DISCLAIMER:

READ BEFORE YOU BEGIN! THESE PLANS ARE INTENDED AS A GUIDE ONLY! READ THESE INSTRUCTIONS COMPLETELY THROUGH ONCE AND UNDERSTAND WHAT IS REQUIRED.

We will not be held responsible for any accidents or injuries anyone may sustain. Builder assumes all risks associated with construction work!

We assume some builder competency in the use of tools, safety and equipment.

If you are unsure of any procedures, please contact a professional. The methods in this plan assume a minimum amount of power tools. Also, if you know of alternate methods of construction, feel free to use them!

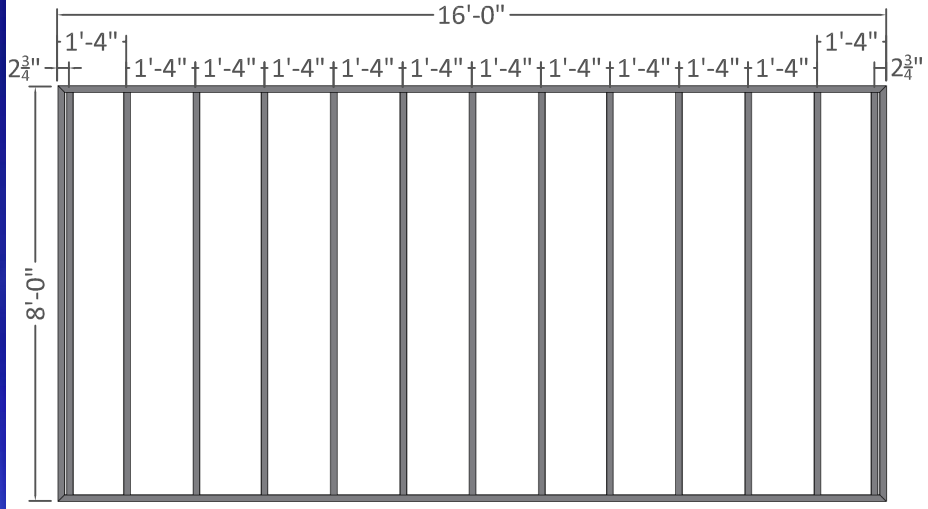
Using other tools to speed the work process is just fine.

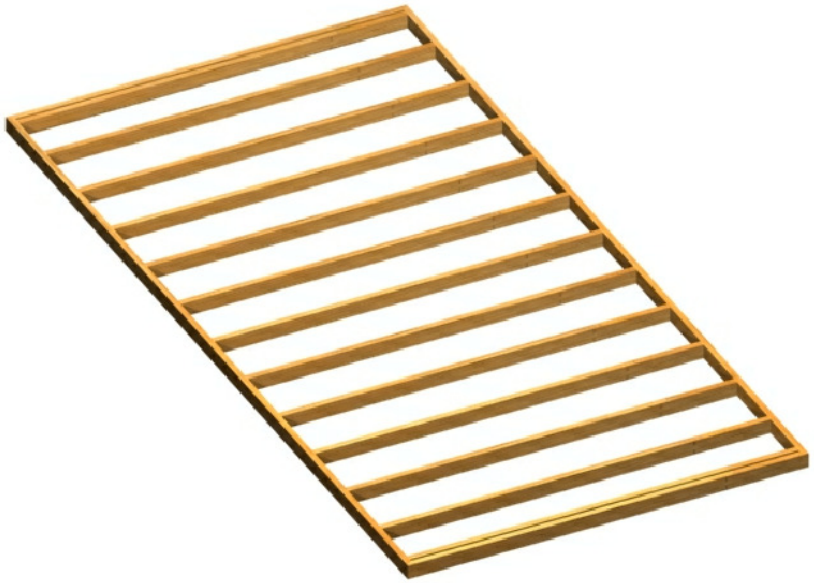
Work safely and wear proper safety equipement such as gloves, ear protection and eye protection.

MATERIALS

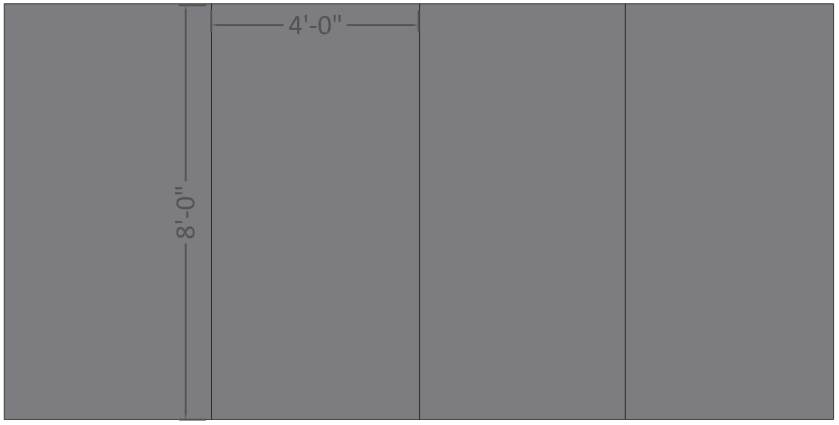
Description	Dimensions	Quantity
2x4 plank	2x4x6'	26
2x4 plank	2x4x8'	100
2x4 plank	2x4x16'	3
2x6 plank	2x6x10'	11
2x6 plank	2x6x16'	1
2x6 plank	2x8x16'	1
Oak or Cedar sheeting	4x8x$\frac{3}{4}$"	8
Oak or Cedar sheeting	4x8x$\frac{1}{2}$"	14
1x4 trim board	1x4x8'	8
1x4 trim board	1x4x16'	4
4x4 Pressure-treated Post	4x4x10'	4
4x4 Pressure-treated Post	4x4x8'	15
4x4 Pressure-treated Post	4x4x18'	7
Acrylic or PVC pane	By Builder	By Builder

To begin, cut 2x4 planks as dimensioned below. Mitering the ends is NOT required, but we recommend it for a professional-looking finish!



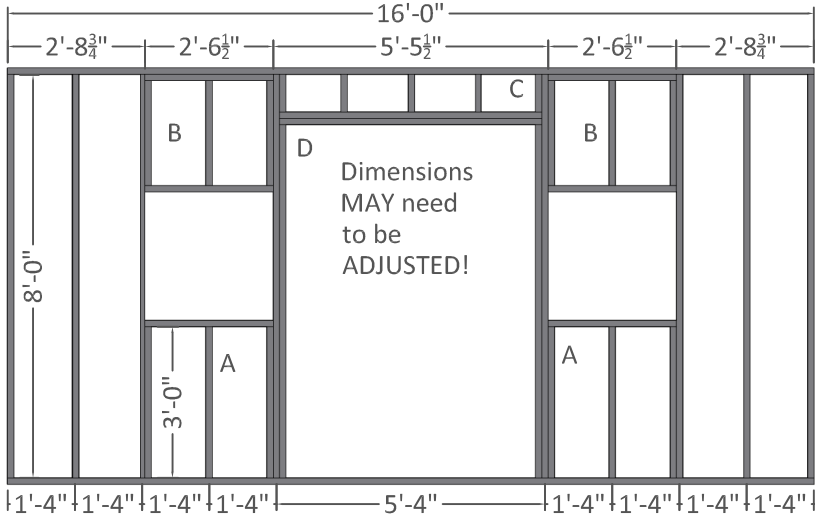


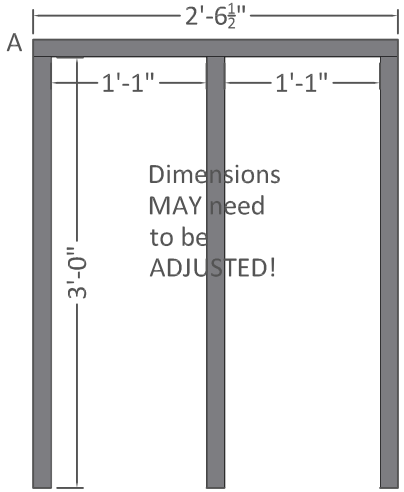
When you lay out the flooring, you should see that the flooring fits rather nicely. Anchor the flooring with screws or nails.

