The Nomad Bicycle Camper

Designed and Constructed by
Paul Elkins Copyright 2015

I created the Nomad camper with cost, simplicity and weight being the main considerations.

Most of the fluted plastic came from five 4x8 foot 4mm thick recycled campaign signs. I also used four smaller signs for the sub floor.

You probably won't have used campaign signs at your disposal, and will have to purchase the material.

I know here in America you can purchase a 10 count of 4mm white fluted plastic from Home Depot thru their on-line store. It takes a week to be delivered to your nearest Home Depot, then you have to pick it up.

Besides Home Depot you can Google 'Fluted Plastic' with your nearest city in the search. You should get a list of potential sellers. Give each outfit a call.

You can also try your nearest sign shop. They often have a few sheets they will sell over the counter.

Most of the other items you will need are at the big box Home improvement stores.

This being a prototype, there were several improvements that I thought of after testing the camper out. One is using two front wheels instead of a front and rear wheel.

This lightens the load by 1 pound and makes the frame symetrical. It also making the interior wheel wells mirror in measurements rather than the custom ones I had to make.

Another recommendation is to move the wheels all the way back. As it is, if I sit near the edge the front end pops up.

You could just store heavier items toward the front and enter the camper sitting as far back as you can, as I do now, because the downfall to moving the wheels to the rear is you loose room for the counter sunk stove and sink. Crap!

I've also discovered that the Krylon Fusion paint for plastic is not very durable, especially over the duct tape.

For making holes I use hole punches made with an old broom handle and finish nails. I find a nail the same width as my ziptie, grind off the head and pound it into the end of a 6" length. I round off the handle end so it doesn't blister my palm.

One final recommendation:

Include artistic expression. Make it your own and have fun!

Material List:

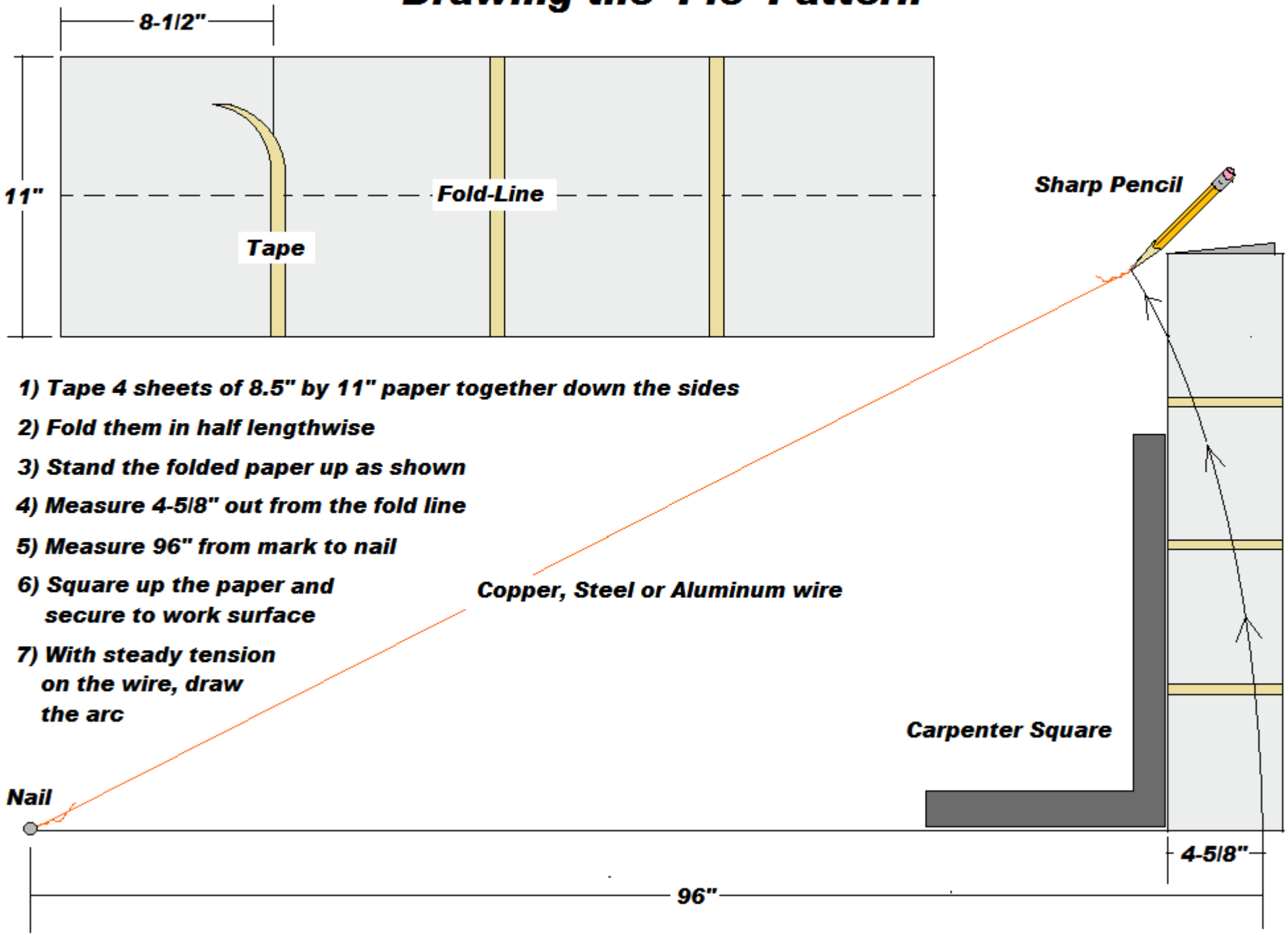
* 6 sheets 4mm thick fluted plastic
* 100 count 8" long zip or cable ties
* 100 count 4" long zip or cable ties
* 2 rolls UV protected Duct tape
  (or silicone caulking)
*24" x 16" x 1/8" plexiglass
  (or an equivalent)
* 7- I" x 2" x 8ft pine boards (knot free)
*35- 2" long phillips head wood screws
*4- double box electrical box covers
* 4- double box electrical plates
* 6- 1-1/4" long 3/16" bolts, washers, nuts.
* 10ft long 3/4" electrcal conduit (legs)
* 100 ft steel wire (attaches wood triangle)
* 2- 3/4" rubber boots for support legs
* 6"x6"x1/8" aluminum plate. (tow tounge)
* 6- 1" long wood skrews (tow tounge)
* 16"x16"x 1/16" aluminum sheeting
* 2- 20" diam. wheels (2 fronts preferably)
* 25- 1/8"x 3/8" long pop-rivets / washers
* 120- washer head screws
* 1 gallon plastic bucket with lid
* 1-trailer exterior hatch door lock
* 100 sq ft 1/4" ?? bubble foil insulation
* 2 cans Elmers spray glue
* 3 cans Krylon Fusion plastic spray paint
* 16"x 8" bug screen

