PATCH WORK
a pattern to fill a need

Patch Work is a system of reusable panels that can quickly be assembled using minimal tools to create emergency shelter.

The panels are of a manageable size and built using typical North American wood-frame construction techniques, so that individual community members with basic building skills can contribute one or more panels to a shelter.

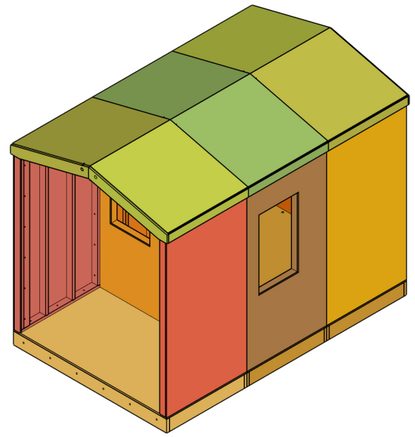
Germaine Koh Studio

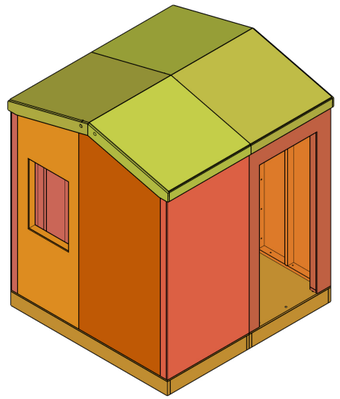
CONTENTS

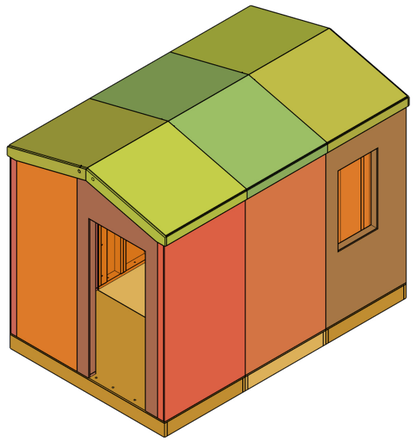
PATCH WORK CONFIGURATIONS

All panels are constructed using typical North American wood-frame construction techniques. Constructed by different people according to the plans on the following pages, they will arrive on site ready to fasten together into a shelter.

The panels can be assembled in different combinations. Some of the possible configurations are shown here.







PATCH WORK COMPONENTS

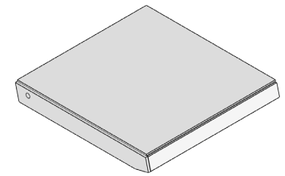
Each shelter requires enough side and gable wall panels, roof panels, and floor panels to make the desired configuration, plus a few individual pieces of lumber, and commonplace fasteners available from your local lumber yard.

Each type of panel is of a standard size and interchangeable with the others. The overall set of panels ranges from some very simple panels suitable for construction by people with limited building experience, to ones that should be built by more experienced carpenters.

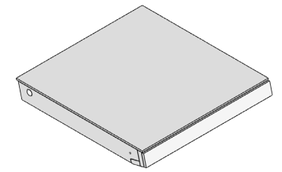
Where indicated, there is room for variation in construction techniques and finishing of some parts, but the overall dimensions must be as specified to permit assembly.

All builders should follow the instructions for the individual panels, to ensure that their panels will fit with the others.

ROOF PANELS

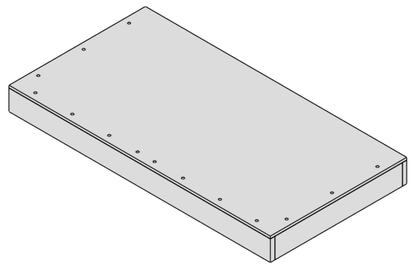


Roof End

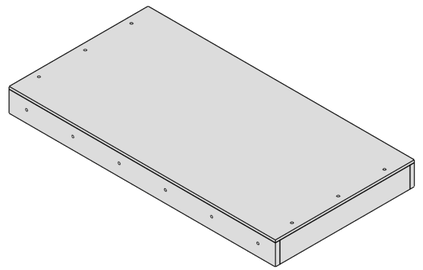


Roof Middle

FLOOR PANELS

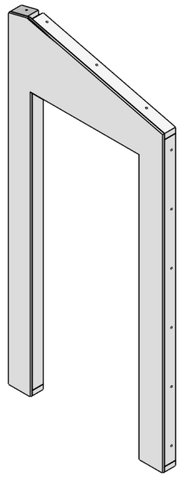


Floor End

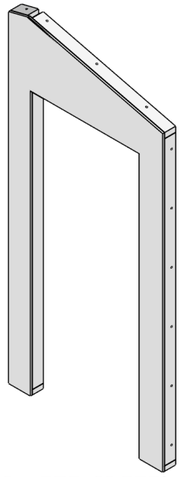


Floor Middle

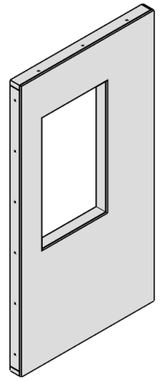
WALL PANELS



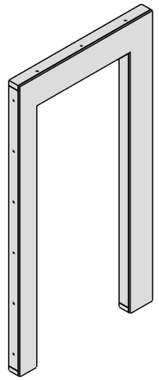
Gable Wall Wide with Door



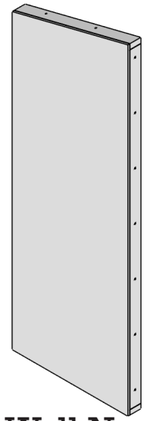
Gable Wall Wide



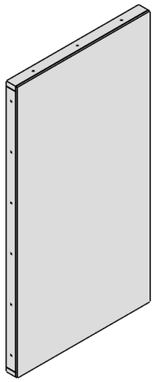
Side Wall with Window



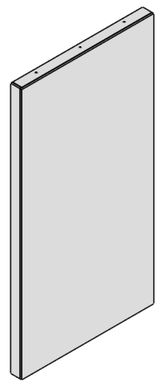
Side Wall with Door



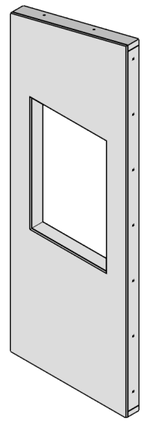
Gable Wall Narrow



Side Wall Middle

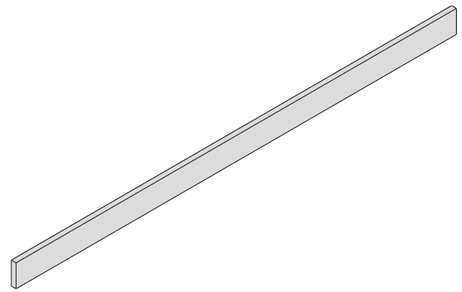


Side Wall End

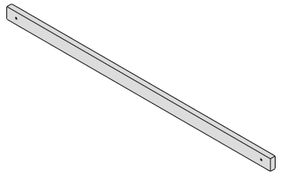


Gable Wall Narrow with Window

LUMBER



Ridge Beam



Rafter Tie

CONSTRUCTION

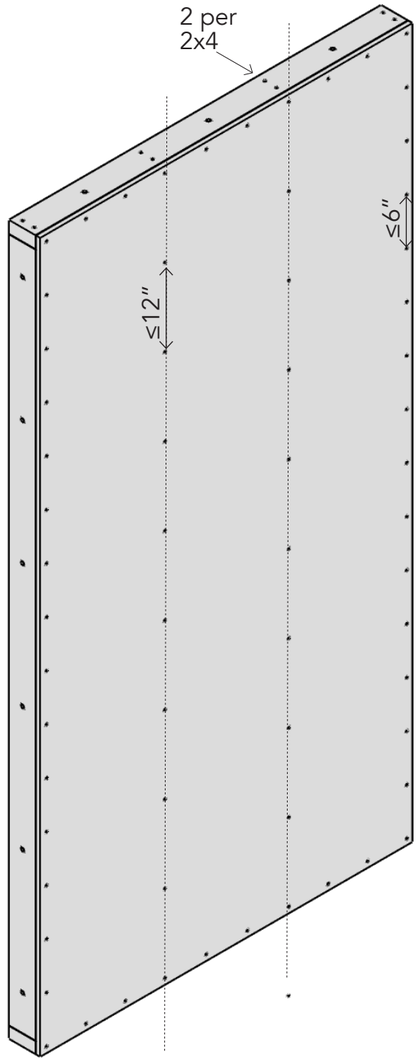
General notes

Fasteners

Use galvanized framing nails or #8 construction screws.