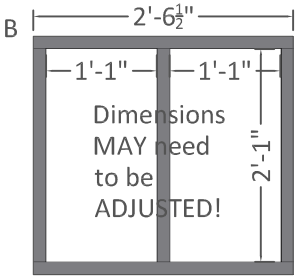


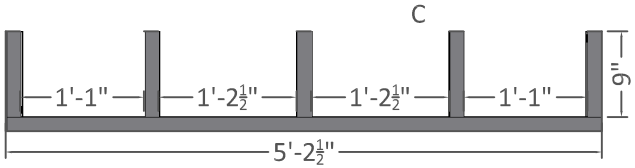
Notes:

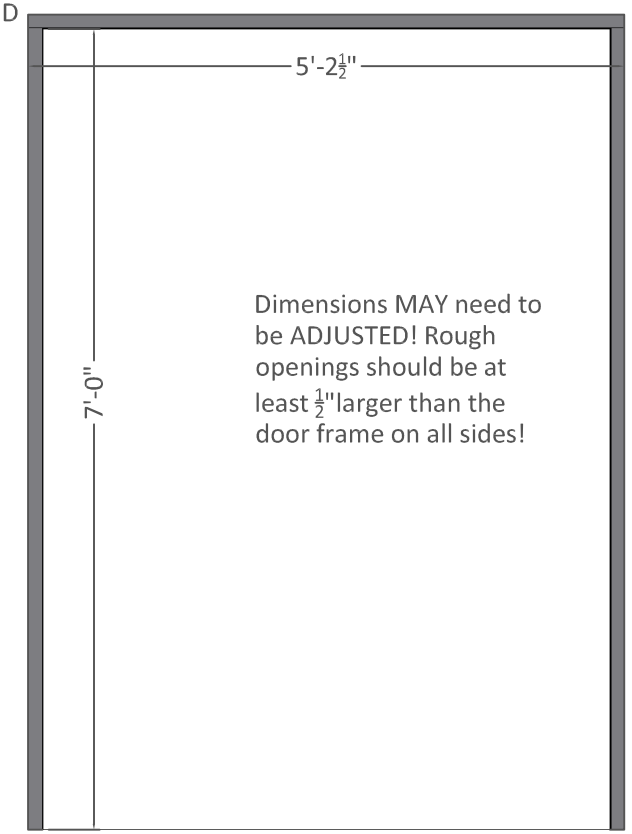
For the tall side wall, cut and assemble 2x4 timber as shown below.

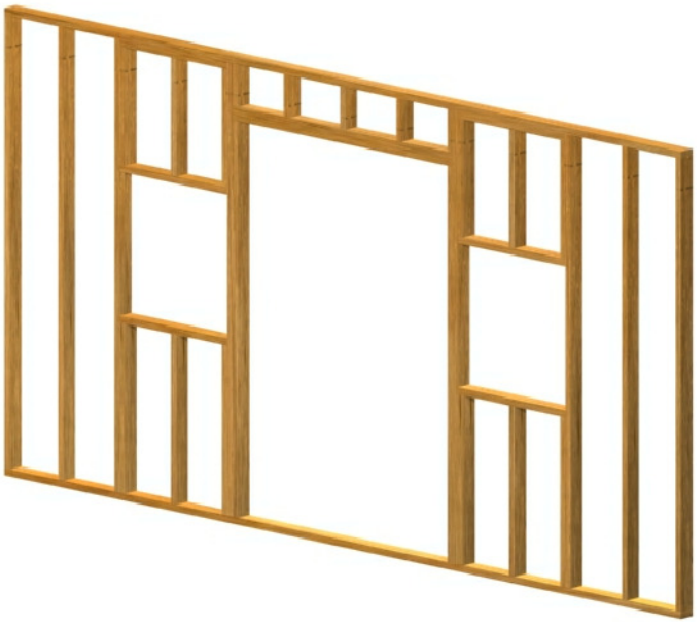




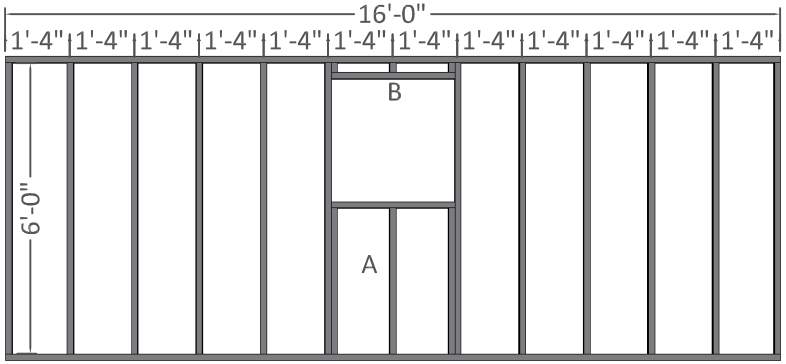


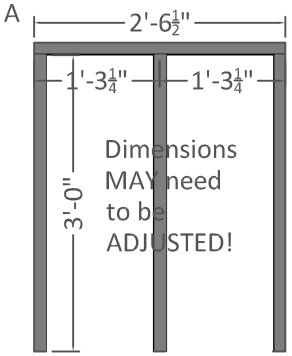


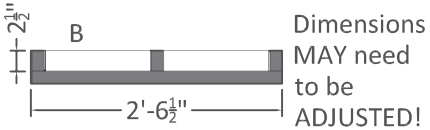




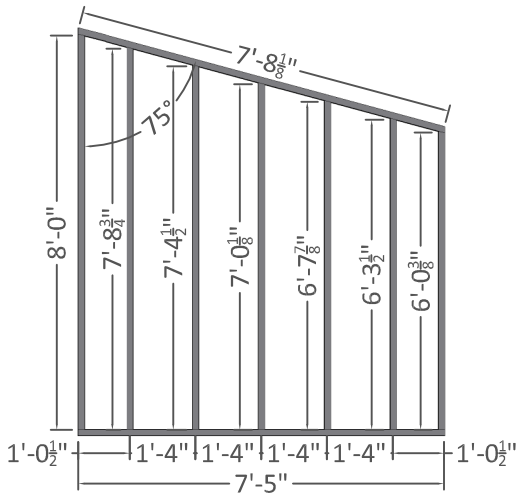
For the short side wall, cut and assemble 2x4 timber as shown below.







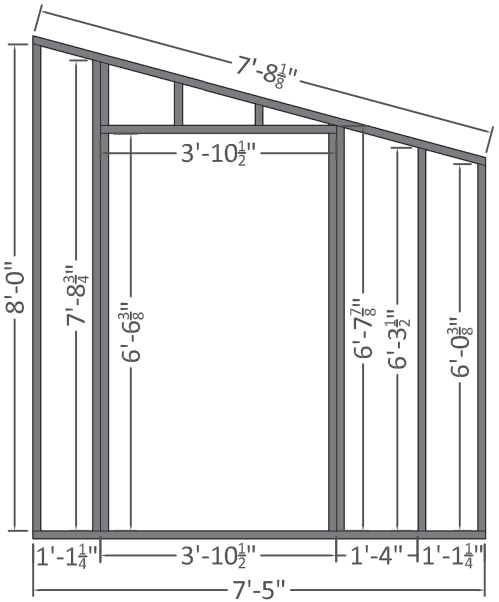
For the rear wall, just follow the diagrams below, and you should have a pretty easy time constructing the wall.

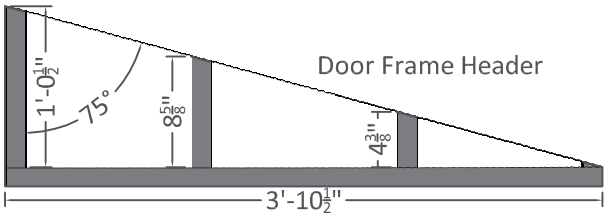


We will continue with the front wall on the next page...

Notes:

The front wall is basically a rear wall with an opening for a door. Don't let it scare you, if you have completed the headers for the door in the tall wall, then you can complete the front wall.



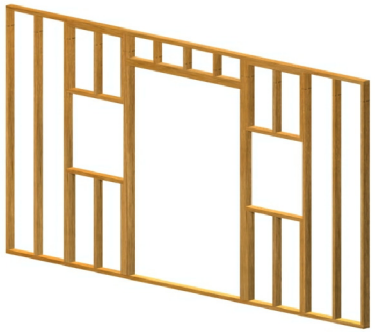


Door Frame Header

Notes:

Now that you have all walls constructed, if you haven't already started, assemble the walls on the completed floor.