Tools List:

* Utility or snap-off razor knife
* min. 12ft tape measure
* Straight egde (for drawing lines)
* Pencil - Fine tip felt pen
* Drawing compass Straigt edge
* Creasing tool (blunt thin board)
* Reversable drill with phillips head
* Misc. Drill bits
* Hand or chop saw
* Screw driver zip tie punch
* 1" roll masking tape
* 2- two inch nails (ark tool)
* Clamps

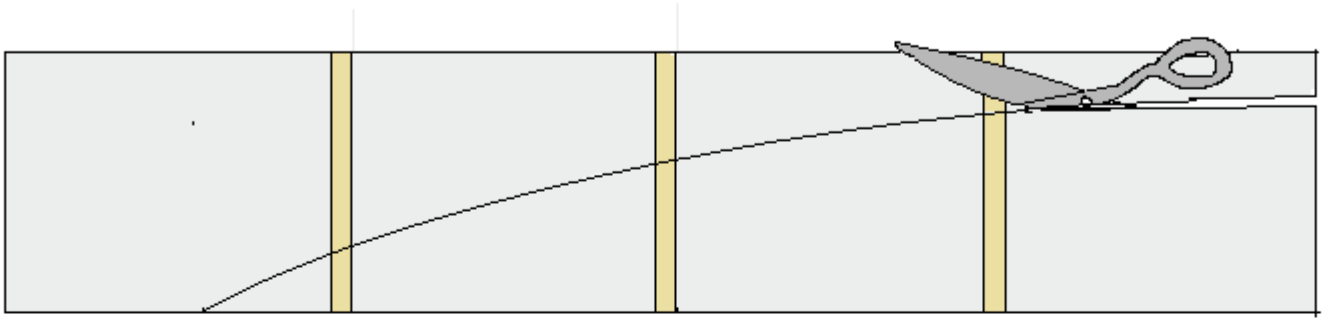
Flat work surface

Drawing the 'Pie' Pattern

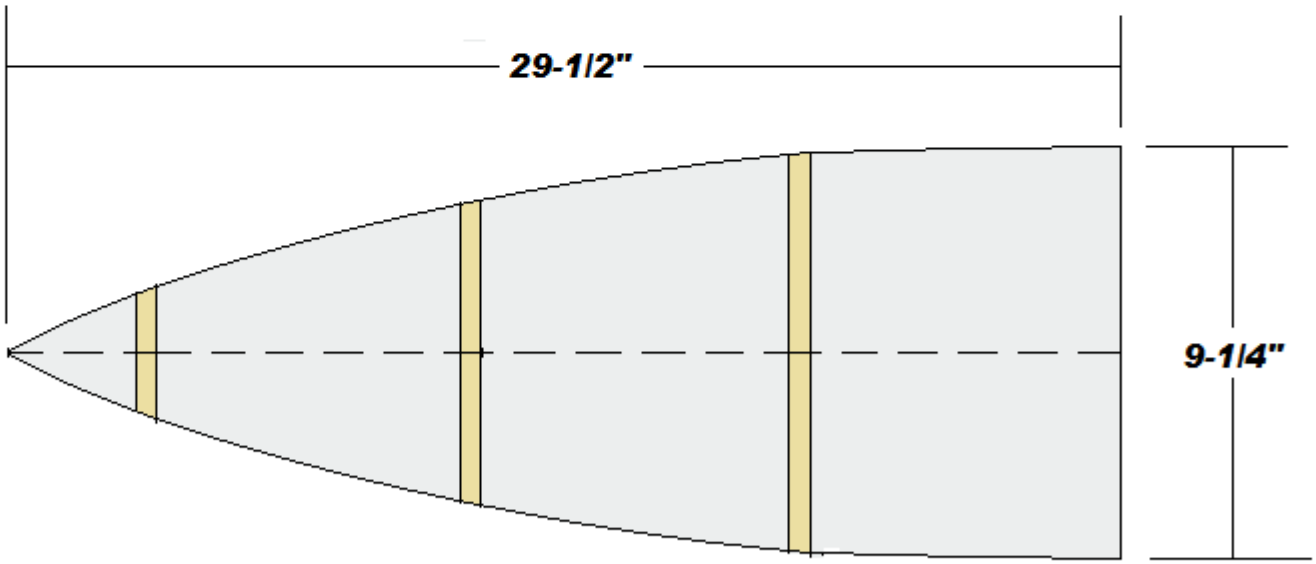


1) Tape 4 sheets of 8.5" by 11" paper together down the sides
2) Fold them in half lengthwise
3) Stand the folded paper up as shown
4) Measure 4-5/8" out from the fold line
5) Measure 96" from mark to nail
6) Square up the paper and secure to work surface
7) With steady tension on the wire, draw the arc

Drawing not to scale



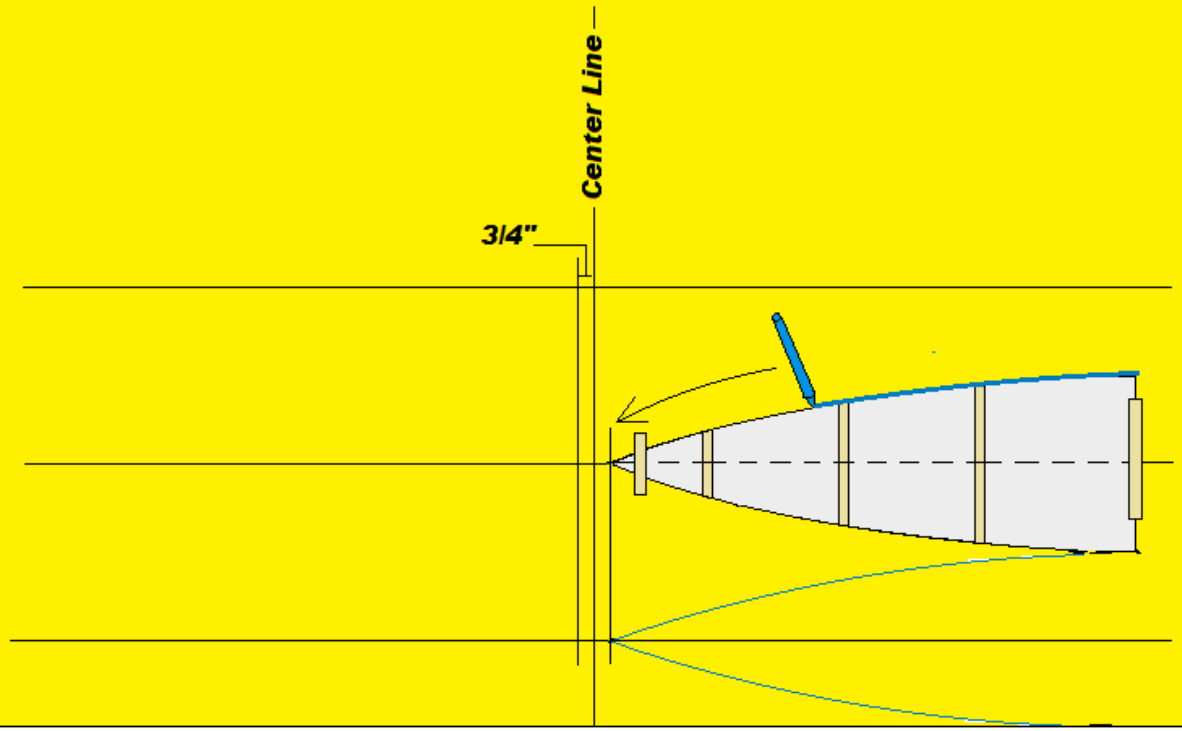
While keeping the folded paper flat, carefully cut along the pencil line and unfold.



