

Prefabricating Passive House



High Performance Design and Construction

Richard Pedranti of RPA
and
Chris Corson of Ecocor

NAPHC September 22, 2016

Prefabricating Passive House

Presentation Outline

- Model homes
- Design
- Manufacturing



Passive House





Design









Passive House



Model Homes

SOLSKEN



RPA | ECOCOR
High Performance Design and Construction

Passive House



SOLSKEN

- 11 model homes
- 1 and 2 story
- 323 sf to 2,685 sf
- Climate zones 5 / 6 / 7
- PHIUS and PHI



Model A

Model C

Model E



Model G

Model J

Model K



Model M

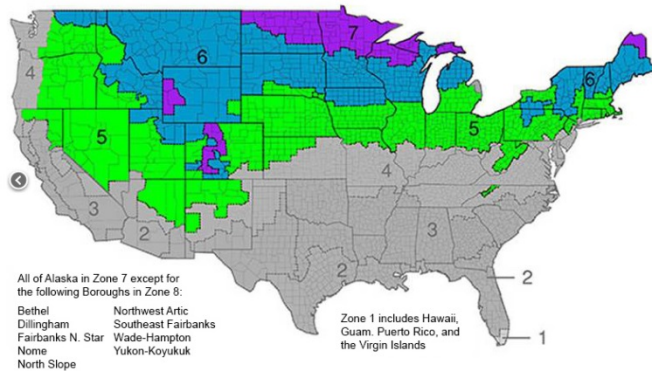
Model P

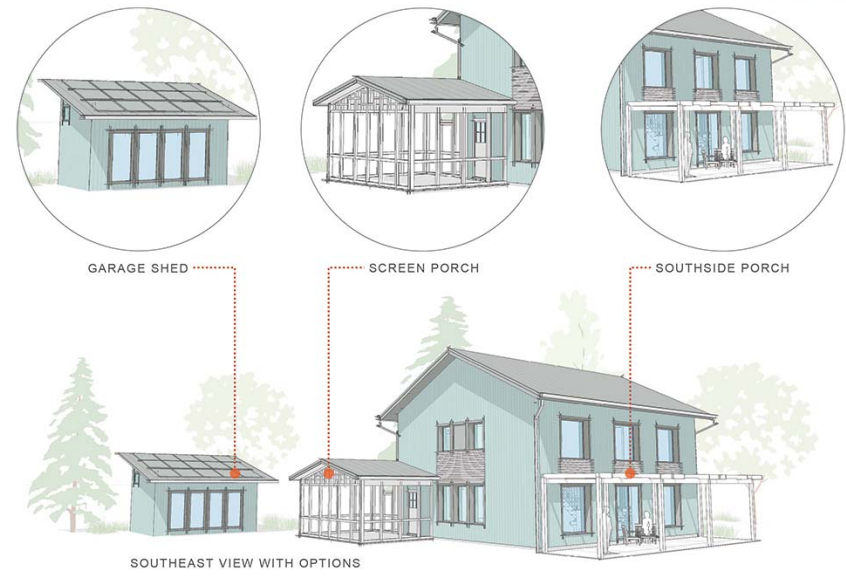
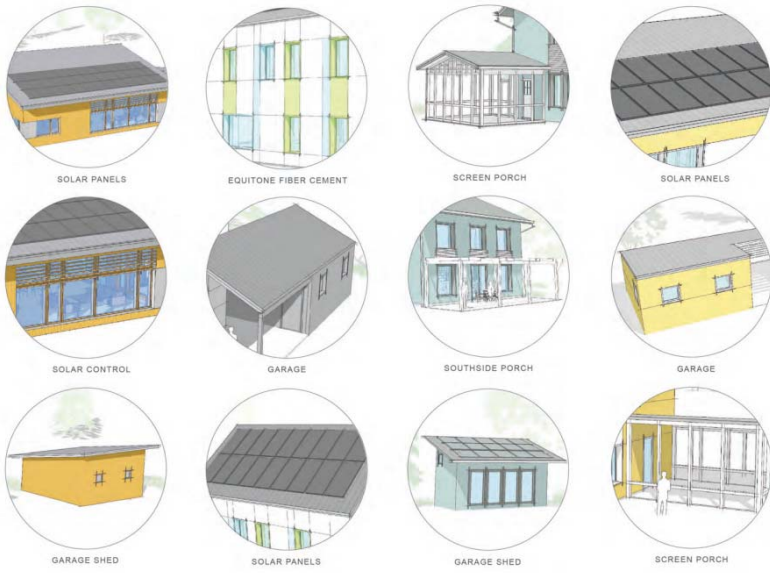
Model R



Model T

Model V





MODEL HOME OPTIONS MATRIX

MODEL **V** | BEDROOMS: 3 | BATHROOMS: 2.5 | EXT. SQFT.: 2340 | INT. SQFT.: 1932 | V5



MODEL **V** | BEDROOMS: 3 | BATHROOMS: 2.5 | EXT. SQFT.: 2340 | INT. SQFT.: 1932 | V6

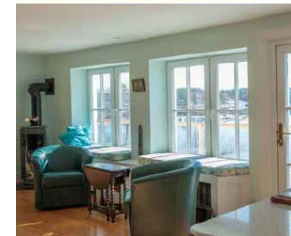
SOLSKEN

MODELS



Model C

Ext. SqFt. 1051
Int. SqFt. 842
Bedrooms: 2
Bathrooms: 1



Model E



- FIRST FLOOR PLAN
- 1. KITCHEN
 - 2. BREAKFAST ROOM
 - 3. LIVING ROOM
 - 4. DINING ROOM
 - 5. PORCHES
 - 6. PANTRY
 - 7. MECHANICAL ROOM
 - 8. LAUNDRY ROOM
 - 9. STUDY
 - 10. MASTER BEDROOM
 - 11. MASTER BATHROOM