We will lay out the steps for assembly on the next page...



To assemble the walls, we recommend starting with one of the side walls. In this example, we will start by anchoring the tall wall in place. MAKE SURE to screw into the joists below! Do NOT screw into just the plywood flooring.

Now we are going to align the tall sides of both the front and rear walls in place. In this example we will put the rear wall in place by aligning the tallest edge with the side wall.

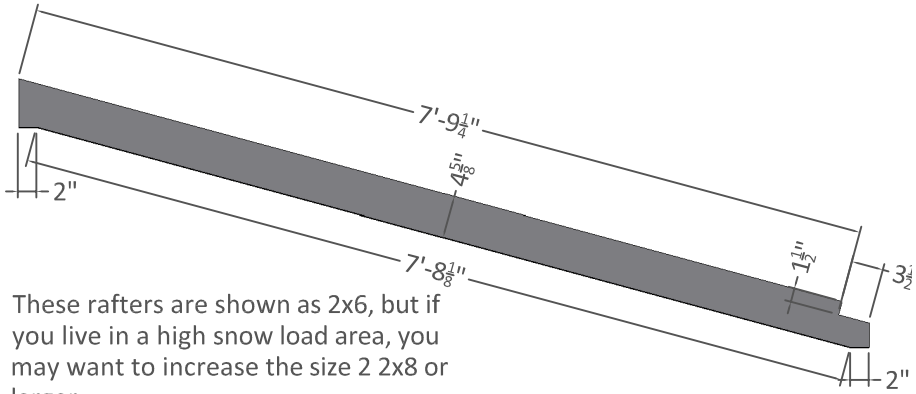
Now for the front.

And enclose the frame with the short wall.

For the roof rafters, you will need some experience with shaping lumber, using speed and carpenter (A.K.A. "rafter") squares. For this structure, there are two types of rafters.

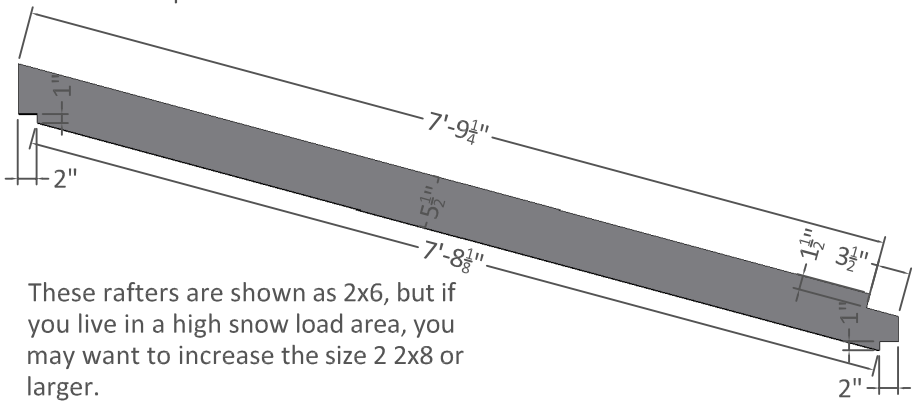
1) The end rafters will need to be ripped slightly thinner than
2) the interior rafters that are thicker to support the roof over the open space below.

Start with the end rafters. We have included general instructions on the use of carpenter and speed squares to build rafters in the appendix.

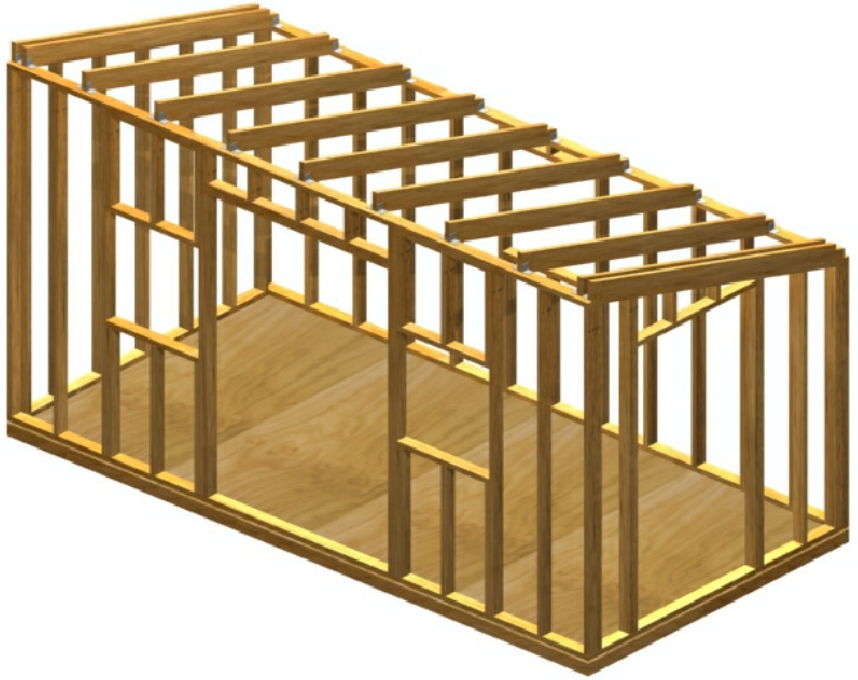


These rafters are shown as 2x6, but if you live in a high snow load area, you may want to increase the size 2 2x8 or larger.

Now the interior rafters. You will need a total of 9 interior rafters. Locate rafters at 16" on center. We do recommend using angle brackets to bolt the rafters in place.



These rafters are shown as 2x6, but if you live in a high snow load area, you may want to increase the size 2 2x8 or larger.



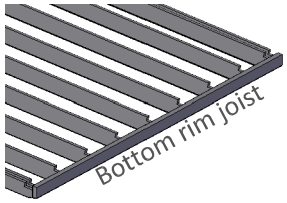
Disclaimer:

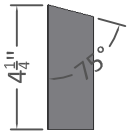
Roofing can be extremely dangerous! Falls from even a short height can cause serious damage! Again, construction is up to your own risk and there is an inherent risk in construction practices!

If you feel at all uncomfortable constructing these rafters or have any doubt about placement, **contact a professional!**

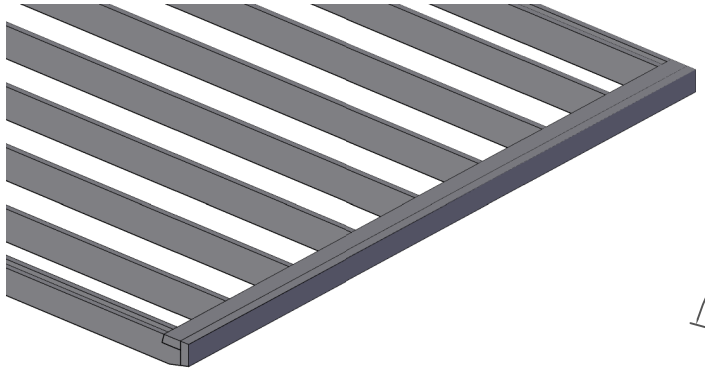
Before we get onto sheathing, you are going to have to put rim joists in place. The roof rim joist will keep your rafters straight vertically and offer a nailing surface for the top and bottom edges of your sheathing.

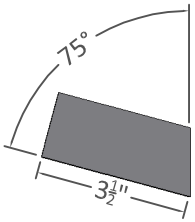
To begin, follow the diagrams below as shown. Use a table or circular saw to rip a 2x6x16' as shown below. If your rafters are constructed properly, you will have the top plate of the short wall with which to set the bottom roof rim joist.





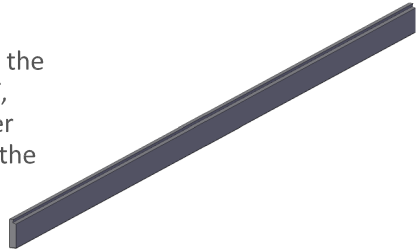
Next step, rip and place the bottom rim plate into place.

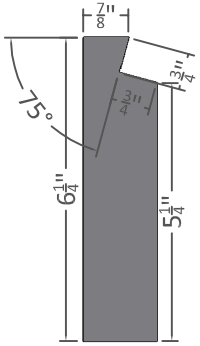




Now, basically the same thing for the top rim joist. You will need to use either a 2x7 or 2x8 with a table saw or a router to cut a seat out of the top rim joist. It will take some patience to get the seat cut correctly.