The length should be roughly 29-1/2"

The width should be roughly 9-1/4"

Drawing out the Pie sections



1) Measure the length of the sheet and find the center point. Draw a center line as shown.

2) At the bottom of the centerpoint, measure up and mark at 4-5/8", 13-7/8" and 23-1/8"

3) At these points draw horizontal lines as shown

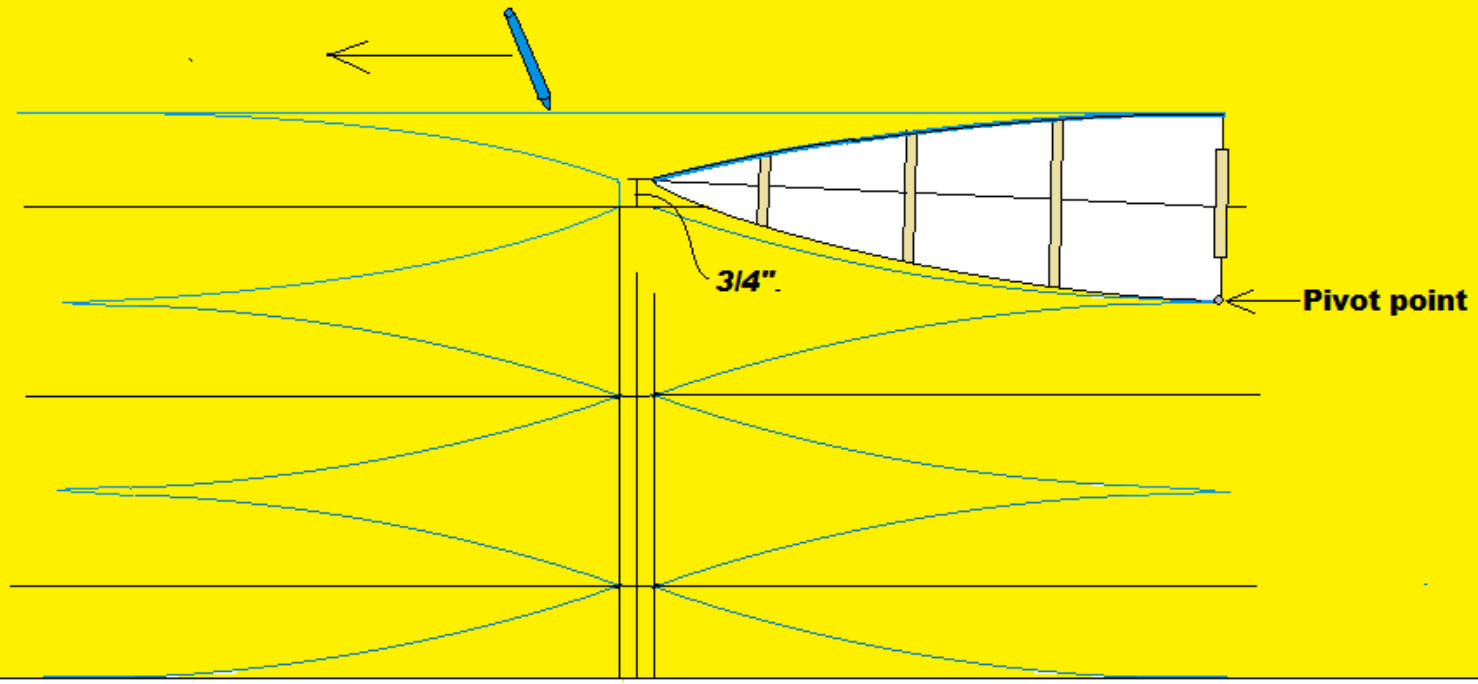
4) On each side of the Center line, draw perpendicular lines 3/4" away from the Center line

5) Line up the pattern fold line with each horizontal line placing the tip 3/4" away from the center line.

