DISCLAIMER:

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

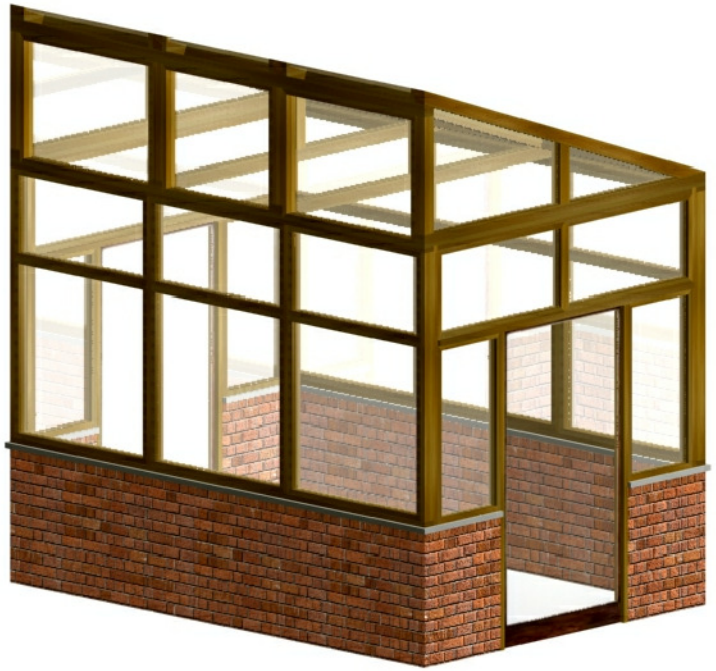
We will not be held responsible for any accidents or injuries anyone may sustain. Builder assumes all risks associated with construction work!

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.



To begin, the choice of whether or not to construct the brick wall is completely up to the builder. However, it is important to note that all construction should be completed on a flat, level surface.

As the builder, you do NOT have to complete the brick wall, but these instructions are going to assume the wall is to be constructed. If you decide to forgo constructing the brick wall, skip to the structure instructions.

For those who want to construct the brick wall, here are some guidelines on constructing a brick wall:

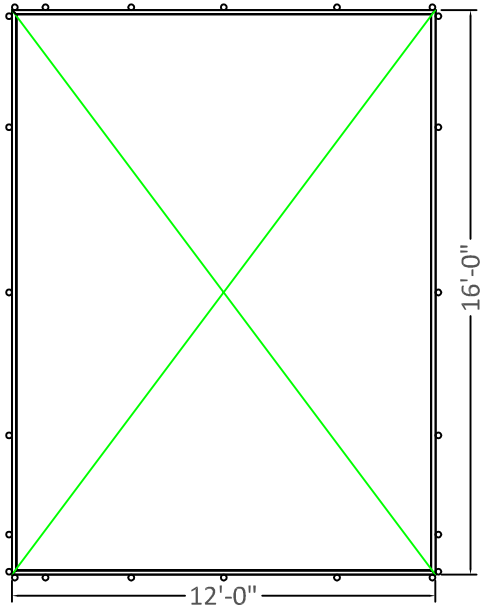
1) Brick walls should ALWAYS be constructed on solid, concrete surfaces. Bricks alone are not strong enough to support the wooden structure for this design and are heavy enough, the brick wall may "sink" into the ground and cause problems further on. Make sure your brick wall is on top of a solid surface!

To construct a "slab-on;grade" follow the instructions below:

1) Measure out where you want the slab to go and use stakes or corner markers to define the outline.

2) Clear the area of underlying grass or shrubbery.

3) Construct a simple form from 2x4 as shown below. Note: You do NOT have to miter the edges, but if you want to leave the form in place after the concrete has cured, it will make the finished product look much more professional!



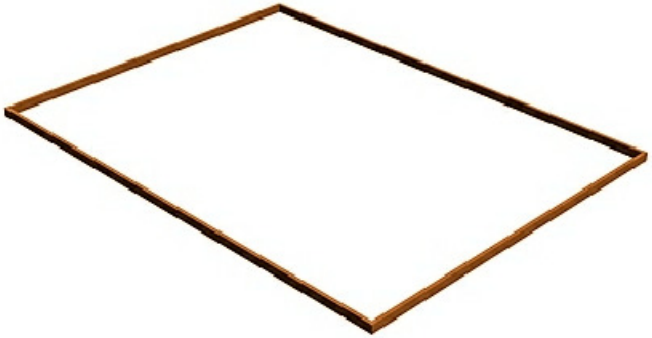
Once you have the frame on the ground, you will want to ensure the frame is square. The easiest way to ensure square is to measure across the diagonal length of the frame. In the diagram, the green lines should be equal.

Once the frame is square, pound some stakes around the perimeter to keep the frame from bowing under the weight of the concrete inside. You will also want to make sure the frame makes a good, solid connection with the ground all around. The concrete will not seep easily, but it will seep out if there is a big enough gap!

Once you have your form squared and anchored properly, it is time to pour the concrete. The brand of concrete is up to you (the builder) so always follow manufacturer recommended instructions! And always wear safety equipment!

You will need:
16'x12' = 192 sq ft x 12 in/ft = 2304 inches x 3.5 in (depth of 2x4) = 8064 in^3
8064 in^3 / 1728in^3 (12"x12"x12") per ft^3 = **4.6 cubic feet of concrete**
4.6ft^3 / 27ft^3/ yd^3 = **0.17 cubic yards of concrete**

Feel free to check our math if you wish!



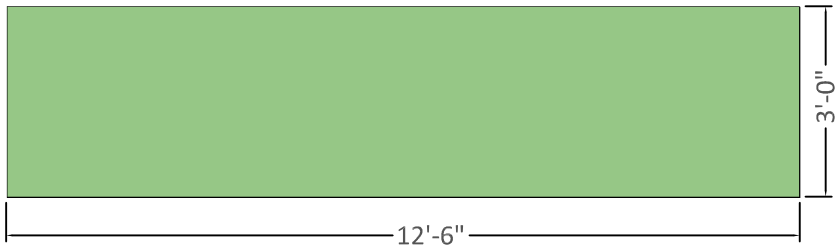
Let your concrete slab cure for at least a couple of days (or as specified by the manufacturer's recommended instructions). Once the concrete is nice and solid, you can get to work on the brick base.

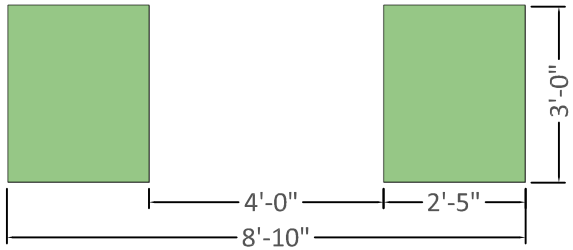
Materials		
Plank	2x4x12'	2
Plank	2x4x16'	2
Concrete Mix (@ 0.6 ft^3 per bag)	80lb bags	≈ 8

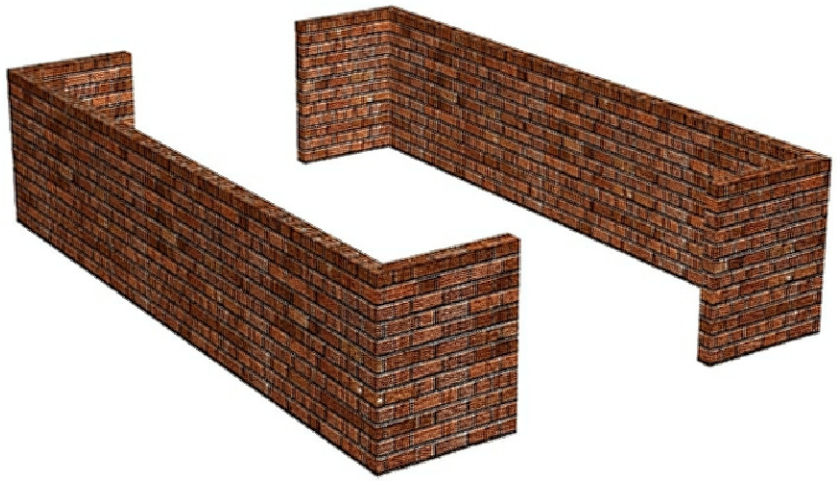
Before you get onto the laying bricks, you need to be sure you have the ability to lay brick. Do some research and find the best method that suits your particular needs. Below are some general hints and you may want to practice without mortar before diving right in. **If you are at all unsure about laying brick, either skip this step or contact a professional!**

We have included an excerpt from an article on laying a brick garden wall for clarification (see appendix).

