

Self-Build Zero-Energy Homes



Two Minnesota Case Studies

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Peterson



Abrahamson

Collaborative Design Process



Shared Principles

- **LIVING:** Lifestyle and social dynamics
- **BUILDING:** Technical and system requirements

LIVING Self-Build

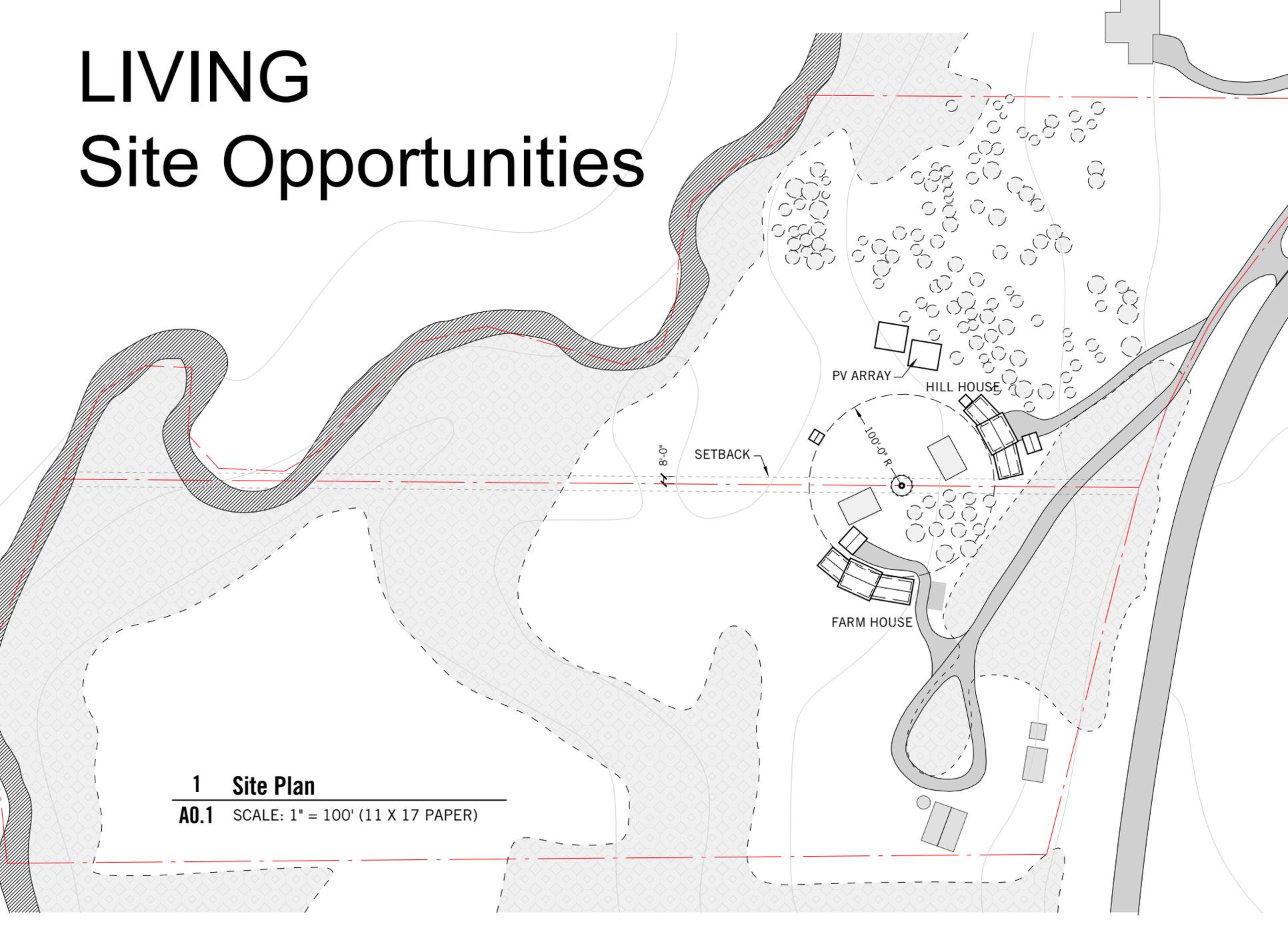


LIVING Site Opportunities



LIVING

Site Opportunities



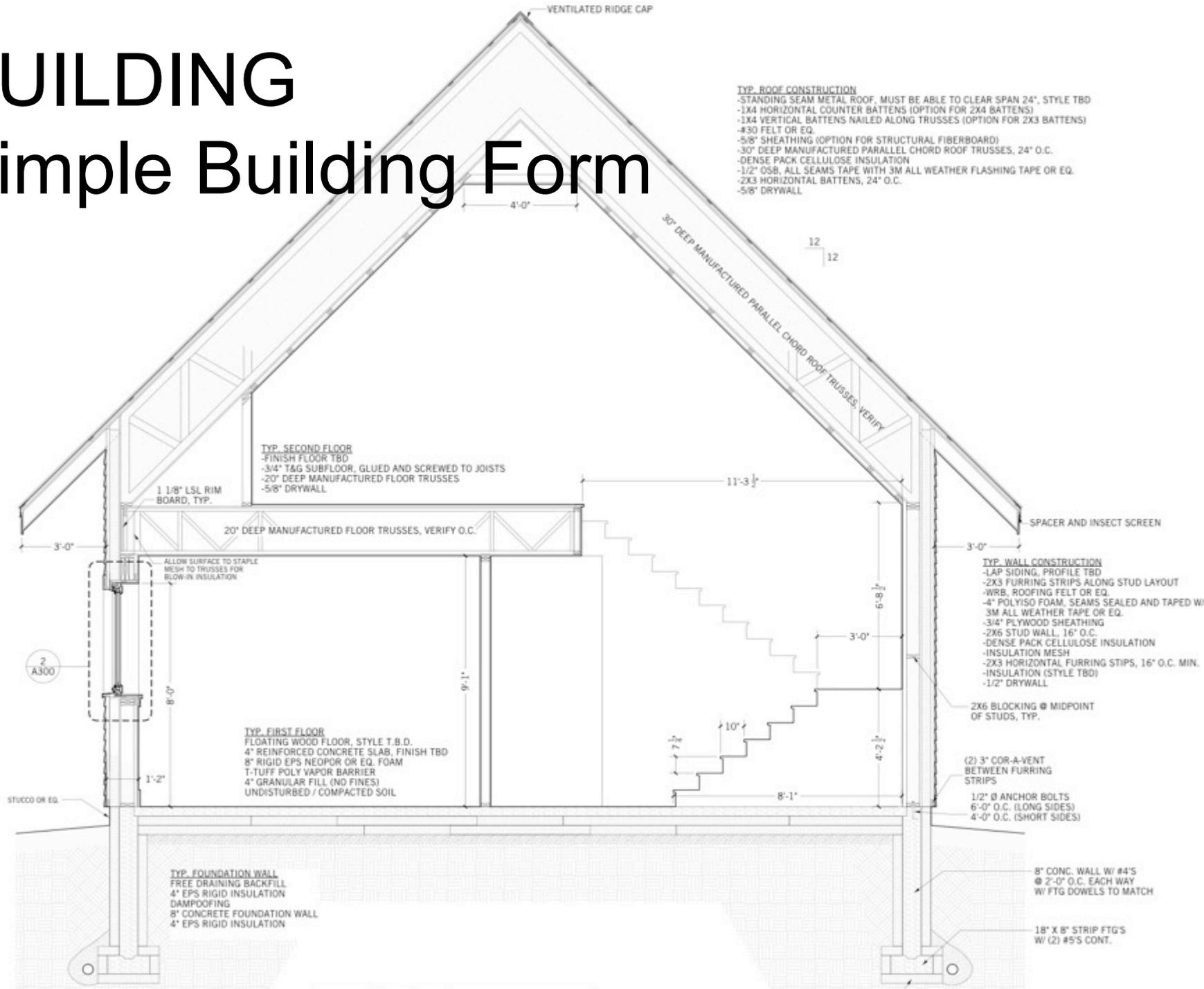
1 Site Plan
A0.1 SCALE: 1" = 100' (11 X 17 PAPER)

