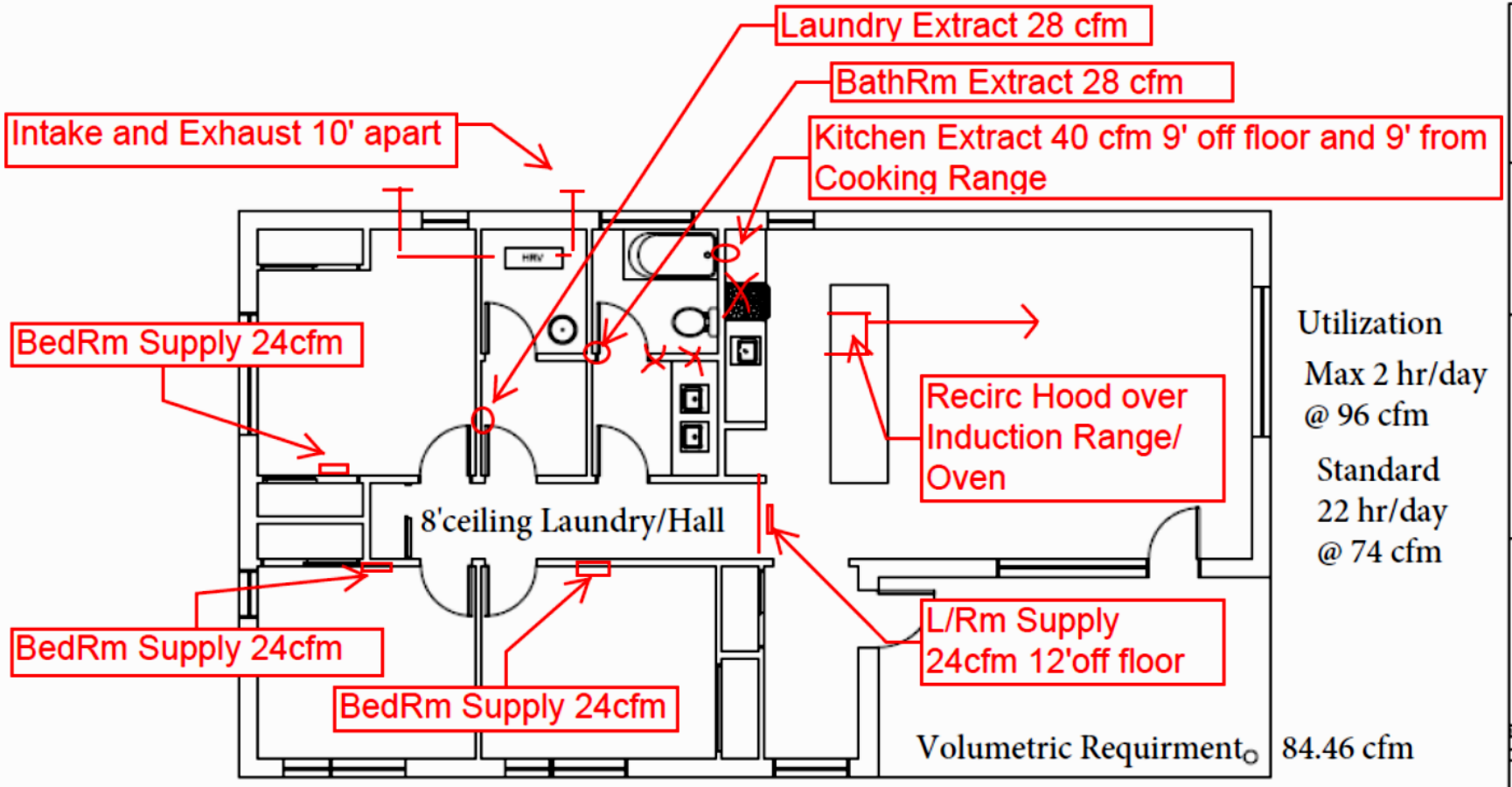
ACH50:	**0.17**	1/hr
target:	**1.24**	1/hr
CFM50 per envelope area:	**0.01**	cfm/ft²
target:	**0.05**	cfm/ft²



Zehnder HRV ComfoAir 350

- Design Extract Flow Rate 96cfm
- PH supply flow rate 18 cfm/person
- 4 Occupants
- # of Bedrooms + 1
- Per Person Flow Rate 18cfm/person *4 =
- 72 cfm