To begin, determine the height of the brick wall. In this case

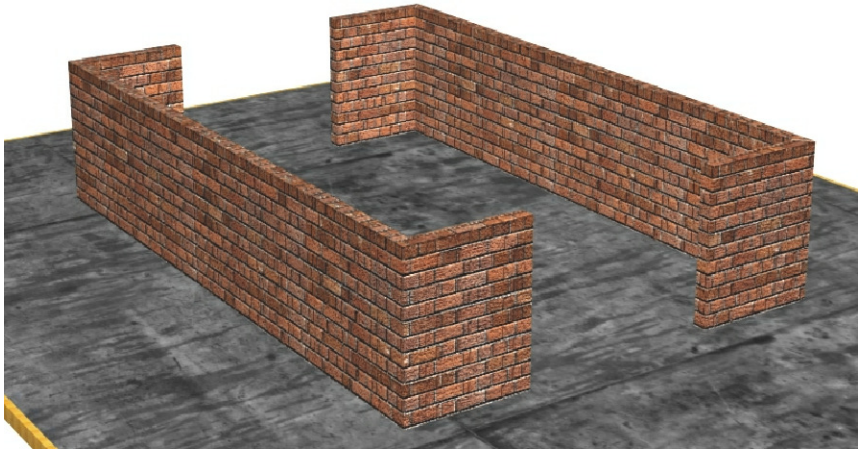






Before you lay the first brick, be absolutely sure you know what you are doing! Depending on the type of brick, you will want the wall at least two bricks thick to support the load above.

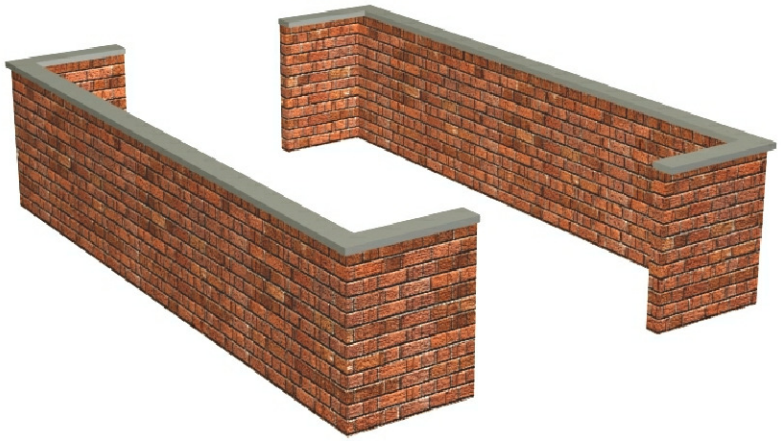
If you do NOT want the bricks to support the load, make the structure walls the overall height as diagramed and build the brick wall around the outside perimeter of the wall.



To attach the wooden transom to the brick wall we would recommend heavy duty concrete screws or Tapcon® screws.

Tapcon® -style concrete screws are driven into concrete, brick and block, and serve as anchors. These concrete screws tap threads into a predrilled hole.

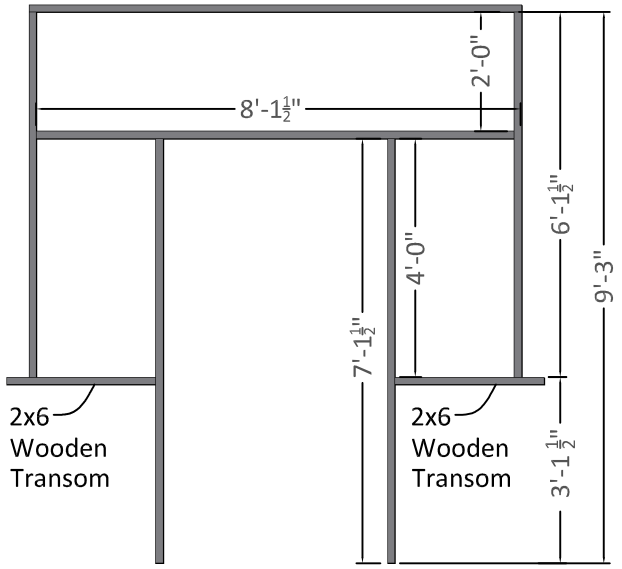
The concrete screw has alternating raised and lowered threads with sharp cut notches that offer essential grip and stability. A blue xylan coating (comparable to Stalgard coating) offers longer life and enables easier driving.



Make absolutely sure the mortar has set solid and the top transom, centered on the brick wall, is set firmly and has absolutely zero wobble when given a firm tug. Don't pull the wall down, but you should be able to lean firmly against the wall and it should remain solid.

For the entrance, this wall will be erected twice. One time for the front and once for the rear.

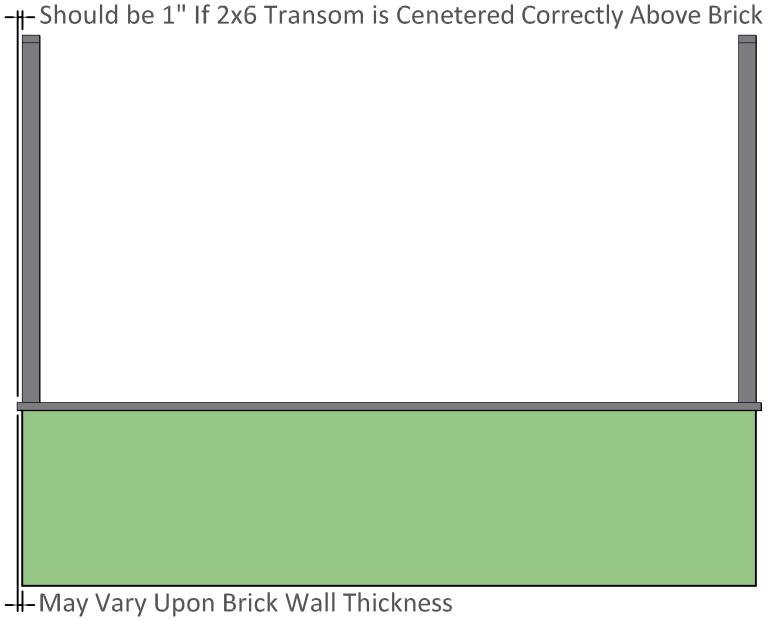
If you DID NOT build the brick partition, the entire wall should be the overall height of the walls!



Materials		
Plank (for both walls)	2x4x8'	12

Notes:

Center the walls over the brick as best you can by measuring the depth from the brick to the outside edge of the 2x6 transom. Mark this depth on the top of the 2x6 transom. Repeat for the other side. You can use a chalk-line or level to layout the positioning of the wall structures.