If your skills do not allow this type of cutting, simply miter the top edge at 15°, BUT, you will have to miter each roof sheet and the corner will not be as neat.





Notes:

Now, we do not dimension sheathing because of the difference in construction techniques, tools and methods. The sheathing should look something similar to the diagrams below. We are using $\frac{1}{2}$" thick sheeting for the sides and $\frac{3}{4}$" sheeting for the roof.

You do NOT have to follow this method, but for this example we are going to sheath in the short wall first. Make sure the top overlaps by about $\frac{3}{4}$" for the roof sheathing.

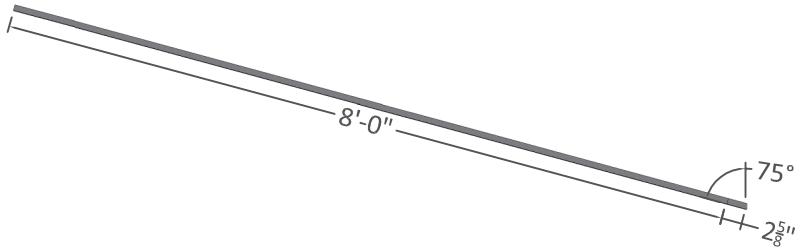
For the front wall, keep the cut-out pieces of sheathing for the door!

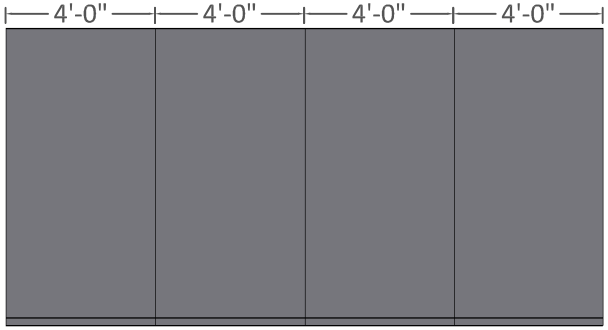
For the tall wall, keep the cut-out pieces of sheathing for the door!

You should be able to find scrap pieces from the short wall to lay across the top. If you wish to ventilate the shed, leave the top sheathing off!

The rear wall should be the easiest so far!

The roof sheathing should be by far the easiest, simply put into place and screw down! Cut and place the small filler pieces at the bottom. The roof seat should align nicely. Be sure all the sheets fit and align properly with the rafters below!





Since you have the sheeting done and are on the roof anyway, may as well add roofing. You roofing MAY be DIFFERENT than that shown below.

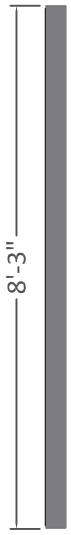
The shed part is essentially completed! All you have to do is add the doors, windows and trim. If you wish to purchase these items, feel free to do so. We have included BASIC instructions on making a door and a window in the appendix.

For safety reasons, you MAY wish to opt to hold off installing doors and windows until the construction on the greenhouse half is completed.

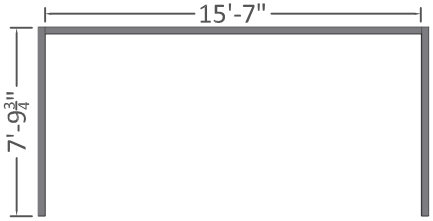
You will want to add trim before continuing onto the greenhouse addition. You will be attaching some of the addition to the trim itself.

Notes:

For the greenhouse, you need to start by anchoring 4x4 posts along the outside edges of the tall wall. Cut the posts as diagramed below.



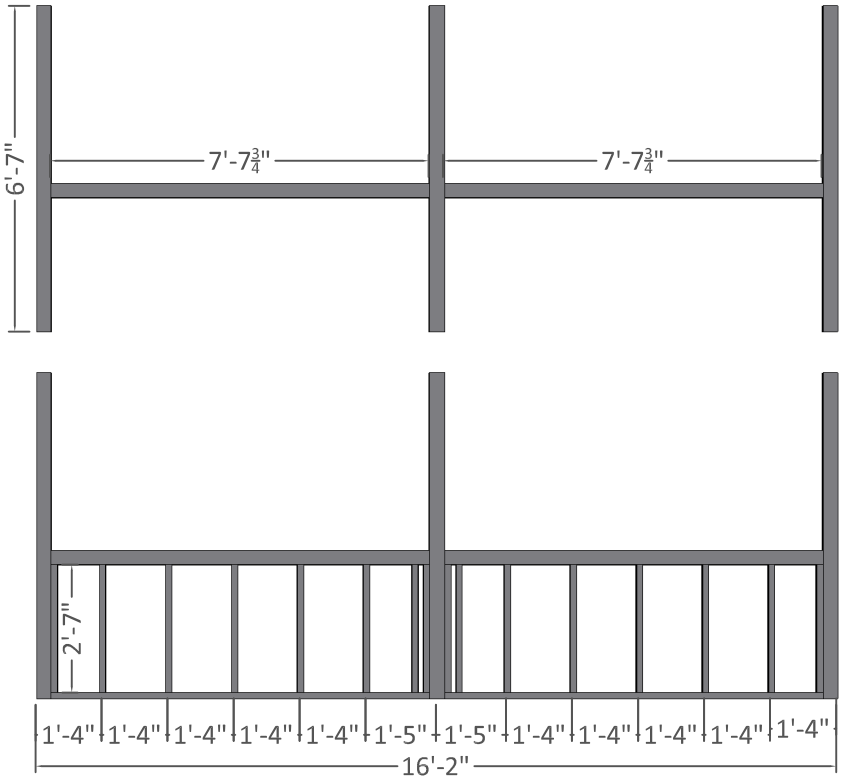
Assemble a base frame of 4x4 post as shown below.



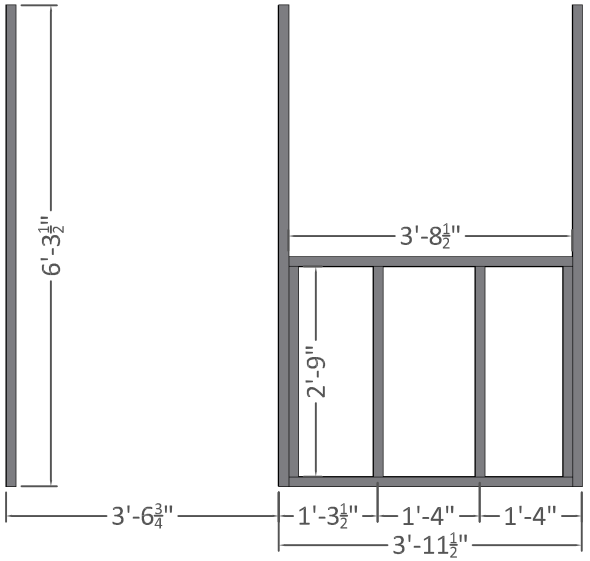
Attach a 4x4 girder over the supports attached to the tall wall.

Notes:

We recommend starting with the side wall frame. Using angle brackets, assemble the posts as shown below. Add the supports located at 16" centers.

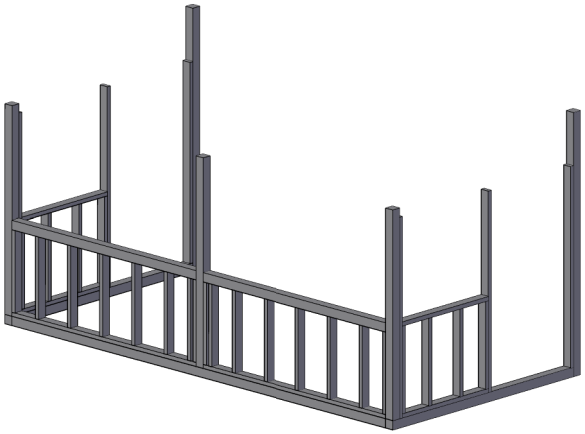


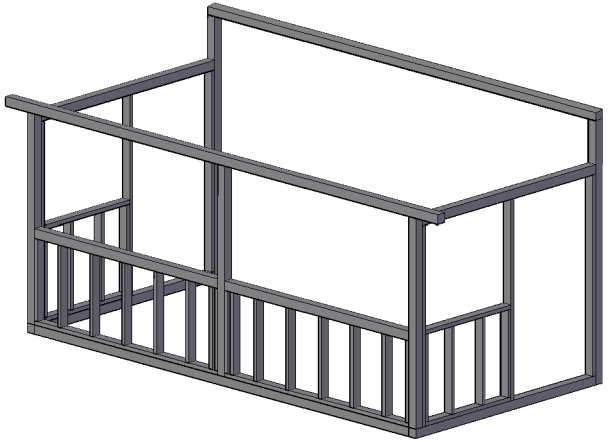
For the front and rear walls, follow the diagrams below.