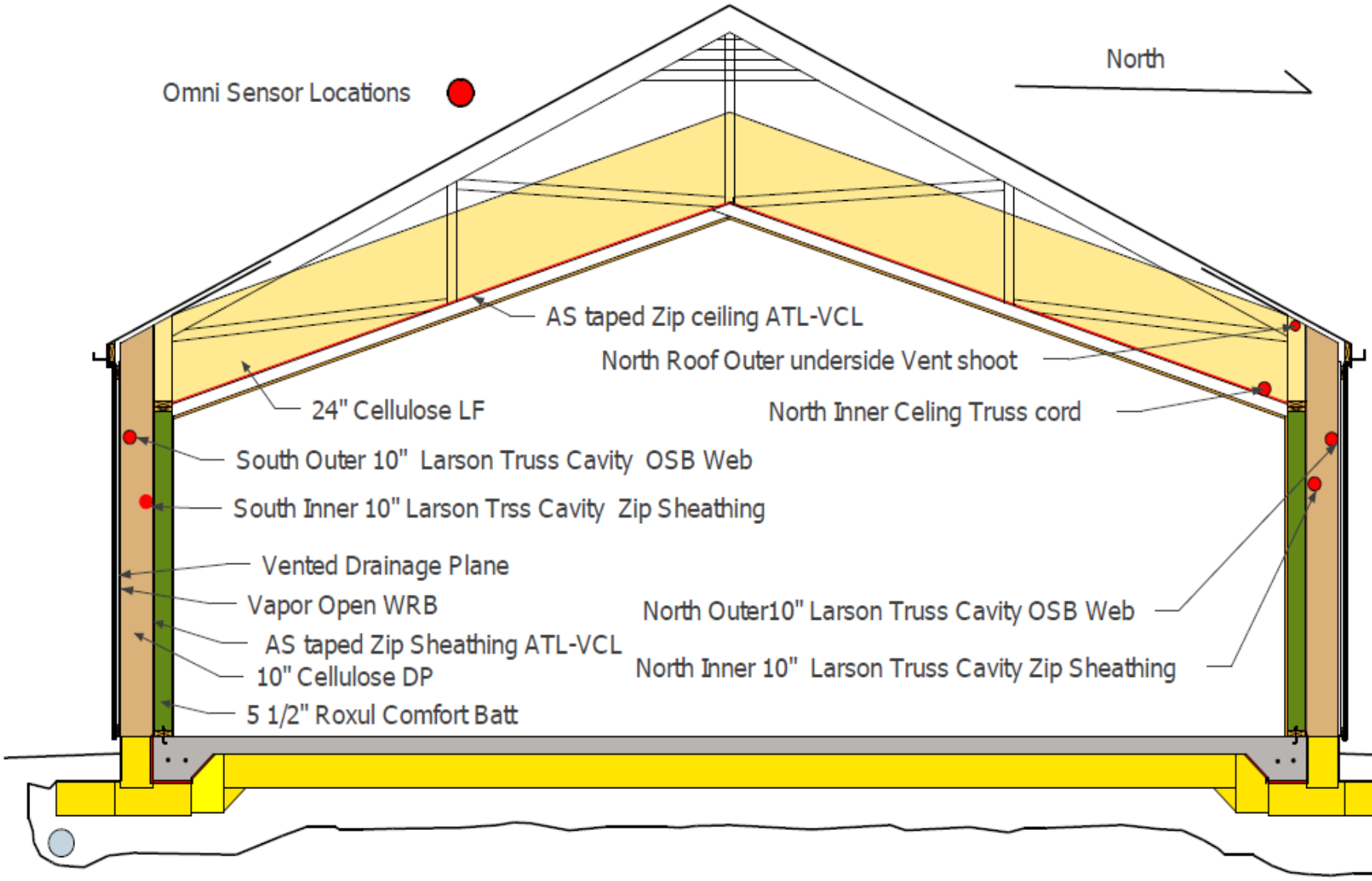
Zehnder HRV ComfoAir 350



Bedroom Supply

Kitchen Extract

Omni Sensor Locations




Assembled in China
64K DataLogging

Wall Omni Sensors

Insulation has started !!