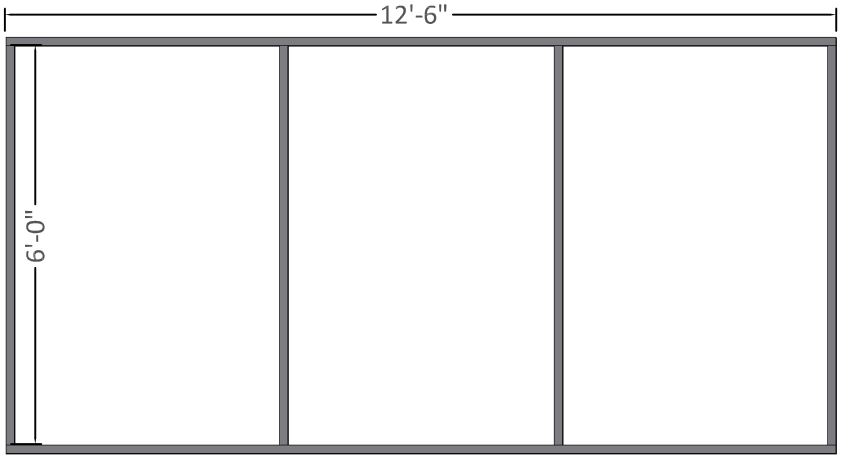


Now, up to this point, the structure is still a bit wobbly. You will want to use some long lengths of 2x4 to act as supports until you get the side walls in place and get the front and rear wall attached to them.

Notes:

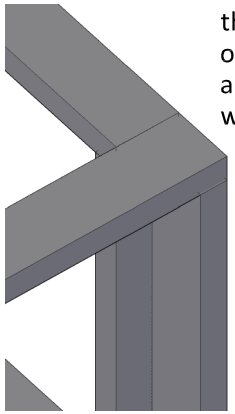
The side walls are relatively simple, though you MUST BE CAREFUL with the stud spacing. The windows are going to go in between the studs and provide the bulk of the stability in the walls. We have dimensioned the windows later on but you may have to adjust the dimensions depending upon your stud spacing!

That having been said: Onto the side walls!

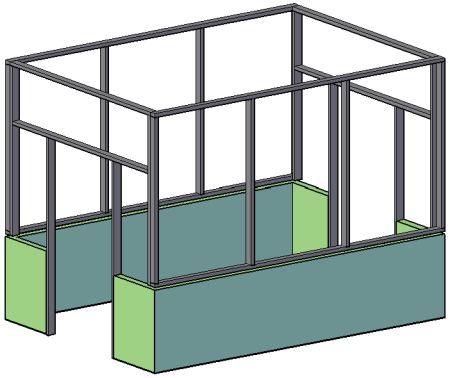


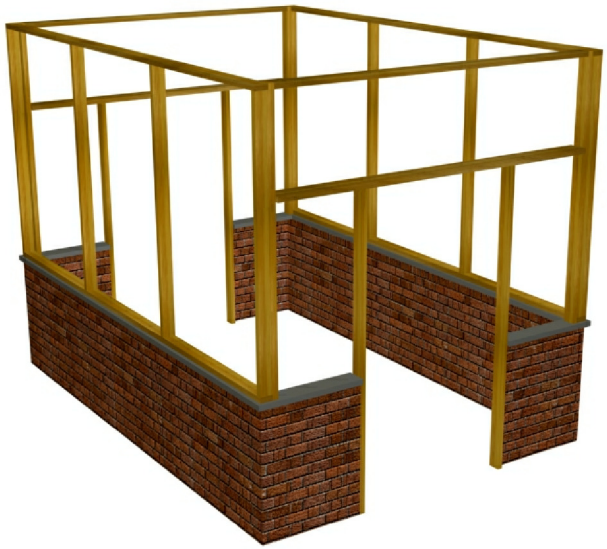
See, simple for a master woodworker like you, huh? Base plate, top plate and 4 studs! You will need 2 of these for both side walls!

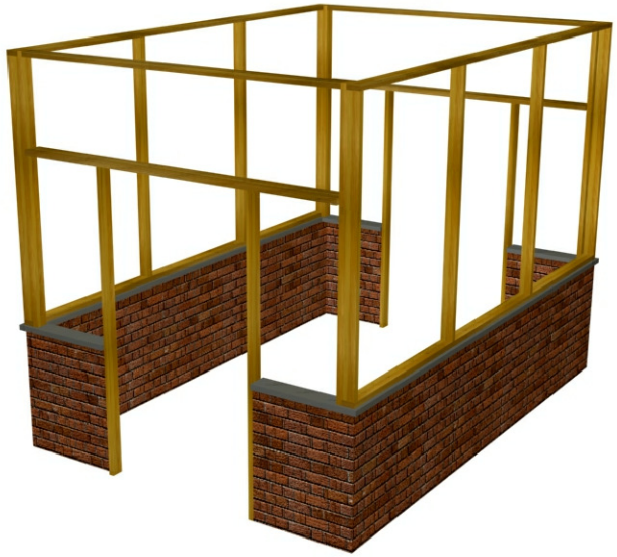
You MAY have to shift the front or rear walls slightly to get the side walls tight with the front walls. Just make sure the structure is square and all studs are vertical before screwing the walls into the transom. If you want, use longer TapCon screws and attach the entire structure directly into the brick wall.



Side walls should fit on the outside of the front and rear walls.







Materials		
Plank	2x4x14'	4
Plank	2x4x6'	8

DISCLAIMER: We take no responsibility for builder choices on window material or construction method! It is up to the builder to determine the safest, strongest paneling material for their particular needs! Glass is a great conductor of solar energy, but may break or shatter if impacted! Glass can also be a very heavy and costly panel material. Should you determine to use glass, always opt to spend a little more and purchase tempered glass as it does not break into jagged shards.

Also, we do NOT recommend cutting glass yourself unless you are a trained professional! Most window and glass repair shops offer glass cutting at reasonable rates. If you do decide to cut your own glass, ALWAYS wear appropriate safety gear such as gloves and goggles!

These plans are intended for use as a guide only! Your particular panel dimensions may vary slightly depending upon your precision, tools used and methodology!

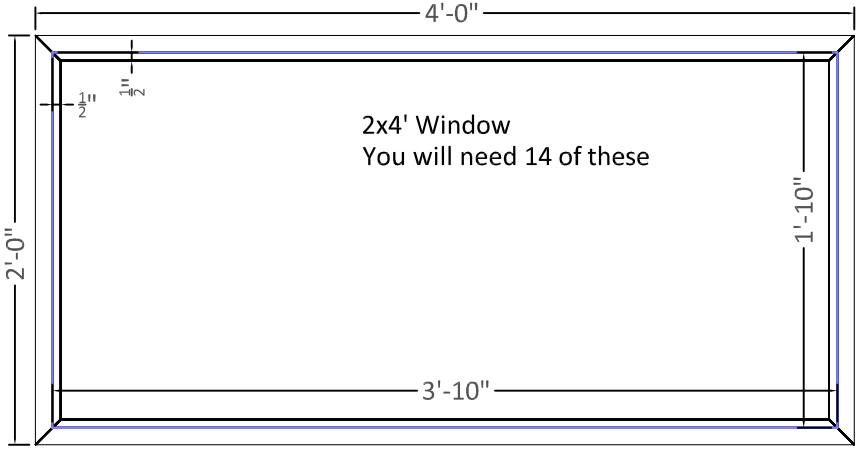
We recommend the use of either clear acrylic, clear PVC or rigid plastic for paneling. DO NOT USE GLASS LESS THAN $\frac{1}{4}$" THICK! AGAIN, IF YOU DO DECIDE TO USE GLASS, YOU SHOULD ALWAYS USE TEMPERED GLASS PANELS AND HAVE THEM PROFESSIONALLY CUT TO SIZE AND SHAPE!