BUILDING Solar Access



BUILDING

Simple Building Form



TYP. ROOF CONSTRUCTION

- STANDING SEAM METAL ROOF. MUST BE ABLE TO CLEAR SPAN 24', STYLE TBD
- 1X4 HORIZONTAL COUNTER BATTENS (OPTION FOR 2X4 BATTENS)
- 1X4 VERTICAL BATTENS NAILED ALONG TRUSSES (OPTION FOR 2X3 BATTENS)
- #30 FELT OR EQ.
- 5/8" SHEATHING (OPTION FOR STRUCTURAL FIBERBOARD)
- 30" DEEP MANUFACTURED PARALLEL CHORD ROOF TRUSSES, 24" O.C.
- DENSE PACK CELLULOSE INSULATION
- 1/2" OSB. ALL SEAMS TAPE WITH 3M ALL WEATHER FLASHING TAPE OR EQ.
- 2X3 HORIZONTAL BATTENS, 24" O.C.
- 5/8" DRYWALL

TYP. SECOND FLOOR

- FINISH FLOOR TBD
- 3/4" T&G SUBFLOOR, GLUED AND SCREWED TO JOISTS
- 20" DEEP MANUFACTURED FLOOR TRUSSES
- 5/8" DRYWALL

1 1/8" LSL RIM BOARD, TYP.

20" DEEP MANUFACTURED FLOOR TRUSSES, VERIFY O.C.

ALLOW SURFACE TO STAPLE MESH TO TRUSSES FOR BLOW-IN INSULATION

2
A300

TYP. FIRST FLOOR

- FLOATING WOOD FLOOR, STYLE T.B.D.
- 4" REINFORCED CONCRETE SLAB, FINISH TBD
- 8" RIGID EPS NEOPOR OR EQ. FOAM
- T-TUFF POLY VAPOR BARRIER
- 4" GRANULAR FILL (NO FINES)
- UNDISTURBED / COMPACTED SOIL

STUCCO OR EQ.

TYP. FOUNDATION WALL

- FREE DRAINING BACKFILL
- 4" EPS RIGID INSULATION
- DAMPPOOFING
- 8" CONCRETE FOUNDATION WALL
- 4" EPS RIGID INSULATION

30" DEEP MANUFACTURED PARALLEL CHORD ROOF TRUSSES, VERIFY

12
12

SPACER AND INSECT SCREEN

TYP. WALL CONSTRUCTION

- LAP SIDING, PROFILE TBD
- 2X3 FURRING STRIPS ALONG STUD LAYOUT
- WRB, ROOFING FELT OR EQ.
- 4" POLYISO FOAM, SEAMS SEALED AND TAPED W/ 3M ALL WEATHER TAPE OR EQ.
- 3/4" PLYWOOD SHEATHING
- 2X6 STUD WALL, 16" O.C.
- DENSE PACK CELLULOSE INSULATION
- INSULATION MESH
- 2X3 HORIZONTAL FURRING STRIPS, 16" O.C. MIN.
- INSULATION (STYLE TBD)
- 1/2" DRYWALL

2X6 BLOCKING @ MIDPOINT OF STUDS, TYP.