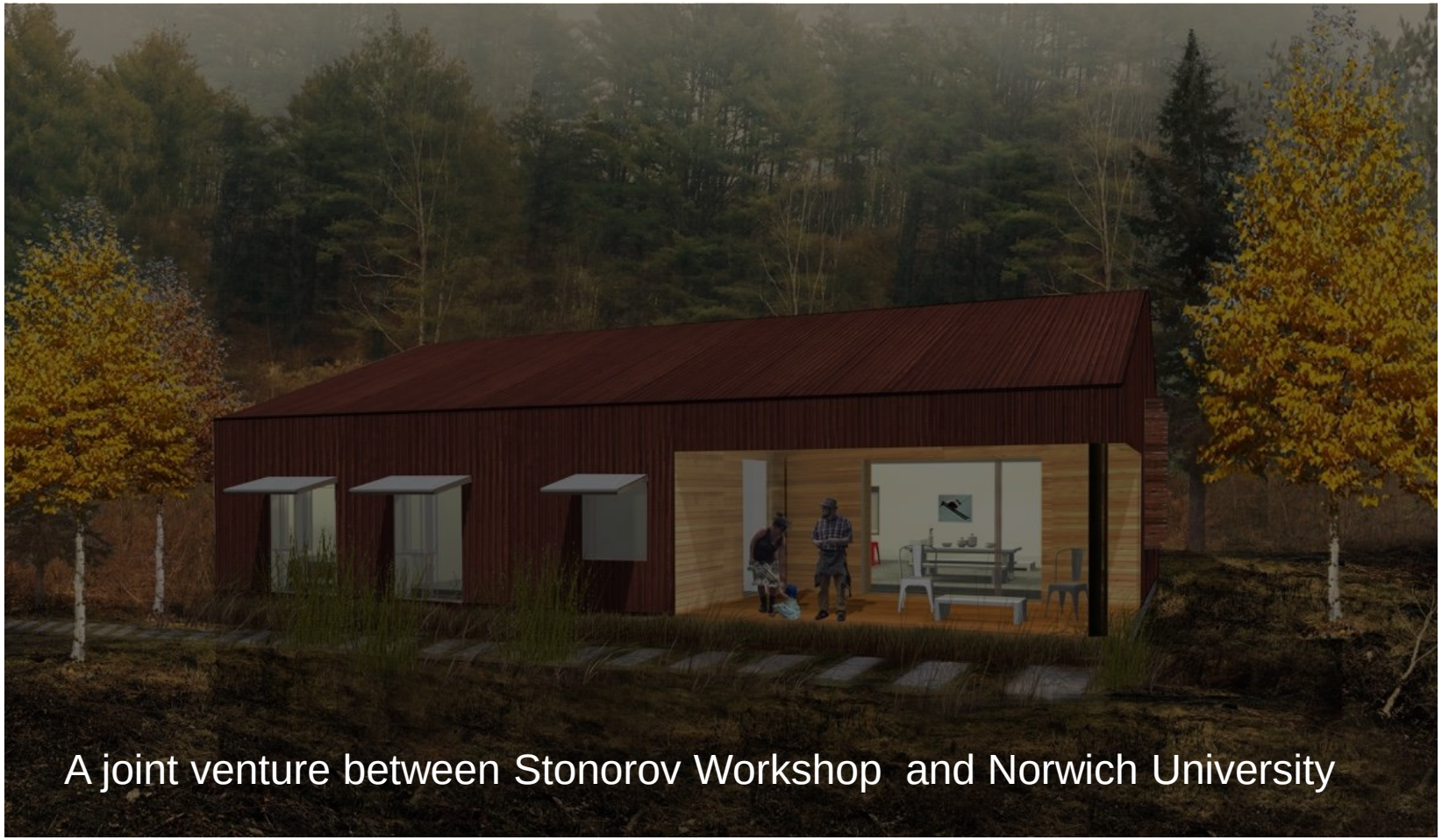
Roxul Install 2x6 service cavity

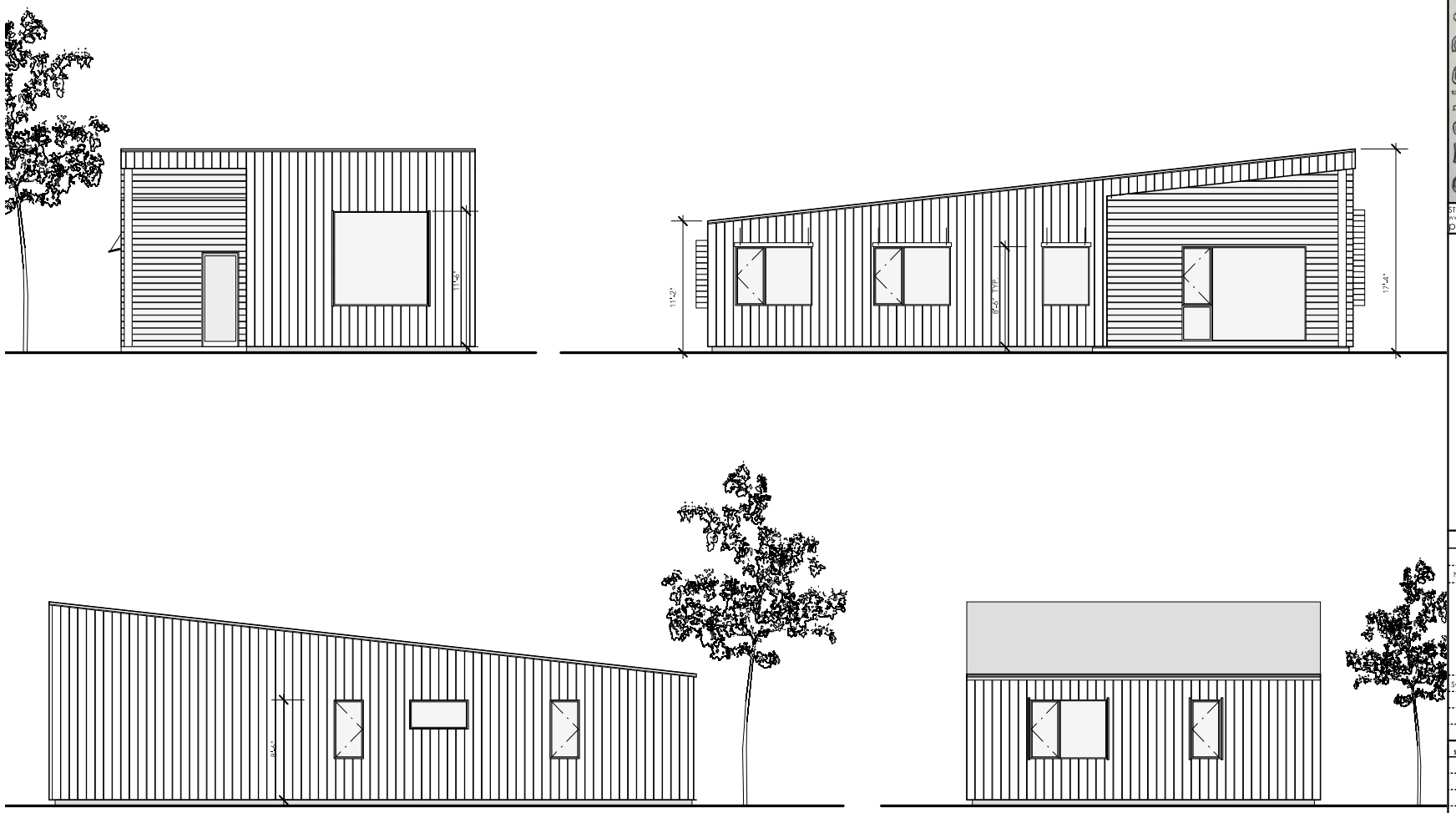
5.25 Tons of Cellulose


DUPONT
USA

Debbie Goodwin
www.centralvermonthabitat.org

Design and Project Development


A joint venture between Stonorov Workshop and Norwich University



1 A3.0 PROPOSED ELEVATIONS

1/8" = 1'-0"

STONOROV WORKSHOP

STONOROV WORKSHOP
www. STONOROVWORKSHOP.COM
p:4154977337

HABITAT HOUSE

EAST MONTPELIER, VERMONT

NORTH

SCHEMATIC DESIGN

Sheet Information:

DATE 02.17.2016

SCALE 1/8" / 1'-0"

JOB NO. 48

DRAWN BY TS, DS

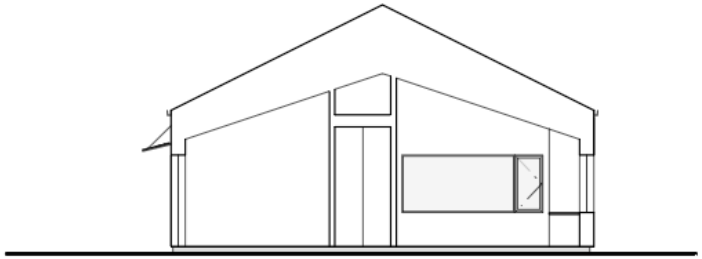
Sheet Number:

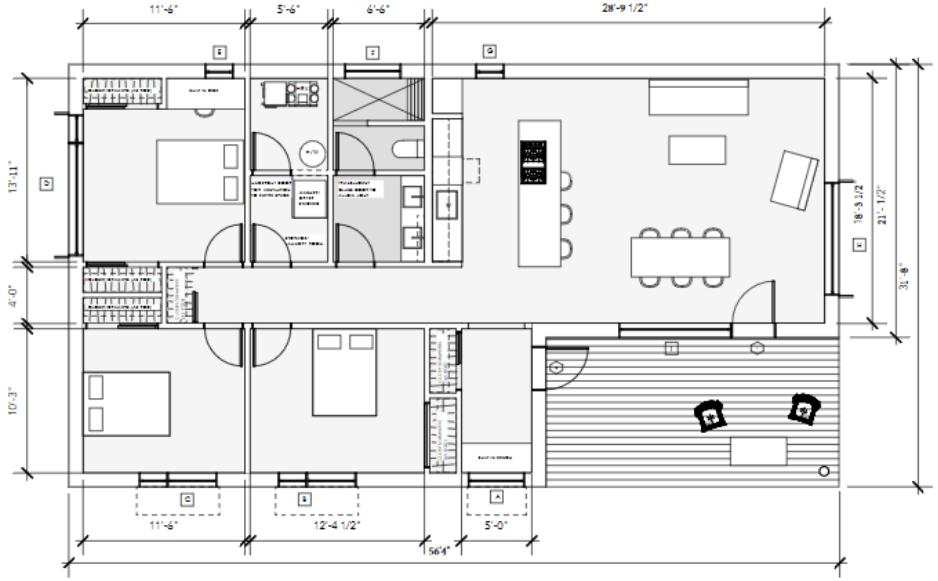
A3.0

Window	TYPE	Qty.	Width x Height	Egress Compliant	Glazing	Construction	Remarks
A	Fixed	1	4'-0" X 4'-1"	no	transparent		
B	Multi	1	5'-6" x 6'-6"	yes	transparent		See Elevation
C	Multi	1	5'-6" x 6'-6"	yes	transparent		See Elevation
D	Multi	1	10' - 0" x 4'-1"	yes	transparent		See Elevation
E	Casement	1	2'-0" x 4'-1"	no	transparent		
F	Fixed	1	4'-1" x 2'-0"	no	translucent		tempered
G	Casement	1	2'-0" x 4'-01	no	transparent		
H	Fixed	1	8'-0" x 8'-0"	no	transparent		
I	Fixed	1	8'-0" x 8'-0"	no	transparent		tempered

DOOR #	TYPE	WIDTH x HEIGHT	GLAZING	Remarks
1	Swing	3'-0" x 6'-8"	YES	Transom above to match window head
2	Swing	3'-0" x 6'-8"	YES	Transom above to match window head

NOTE: ALL WINDOW AND DOOR DIMENSIONS TO BE CHECKED AND CONFIRMED BY CONTRACTOR. ARCHITECT IS NOT RESPONSIBLE FOR FINAL DIMENSIONS.





1 / A2.0 PROPOSED PLANS , 1,245 INTERIOR SQUARE FEET

1/8" = 1'-0"

STONOROV WORKSHOP

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www.stonorovworkshop.com
p:4154977337