We have even included instructions for the use of 6mm plastic sheeting.

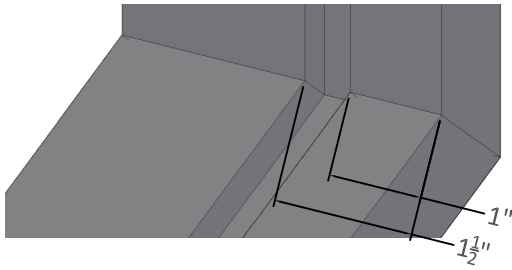
IT IS UP TO THE DETERMINATION OF THE BUILDER TO USE THE SAFEST MATERIAL FOR THEIR SKILL LEVEL!

For the windows, we will detail the windows we use in this structure. Always remember to measure your openings in case of cutting variations or tool differences. For these particular windows, moderate knowledge of using a router is recommended. If you do not possess or own a router with a guide, you may opt to use a table saw with a dado blade.

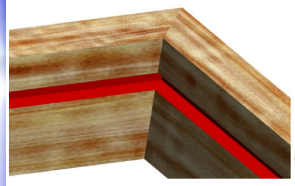
Always read manufacturer recommended instructions for both the installation and use of a dado blade. Always make a practice cut with a scrap piece of material before continuing onto the final piece!

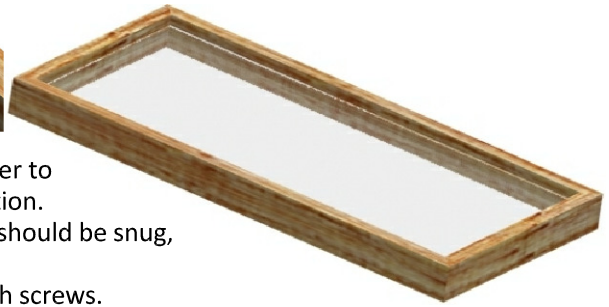


The black frame is the actual 2x4 window frame. The blue line represents the groove to seat the window in. Your best bet would be to router or dado a 12' plank and use the same plank with each window frame.



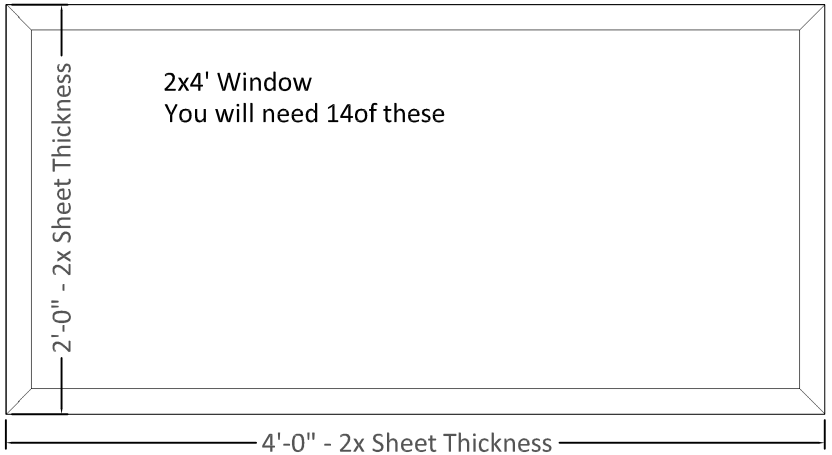
Apply a bead of epoxy sealant to the inside of the groove all the way around before assembling around the pane. Glue the corners and assemble the frame with wood screws.

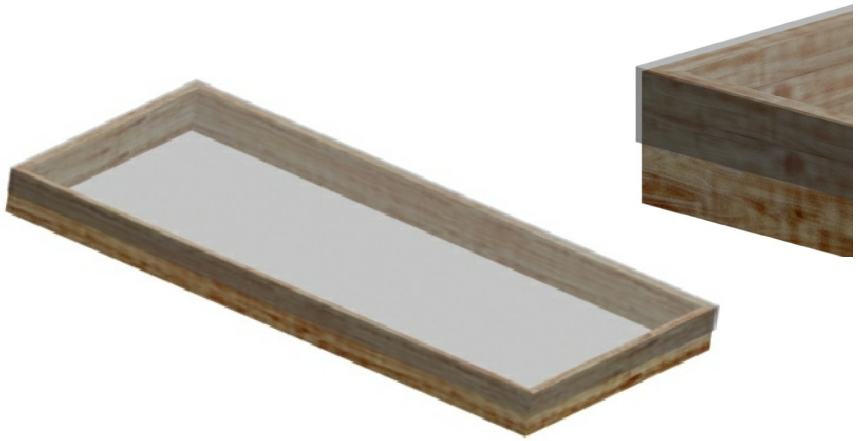




Use a dead-blow hammer to tap the frame into position.
For stability, the frame should be snug, but not tight.
Attach to the frame with screws.

If you opt to use plastic sheeting, measure the interior openings of the frame. You will need to take a slight amount from the exterior of the frame to account for the thickness of the plastic sheet. We would recommend a minimum sheet thickness of 6mm. **If you are not using plastic sheet, skip to next page!**



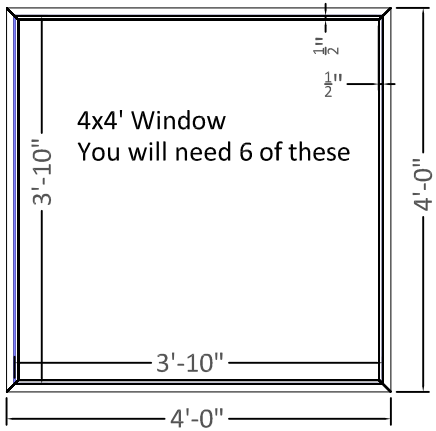


Use a dead-blow hammer to tap the covered frame into position. Attach to the frame with screws. For stability, the frame should be snug, but not tight.

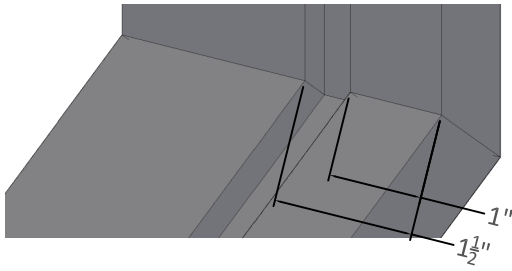
Materials		
Plank	2x4x14'	14
Pane material	1'10"x3'10"x½"	14

For the windows, we will detail the windows we use in this structure. Always remember to measure your openings in case of cutting variations or tool differences. For these particular windows, moderate knowledge of using a router is recommended. If you do not possess or own a router with a guide, you may opt to use a table saw with a dado blade.

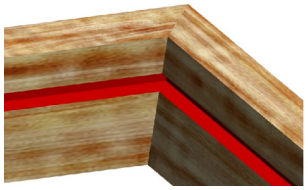
Always read manufacturer recommended instructions for both the installation and use of a dado blade. Always make a practice cut with a scrap piece of material before continuing onto the final piece!

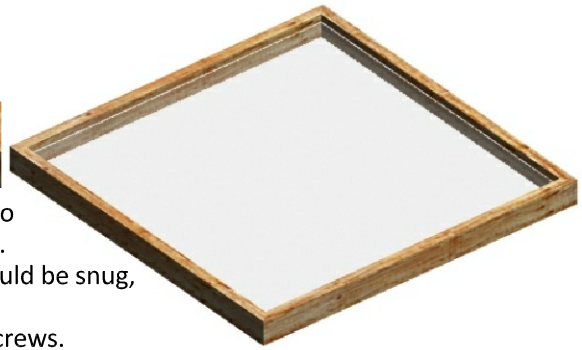


The black frame is the actual 2x4 window frame. The blue line represents the groove to seat the window in. Your best bet would be to router or dado a 12' plank and use the same plank with each window frame.