6) tape the pattern down on each end as shown

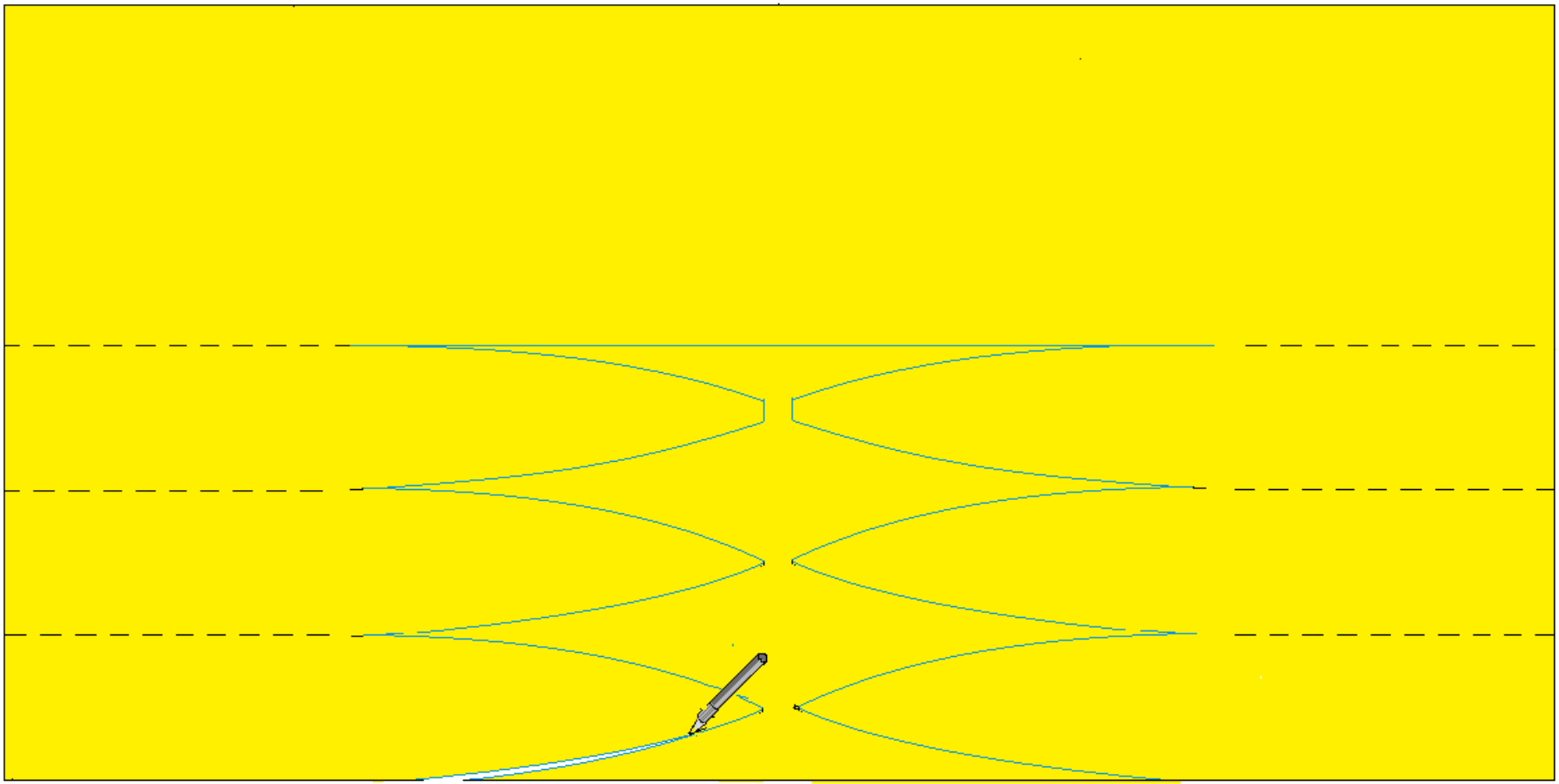
7) With a medium tip felt pen trace around the long sides of the pattern

Drawing out the Middle *Pie sections*

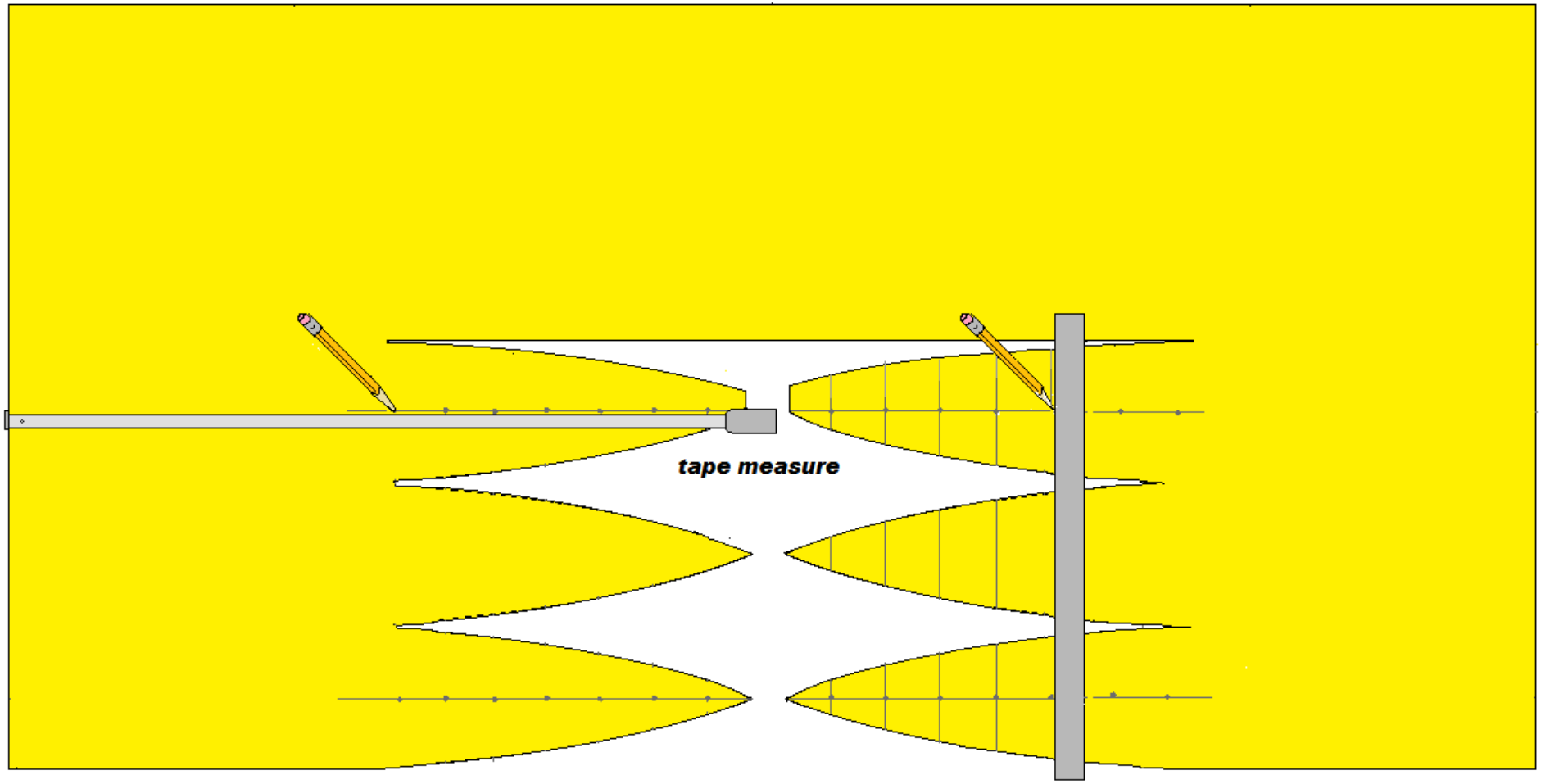


Because of the unique geometry of the dome I've found it's good to add some material on the inner side of the pie sections that join the arced wall.
Here's how that's done:

1) On the middle pies, lay out and tape down your pattern.
2) Trace out your bottom arc.
3) Peel the tape up and pivot the pattern at the point indicated.
4) Move the Pie 'tip' up 3/4" and re-tape to the panel.
5) With your felt pen, trace the top arc.
6) Draw a 3/4" long vertical line connecting the tips.
7) Finally, draw a straight line across the top of the middle arcs.