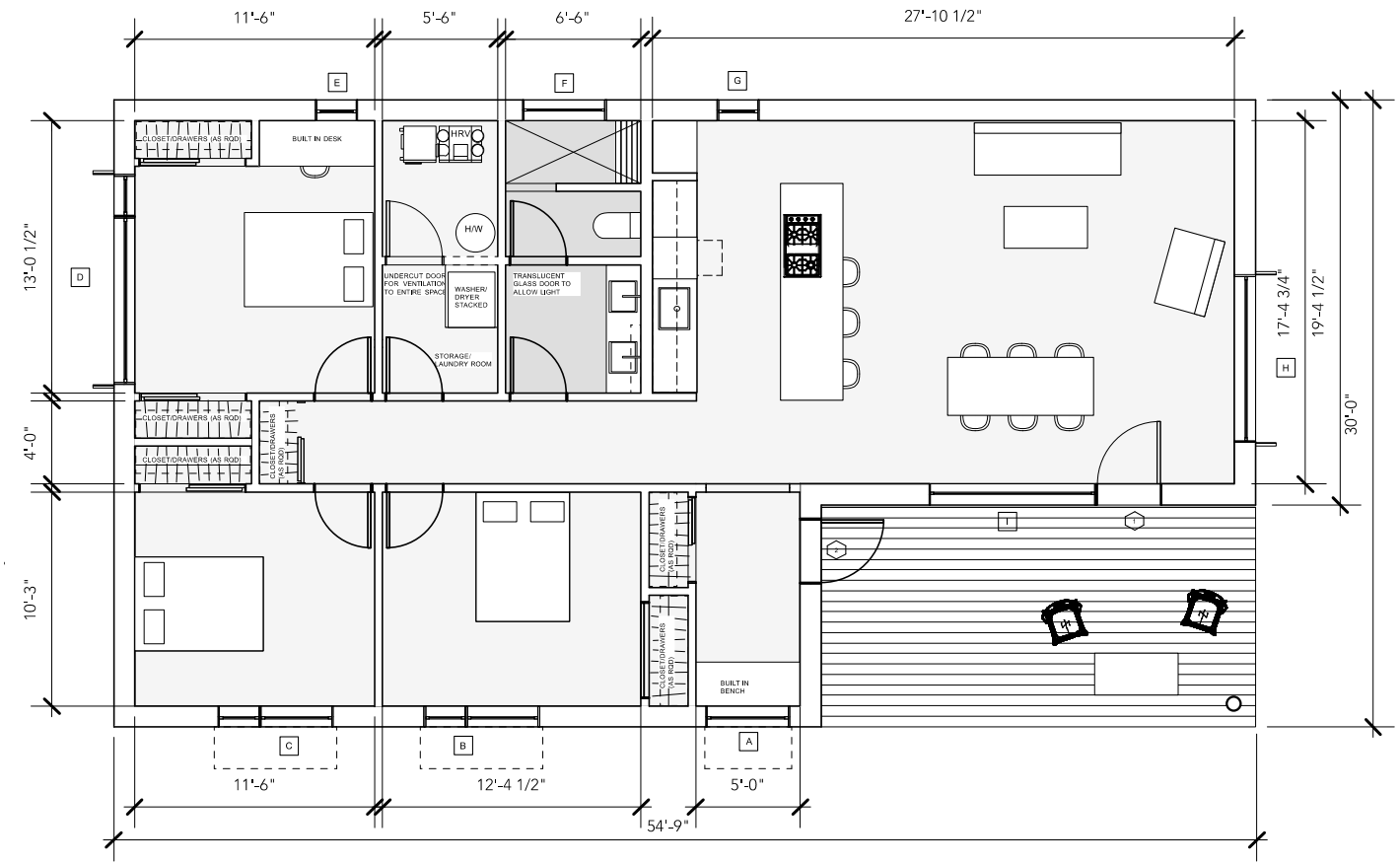
HABITAT HOUSE
EAST MONTPELIER, VERMONT

NORTH

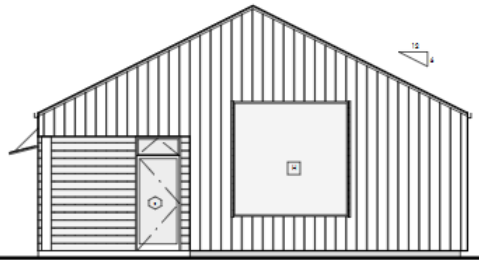
FINAL DESIGN

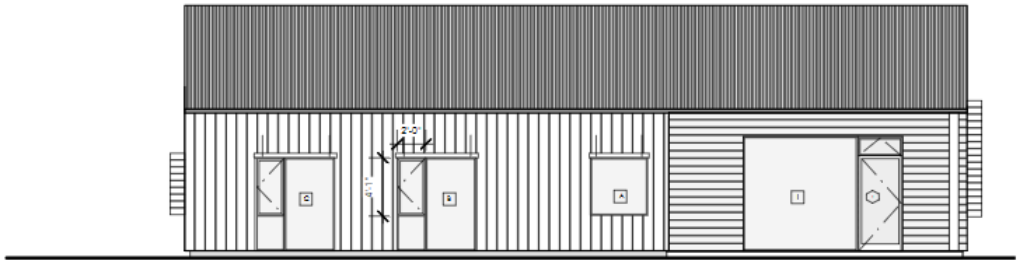
Sheet Information:
DATE 04.29.16
SCALE 1/8"/1'-0"
JOB NO. 48
DRAWN BY TLM