(2) 3" COR-A-VENT BETWEEN FURRING STRIPS

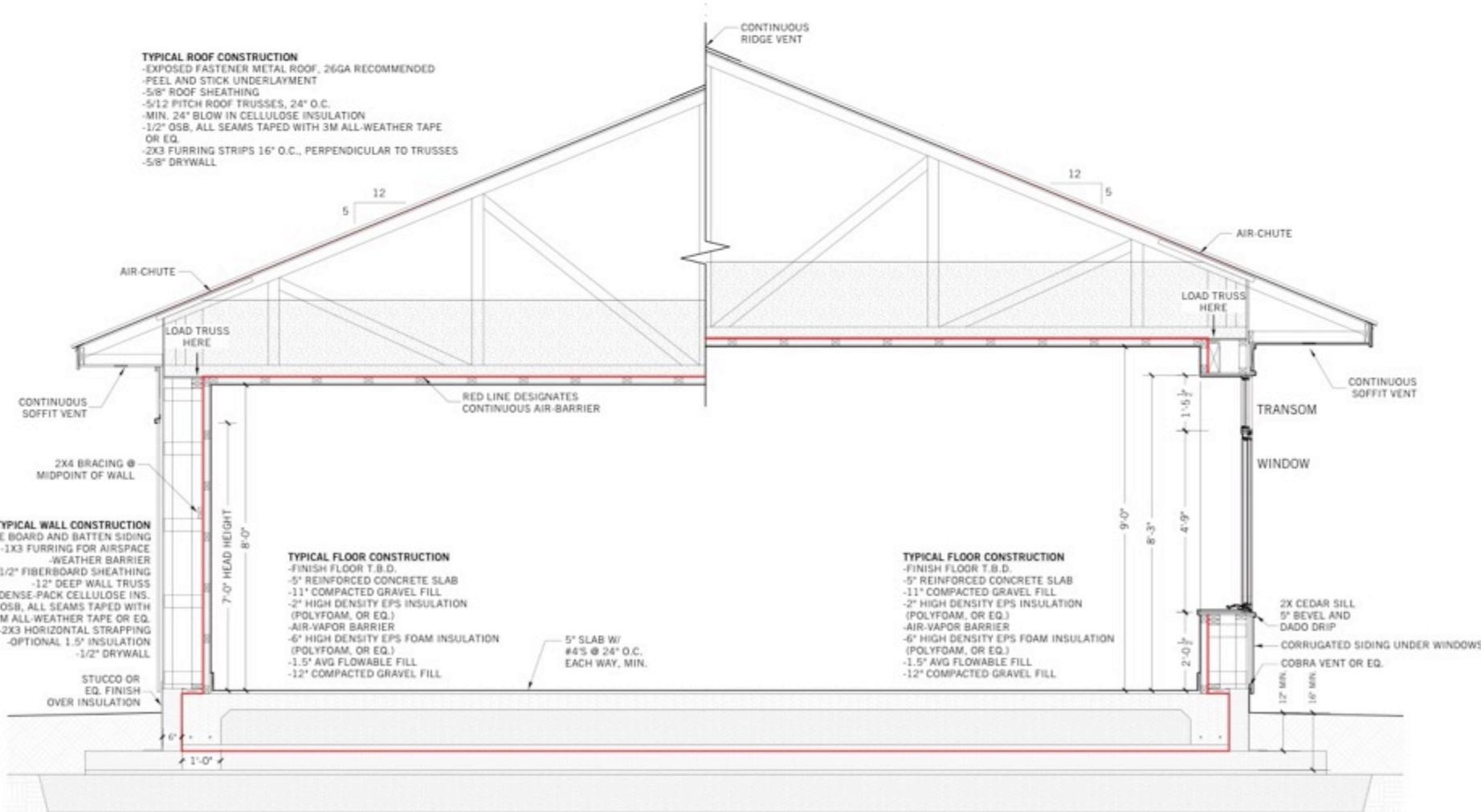
1/2" Ø ANCHOR BOLTS
6'-0" O.C. (LONG SIDES)
4'-0" O.C. (SHORT SIDES)

8" CONC. WALL W/ #4'S
@ 2'-0" O.C. EACH WAY
W/ FTG DOWELS TO MATCH

18" X 8" STRIP FTG'S
W/ (2) #5'S CONT.