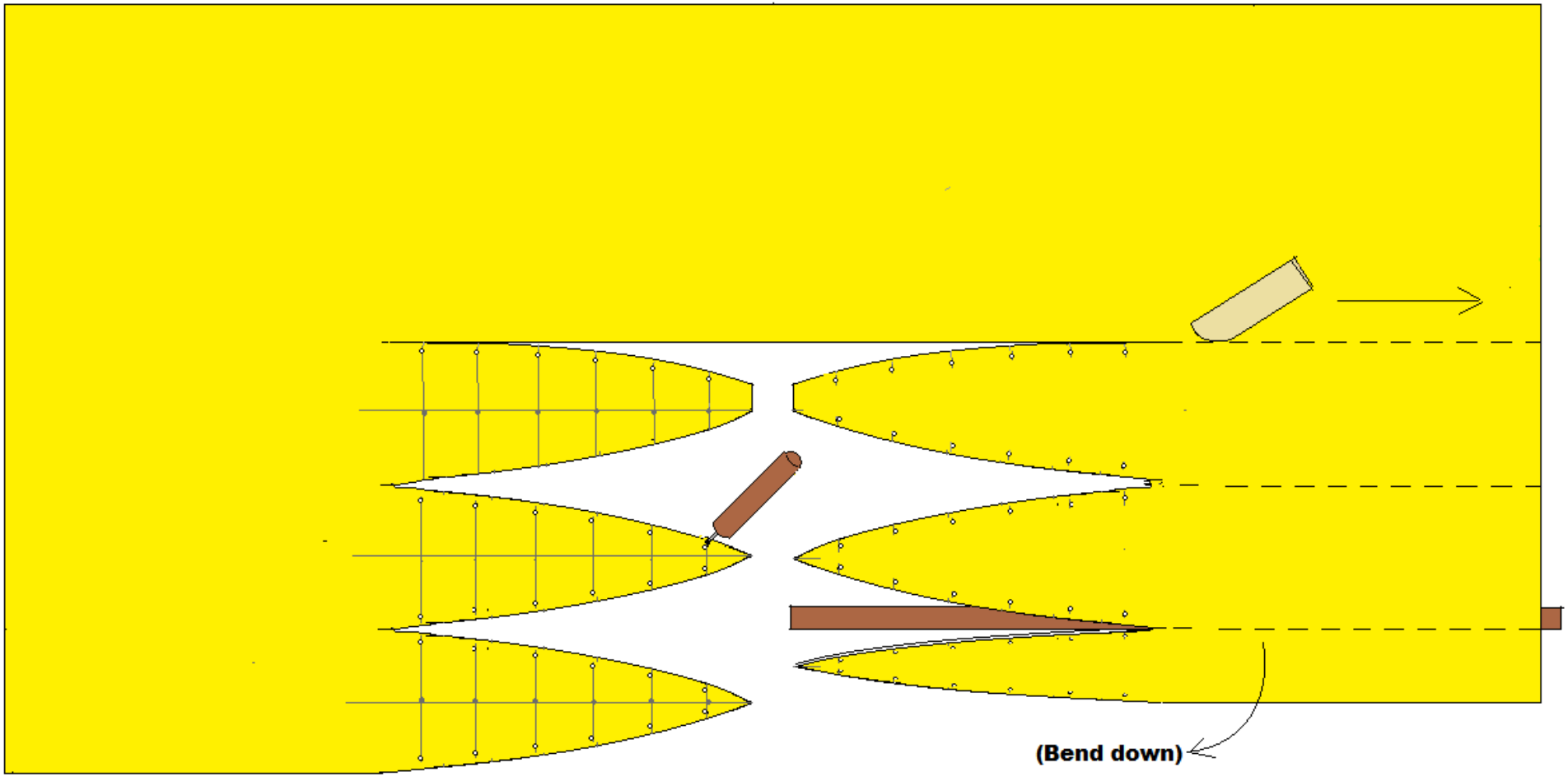


Carefully cut out using a pen or razor knife. Always cut <u>away</u> from the channels, not into.
This way if your blade starts following a channel it will not cut into your part.



Using a tape measure and starting from the panel edges, measure out 3" increments on both top and bottom pie center lines.
Repeat for the other three pie sections.

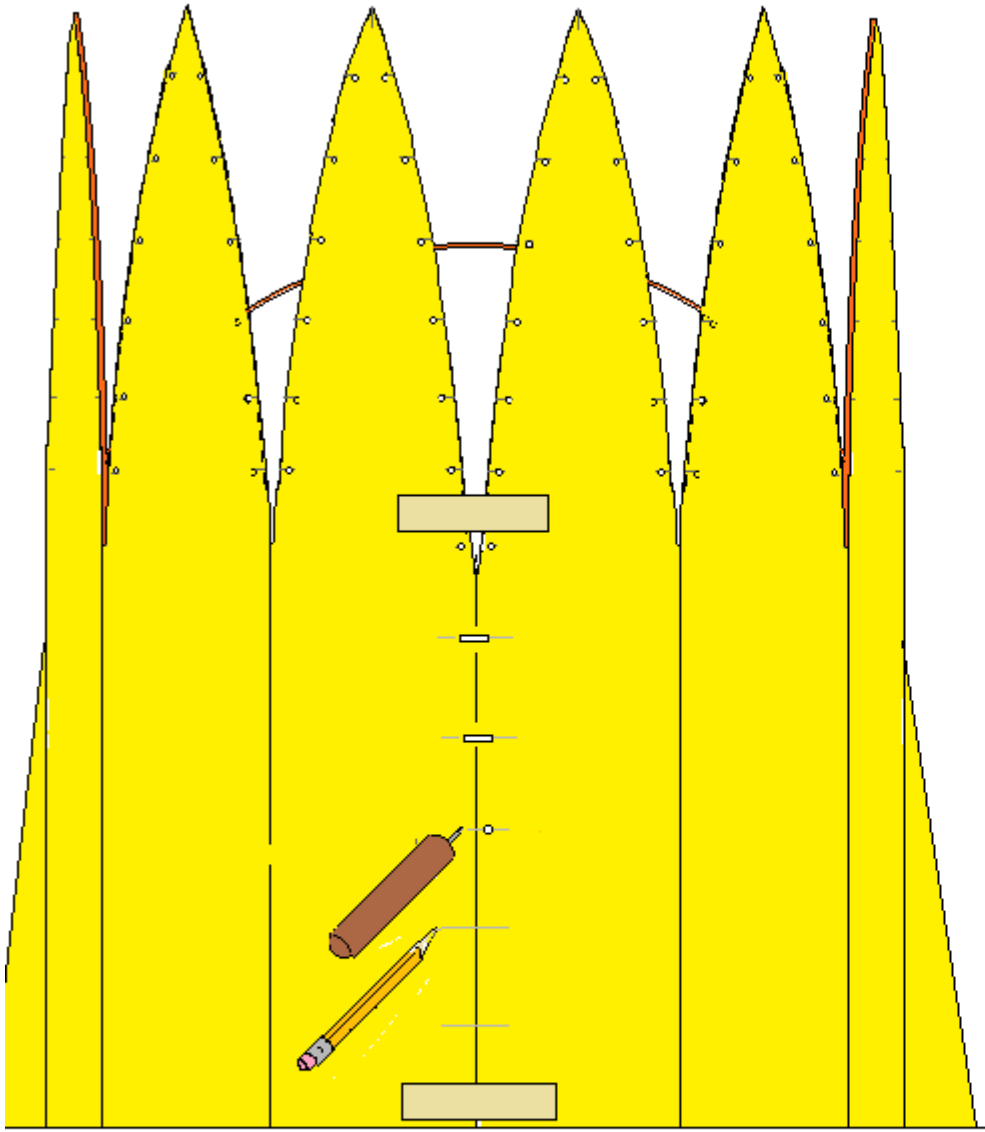
Use a board or straight edge to line up the opposing marks, lightly pencil in a vertical line through all three pie sections.