ECOCOR: Prefab Passive House 3

High quality

- Healthy
- Comfortable
- Energy efficient

SOLSKEN

Model P

ECOCOR: Prefab Passive House



SPECS
1235
2381273
7827834



MODEL HOME MATRIX

MODEL	TYPE	SIZE	DETAILS	 MAINE	 NEW ENGLAND	 MID-ATLANTIC	 ALL OTHER STATES
MODEL A		EXTERIOR 323 SF INTERIOR 218 SF	BEDROOMS 1 BATHROOMS 1	\$140,000	\$146,000	\$152,000	\$158,000
MODEL C		EXTERIOR 1051 SF INTERIOR 842 SF	BEDROOMS 2 BATHROOMS 1	\$290,000	\$296,000	\$302,000	\$308,000
MODEL E		EXTERIOR 1,333 SF INTERIOR 1,104 SF	BEDROOMS 2 BATHROOMS 1.5	\$333,000	\$339,000	\$345,000	\$357,000
MODEL G		EXTERIOR 1,431 SF INTERIOR 1,192 SF	BEDROOMS 2 BATHROOMS 2	\$337,000	\$343,000	\$349,000	\$355,000
MODEL J		<div style="border: 2px dashed blue; padding: 5px;"> <p>RPA ECOCOR High Performance Design and Construction</p> <p>PRELIMINARY PRICING - RAFT SLAB FOUNDATION</p> <p>Ecocor Shell</p> <ul style="list-style-type: none"> Raft Slab Foundation ¹ Exterior Wall Panels Interior Walls & Doors Ventilation System ² Roof ³ Air-Sealing & Insulation Windows & Doors Siding & Exterior Trim Equipment Rental Travel & Transportation Costs Consulting Costs <p style="text-align: right;">Subtotal : \$ 273,081.10</p> <p>Elements Provided by Others</p> <ul style="list-style-type: none"> Concrete & Rebar Standing Seam Metal Roof Interior Finishes MEP & Miscellaneous Costs Ventilation System Installation <p style="text-align: right;">Subtotal : \$ 132,549.90</p> <p>TURNKEY*</p> <p style="text-align: right;">Subtotal : \$ 405,631.00</p> <p><small>¹ Ecocor Passiv foundation system by Ecocor. Concrete and steel by others. ² Zehnder Comfo Air ventilation system supplied by Ecocor; installation by others. ³ Standing seam metal roof priced by Ecocor in our market. Linn been held by others. * Excludes cost of land, site work, well, septic, and utilities. Cost of owner items may vary from region to region. The stated cost is for Maine region only. See RPA Ecocor model home matrix for costs in other regions.</small></p> </div>					
MODEL K							
MODEL M							
MODEL P							
MODEL R							
MODEL T		EXTERIOR 1,850 SF INTERIOR 1,484 SF	BEDROOMS 3 BATHROOMS 2.5	\$413,000	\$419,000	\$425,000	\$431,000
MODEL V		EXTERIOR 2,340 SF INTERIOR 1,932 SF	BEDROOMS 3 BATHROOMS 2.5	\$484,000	\$490,000	\$496,000	\$502,000

Cost per sq/ft

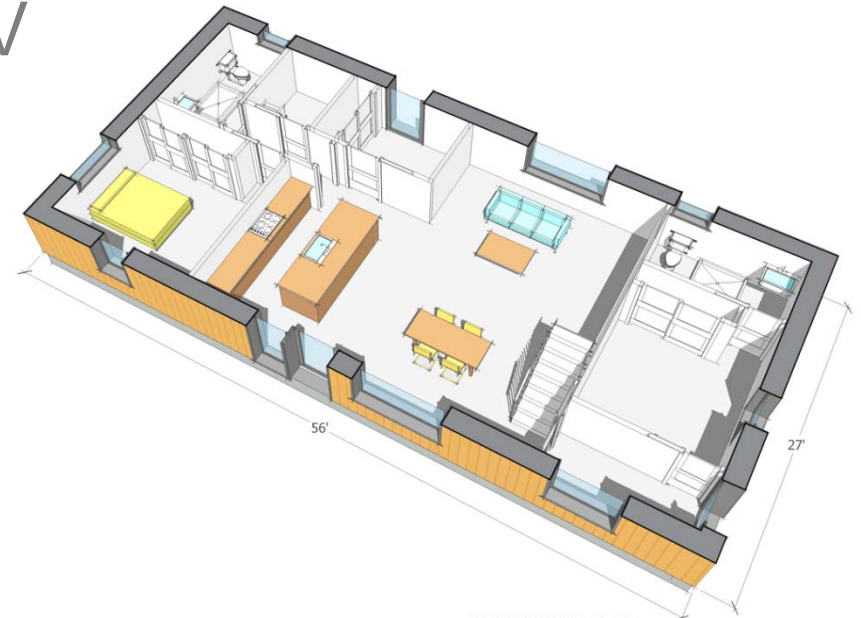
Model A	470
Model C	287
Model E	258
Model G	243
Model J	210
Model K	240
Model M	192
Model P	252
Model R	244
Model T	229
Model V	211

GOLDENROD PASSIVE HOUSE

ALBANY, NY

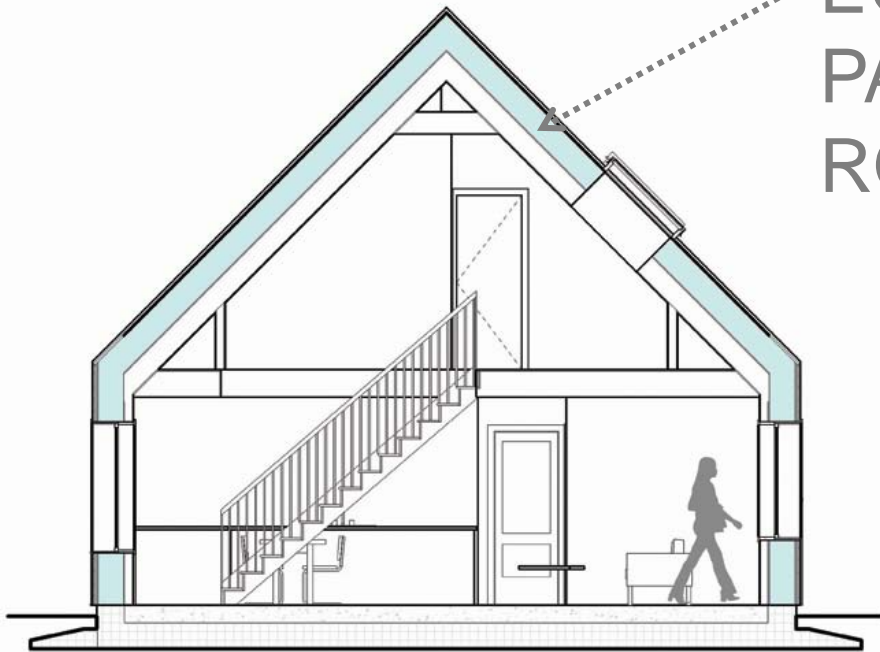


LOFT FLOOR PLAN



FIRST FLOOR PLAN

ECOCOR
PASSIV
ROOF



SECTION

CHANG RESIDENCE PASSIVE HOUSE

CRAIGSVILLE, NJ



VIEW FROM SOUTHEAST



VIEW FROM SOUTHWEST



VIEW FROM SOUTHWEST



VIEW FROM NORTHEAST



VIEW FROM NORTH

IRWIN RESIDENCE PASSIVE HOUSE

NAZARETH, PA



VIEW FROM SOUTHWEST



BIRD'S EYE VIEW FROM NORTHWEST



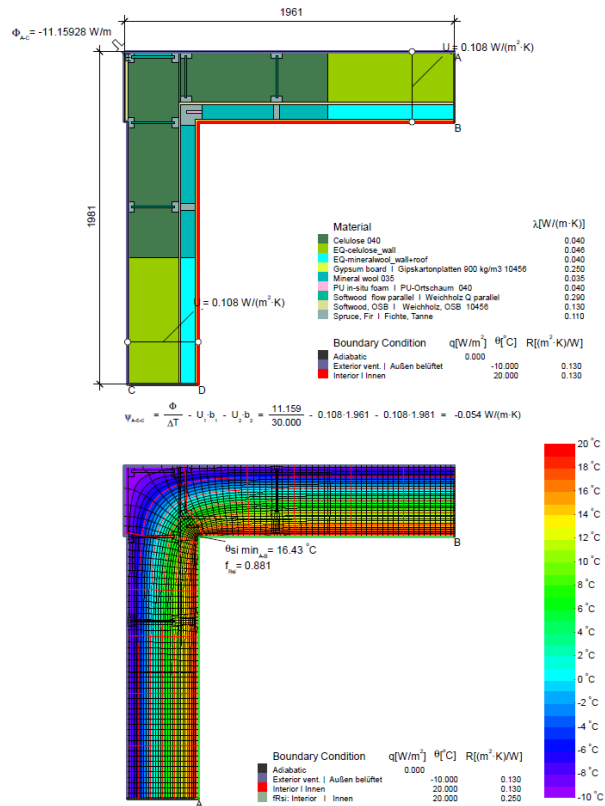
VIEW FROM SOUTHEAST

CERTIFICATE

Certified Passive House Component

ID: 0788ws03 valid until 31. December 2016

Passive House Institute
Dr. Wolfgang Feist
64342 Darmstadt
GERMANY



Category: Construction system | Lightweight timber Construction
 Manufacturer: ECOCOR High Performance Buildings
 Searsmont
 UNITED STATES OF AMERICA
 Product name: ECOCOR Passiv