2x framing material
For fastening 2x material together use 3" fasteners. Use two per 2x4 connection, three per 2x6, and four per 2x8 connection.

Sheathing to framing
For fastening sheathing to framing materials, use 1.5" to 2" fasteners. Sheathing must be fastened every 6" or less around the edges, and every 12" or less to interior framing.

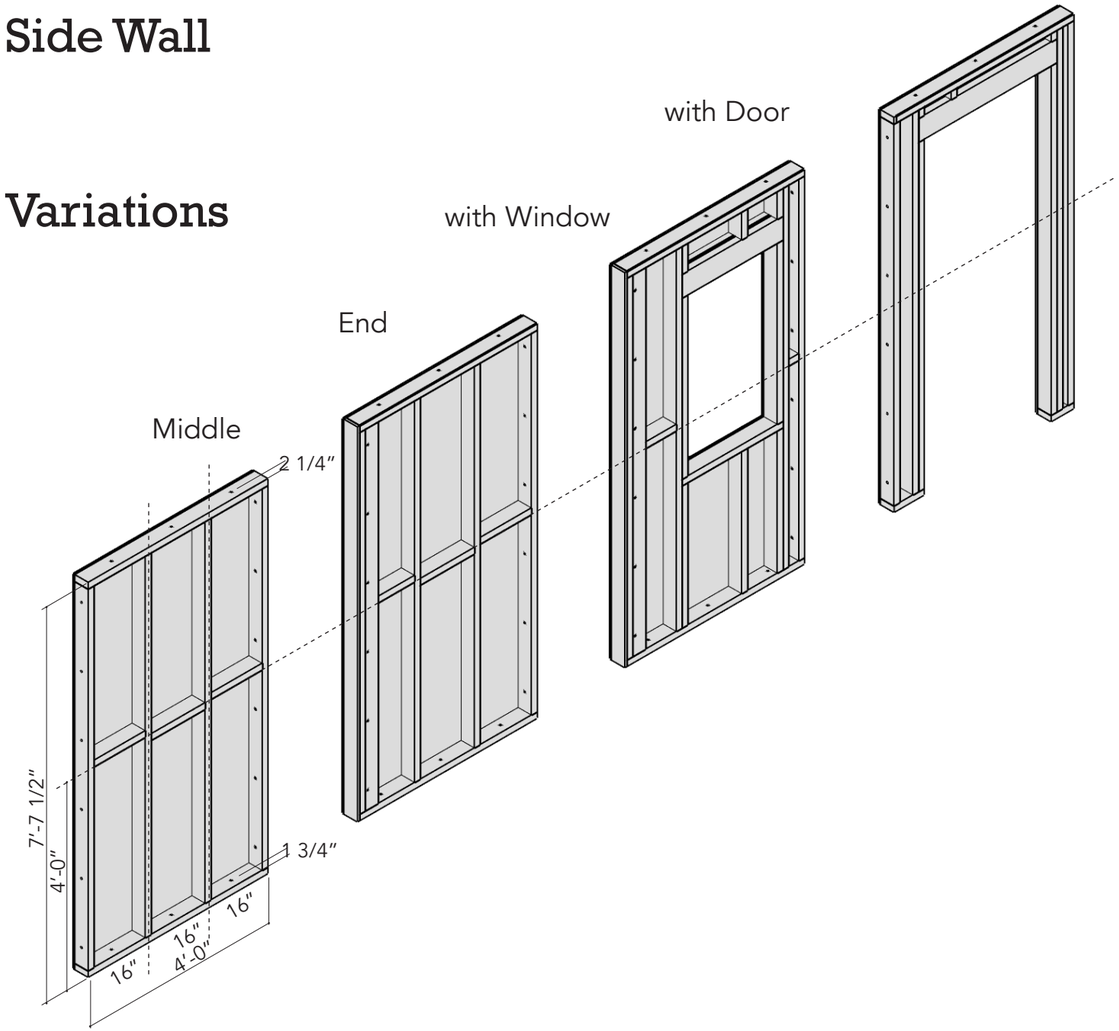


Safety precautions

Use suitable hearing, eye and respiratory protection when using power tools.

Side Wall

Variations



All side walls

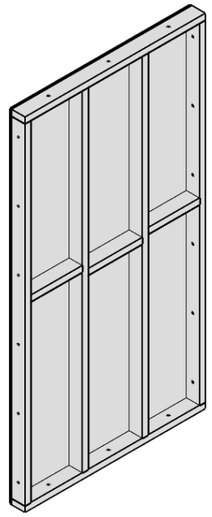
- Finished size of 4'-0" wide x 7'-7 1/2" high.
- Stud centres spaced at 16" from edges
- The panels have a series of holes drilled on each edge, to bolt to other panels: Sides holes are 3/8" diameter, spaced 16" centre-to-centre, starting 4 1/2" from bottom of stud (6" from bottom of wall), centred on the stud. Top & bottom plate holes are 3/8", spaced 16" centre-to-centre, starting 8" from finished end. Bottom holes are 1/2" diameter, centred on the stud, top are 3/8", placed 2 1/4" from one edge.

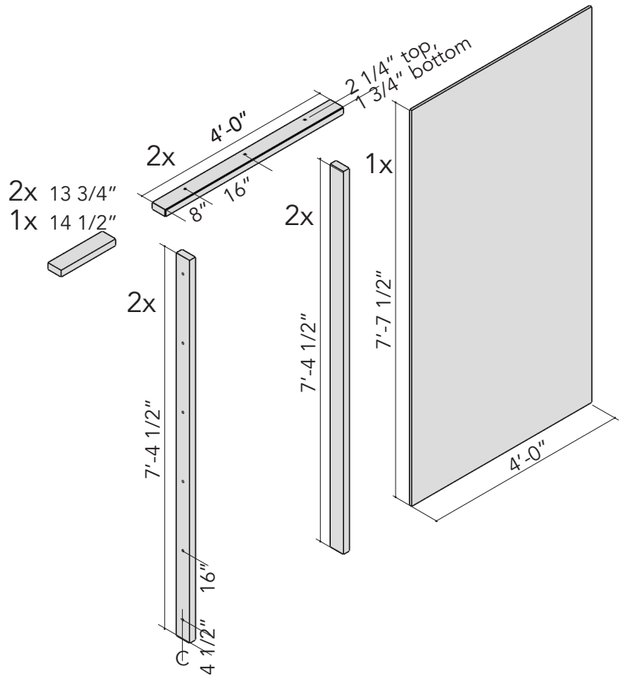
The basic framing for all side walls is similar, but there are slight differences between modules intended for the ends of the finished wall. See separate page for adding a window or door opening to the basic framing.