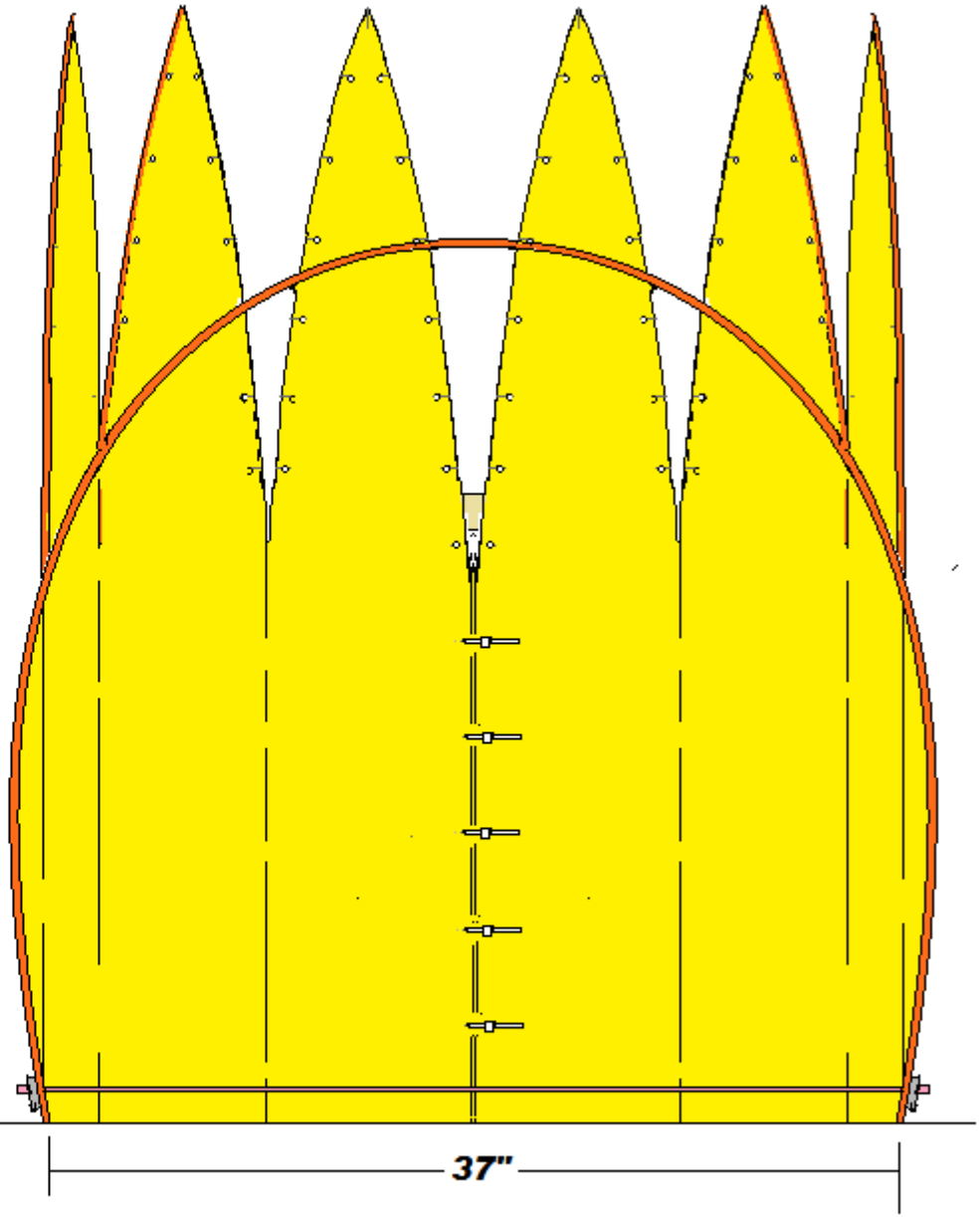
Use a nail punch or a drill bit the same width as your tie, make holes about 1/4" away from the edges.

To make the creases between the pie sections it's good to first run a dull object down the flute that you want to collaps. Afterwards, place a sharp board edge under the dotted lines then fold the sections down until the flute collapses and bends.