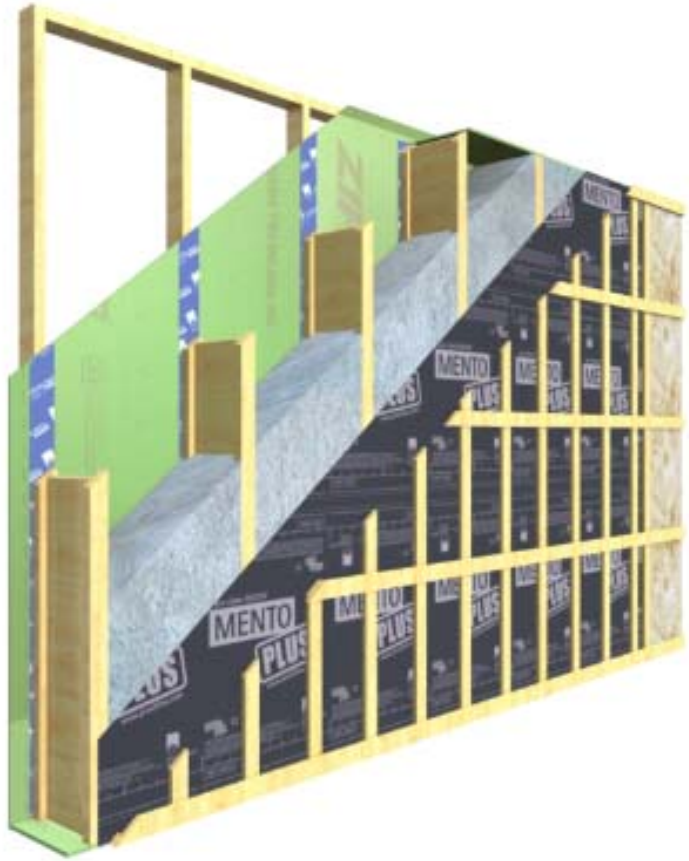
This certificate for the cool, temperate climate zone was awarded based on the following criteria

Hygiene criterion The minimum temperature factor of the interior surfaces is	$f_{ra,0,25m^2K/W} \geq$	0.70
Comfort criterion The U-value of the installed windows is	$U_{W,U} \leq$	0.85 W/(m²K)
Efficiency criteria Heat transfer coefficient of building envelope	$U^*_{PH} \leq$	0.15 W/(m²K)
Temperaturfactor of opaque junctions	$f_{ra,0,25m^2K/W} \geq$	0.86
Thermal bridge free design for key connection details	$\Psi \leq$	0.01 W/(m²K)

An airtightness concept for all components and connection details was provided.



EWec: WALL EXTERIOR CORNER | WAND AUSSENECKE

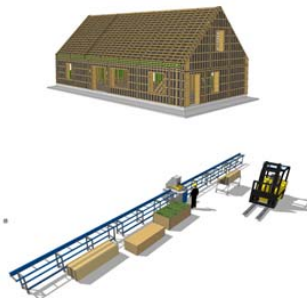
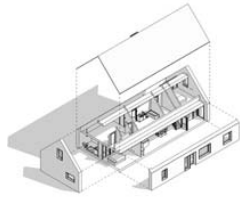


CORSON WALL

Design



Model G



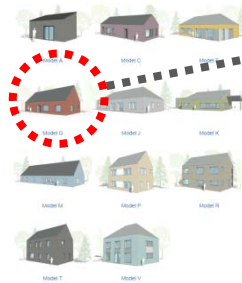
RPA | ECOCOR
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Passive House



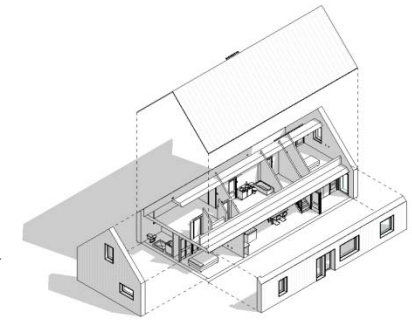
Design flow diagram

1. Choose model home



2. Revit

customization



3. Sketchup

Customer



4. Cadwork

CAD / CAM production

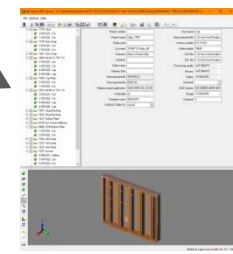


5. BTL file

digital shop drawings

6. Manufacturing

Ecocor Randek SP728 saw



1. CHOOSE MODEL HOME FROM RPA \ ECOCOR MODEL HOME MATRIX



MODEL **G** BEDROOMS: 2 BATHROOMS: 2 EXT. SOFT : 1431 INT. SOFT : 1192 RPA ECOCOR G1



Model A

Model C

Model E



Model G



Model J



Model K



MODEL G

PRELIMINARY PRICING - RAFT SLAB FOUNDATION

Ecocor Shell

- Raft Slab Foundation¹
- Exterior Wall Panels
- Interior Walls & Doors
- Ventilation System²
- Roof³
- Air-Sealing & Insulation
- Windows & Doors
- Siding & Exterior Trim
- Equipment Rental
- Travel & Transportation Costs
- Consulting Costs

Subtotal : \$ 222,807.99

- #### Elements Provided by Others
- Concrete & Rebar
 - Standing Seam Metal Roof
 - Interior Finishes
 - MEP & Miscellaneous Costs
 - Ventilation System Installation