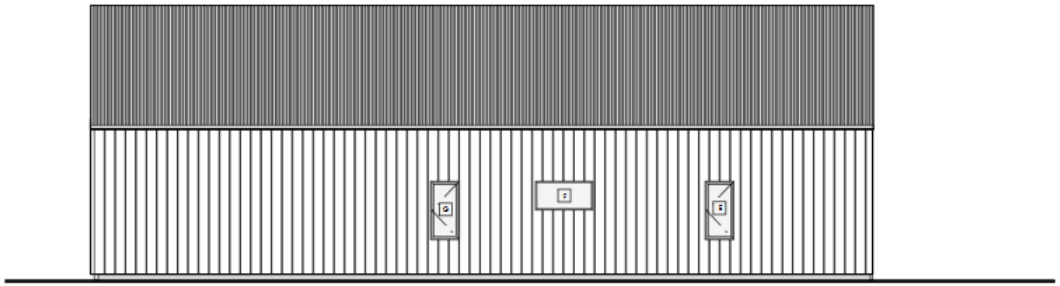
Sheet Number:
A2.0

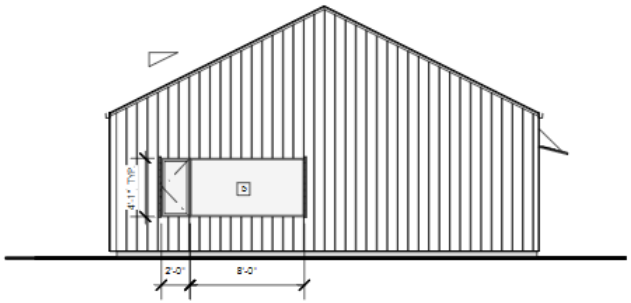


1,200 SF INTERIOR









1 A3.0 PROPOSED ELEVATIONS
1/8" = 1'-0"

STONOROV WORKSHOP
P: 4154977337

HABITAT HOUSE
EAST MONTPELIER, VERMONT

NORTH

FINAL DESIGN

Sheet Information:
DATE 06.20.2016
SCALE 1/8"=1'-0"
JOB NO. 16
DRAWN BY TS, DK

Sheet Number:
A3.0

Habitat for Humanity Passive-Solar Home
East Montpelier

This Passive-Solar Home design is forged through the collaboration of Sinclair Workshop, Montpelier Construction, Central Vermont Habitat for Humanity, and the architectural students of Harwich University. To produce a project that meets Passive House Low Energy standards while being affordable and net zero. This design will also be in accordance with PHIUS certification. By conforming to these guidelines the building aims to promote a comfortable and eco friendly living space and environment.

INDEX

SITE PLAN

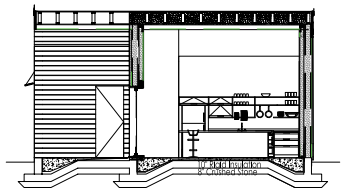
EXTERIOR PERSPECTIVE

HABITAT HOUSE FOR HUMANITY EAST MONTPELIER ROAD VERMONT

COVER PAGE

SCALE

A0.0



SECTION B

HABITAT HOUSE FOR HUMANITY EAST MONTPELIER ROAD VERMONT

SECTION

SCALE

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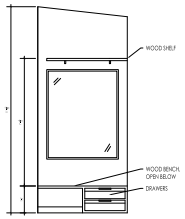

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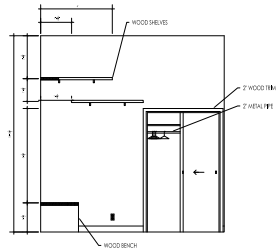

WEST

HABITAT HOUSE FOR HUMANITY EAST MONTPELIER ROAD VERMONT

MUDROOM INTERIOR ELEVATION

SCALE

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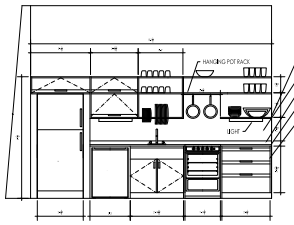

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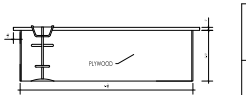

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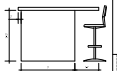

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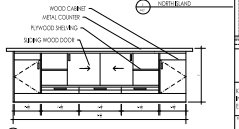