Front view



Rear view

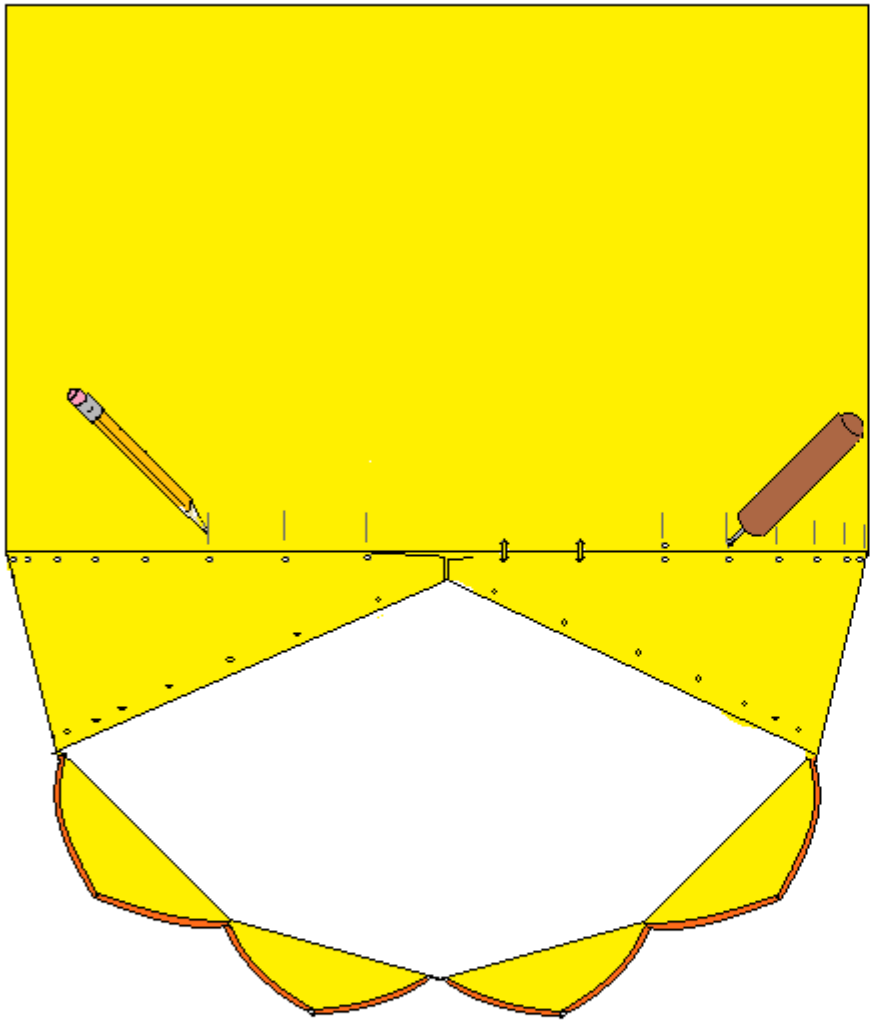


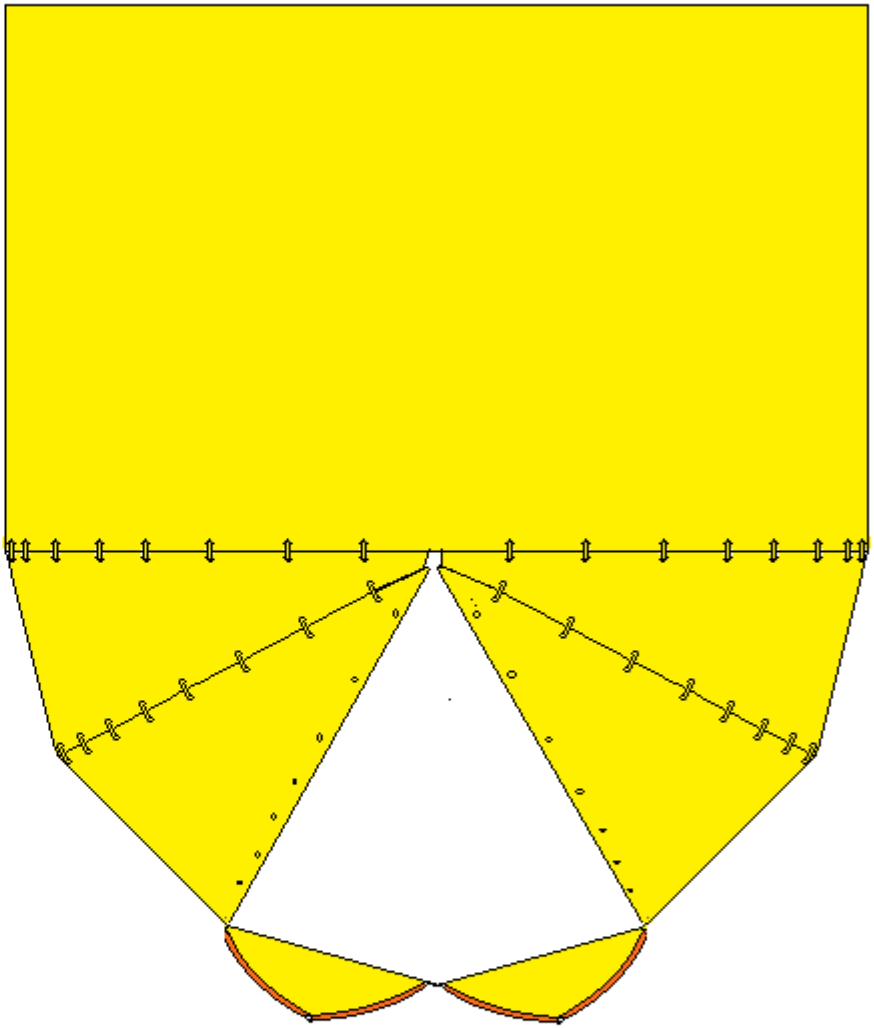
Arc the panel lengthwise and bring the pie sections together as shown.
Square up the bottoms and secure with tape.

At 3" increments, mark, drill or punch holes and attach sides together using 4" zipties.

At this point you'll notice the rear of the dome will want to bow out. I added holes on the lower ends of the dome and installed a long piece of string to keep the ends together.

Top view





Make reference marks on the arc for the adjoining cable tie holes.
Drill or punch holes on the arced roof.
Add cable ties joining the inner pies to the arc.

Connect the rest of the pies working toward the front of the dome.

For a smoother exterior look tread the zipties alway starting from the inside. This keeps the locking nub on the inside of the structure.

Finished Dome

The top of the dome will poof up at the tips due to the stiffeness of the fluted plastic.