Side Wall — Middle

Parts

1	4′-0″ x 7′-7 1/2″	1/2″ plywood or oriented strand board (may be assembled from multiple pieces)
2	7′-4 1/2″	2x4 stud
2	7′-4 1/2″	2x4 stud drilled with 6— 3/8″ holes @ 16″
2	4′-0″	2x4 top/bottom plate drilled with 3— 3/8″ holes @ 16″
2 1	13 3/4″ 14 1/2″	2x4 blocking



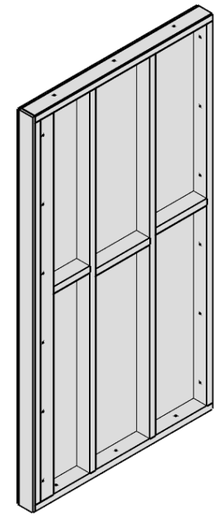


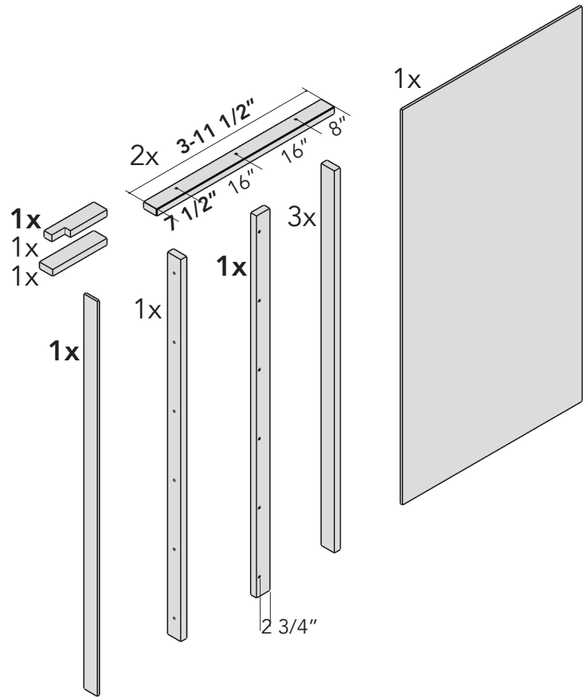
The studs on the ends have a series of holes drilled at 16″ intervals that will connect with other panels. Holes in the top and bottom 2x4 plates are also 16″ between centres, with the bottom holes centred on the stud and the top 2 1/4″ from the interior (non-plywood) side.

Side Wall — End

Parts

1	4′-0″ x 7′-7 1/2″	1/2″ plywood or oriented strand board (may be assembled from multiple pieces)
1	7′-4 1/2″	2x4 stud
1	**7′-4 1/2″**	**2x4 corner stud drilled with 6— 3/8″ holes @ 16″**
2	3′-11 1/2″	2x4 top/bottom plate drilled with 3— 3/8″ holes @ 16″
1 1	13 3/4″ 14 1/2″	2x4 blocking
1	**13 3/4″**	**2x4 blocking, notched for corner stud**
1	**3 1/2″ x 7′-7 1/2″**	**1/2″ plywood or OSB strip**





Only those dimensions different from Side Wall Middle are indicated.

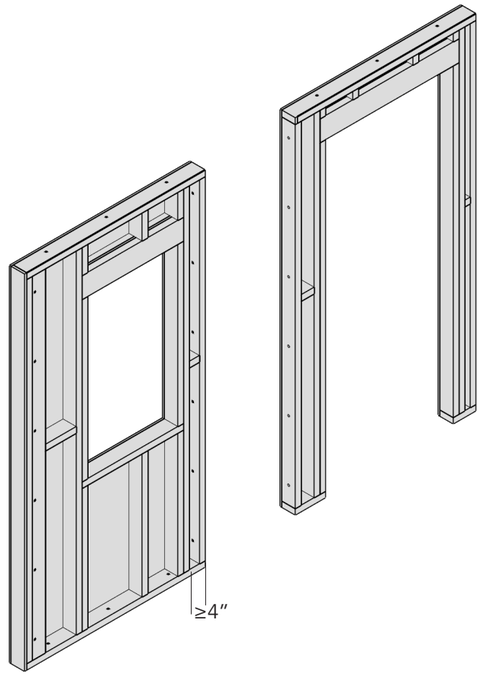
- Top & bottom plates are reduced by 1/2″ on the outside edge and the entire outside edge is capped by a strip of 1/2″ sheathing material to keep the total width of 4′-0″.
- At the outside edge, a drilled stud is added at 90° for attachment to the gable wall. Vertical spacing is the same as the other uprights but ditance from the edge is different. See drawing.

Side Wall variations — Door or Window

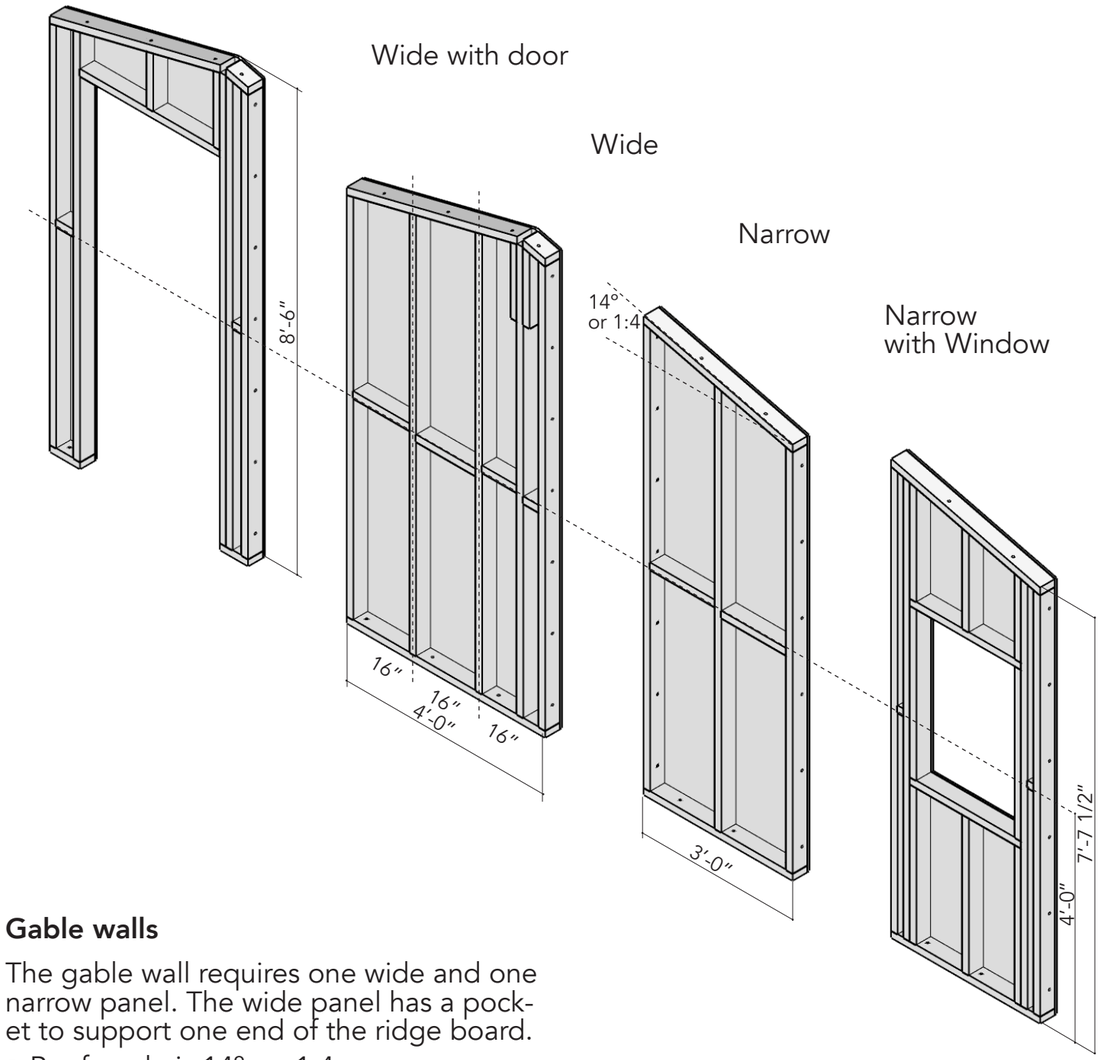
Door and window panels should be undertaken only by more experienced builders. The notes below are intended for them.