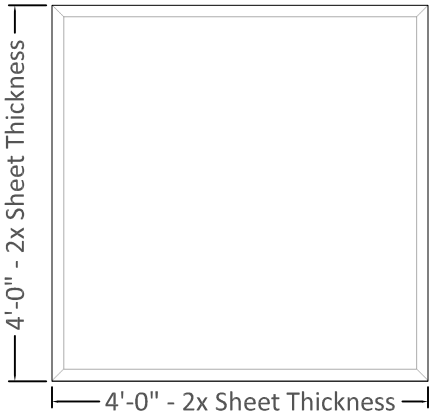
Apply a bead of epoxy sealant to the inside of the groove all the way around before assembling around the pane. Glue the corners and assemble the frame with wood screws.





Use a dead-blow hammer to tap the frame into position.
For stability, the frame should be snug, but not tight.
Attach to the frame with screws.

If you opt to use plastic sheeting, measure the interior openings of the frame. You will need to take a slight amount from the exterior of the frame to account for the thickness of the plastic sheet. We would recommend a minimum sheet thickness of 6mm. **If you are not using plastic sheet, skip to next page!**

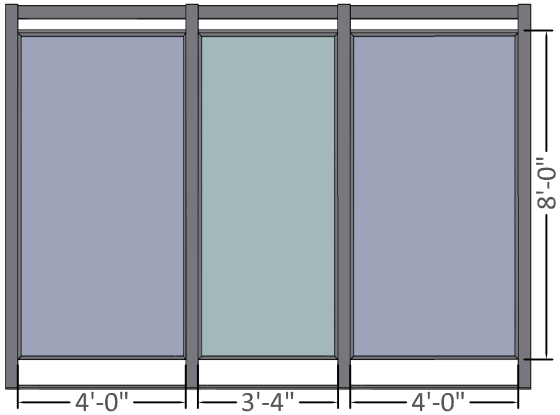


Use a dead-blow hammer to tap the covered frame into position. Attach to the frame with screws. For stability, the frame should be snug, but not tight.

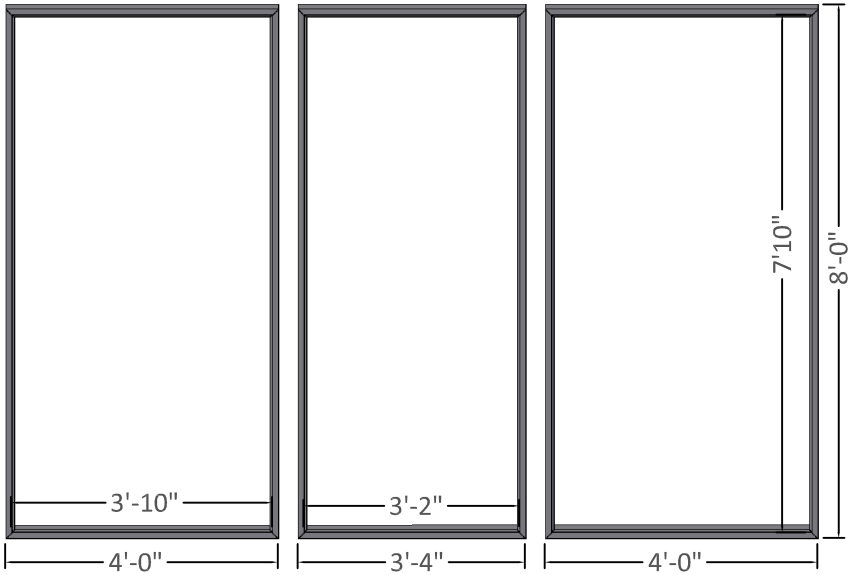
Materials		
Plank	2x4x16'	6
Pane material	3'10"x3'10"x1/2"	6

For the windows, we will detail the windows we use in this structure. Always remember to measure your openings in case of cutting variations or tool differences. For these particular windows, moderate knowledge of using a router is recommended. If you do not possess or own a router with a guide, you may opt to use a table saw with a dado blade.

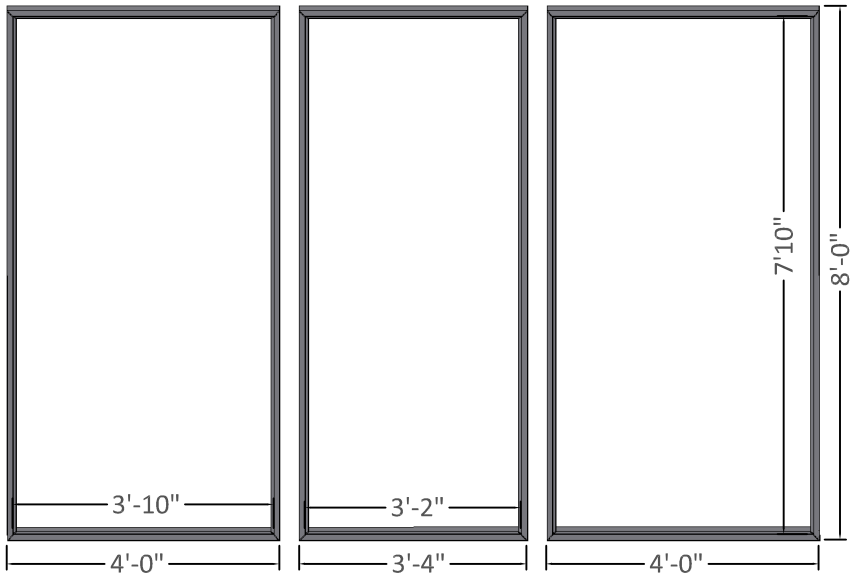
Always read manufacturer recommended instructions for both the installation and use of a dado blade. Always make a practice cut with a scrap piece of material before continuing onto the final piece!



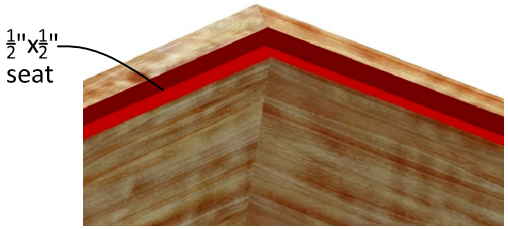
The black frame is the actual 2x4 window frame. The blue line represents the groove to seat the window in. Your best bet would be to router or dado a 12' plank and use the same plank with each window frame. **With the pane material for the top, it is more important to use a lightweight alternative or tempered glass!**



For the top, we would recommend AGAINST plastic sheeting. It is OK to use, just know the plastic may wear faster, bow under water weight and possibly leak. If you DO wish to use plastic sheeting, cut the frames the same size as shown, but you may disregard the dados for the pane material.



Materials		
Plank	2x4x8'	9
Pane material	3'10"x7'10"x$\frac{1}{2}$"	2
Pane material	3'2"x7'10"x$\frac{1}{2}$"	1



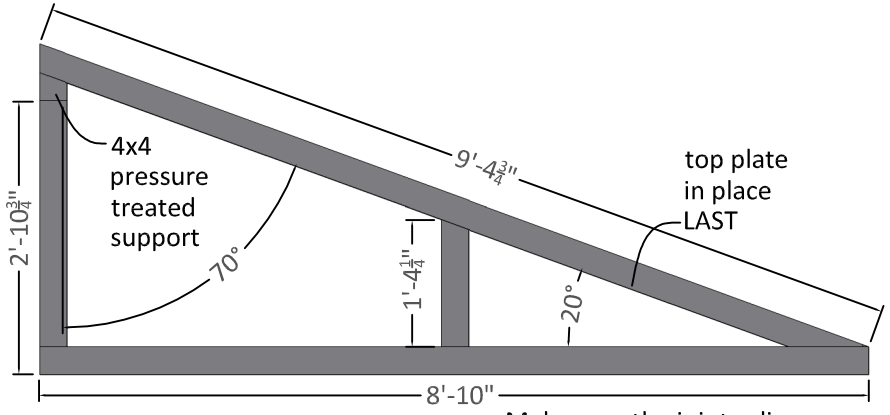
Apply a bead of epoxy sealant to the inside of the groove all the way around before assembling around the pane. Glue the corners and assemble the frame with wood screws.