Subtotal : \$ 107,270.40

TURNKEY*

Subtotal : \$ 330,078.39



Model M



Model P



Model R



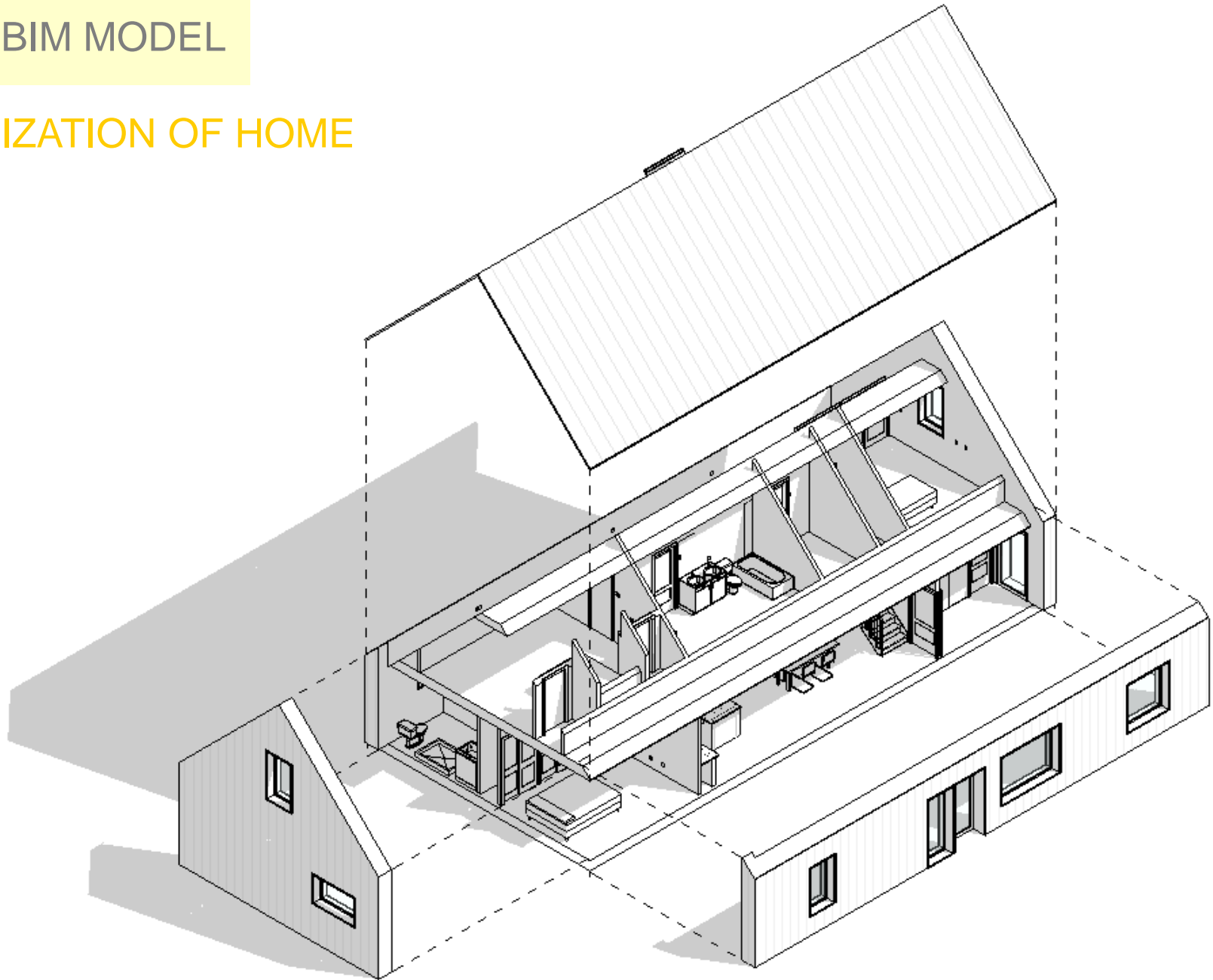
Model T



Model V

2. REVIT BIM MODEL

CUSTOMIZATION OF HOME



3. SKETCHUP CLIENT PRESENTAITON

SKETCHUP 3D MODEL RENDERINGS AND MOVIE WALK THROUGH



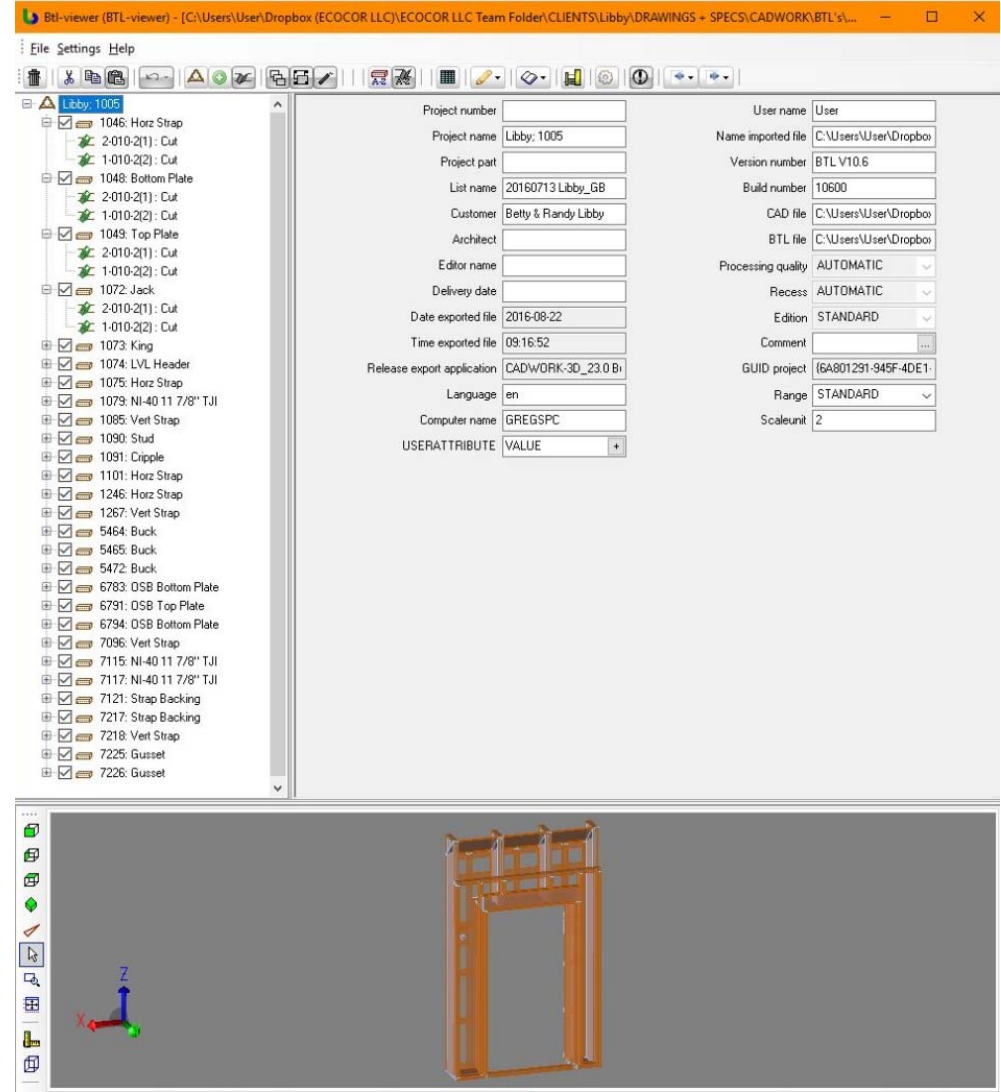
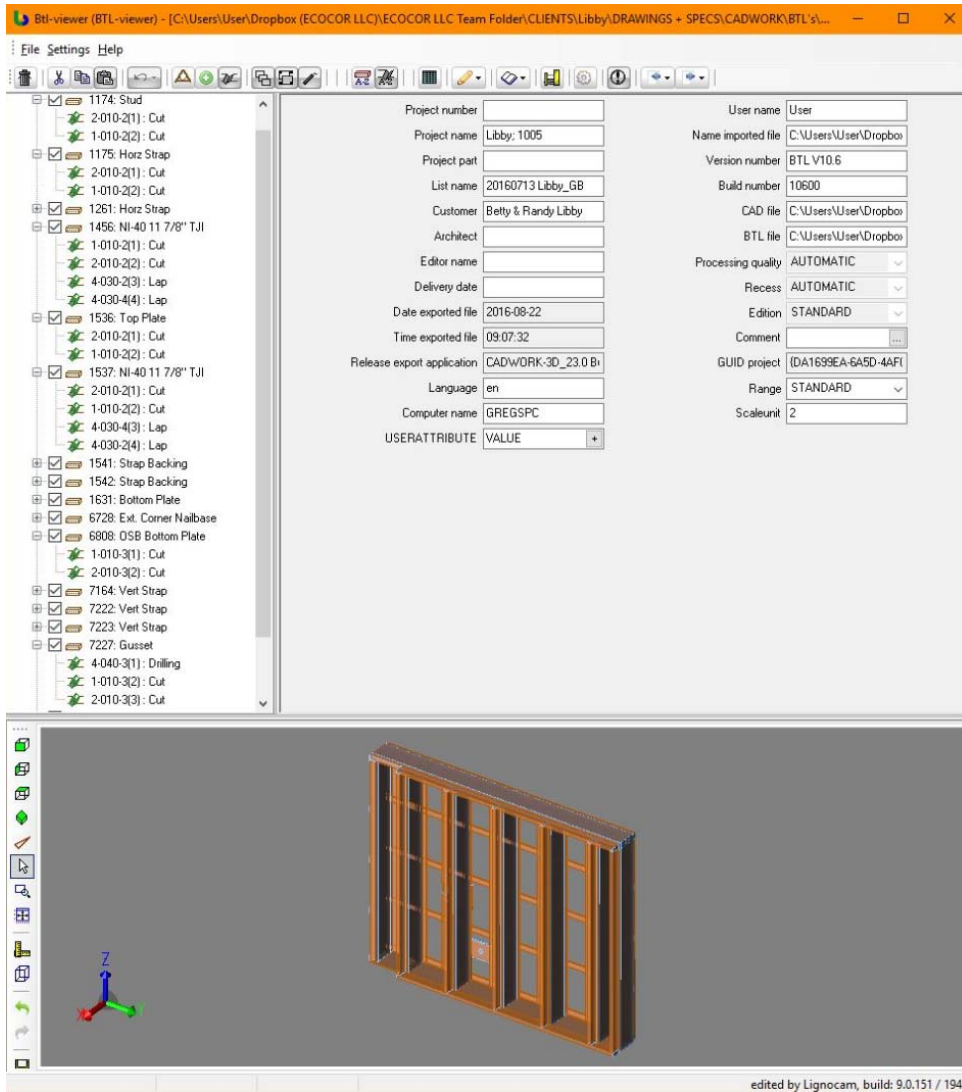
4. CADWORK PRODUCTION