Side Wall door & window notes

- Add window or door framing while maintaining the same framing pattern and stud spacing as the Middle or End panels.
- Use doubled 2x6 + 1/2″ plywood header as these are load-bearing panels.
- Distance from outside edge to first stud must be ≥4″ to allow for assembly bolts.
- Keep rough opening relatively tight to your door/window.



Gable Wall Variations



Gable walls

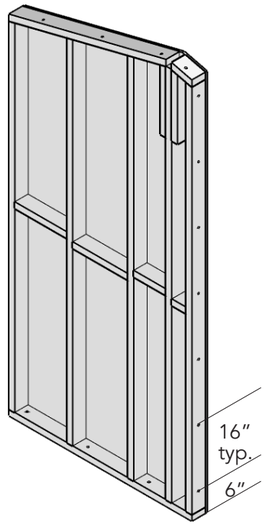
The gable wall requires one wide and one narrow panel. The wide panel has a pocket to support one end of the ridge board.

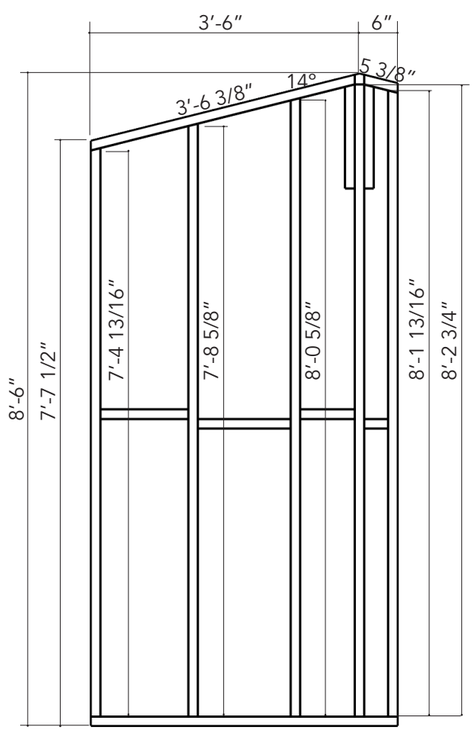
- Roof angle is 14°, or 1:4.
- Stud centres spaced at 16″ from edges
- The panels have a series of holes drilled on each edge, to bolt to other panels:
  - Side holes are 3/8″ diameter, spaced 16″ centre-to-centre, starting 4 1/2″ from bottom of stud (6″ from bottom of wall), centred on the stud.
  - Bottom plate holes are 1/2″, spaced 16″ centre-to-centre, starting 3″ from finished end, centred on the stud.
  - Holes in the angled top plates are square to the surface, 3/8″ diameter, spaced at 16″ centre-to-centre, beginning 8″ from the low edge, located 1 1/4″ from inside edge.

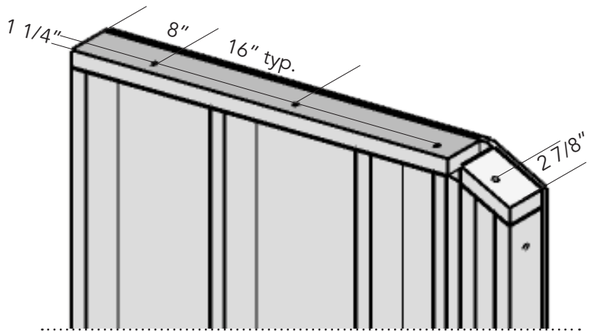
Gable Wall — Wide

Parts

1	4′-0″ x 8′-6″	1/2″ plywood or oriented strand board (may be assembled from multiple pieces)
1 1	7′-4 13/16″ 8′-1 13/16″	2x4 end studs with angled top, drilled with 3/8″ holes at 16″ (same spacing as Side Wall studs). Lengths measured to high end.
1 1	7′-8 5/8″ 8′-0 5/8″	2x4 studs with angled top. Lengths measured to high end.
1	8′ 2 3/4″	2x4 square-cut stud supporting ridge board
2	16″	2x4 brackets for ridge board stud with angled tops
1 1	3′-6 3/8″ 5 3/8″	2x4 angled top plates, angled both ends, drilled with 3/8″ holes at 16″
1	4′-0″	2x4 bottom plate, drilled with 1/2″ holes at 16″
1 1 1 1	13 3/4″ 14 1/2″ 8 1/2″ 3 3/4″	2x4 blocking



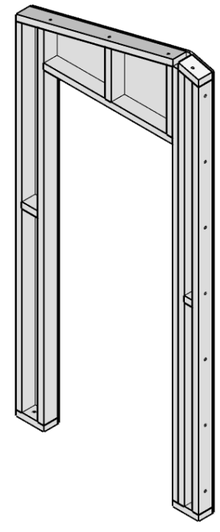


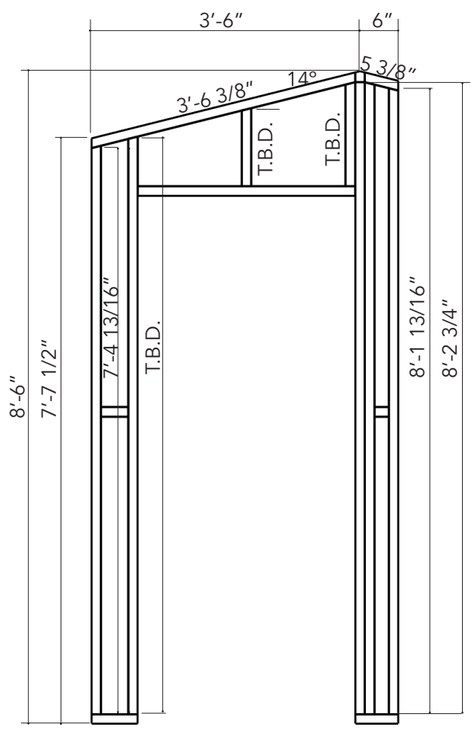


Gable Wall — Wide with Door

Parts

1	4′-0″ x 8′-6″	1/2″ plywood or oriented strand board (may be assembled from multiple pieces)
1 1	7′-4 13/16″ 8′-1 13/16″	2x4 end studs with angled top, drilled with 3/8″ holes at 16″ (same spacing as Side Wall studs). Lengths measured to high end.
1 1	8′ 2 3/4″ T.B.D. based on door size	2x4 studs with angled top. Lengths measured to high end.
1	8′ 2 3/4″	2x4 square-cut stud supporting ridge board
1 1	T.B.D. based on door height	2x4 angled-top cripple studs above door
1	T.B.D. based on door width	2x4 header above door
1 1	3′-6 3/8″ 5 3/8″	2x4 angled top plates, angled both ends, drilled with 3/8″ holes at 16″
2	T.B.D.	2x4 bottom plate, drilled with 1/2″ holes at 16″
2	T.B.D.	2x4 blocking





Door and window panels should be undertaken only by more experienced builders. The notes below are intended for them.