BUILDING

Insulated and Air-Sealed



BUILDING Energy Modeling

Group	Description	Area	Units	Notes	Factor for X	
4	South windows					
5	West windows	A	13	ft ²		
6	Horizontal windows	A	0	ft ²		
7	Exterior door	A	0	ft ²	Please subtract area of door from respective building assembly	
8	Exterior wall - Ambient	A	1674	ft ²	Temperature zone "A" is ambient air	
9	Exterior wall - Ground	B	0	ft ²	Temperature zone "B" is the ground	
10	Roof/Ceiling - Ambient	A	2182	ft ²		
11	Floor slab / Basement ceiling	B	2182	ft ²		
12			0	ft ²	Temperature zones "A", "B", "P" and "X" may be used. NOT "I"	
13			0	ft ²	Temperature zones "A", "B", "P" and "X" may be used. NOT "I"	
14		X	0	ft ²	Temperature zone "X". Please provide user-defined reduction factor (0 < R < 1).	
					7.5%	
15	Thermal bridges Ambient	A	0	ft	Units in ft	
16	Perimeter thermal bridges	P	0	ft	Units in ft; temperature zone "P" is perimeter (see Ground worksheet)	
17	Thermal bridges FS/BC	B	0	ft	Units in ft	
18	Partition wall to neighbor	I	0	ft ²	No heat losses; only considered for the heating load calculation	
Total thermal envelope				6498	ft ²	

Window areas are subtracted from individual opaque areas, which is displayed in the "Windows" worksheet.

Group	Description	Area	Units
19	South windows		
20	West windows		
21	Horizontal windows		
22	Exterior door		
23	Exterior wall - Ambient		
24	Exterior wall - Ground		
25	Roof/Ceiling - Ambient		
26	Floor slab / Basement ceiling		
Thermal bridges - Overview			
27	Thermal bridges Ambient		
28	Perimeter thermal bridges		
29	Thermal bridges FS/BC		
30	Partition wall to neighbor		
Average therm. envelope			

Area input															Sort: BY ID						
As No.	Building assembly description	Group No.	Assigned to group	Qty	x (	Length			x	Width			+	User determined	-	User subtraction	-	Subtracted window areas	)=	Area	Selection of building assembly / certified building system
						[ft]	[in]	[in]		[ft]	[in]	[in]									
	Treated floor area	1	Treated floor area	1	x (								+	1818.8	-				=	1818.8	
	North windows	2	North windows		x (														=	84.3	From 'Windows' worksheet
	East windows	3	East windows		x (														=	13.3	From 'Windows' worksheet
	South windows	4	South windows		x (														=	349.1	From 'Windows' worksheet
	West windows	5	West windows		x (														=	13.3	From 'Windows' worksheet
	Horizontal windows	6	Horizontal windows		x (														=	0.0	From 'Windows' worksheet
	Exterior door	7	Exterior door		x (														=		R-value exterior door
1	Wall_195403_N	8	Exterior wall - Ambient	1	x (	20.00	ft	0.00	in	x	8.00	ft	7.00	in	+				=	160.8	83ud PH External wall
2	Wall_195440_N	8	Exterior wall - Ambient	1	x (	30.00	ft	0.00	in	x	8.00	ft	7.00	in	+				=	241.2	83ud PH External wall
3	Wall_195544_N	8	Exterior wall - Ambient	1	x (	34.00	ft	0.00	in	x	9.00	ft	7.00	in	+				=	268.8	83ud PH External wall
4	Wall_195272_E	8	Exterior wall - Ambient	1	x (	22.00	ft	0.00	in	x	8.00	ft	7.00	in	+				=	175.5	83ud PH External wall
5	Wall_195341_E	8	Exterior wall - Ambient	1	x (		ft		in	x		ft		in	+	72.84			=	72.8	83ud PH External wall
6	Wall_195321_S	8	Exterior wall - Ambient	1	x (	25.00	ft	10.74	in	x	8.00	ft	7.00	in	+				=	133.6	83ud PH External wall
7	Wall_195359_S	8	Exterior wall - Ambient	1	x (	34.00	ft	0.00	in	x	9.00	ft	7.00	in	+				=	161.6	83ud PH External wall
8	Wall_195259_S	8	Exterior wall - Ambient	1	x (	35.00	ft	10.74	in	x	8.00	ft	7.00	in	+				=	211.8	83ud PH External wall
9	Wall_195395_W	8	Exterior wall - Ambient	1	x (	22.00	ft	0.00	in	x	8.00	ft	7.00	in	+				=	175.5	83ud PH External wall
10	Wall_195368_W	8	Exterior wall - Ambient	1	x (		ft		in	x		ft		in	+	72.84			=	72.8	83ud PH External wall
11	Roof_195385_H	8	Roof/Ceiling - Ambient	1	x (		ft		in	x		ft		in	+	504.84			=	504.8	84ud PH Roof
12	Roof_195307_H	10	Roof/Ceiling - Ambient	1	x (	34.00	ft	0.00	in	x	28.00	ft	0.00	in	+				=	952.0	84ud PH Roof
13	Roof_195285_H	10	Roof/Ceiling - Ambient	1	x (		ft		in	x		ft		in	+	724.84			=	724.8	84ud PH Roof
14	Floor_195229_D	11	Floor slab / Basement ceiling	1	x (		ft		in	x		ft		in	+	2181.69			=	2181.7	85ud PH Floor
15					x (		ft		in	x		ft		in	+				=	0.0	
16					x (		ft		in	x		ft		in	+				=	0.0	