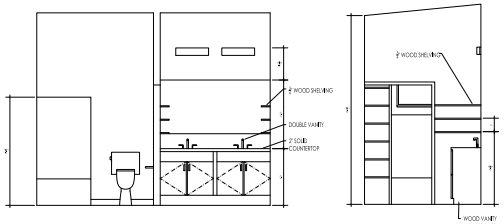
WEST ISLAND

HABITAT HOUSE FOR HUMANITY EAST MONTPELIER ROAD VERMONT

KITCHEN INTERIOR ELEVATION

SCALE

A4.2



EAST

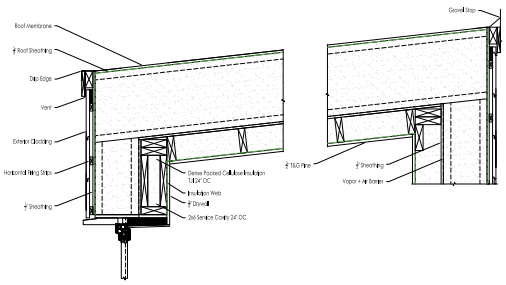
NORTH

HABITAT HOUSE FOR HUMANITY EAST MONTPELIER ROAD VERMONT

BATHROOM INTERIOR ELEVATION

SCALE

A4.3



LOW POINT ROOF DETAIL

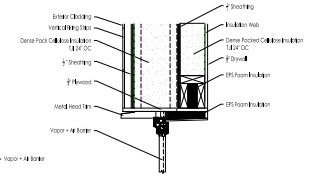
HIGH RISING ROOF DETAIL

HABITAT HOUSE FOR HUMANITY EAST MONTPELIER ROAD VERMONT

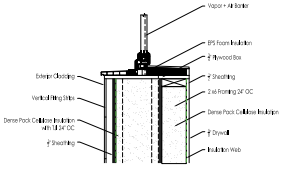
ROOF DETAILS

SCALE

A5.0



WINDOW HEADER DETAIL



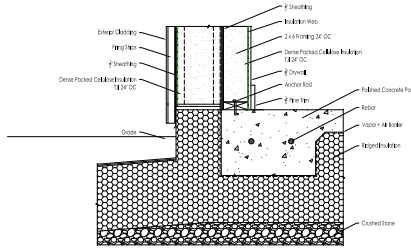
WINDOW SILL DETAIL

HABITAT HOUSE FOR HUMANITY EAST MONTPELIER ROAD VERMONT

WINDOW DETAIL

SCALE

A5.1



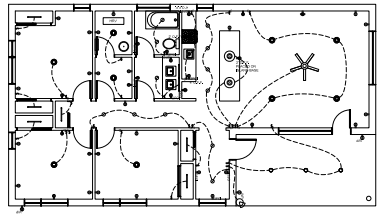
FOUNDATION DETAIL

HABITAT HOUSE FOR HUMANITY EAST MONTPELIER ROAD VERMONT

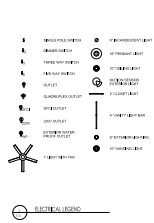
FOUNDATION DETAIL

SCALE

A5.2



ELECTRICAL PLAN



ELECTRICAL LEGEND

HABITAT HOUSE FOR HUMANITY EAST MONTPELIER ROAD VERMONT

MEP

SCALE

E1.0

Central Vermont Habitat for Humanity®

Habitat Myths

- Government Subsidies
- Family Partners get a free Home
- HfH has Paid Staff

Central Vermont Habitat for Humanity®

- Simple
- Affordable
- Sustainable

Habitat Development and Funding

Funding

- Mortgages
- Corporate Donations
- Private Donations
- Supplier Donations
- Community Fundraising

Community Collaboration

- Norwich University
- CVTA
- Youth Build
- Yestermorrow
- Eff VT
- VHCB
- Volunteers
- AmeriCorp

Habitat $$ Budget

Building and Site Development

- $ 136,000
- $ 103 /square foot

- Septic System
- Site Work
- Water Well
- Electric to Pole
- Permitting
- PH Certification

Building

- $ 106,000
- $ 80 /square foot

- 3 bedroom
- 1 Bath
- 1300 sf
- Slab on Grade

Central Vermont Habitat for Humanity®

CRITERIA

Comfortable Healthy Housing

Stable Energy Bills Over Time

Low Energy Bills

Net Zero

Affordability for the Homeowners

Central VT Habitat

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DESIGN/BUILD SCHOOL

VERMONT MUTUAL
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Efficiency VT Work Day

Klearwall PH Window Workshop

Zehnder HRV Workshop

Zehnder Ducting

Electric Wiring Day w/Jan Ruta

Maclay Architects

Middlebury College

Some regulars


Ampatop® Aero TR2

VT Habitat Affiliates
http://www.vthabitat.org/

Central Vermont

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