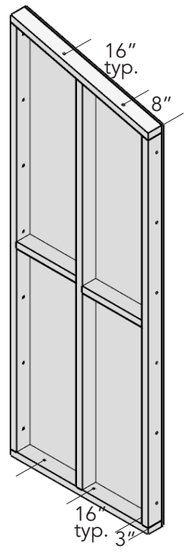
Gable Wall door & window notes

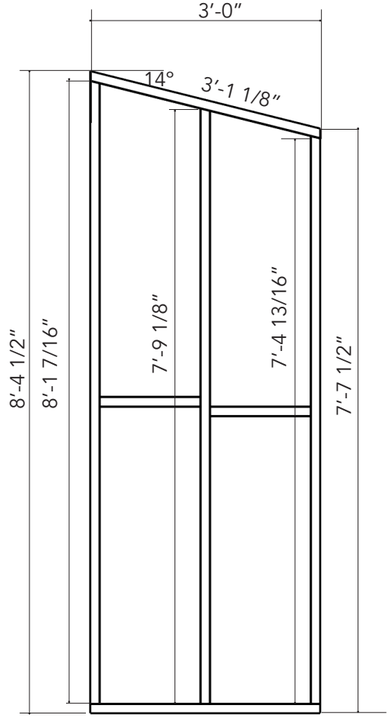
- Add window or door framing while maintaining the same framing pattern and stud spacing as the non-window/door panels.
- Distance from outside edge to first door or wall stud must be ≥4″ to allow for assembly bolts.
- Keep rough opening relatively tight to your door/window to minimize shims, as the panels will be moved.

Gable Wall — Narrow

Parts

1	3′-0″ x 8′-4 1/2″	1/2″ plywood or oriented strand board (may be assembled from multiple pieces)
1 1	7′-4 13/16″ 8′-1 7/16″	2x4 stud with angled top, drilled with 3/8″ holes at 16″
1	7′-9 1/8″	2x4 stud with angled top
1	3-1 1/8″	2x4 angled top plate, angled both ends, drilled with 3/8″ holes at 16″
2	3′-0″	2x4 square-cut bottom plate, drilled with 1/2″ holes at 16″
2	15 3/4″	2x4 blocking



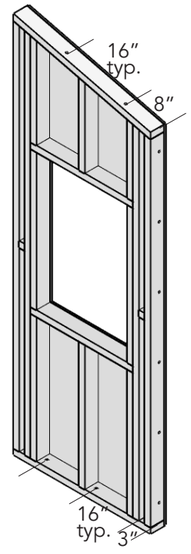


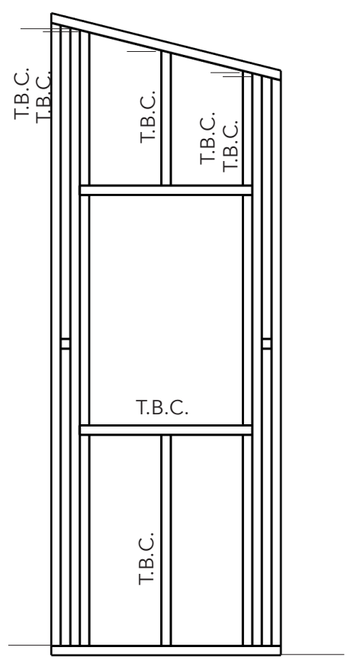
Gable Wall — with Window

Door and window panels should be undertaken only by more experienced builders. The notes below are intended for them.

Gable Wall window notes

- Add window framing while maintaining the same framing pattern and stud spacing as the non-window/door panels.
- Distance from outside edge to first stud must be ≥4″ to allow for assembly bolts.
- Keep rough opening relatively tight to your window to minimize shims, as the panels will be moved.

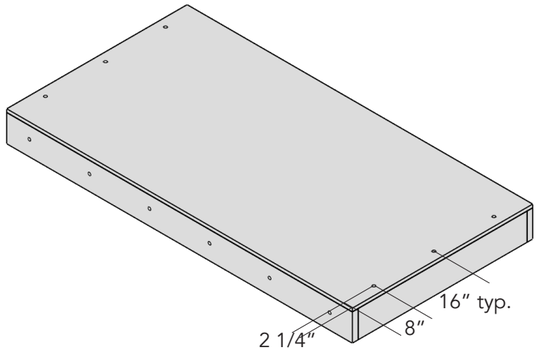




Floor — Middle

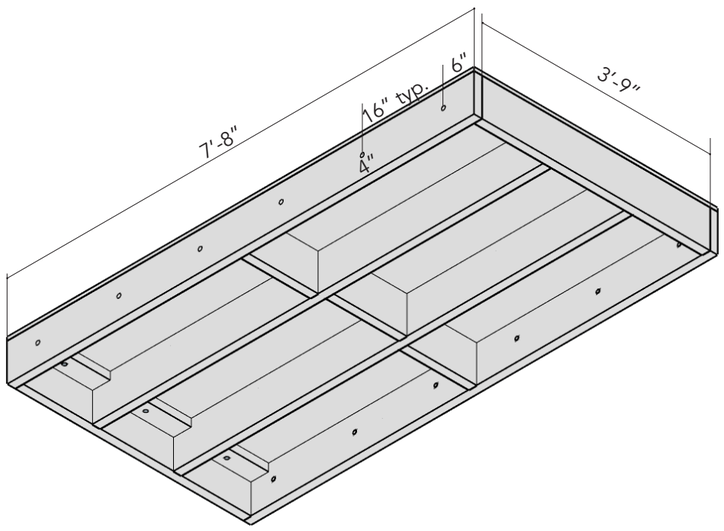
Parts

1	4′-0″ x 7′-9″	3/4″ plywood
2	7′-8″	2x8 floor joist drilled with 6— 1/2″ holes @ 16″
2	7′-8″	2x8 floor joist
2	3′-9″	2x8 rim joist
2 1	15 3/4″ 14 1/2″	2x8 blocking at mid-length
4 2	15 3/4″ 14 1/2″	2x4 reinforcing blocking



Floor — Middle panel framing

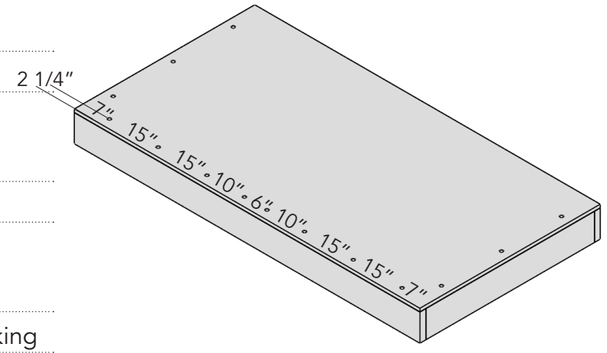
The floor panel edges are drilled at 16″, centred on floor assembly, for assembly to other panels. The assembled 2x8 and plywood backing is additionally drilled on their short ends for assembly with side wall panels