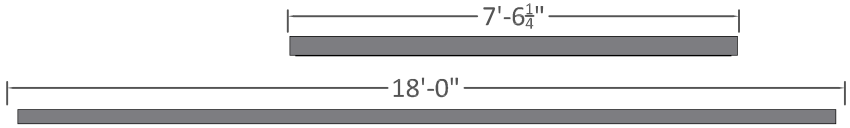


Notes:

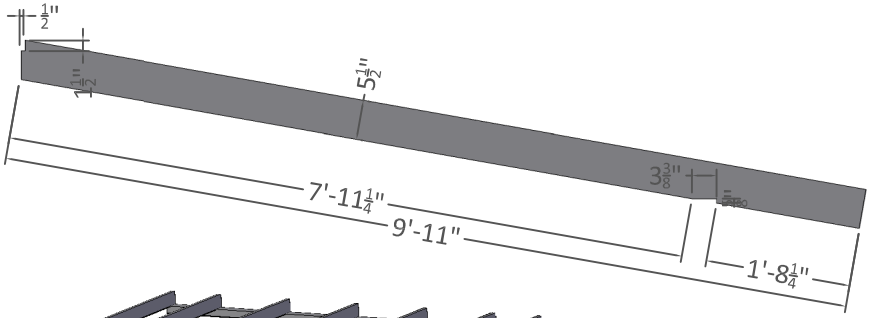
Now you need to put the top plates in place. Make sure the studs are level vertically! Cut the headers from 4x4 post.

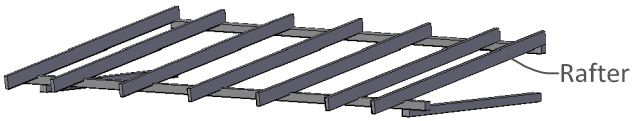


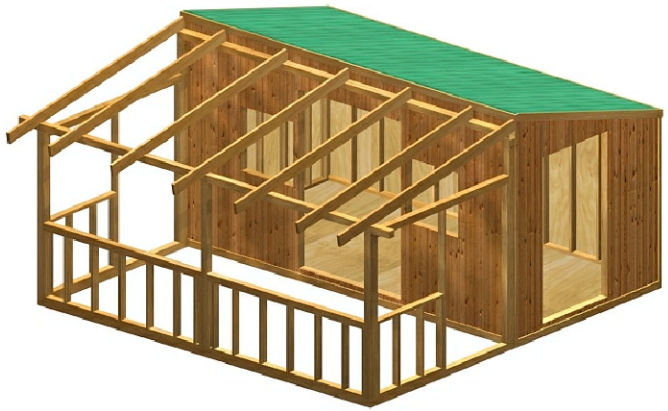




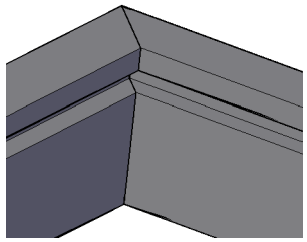
OK, you should now have a nice, strong structure that you can put rafters on for the top windows. Begin by laying out and cutting a 2x6 as shown below.





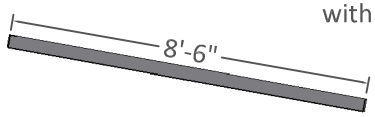


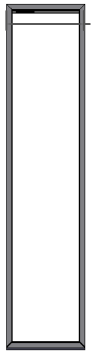
Now, you need to build the 2x4 windows to put in between the rafters. There are two different sizes so be careful about which one you are constructing.

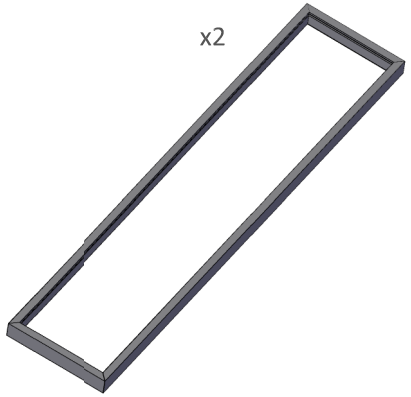


Use a table saw or a router to make a dado (groove in the board) for the pane to sit in. Make sure the dado is along the same plane entirely around the frame or else the pane will not fit in the frame.

We recommend either clear PVC or acrylic as the pane material. We DO NOT recommend glass! The dado depth and thickness will vary with the pane material you choose.

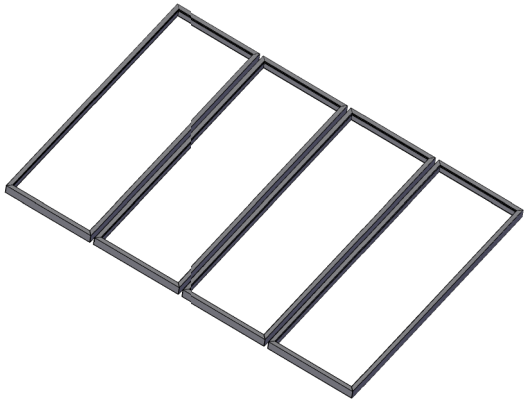


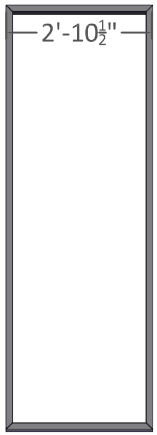




Cut your pane material to fit slightly loosely in the dado around the frame. The pane should just "shake" ever so slightly without coming out. Run a bead of epoxy or silicone caulking in the dado and assemble the frame around the pane material. Let dry and assemble the frame in place as shown below.

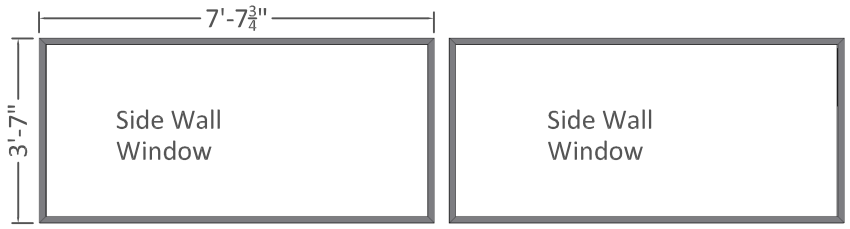
For the second roof window, follow the same instructions as with the first. The ONLY thing that is different is the frame width.

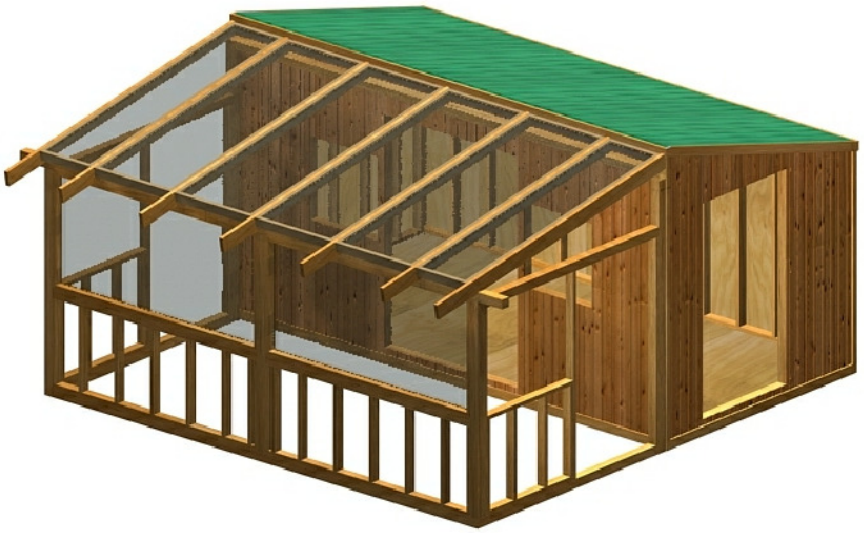




Notes:

The windows are cut much the same as the roof windows. Simply follow the diagrams below to fill in the remaining windows of the structure! **Window sizes MAY need to be adjusted depending upon the sizes of pane material available in your area!**

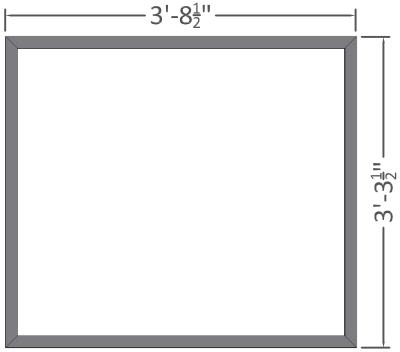




Simply screw through the window frame after assembly and anchor the window assemblies in place into the 4x4 side wall posts.