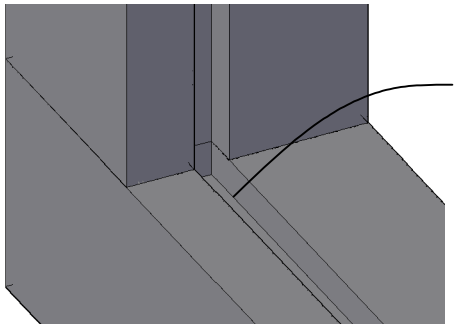
Use a dead-blow hammer to tap the frame into position.
For stability, the frame should be snug, but not tight.
Attach to the frame with screws.

The roof frame is the most important part of the entire greenhouse structure. If you feel you are at all unable to construct the roof panels or unable to complete the roof by yourself, GET HELP! The panels are heavy so you will, at least, want assistance with the panels! If you feel you cannot construct the roof safely, HIRE A PROFESSIONAL!

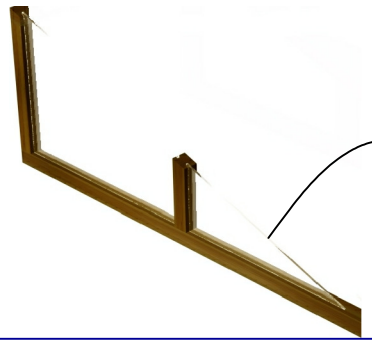
Having said that, onto the roof!

The roof frame is to be constructed of MINIMUM 4x4 pressure treated post! Rip posts exactly as you would with the side, front and rear wall windows. $\frac{1}{2}$x$\frac{1}{2}$x$\frac{1}{2}$" groove down the length of the posts. Construct one roof window frame at a time. The middle trusses will not have glass so they do not need a dado.



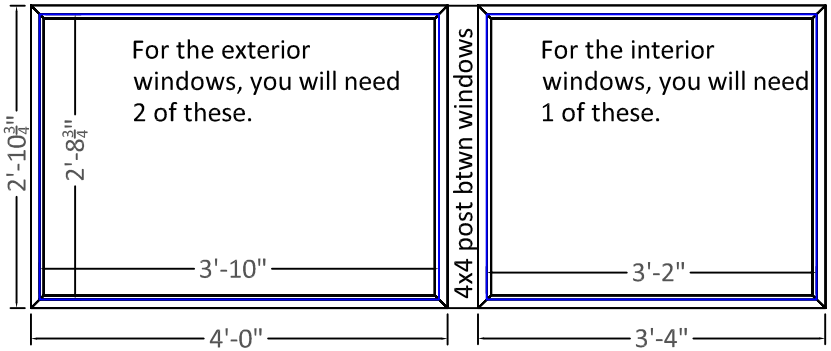


Make sure the joints align properly or you will not be able to assemble the side roof window frame structure. You can assemble the bottom elements of the frame. If you construct them correctly, you should be able to drop the window pane into place and encapsulate the pane with the top plate.

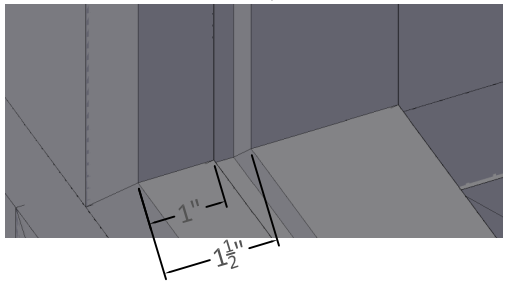


Do NOT attach the top plate of the side frames until you have the glass in place!

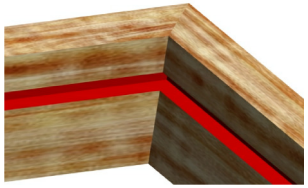
Assemble the three window frames to fill the tallest side of the frame. You will need 2 exterior windows and 1 middle window frame. The middle window frame is thinner than the exterior two.

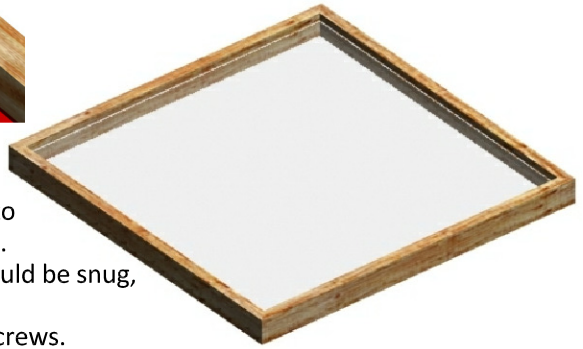


The black frame is the actual 2x4 window frame. The blue line represents the groove to seat the window in. Your best bet would be to router or dado a 12' plank and use the same plank with each window frame.



Apply a bead of epoxy sealant to the inside of the groove all the way around before assembling around the pane. Glue the corners and assemble the frame with wood screws.



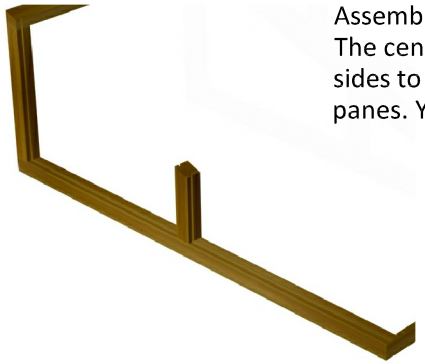


Use a dead-blow hammer to tap the frame into position.
For stability, the frame should be snug, but not tight.
Attach to the frame with screws.

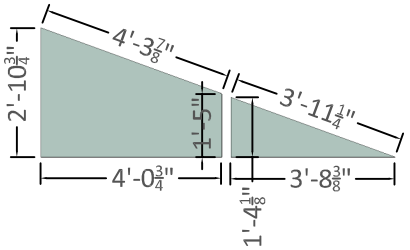
To this point, you should have most of the roof frame finished. You just need to put the windows in place. The diagrams below show how you should assemble the roof frame in pictures.

Start by LOOSELY assembling the roof frame. Get the middle trusses constructed but do not permanently attach them until you are able to get the top windows in place. You will need the internal width between the middle trusses to assemble the middle top and middle side windows!

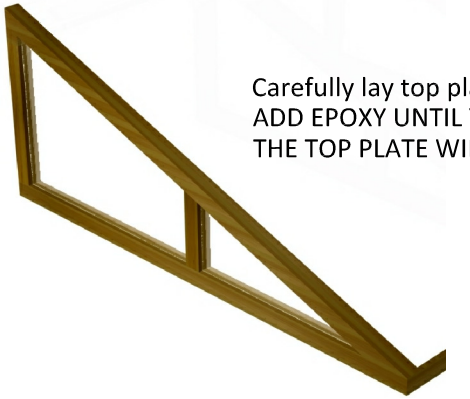
Do NOT assemble the outside frame yet, just make sure the ripped top plate is in place and the bottom portion of the frames are solid and in place.



Assembling the bottom two pieces. The center divider needs dados on both sides to accommodate triangular window panes. You will need 2 of each pane.