Floor — End

Parts

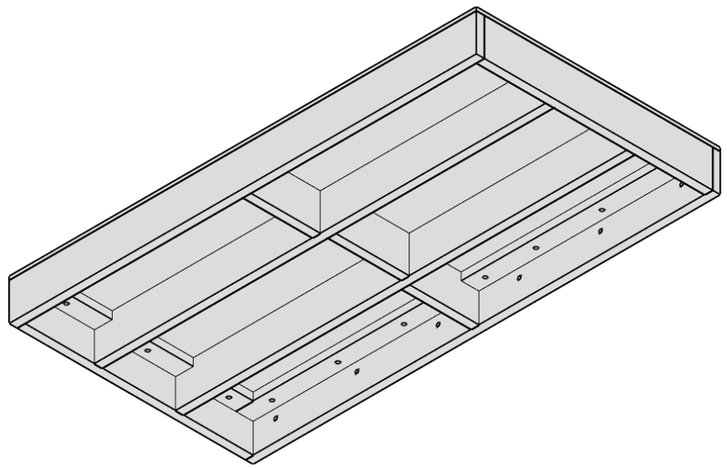
1	4′-0″ x 7′-9″	3/4″ plywood
2	7′-8″	2x8 floor joist, one drilled with 6— 3/8″ holes @ 16″
2	3′-9″	2x8 rim joist
1 1 1	15 3/4″ 15 3/4″, notched 14 1/2″	2x8 blocking at mid-length
1	7′-5″	2x4 reinforcing blocking
4 2	10 1/4″ 14 1/2″	2x4 reinforcing blocking



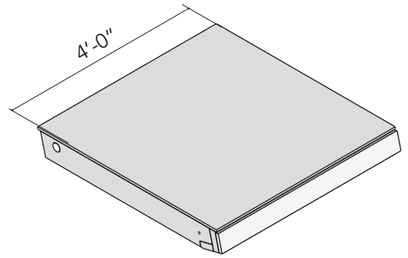
Floor — End panel framing

Framing is similar to the Floor — Middle panel, except:

- The long edge to be assembled with Gable Wall panels is reinforced with a length of 2x4. The assembly is also drilled, at the indicated spacing.
- One piece of 2x8 blocking must be notched to fit around the 2x4 reinforc-ing.



Roof — Middle



Parts

1	4'-0" x 4'-0"	1/2" plywood
2	3'- 9 3/8"	2x6 outer rafter
2	3'-7 7/8"	2x6 inner rafter
1	3'-9"	Ridge side 2x6, angled top edge, drilled at 16"
1	4'-0"	Eave side 2x5, ripped to 5"at 14°
1	4'-0"	2x4 on flat at eave side, drilled at 16", one edge angle cut
1	4'-0"	1x6 trim, ripped to 4 1/4"

All Roof panels

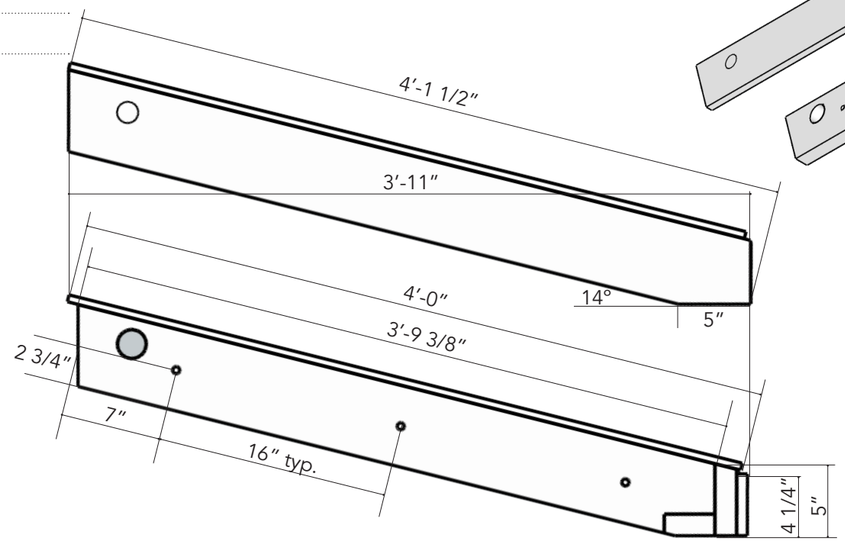
The 4' x 4' roof panels are made to rest against the Ridge Board at the ridge end, and on top of the Side Walls at the eave end. The panel is constructed with 14° angles so that the ridge and eave framing will be plumb when assembled. The roof panels extend 1" from the side walls when assembled.

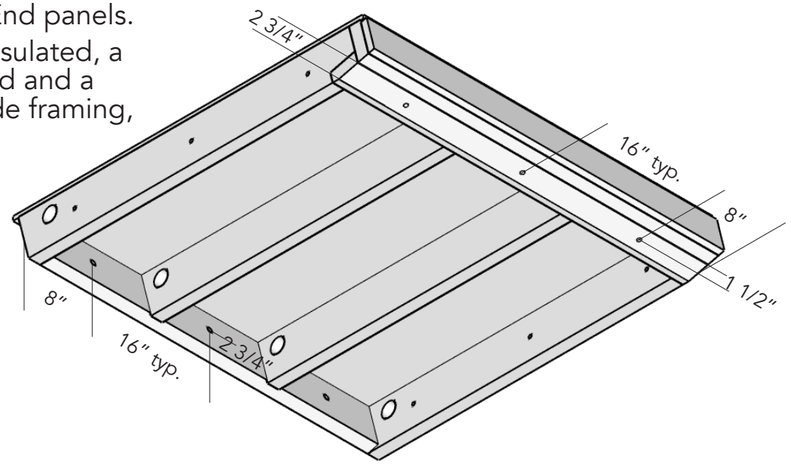
Holes for assembly:

- The ridge end and gable ends are drilled with 3/8" holes at 16" spacing, for assembly to the other compenent
- The edges of the Roof Middle panels are drilled with 3/8" holes at 16".
- A 2x3 drilled with 3/8" holes at 16" is added on flat to the Roof End panels.

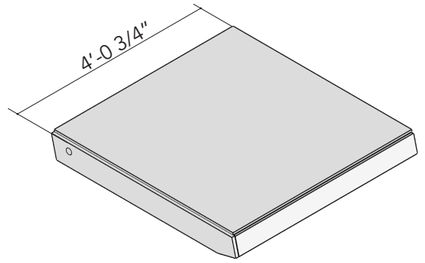
If the roof panels are to be insulated, a hole is drilled at the ridge end and a series of holes in the eave side framing, for ventilation. These holes should be screened on the interior against insects.-

The Roof End panels receive an additional 1x6 fascia trim board.