EVERY COMPONENT AND CONNECTION IS VIRTUALLY BUILT



5. DIGITAL SHOP DRAWING

CADWORK GENERATED BTL FILE



6. MANUFACTURER

ECOCOR RANDEK SP728 SEMI AUTOMATED MULTI AXIS SAW



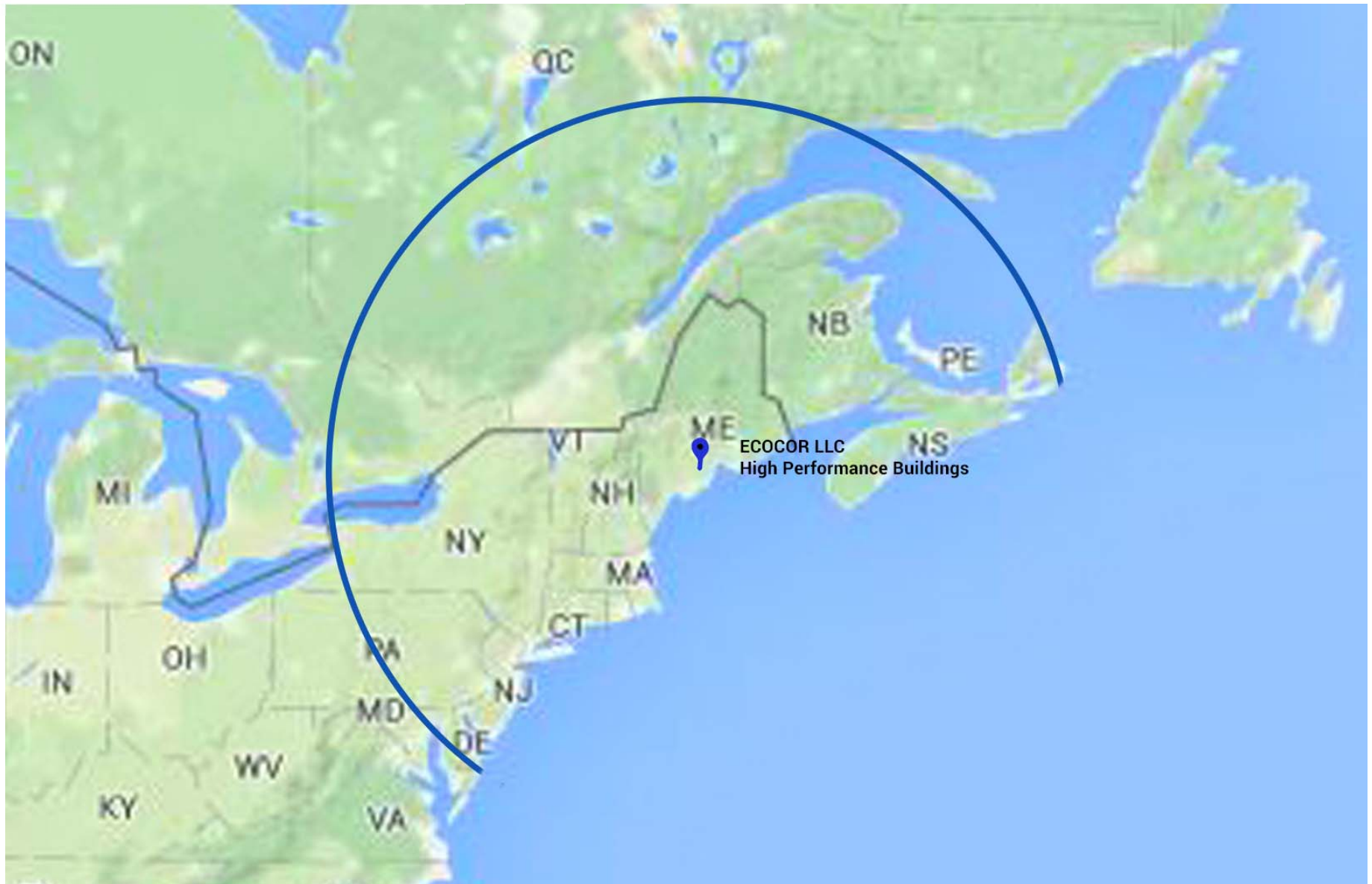
Manufacturing



Passive House



Who are we?