Slide panes into slots. Don't forget to add epoxy sealant in the dados to seal the windows!



Carefully lay top plate over the top. DO NOT ADD EPOXY UNTIL YOU ARE ASSURED THAT THE TOP PLATE WILL FIT PROPERLY!

Assemble the opposing side just as the first. The middle trusses do not need dados as they do not have pane material in them.

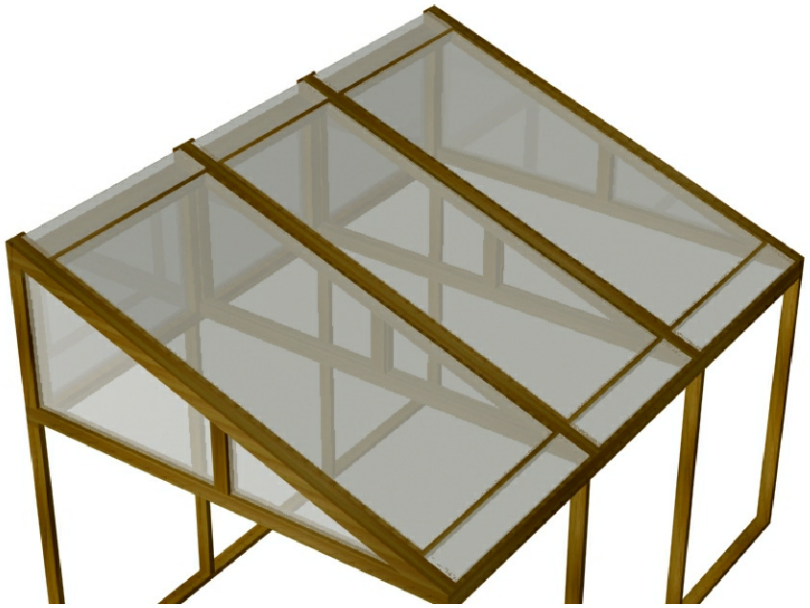
Install the three top, side windows.

Materials		
4x4 Pressure Treated Post	4x4x10'	8
4x4 Pressure Treated Post	4x4x14'	1
2x4 Window Frame	2x4x14'	3

Continuing on:

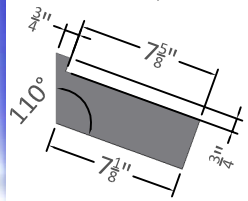
Center the primary panels constructed earlier along the middle trusses.

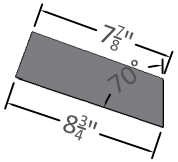
For the small panels at each end, you MAY opt to leave the ends open for ventilation. But if you enclose them, you may extend the growing season.



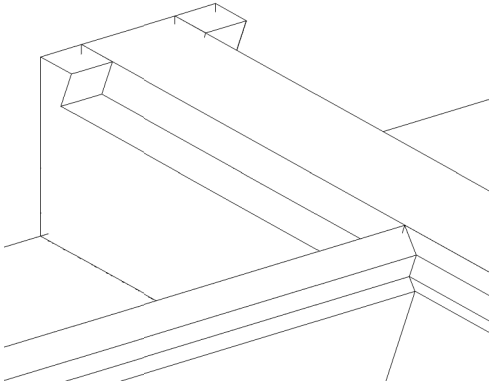
To enclose the ends, cut 2x4 pieces as shown below and adhere to the trusses at the top and bottom.

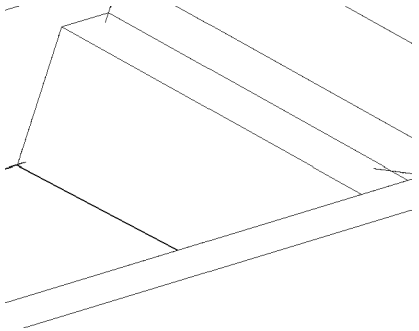
We are leaving the upper-most corner open to allow for ventilation.
Remember, you are building a greenhouse, not a sauna.

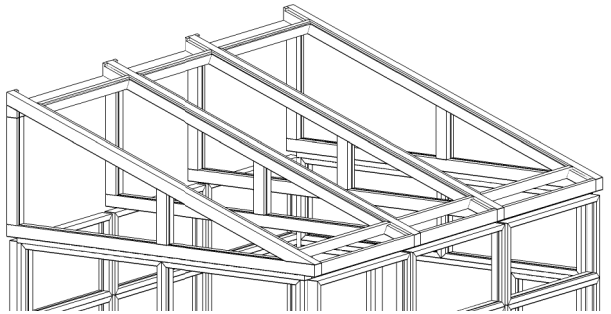




Remember to run a bead of epoxy sealant around any and all seams.







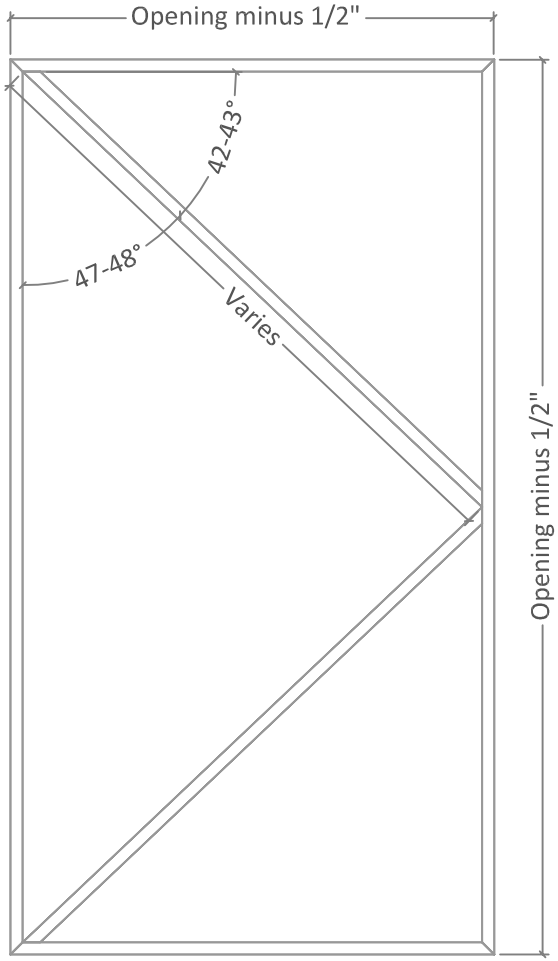
The door is up to the builder. A good choice would be to use a couple of screen doors with a storm window. This way you can take the storm window down if you want to get a cross-breeze through the greenhouse or put the storm window up to control the temperature.

We have included details as to how to build a general door but the door diagrams are for a solid, wood door. If required, you will have to substitute the plywood paneling with acrylic or clear PVC.

Materials		
2x4 Top Finish Piece	2x4x8'	2
Exterior Top Finish Pane	$7\frac{5}{8}$"x3'10"x$\frac{1}{2}$"	2
Exterior Bottom Finish Pane	$7\frac{7}{8}$"x3'10"x$\frac{1}{2}$"	2
Interior Top Finish Pane	$7\frac{7}{8}$"x3'2"x$\frac{1}{2}$"	1
Interior Bottom Finish Pane	$7\frac{7}{8}$"x3'2"x$\frac{1}{2}$"	1

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.