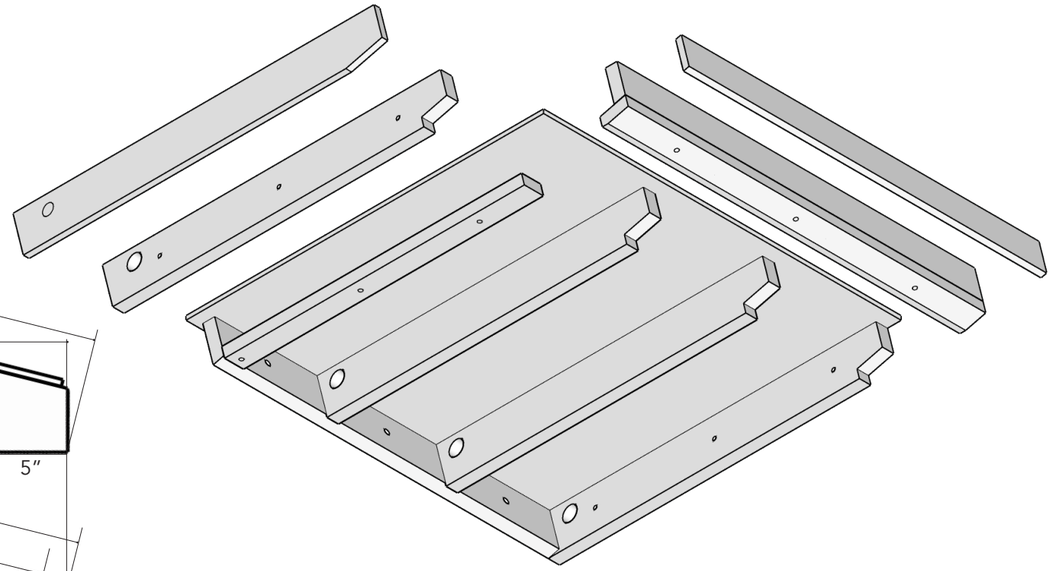
Roof — End

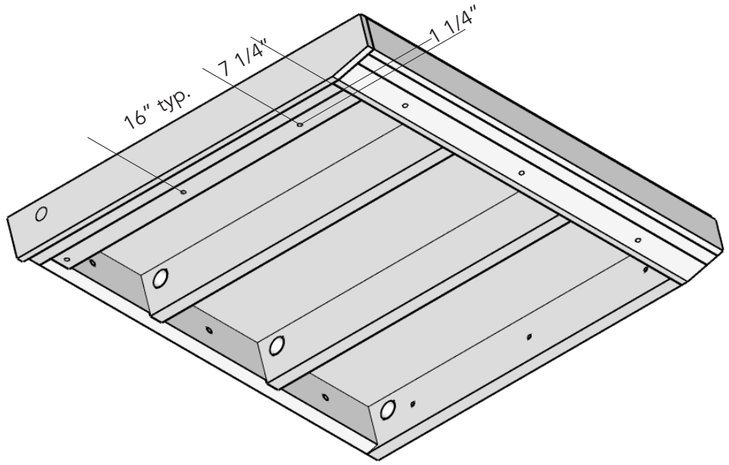


Parts

Same as Roof — Middle, plus:

1	4'-1 1/2"	2x3 on flat along gable, drilled at 16"
1	3'-4 1/4"	1x6 fascia trim

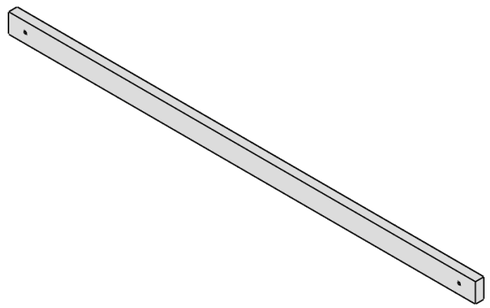




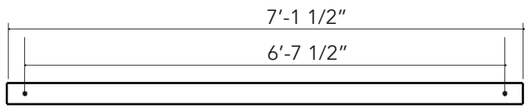
Rafter Tie

Parts

	7′-1 1/2″	2x4



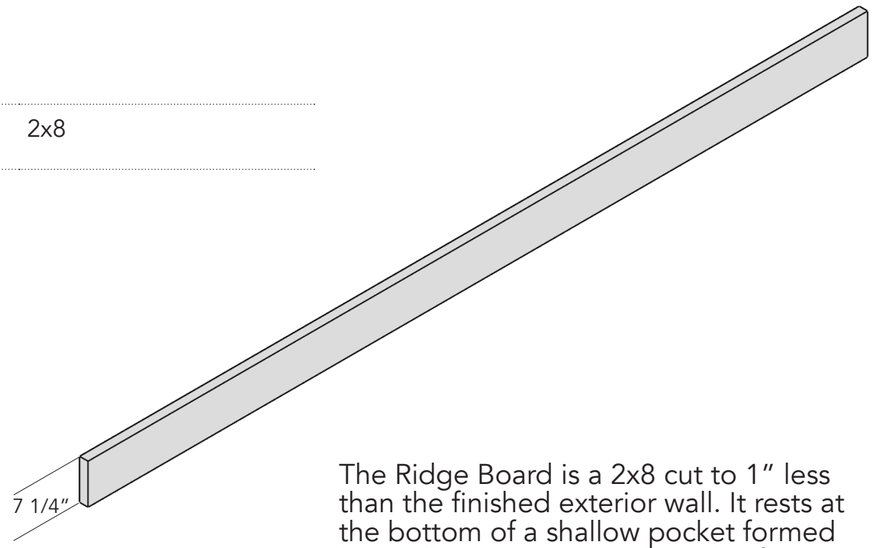
Rafter ties are drilled with 3/8″ holes to bolt to the eave ends of opposite roof panels.