Notes:

And finish up with the front and rear greenhouse wall windows.



Notes:

Once you have the windows in place, now would be a good time to sheath around the outside of the greenhouse base.

For these plans, we are leaving the open area above the doorways open for ventilation.

IF you wish, you may construct another window and completely enclose the structure. OR, you can also simply cut a sheet of plywood to fit the opening to enclose the structure during colder seasons. The choice is yours!

From this point, everything is purely up to the builder! Make it your own! You can install cabinets, you can build the doors or purchase the doors. Purchase and install windows or build windows (Materials for these are NOT represented in the materials list).

You will, however, need to find specific hardware for the door and window types you want.

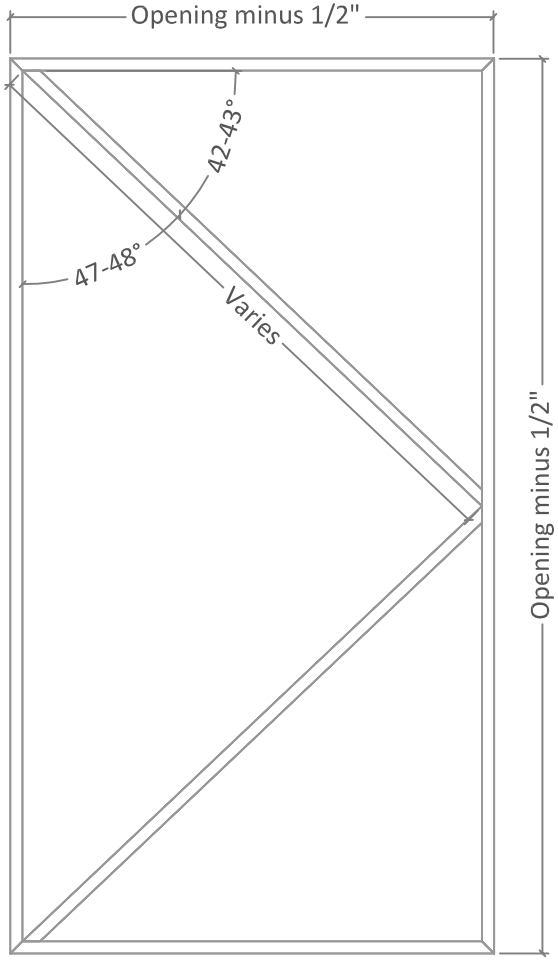
In these plans, we show sliding doors for all openings except the main shed, front door. The openings are LARGER to accommodate ease of access and removal for whatever your project or gardening needs!

This structure is completely electricity adaptable and can be insulated for colder climates.

Have fun! Following this page are some appendices that may assist you with construction and familiarize you with some construction aspects that may have been mentioned in these drawings.

For the door, construction is relatively simple. If you want to install a latch, that is up to you. We do not show the details because there are special tools involved, most of which the normal person does not have. However, if you DO happen to come across such tools, you will be able to add a doorknob and catch should you desire.

As with the window, this is a very simple door and you do NOT have to construct the door in this way.
If you prefer to purchase a door, make sure the rough opening size is adequate. The frame rough opening in this instance can be anything. Just tweak the dimensions to match your rough opening. **Be sure you subtract $\frac{1}{2}$" from the rough opening to allow for swing!**
1) To begin, we are using 1'4 planks and $\frac{1}{2}$" plywood sheeting. Cut the frame pieces as shown below. You DO NOT have to miter the corners, we just recommend it for aesthetic purposes.



We will show the door in this example with a pattern cut out of the front and back sheeting, but this is not required. It is purely for looks and does not affect the integrity of the door at all.

Before you attach the panel to the door frame, you will want to check the swing in the doorway. We have allowed for $\frac{1}{2}$" swing, but depending on construction methods and accuracy, swing may be affected by as much as 1".

Please ensure the frame will swing in the opening without getting stuck or caught. You should allow more swing once you add the door panels so check after each step to ensure swing is not impeded.

Materials

Description:	Qty:
1x4x6' Planks	5
4x8'x$\frac{1}{2}$" Plywood Sheet	2
Hinges	3

2 Attach the front panel to the door frame, and MAKE SURE THE CORNERS ARE SQUARE and edges are flush. You may even want to sand the corners of the inside swing so they are rounded a little bit.

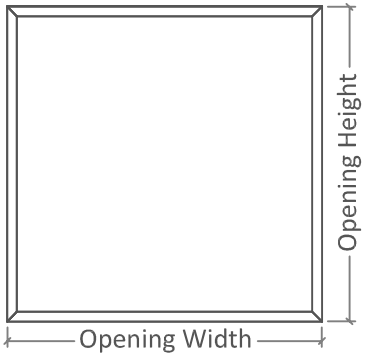
3) Insulate the door with either blow foam or regular R-13 roll insulation will work.

4) Enclose the door with the second panel. You may want to round the edges on this side also.

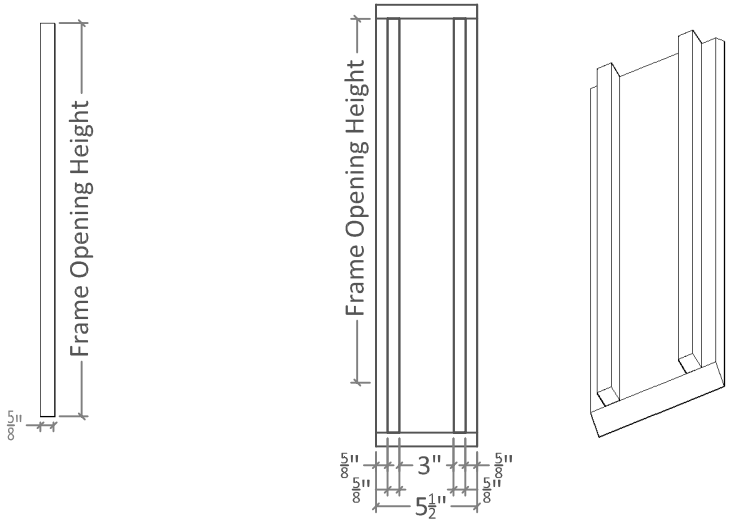
5) A single slide bolt works wonders on the outside and inside to lock the door shut. If you don't want your kids to be able to lock the door, only install the slide bolt on the outside! The slide bolt also offers a grip to pull the door open.

Windows are complicated to design and when at all possible, should be purchased. These details are for a very simple sliding window. You will need, and know how to use, a miter saw, a router (preferably with a guide) or table saw with an adjustable gouging blade (or blade kit, and a square (speed square, carpenter square, either works).

1) Cut and miter 1x6 planks as shown below. DO NOT ASSEMBLE YET!

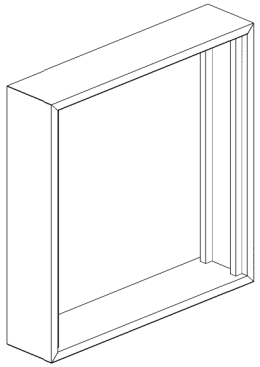


2) Rip a 1x4x8' into strips $\frac{5}{8}$" thick. These will serve many purposes in the future but for now, we just want four of them to match the opening, so either rip and cut one piece or rip an entire board into $\frac{5}{8}$" strips and place the pieces to the side for late.