Area Schedule - MODEL G

Name	Surface Area of Ext. Wall	Surface Area of Ext. Roof	Surface Area of Window/Glazing	Linear Foot of Interior Walls
MODEL G	1711.93 SF	2023.74 SF	148.43 SF	147'-7"

Door Schedule Interior

Door Number	Door Size	Head Height	Manufacturer	Model	Description	Finish
13	80" x 80"	8'-0"	SIMPSON		SLIDING CLOSET	WD PH WD PH
14	16" x 80"	8'-0"	SIMPSON		POCKET DOOR	WD PH WD PH
15	32" x 80"	8'-0"	SIMPSON		POCKET DOOR	WD PH WD PH
16	32" x 80"	8'-0"	SIMPSON		POCKET DOOR	WD PH WD PH
17	32" x 80"	8'-0"	SIMPSON		POCKET DOOR	WD PH WD PH
18	44" x 80"	8'-0"	SIMPSON		SLIDING CLOSET	WD PH WD PH
19	44" x 80"	8'-0"	SIMPSON		SLIDING CLOSET	WD PH WD PH
20	36" x 80"	8'-0"	SIMPSON		POCKET DOOR	WD PH WD PH
21	32" x 80"	8'-0"	SIMPSON		POCKET DOOR	WD PH WD PH
22	72" x 80"	8'-0"	SIMPSON		SLIDING CLOSET	WD PH WD PH
23	32" x 80"	8'-0"	SIMPSON		POCKET DOOR	WD PH WD PH
24	32" x 80"	8'-0"	SIMPSON		POCKET DOOR	WD PH WD PH
25	80" x 68" LOFT	7'-0"	SIMPSON		SINGLE FLUSH SWING	WD PH WD PH
26	80" x 68" LOFT	7'-0"	SIMPSON		SLIDING CLOSET	WD PH WD PH
27	80" x 68" LOFT	7'-0"	SIMPSON		SLIDING CLOSET	WD PH WD PH
28	32" x 80"	8'-0"	SIMPSON		POCKET DOOR	WD PH WD PH
29	32" x 80"	8'-0"	SIMPSON		POCKET DOOR	WD PH WD PH
30	32" x 80"	8'-0"	SIMPSON		SINGLE FLUSH SWING	WD PH WD PH
31	32" x 80"	8'-0"	SIMPSON		SINGLE FLUSH SWING	WD PH WD PH

Door Schedule Exterior

Door Number	Door Size	Head Height	Manufacturer	Model	Description	Finish
10	43 7/8"	7'-0"	CDM		EXTERIOR PH DOOR	
11	43 7/8"	7'-0"	CDM		EXTERIOR PH DOOR	
12	43 7/8"	7'-0"	CDM		EXTERIOR PH DOOR	

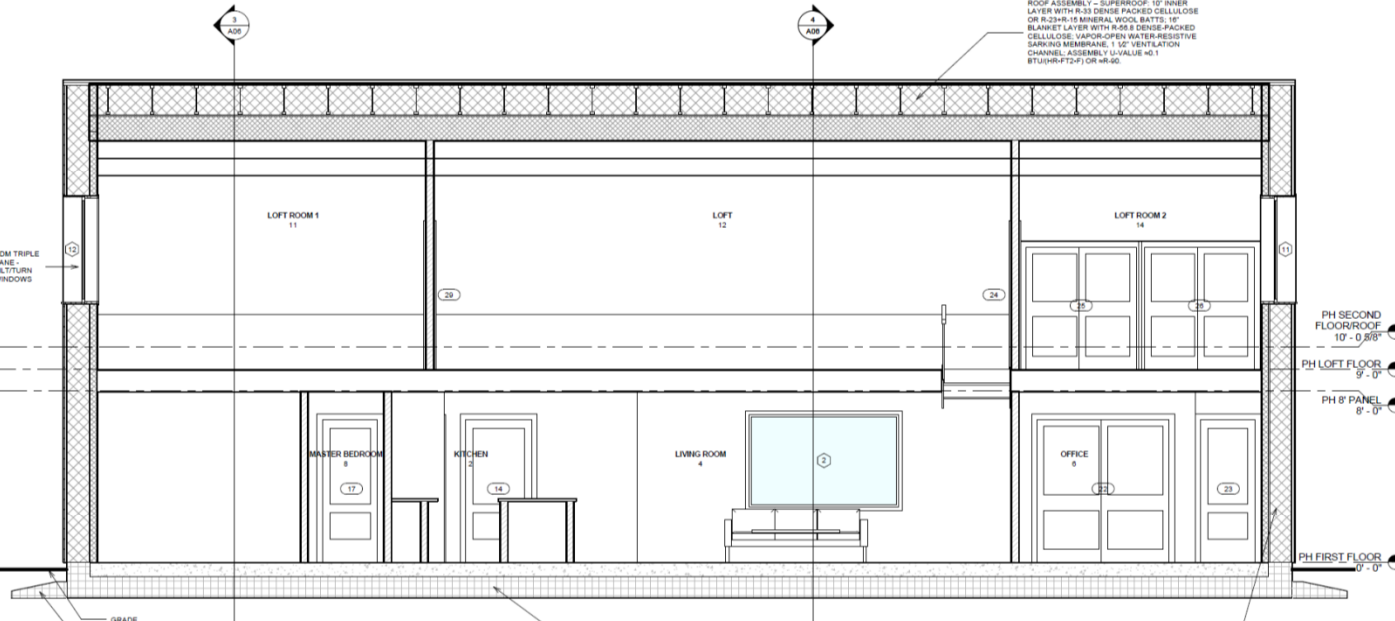
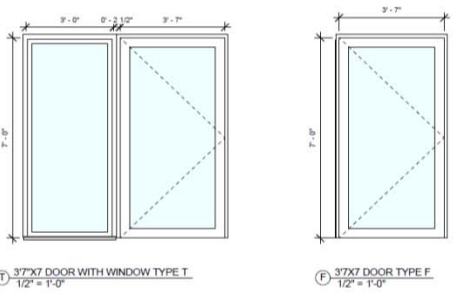
Window Schedule - MODEL G

Mark	Dimensions	Head Height	Type	Manufacturer	Model	Glazing	Comments
1	5'-0" x 3'-0"	7'-0"	Casement with Trim	CDM			
2	7'-0" x 4'-0"	7'-0"	Fixed with Trim	CDM			
3	5'-0" x 3'-0"	7'-0"	Casement with Trim	CDM			
4	5'-0" x 5'-0"	7'-0"	Casement with Trim	CDM			Egress
5	6'-0" x 6'-0"	7'-0"	Fixed with Trim	CDM			
6	7'-0" x 5'-0"	7'-0"	Fixed with Trim	CDM			
7	5'-0" x 7'-0"	7'-0"	Fixed with Trim	CDM			
8	5'-0" x 5'-0"	7'-0"	Casement with Trim	CDM			Egress
9	5'-0" x 3'-0"	7'-0"	Fixed with Trim	CDM			
11	5'-0" x 5'-0"	7'-0"	Casement with Trim	CDM			Egress
12	5'-0" x 5'-0"	7'-0"	Casement with Trim	CDM			Egress
13	1'-10" x 2'-10"		Skylight	FAKRO			