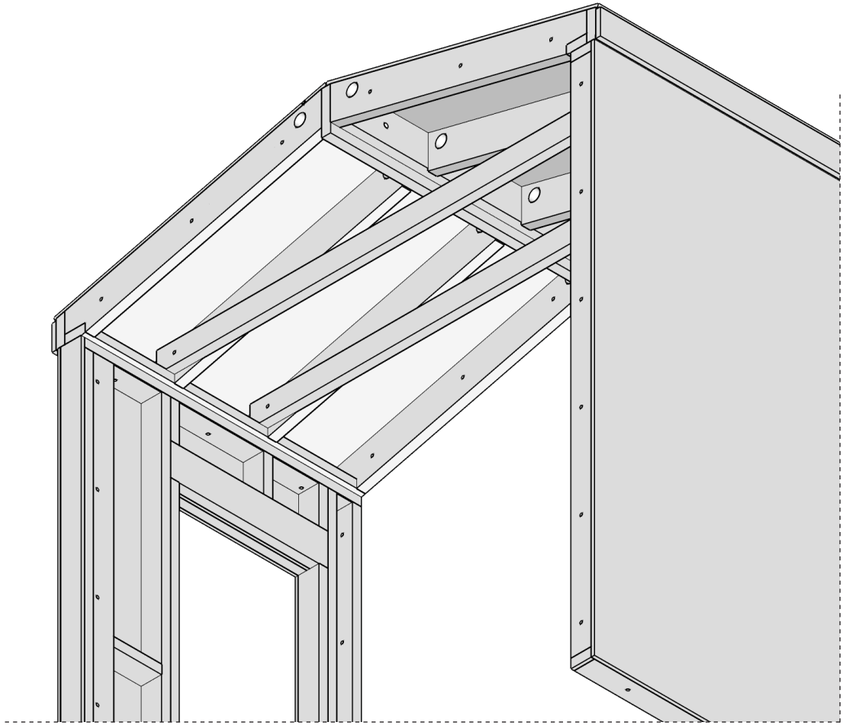
Ridge Board

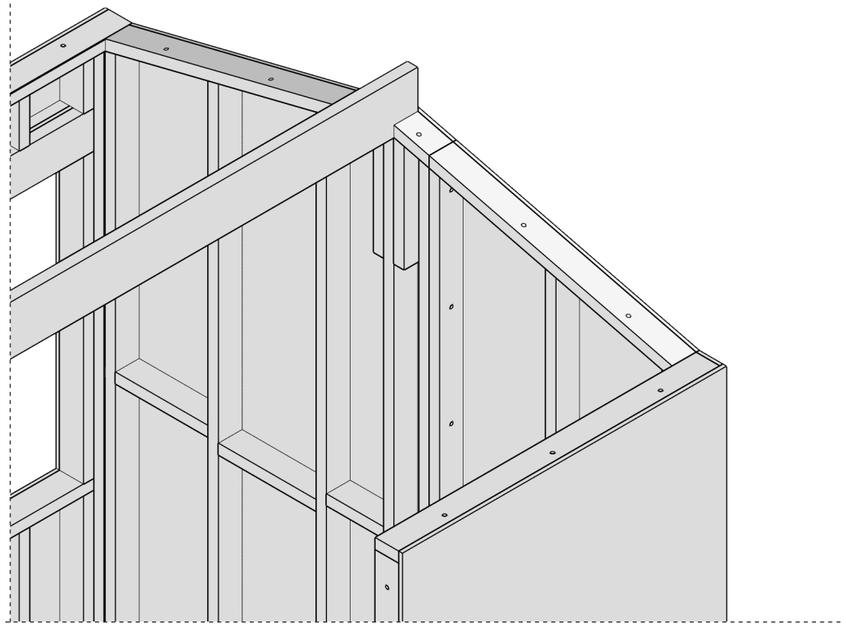
Parts

1	7′-11″ or 11′-11″	2x8



The Ridge Board is a 2x8 cut to 1″ less than the finished exterior wall. It rests at the bottom of a shallow pocket formed in the Gable Wall Wide. The Roof panels rest against the Ridge Board and all are bolted together at every 16″ at time of assembly. The Ridge Board is drilled at that time.





ASSEMBLY—
BASIC STRUCTURE

Parts

3 1/2"	1/4" nuts, washers & bolts
5"	1/4" nuts, washers & bolts
4"	3/8" nuts, washers & bolts
3"	Construction screws

Tools

- Socket set
- Wrenches
- Drill with 3/8" and 1/2" bits
- Screw gun

Assembly

1. Floor

Use six 3/8" bolts to bolt together each floor section connection, ensuring that you have Floor End panels along each side that will have a Gable Wall above it.

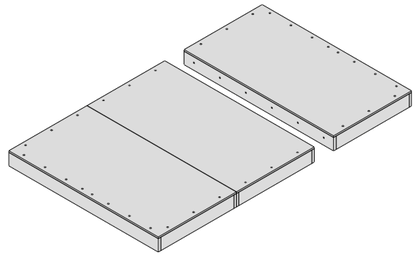
2. Foundation

Tip assembled floor onto concrete or other foundation blocks. Build up compacted ground or use different height blocks to level the floor platform. Support is required under the corner of each Floor panel.

3. Wall corners

Tip the left End Side Wall and one Gable Wall Wide panel upright on the floor platform and bolt together with six 1/4" bolts. This should now stand upright on the floor. Move into place at the edge of the wall, aligning the pre-drilled floor and wall bottom plate holes, and bolt with 3/8" bolts through each set of holes. The floor-to-wall bolts will likley require two people.

1



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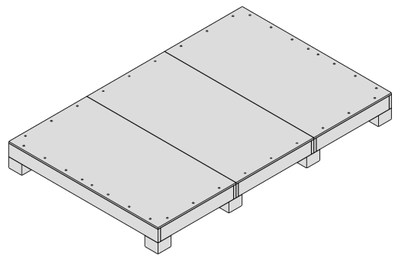

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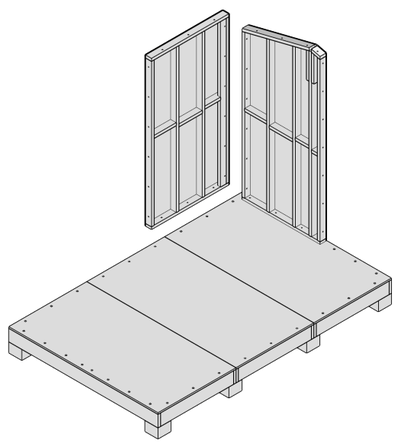


4. Ridge Board

This step may alternatively be done after all wall sections are in place.

When both corners of the structure are in place you can place the Ridge Board into the pockets of the two Gable Wall Wide sections.

The Ridge Board should be cut 1" shorter than the assembled floor. It will be drilled with 3/8" holes to match the roof panels it will receive. You could temporarily tack it into place until it is secured to the Roof panels.

5. Complete walls

This step may alternatively be completed before the Ridge Board.

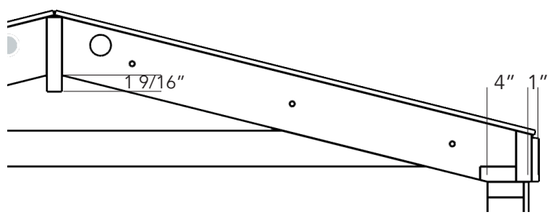
Continue to assemble the wall sections with six 1/4" bolts on the vertical edges and a 3/8" bolt through each floor-to-wall hole. Two people are likely needed for the floor-to-wall connections.

6. Roof

Beginning with a corner, lift the roof sections into place. Align the top-plate-to-roof holes and bolt into place with 1/4" bolts.

Using the holes on the ridge side of the roof, drill holes through the Ridge Board to bolt opposite roof panels together through the Ridge Board using 5" bolts.

Add rafter ties between the gable ends of opposite roof panels. The rafter ties bolt to the gable end of each rafter.



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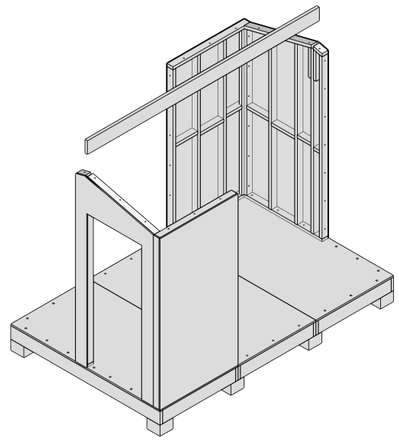

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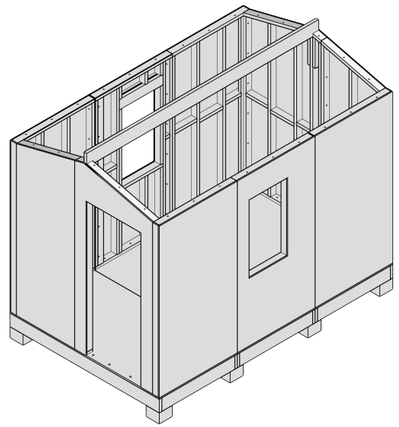

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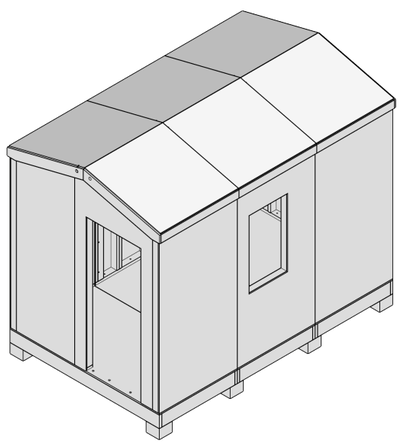

FINISHING

Roofing

Once assembled, the roof should additonally be sealed with a drip-edge flashing around the edges, and roofing on top of that. If torch-on or self-adhering membrane roofing is used there is a possibility of it being reused when the structure are disassembled and assembled in a different location.

Insulation

The structure has been designed with the possibility of adding insulation, a vapour barrier, and interior finishing once assembled.