Please complete in Windows worksheet only!

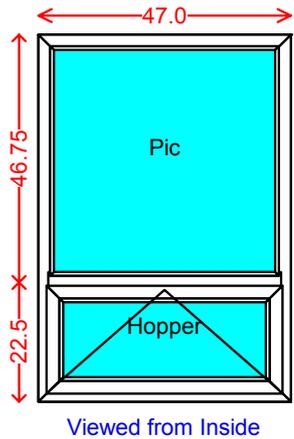
BUILDING Air Quality



BUILDING Budget

0008

5/6



Living Room

1-OFF

47.0000w x 69.2500h

LoE 180 3P 3/41 WASCO 90% Argon Fill 3P

Dimensions

Frame

Color

White

Painted?

No

Handleset

London

Hardware Color?

White

Screen Color

Rehau White

A. Brake Stay?

No

Designo?

No

Nailing Fin ?

Yes

Geneo PHZ

No

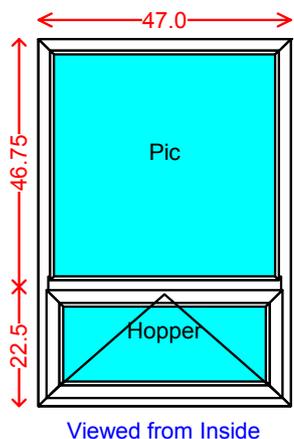
1

907.90

907.90

0009

5/6



Dining Room West

1-OFF

47.0000w x 69.2500h

LoE 366/180 3P 3/41 WASCO 90% Argon Fill 3P

Dimensions

Frame

Color

White

Painted?

No

Handleset

London

Hardware Color?

White

Screen Color

Rehau White

A. Brake Stay?

No

Designo?

No

Nailing Fin ?

Yes

Geneo PHZ

No

1

918.14

918.14

0010

5/6

Dining Room West

BUILDING

Low Energy and Durable Materials



PETERSON





Sub Slab Prep

Sub Slab Prep





Slab Prep

Slab Prep







Walls



Walls

Walls





Walls

Roof



Roof



Trench





Roof

Sheathing





Framing



Windows



Enclosed