Room Finish Schedule

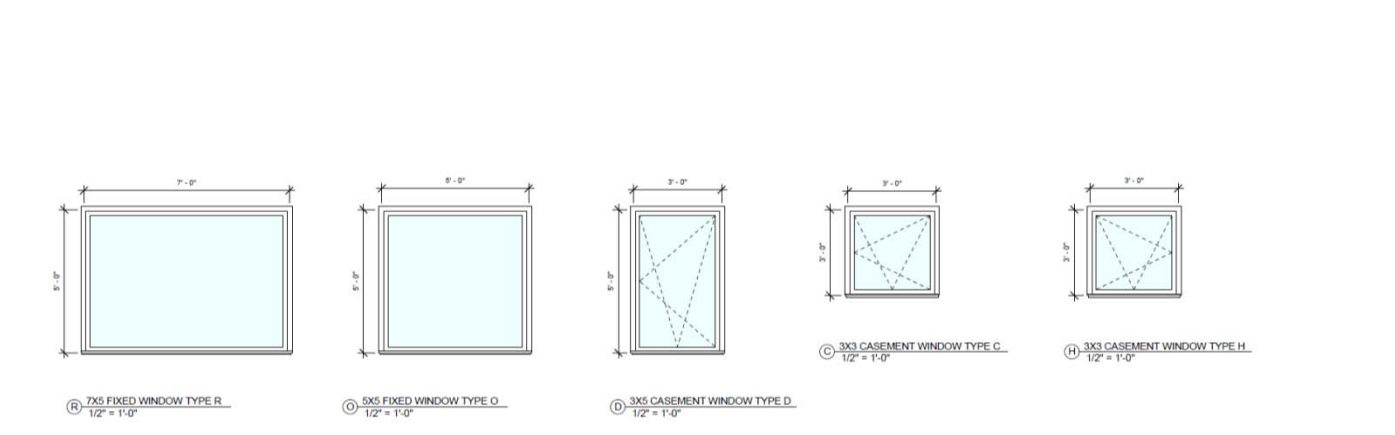
Room Number	Room Name	Floor	Base	Wall	Ceiling
1	FOYER	CONCRETE	1X4 GYP. BRD.	GYP. BRD.	GYP. BRD.
2	KITCHEN	CONCRETE	1X4 TILE	GYP. BRD.	GYP. BRD.
3	DINING ROOM	CONCRETE	1X4 GYP. BRD.	GYP. BRD.	GYP. BRD.
4	LIVING ROOM	CONCRETE	1X4 GYP. BRD.	GYP. BRD.	GYP. BRD.
5	BACK ENTRY	CONCRETE	1X4 GYP. BRD.	GYP. BRD.	GYP. BRD.
6	OFFICE	CONCRETE	1X4 GYP. BRD.	GYP. BRD.	GYP. BRD.
7	BATHROOM	TILE	TILE	GYP. BRD.	GYP. BRD.
8	MASTER BEDROOM	CONCRETE	1X4 GYP. BRD.	GYP. BRD.	GYP. BRD.
9	MASTER BATHROOM	TILE	TILE	GYP. BRD.	GYP. BRD.
10	MECHANICAL	CONCRETE	1X4 GYP. BRD.	GYP. BRD.	GYP. BRD.
11	LOFT ROOM 1	WOOD	1X4 GYP. BRD.	GYP. BRD.	GYP. BRD.
12	LOFT	WOOD	1X4 GYP. BRD.	GYP. BRD.	GYP. BRD.
13	LOFT BATHROOM	TILE	TILE	GYP. BRD.	GYP. BRD.
14	LOFT ROOM 2	WOOD	1X4 GYP. BRD.	GYP. BRD.	GYP. BRD.
15	LOFT STORAGE	WOOD	1X4 GYP. BRD.	GYP. BRD.	GYP. BRD.

WINDOW / DOOR TYPES

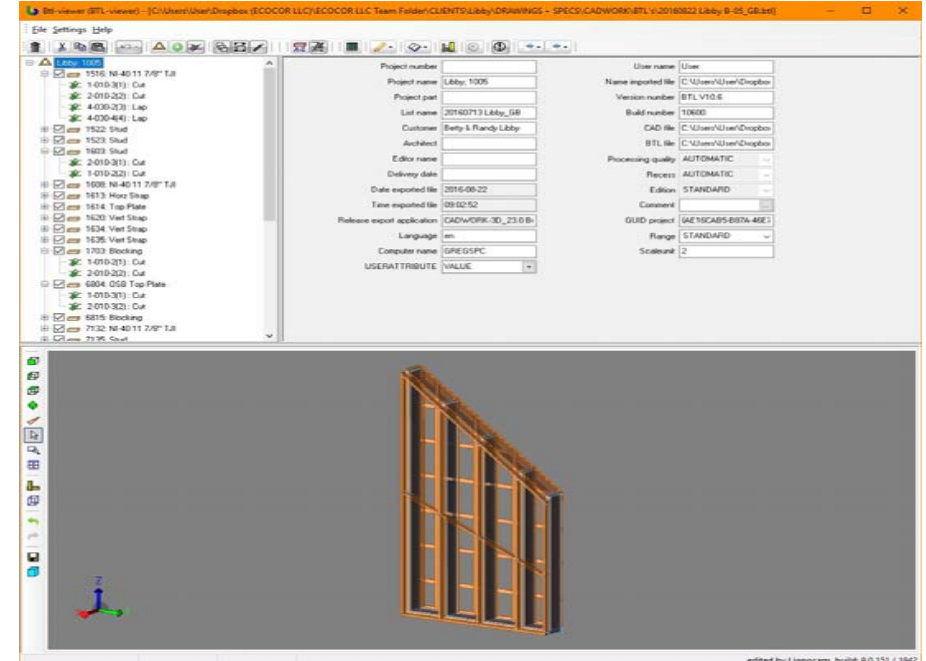
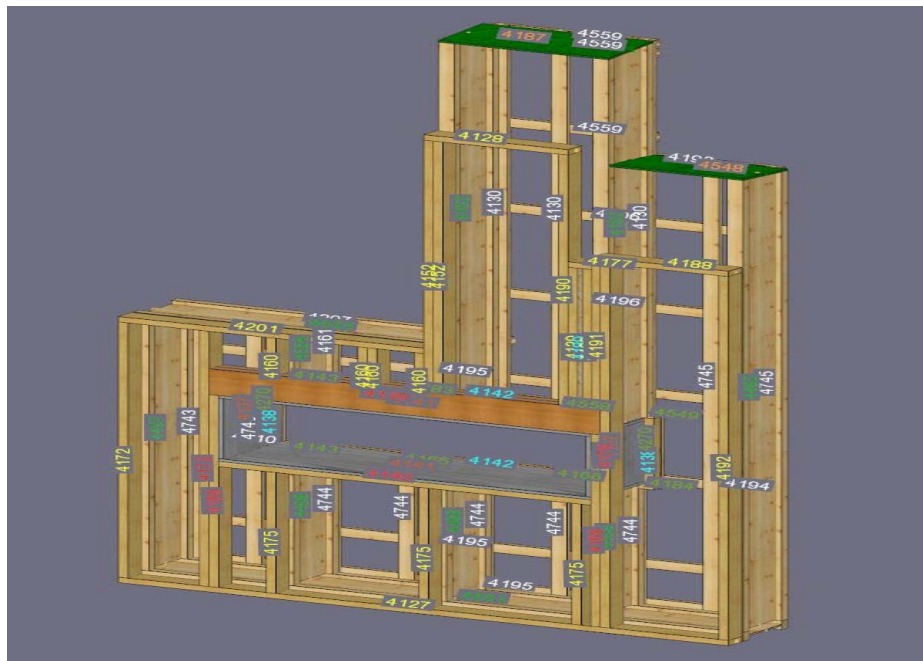
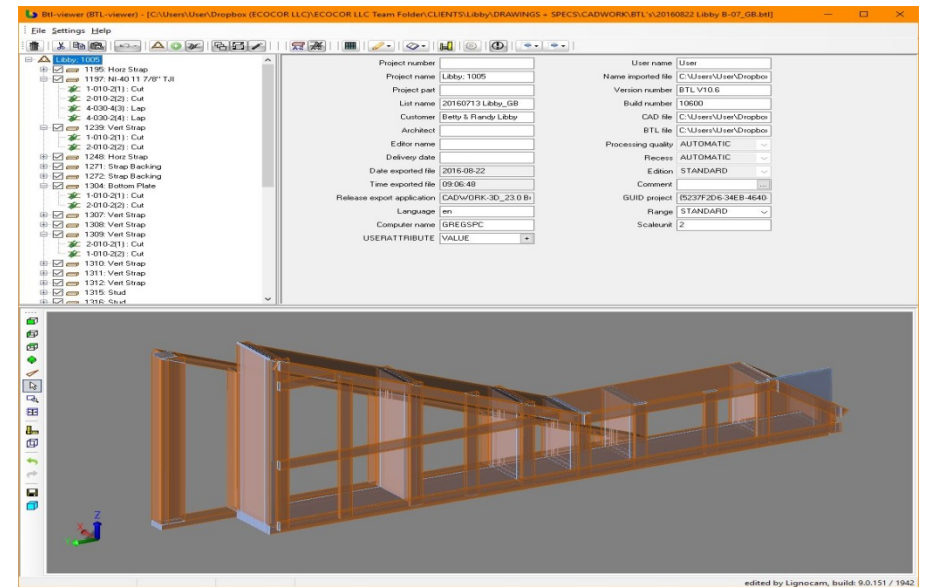
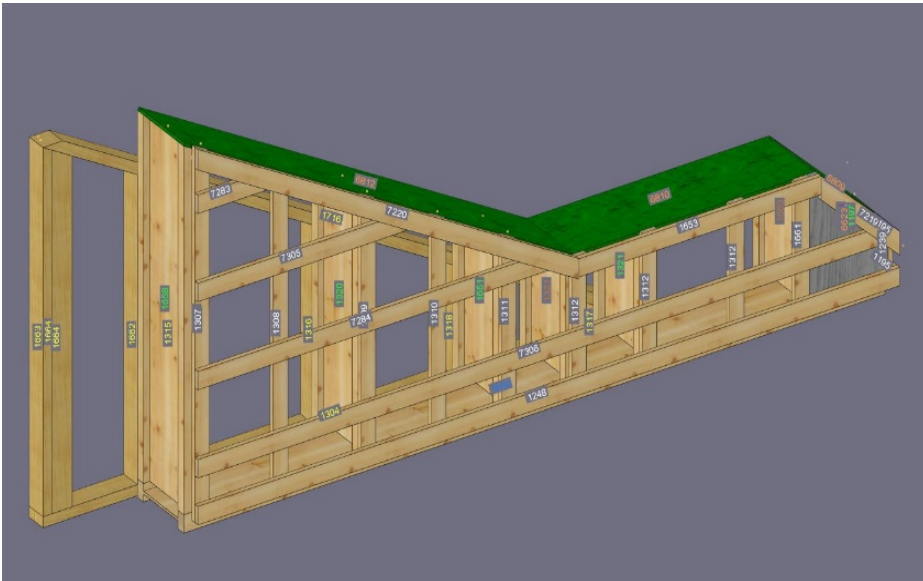