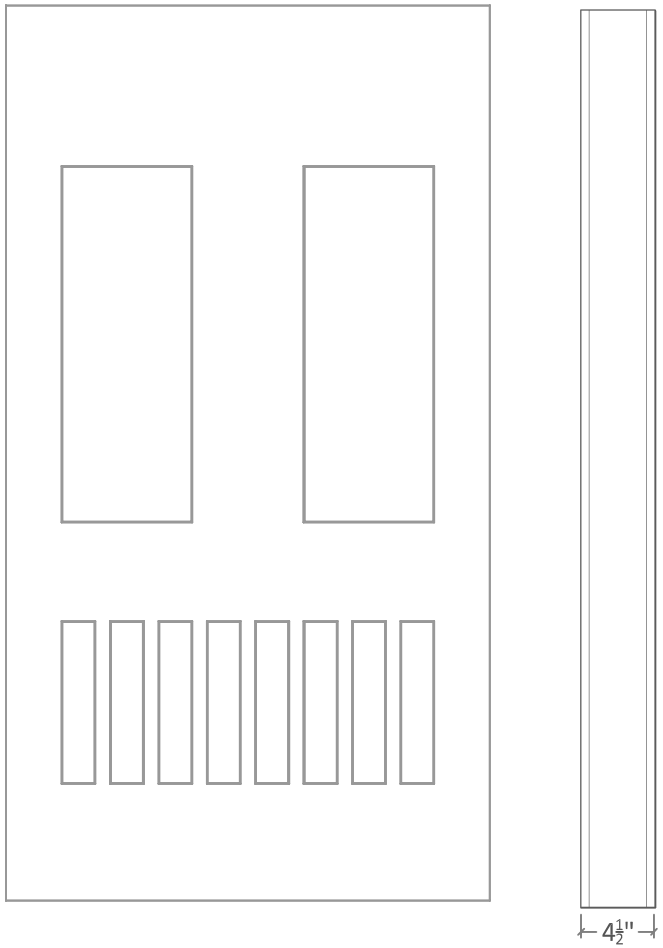
As with the window, this is a very simple door and you do NOT have to construct the door in this way.
If you prefer to purchase a door, make sure the rough opening size is adequate. The frame rough opening in this instance can be anything. Just tweak the dimensions to match your rough opening. **Be sure 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.

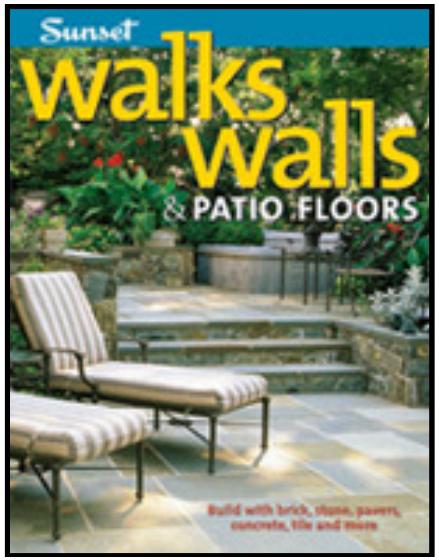
5) A single slide bolt works wonders on the outside and inside to lock the door shut. If you don't want your kids to be able to lock the door, only install the slide bolt on the outside! The slide bolt also offers a grip to pull the door open.

Build a Brick Garden Wall

The following article is an excerpt from* Walks, Walls and Patio Floors*, a release from Sunset Books. The book is full of great "how-to" stories and step-by-step photos on enhancing your outdoor living space with brick, stone, pavers, concrete, tile and more. To learn more, visit www.sunsetbooks.com. *Photos courtesy of Frank Gaglione*

Low, short garden walls can be built with a single wythe—that is, with only one horizontal row of bricks. But such walls are not strong. You can even push them over by hand. Double-wythe brick walls are much stronger, though if they are more than 2 feet high, they may not be strong enough to act as retaining walls.

Brick walls must rest atop a solid concrete footing. Patterns, called bonds, allow you to build double-wythe walls that interlock in various ways. Bricks turned sideways to tie the wythes together are called headers, while the rest of the bricks are stretchers. Most bonds require cutting. To help you maintain rhythm and concentration as you throw mortar and lay bricks, cut a number of bricks ahead of time.



Working with Mortar

A professional mason can throw a neat line of mortar at just the right thickness with ease and speed. Don't expect to equal that after a couple of hours of practice. But you can learn to throw mortar well enough to construct a straight wall with neat joints. Type N is usually fine choice of mortar. Mix the mortar with a hoe or shovel in a wheelbarrow or mortar tray, or use a paddle mixer in a large plastic tub. You can scoop mortar out of the mixing container, but it's often easier to load a shovelful onto a hawk or a piece of plywood about 16 inches square and work from there.

Make up about one-third of a bag of mortar mix with just enough water so it's thick enough to hold its shape when you cut ridges in it with a mason's trowel. If you scoop up some mortar with the trowel and hold it upside down, the mortar should stick to the trowel for a second or two. Here's how to practice your technique.

Building a Brick Wall

Before you start laying bricks, make a story pole so you can quickly measure bricks for the correct height. Lay a number of bricks with 3⁄8-inch spaces between them, on edge on a flat surface. Then lay a length of 1-by-2 or 1-by-4 next to the bricks and draw marks indicating the centers of each mortar joint. Alternatively, purchase a ready-made story pole. A standard model has marks every 8 inches to indicate three courses of common brick plus the mortar joints.

Lay a Dry Run

Snap chalk lines on the footing indicating the outline of the wall. Place the bricks on the footing in a dry run, with 3⁄8-inch dowels between them to represent the joints. Make sure you understand how the bricks will be laid out at the corner. You might need to cut a brick or two. You may choose to minimize cutting by moving one wall over an inch or two. With a pencil, mark the footing for the centers of each joint.

Lay the First Bricks

Remove the dry-laid bricks. Starting at a corner or at the end of a wall, throw a line of mortar for the first three bricks. Set and place the first brick. Butter one end of the other bricks and set them. Push the bricks into place and see that the centers of the joints are at the pencil marks. Use a level to check that the bricks form an even surface in both directions. Scrape away excess mortar. Repeat for the second wythe and lay bricks for the start of an adjoining wall if you are at a corner.

Lay the Header Course

Be sure you understand how the bricks must be stacked. As you stack, every now and then hold a level against the joints to see that they line up vertically. For common bond (shown here), a header course needs two 3/4 bricks and two 1/4 bricks, known as closures, at each corner. Scrape away excess mortar as you go. Every so often, check the joints to see if they need to be struck.

Build a Lead

Continue building the corner or the end of the wall, which is called a lead. Make a stack seven or eight bricks high. As you go, use a level to check that the corner is plumb and the courses level. Use a story pole to check joint thickness. Do not slide bricks to adjust their position, unless you have laid them within the past two minutes.

String a Line Between Leads

Build a lead at the other end of the wall in the same way and check it with the story pole and level. Lay all the in-between bricks for the bottom course of both wythes, using the pencil lines as guides. Hook mason's blocks and stretch a mason's line from one lead to the other at the center of a joint. The line should be taut and about 1⁄8 inch from the bricks.

Fill in Between the Leads

For each course, move the line blocks up one joint and use the line as a guide for the height and for the outer edge of the wall. Don't let bricks touch the line. The last brick in the middle of a course, called the closure brick, is buttered at both ends. Butter it generously and slip it in straight down. Avoid sliding it. You may need to use a striking tool to force more mortar into one joint

Strike the Joints
Every 20 minutes or so, depending on weather conditions, test the joints by pressing with your thumb. If a thumbprint holds its shape, it's time to strike. With a brick jointer, smooth all horizontal joints, then smooth the verticals so water will drain properly. If a bit of mortar oozes out from the jointing tool, leave it or it will smear.

Brush and Clean
Brush off excess mortar once it has started to harden and appears crumbly. If the mortar smears, stop and wait a few minutes longer. You may be able to wipe any smears away with a damp sponge, but take care not to get the joints very wet or you will weaken them. Alternatively, wait a day and then clean with a mild muriatic acid solution.