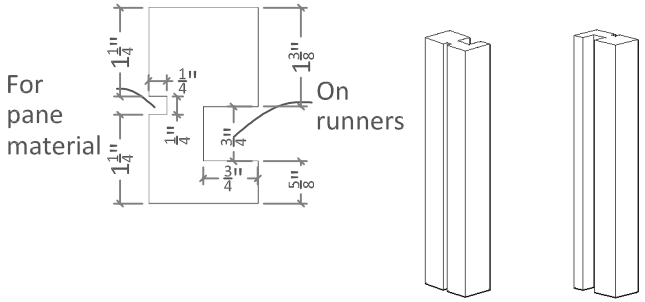
3) Using 1" screws and a level, screw two runners onto one of the exterior frame pieces. Repeat for the second side (see above).

4) Check to make sure the runners will fit inside the frame when assembled. Make any adjustments if necessary. DO NOT ASSEMBLE!

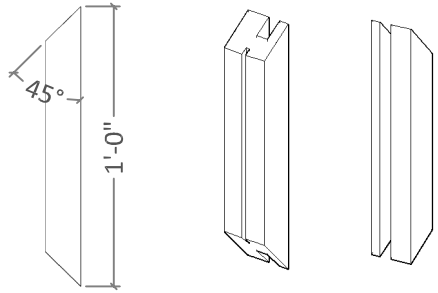


5) Rip a 8'-2x6 down the center lengthwise.

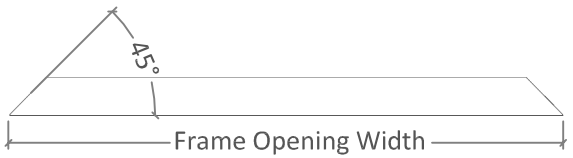
6) Use a router to gouge a $\frac{3}{4}$"x$\frac{3}{4}$" groove down the center of one side. Flip the board over and gouge a $\frac{1}{4}$x$\frac{1}{4}$" groove down the center of the other side (see detail)

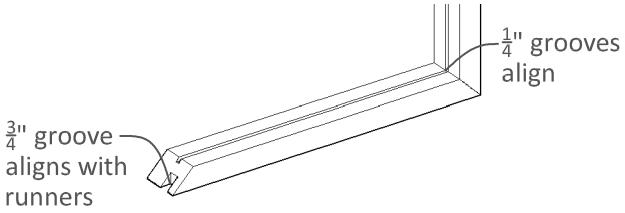


7) Miter the ends. Make sure the narrow ($\frac{1}{4}$x$\frac{1}{4}$") groove is facing inwards! The wide ($\frac{3}{4}$x$\frac{3}{4}$") grooves go out toward the runners, the inside grooves will hold a pane of window material.



8) Rip a 2x6 lengthwise down the middle and miter ends as shown below. Run a $\frac{1}{4}$"x$\frac{1}{4}$" groove down the middle, just as with the 2x6 above. Hold them together and MAKE SURE THE GROOVES ALIGN PROPERLY! You will need to gouge a $\frac{3}{4}$x$\frac{3}{4}$" groove out of the ends.





Materials

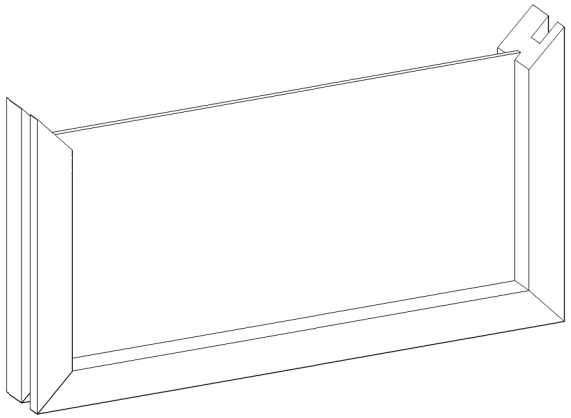
Description:	Qty:
2x6x6' Planks	24
1x6x8' Planks	6
1x4x8' Planks	6

9) Lastly, before construction, you will need to determine what type of pane material you want to use. For a playhouse, we would recommend against using glass and go with clear acrylic or polyvinyl pane.

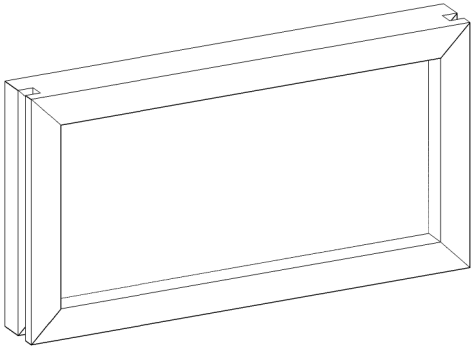
IF YOU DECIDE TO USE GLASS, WE HIGHLY RECOMMEND PURCHASING $\frac{1}{4}$" THICK PROFESSIONALLY CUT PANES. YOU WILL NEED 2 PER WINDOW. ON THIS SET THAT EQUALS 12 PANES OF GLASS TOTAL.

SHOULD YOU DECIDE TO CUT YOUR OWN GLASS, YOU DO SO AT YOUR RISK! USE ALL SAFETY PROCEDURES AND EQUIPMENT WHEN HANDLING GLASS!

10) Assemble the window frame around the pane. Run a bead of epoxy or polyethylene (or equivalent) seal down the frame pieces as you assemble the window to get a good, weather-tight, bond. You could increase rotting and mildew growth if you choose not to.

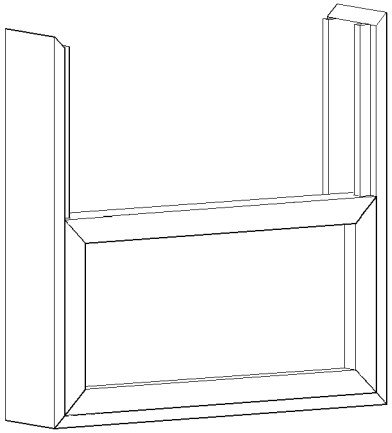


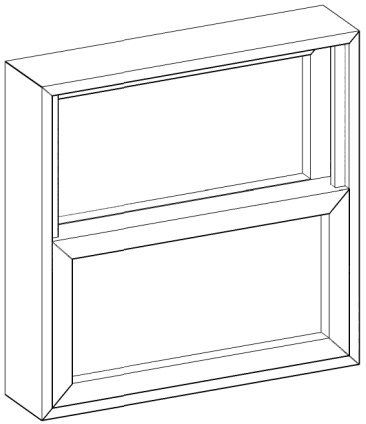
11) Cap off the window with the top piece and connect all pieces with 1" small radius ($\frac{1}{4}$" or smaller) screws. Be sure you don't screw down into the window pane!



12) Repeat for second window.

13) Once you have two window assemblies, two exterior frame pieces with runners on them, and two exterior frame pieces for the top and bottom, carefully assemble the exterior window frames AROUND the window assemblies.





14) Cap off the window assembly, Ensure the windows slide easily and there is about $\frac{1}{16}$-$\frac{1}{8}$" gap between the window assemblies so they will not impede each other's movement.

15) Place the window in the window frame. Screw the exterior frame to the opening provided. You may have to use a soft mallet or a dead-blow hammer to get the window centered in the opening.

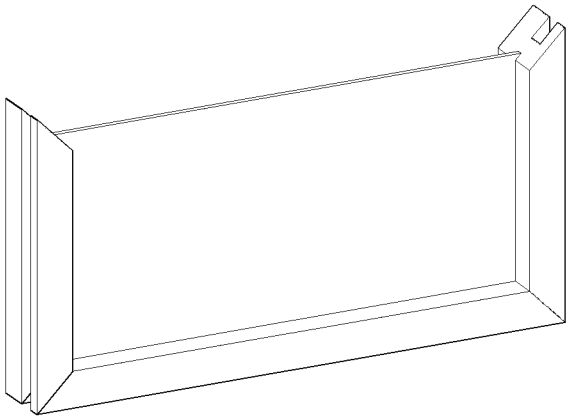
16) How the windows stay up or down is up to the user. We recommend getting a slide bolt and installing at least one on the movable assembly. Which assembly moves or stays stationary is up to the builder.

17) Lastly, before construction, you will need to determine what type of pane material you want to use. For a playhouse, we would recommend against using glass and go with clear acrylic or polyvinyl pane.

IF YOU DECIDE TO USE GLASS, WE HIGHLY RECOMMEND PURCHASING $\frac{1}{4}$" THICK PROFESSIONALLY CUT PANES. YOU WILL NEED 2 PER WINDOW. ON THIS SET THAT EQUALS 12 PANES OF GLASS TOTAL.