FOUNDATION - SUPERSLAB: 12\"/>

WALL ASSEMBLY - ECOCOR PASSIVE WALL (AKA SUPERWALL): 4\"/>



CAD/CAM INTEGRATION









Production Cutting

















US CARGO CONTROL

pro cli

pro c

US CARGO CONTROL

WLL 2323 LBS / 1051 KG
uscargocontrol.com

A-02

A-07

PREMIUM
PREMIUM
PREMIUM

A-11

US CARGO CONTROL

WLL 2323 LBS / 1051 KG
uscargocontrol.com

A-10

US CARGO CONTROL

WLL 2323 LBS / 1051 KG
uscargocontrol.com

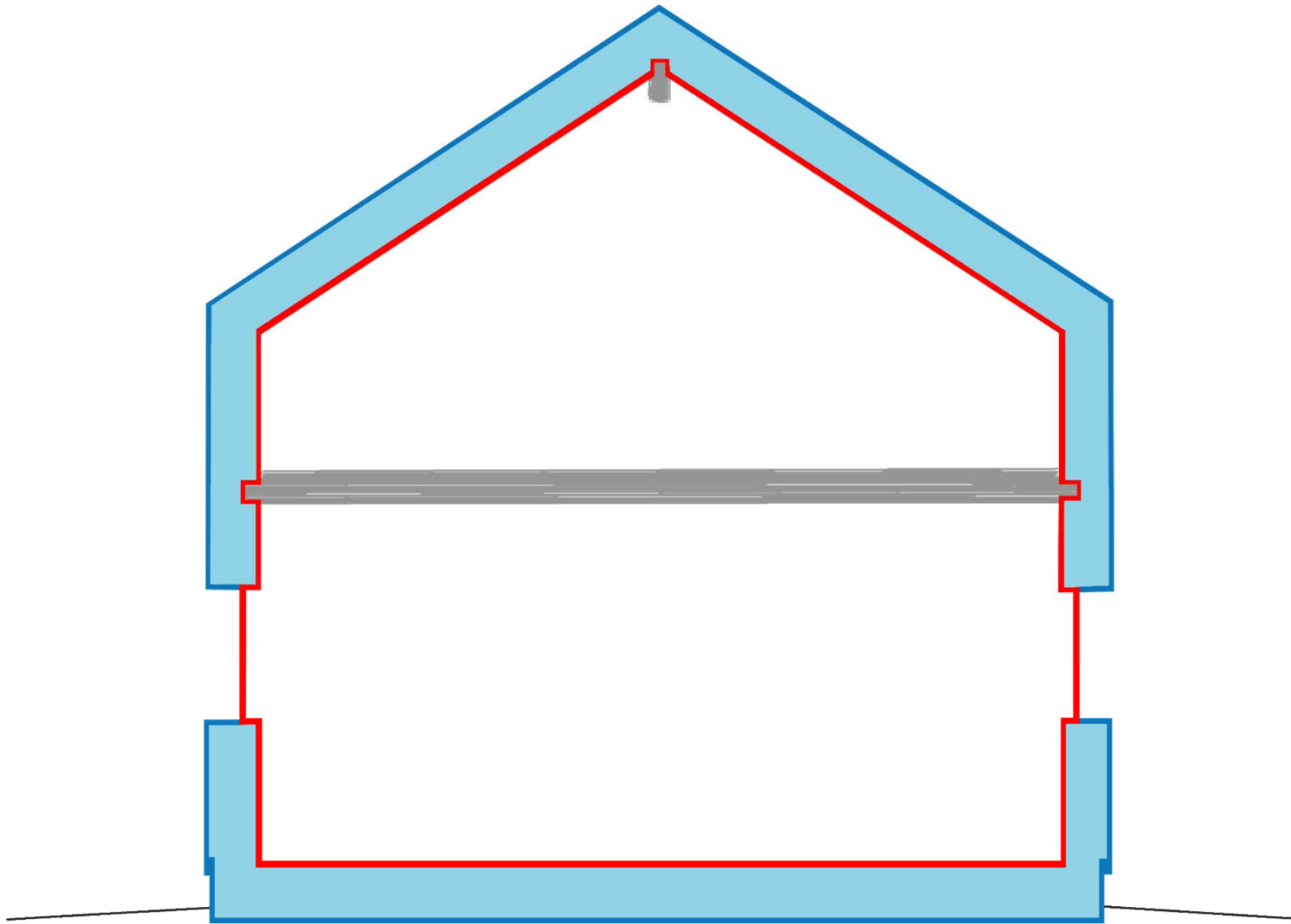














High Performance Design and Construction