SHOULD YOU DECIDE TO CUT YOUR OWN GLASS, YOU DO SO AT YOUR RISK! USE ALL SAFETY PROCEDURES AND EQUIPMENT WHEN HANDLING GLASS!

18) Assemble the window frame around the pane. Run a bead of epoxy or polyethylene (or equivalent) seal down the frame pieces as you assemble the window to get a good, weather-tight, bond. You could increase rotting and mildew growth if you choose not to.



Additional Stuff for the Window Assemblies:

1) Use weather striping along the seam between the window assemblies to keep wind, and weather out as much as possible.

2) We recommend having one stationary, and one movable window. Most often, anchor the exterior window to the top of the assembly and let the interior window slide up and down.

1) Drill a $\frac{1}{4}$" pin hole in the interior, left or right, side of the movable window assembly.

2) While the window is closed, drill into the runner about $\frac{1}{4}$".

3) Keeping the drill bit inside the pin hole, pull the drill bit back out a little, raise the window and drill back in about $\frac{1}{4}$" into the runner. We recommend about 3" increments.

4) Repeat as necessary for how much you wish the window to open. Cut a length of $\frac{1}{4}$" dowel (may need sanding to slide freely) to use as a pin.

5) Add a slide pin to both the top and bottom of the movable window so the windows can be "locked" shut if you wish.

To determine the rafter lengths,

1) Divide the entire span by two (example: If the roof span is 20 feet, divided by 2 = 10 feet, 0 inches.

2) Now add the overhang (example: 18-inch overhang makes the length 11 feet 6 inches).

3) Now, convert the 6 inches of the 11 feet 6 inches into a fraction. It happens to be 0.5 (6 divided by 12). Thus 11 feet 6 inches is now 11.5

4) Suppose you desire an 5/12 roof pitch, or for every 12 inches horizontally, you get 5 inches up and 12 inches vertically. Convert that number by using the rafter conversion chart below or can be found on any framing square.

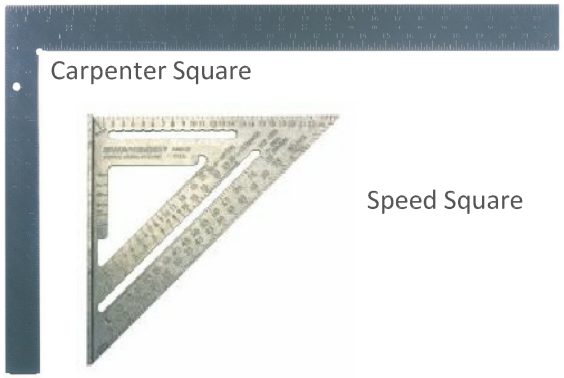
5) For the purpose of this article, the 5/12 roof pitch converts to 1.083 on the rafter conversion chart found on any framing square.Therefore, 11.5 x 1.083 = 12.4545 feet is what the rafter length will be.

6) Obviously, getting to the thousands of an inch is a feat in itself, so lets just round to the nearest $\frac{1}{8}$" which is 12.5 feet or 12'-6".

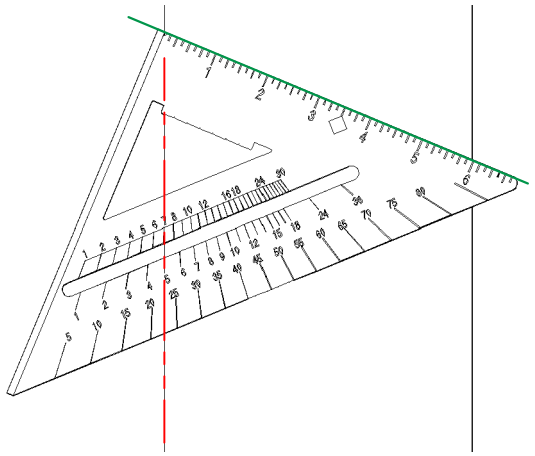
Roof Slope	Factor
Flat	1.0
1:12	1.003
2:12	1.014
3:12	1.031
4:12	1.054
5:12	1.083
6:12	1.118
7:12	1.158
8:12	1.202
9:12	1.250
10:12	1.302
11:12	1.357
12:12	1.414
13:12	1.474
14:12	1.537
15:12	1.601
16:12	1.667
17:12	1.734
18:12	1.803
19:12	1.873
20:12	1.943
21:12	2.015
22:12	2.088
23:12	2.162

If you feel at all uncomfortable constructing roof elements, consult a professional. Also, you will need to be comfortable with heights and please use all safety precautions when placing the rafters. Not every rafter will be directly above a solid surface and there will be open spans beneath them. We recommend use of a ladder and assistant(s) to help you get the rafters into position.

1) If you need to be introduced to the tools most professionals work with when cutting rafters. There are basically two tools used commonly, the speed-square and the carpenter square. Both are shown below.

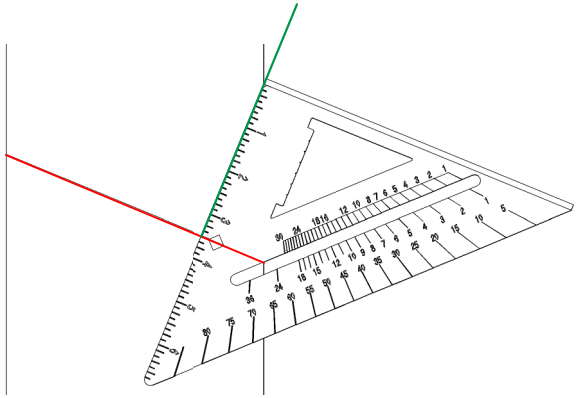


For the speed square, start by lining up your plumb cut by aligning the pivot point on the speed square with the desired pitch. This example is going to use a 5-12 slope but the principle is the same with any slope. See the diagram below.



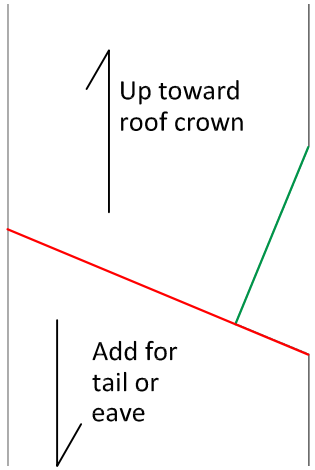
See how the red line lines up with the little notch in the back of the speed square and the number 5 in the "common". The common simply refers to a common rafter. Notice also, how the "HIP/VAL" lines up quite nicely with 7? For a $\frac{5}{12}$ slope, the corresponding hip/valley slope would be 7. Easy peasy.

2) Anyway, mark your line along the GREEN side with all the numbers.To make your seat cut, simply plumb the other side at the length you need and follow the diagram below for a nice $3\frac{1}{2}$" seat cut.



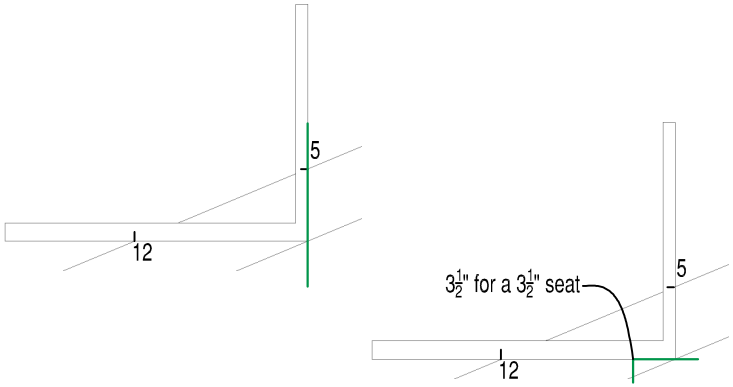
Align the diamond sight so the line cuts the sight down the center and your pivot point is flush against the outside edge of the rafter to be cut.

The RED line represents the mark you just made for plumb. Now again, mark along the green line for your seat cut. See the nice "L" shaped seat? Cut your seat out and it should look something like below.



The previous page contains instructions with a table which will help you measure the overall rafter length.

For a Framing (Rafter) Square it is basically the same principle. Align the 5 and the 12 as shown below. Mark the GREEN line shown in 1 for plumb.



To mark the seat measure the $3\frac{1}{2}$" on the square and mark the plumb at the end as shown above in 2.