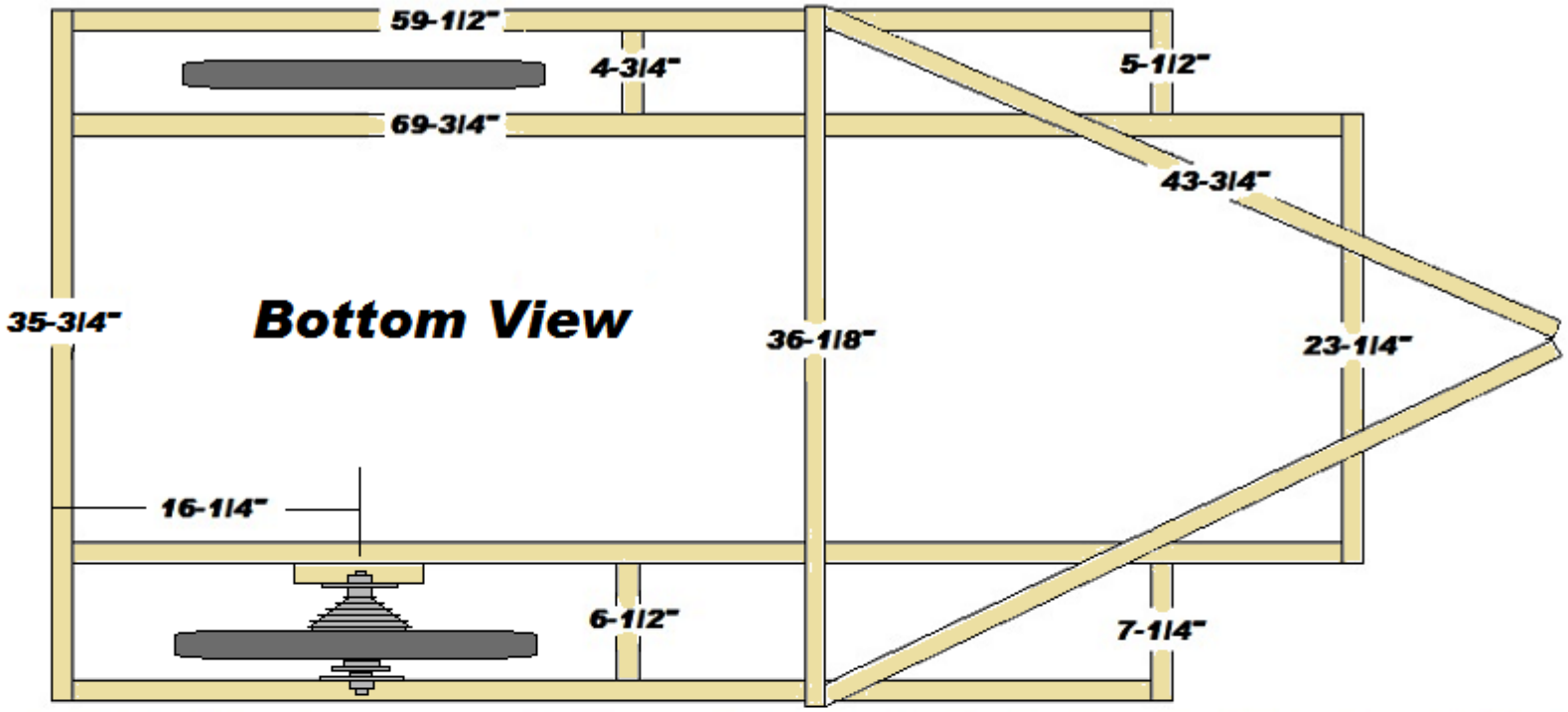
This is my test piece for the dome, but make sure the zipties are located just outside the bucket skylight ring as shown on the right.

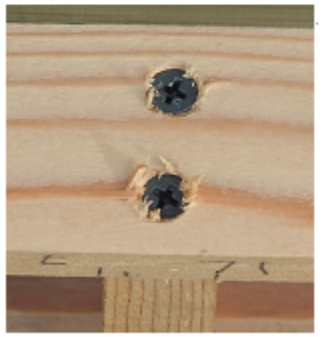
Wood Frame

The frame is made using 1"x2" spruce firring strips.

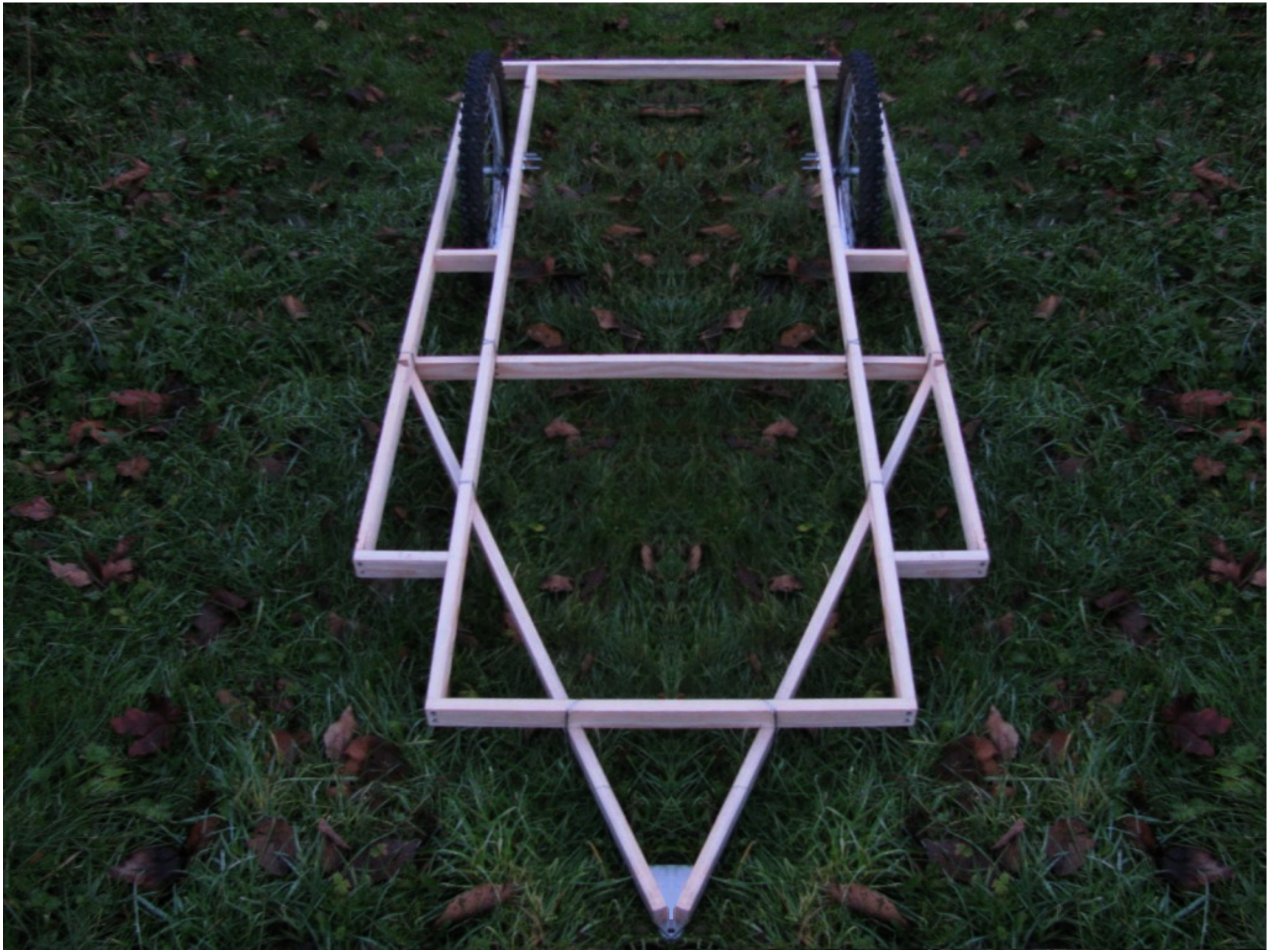
The actual size is (3/4" x 1-1/2")

The boards are attached together using two 2" long #8 zinc plated wood screws.



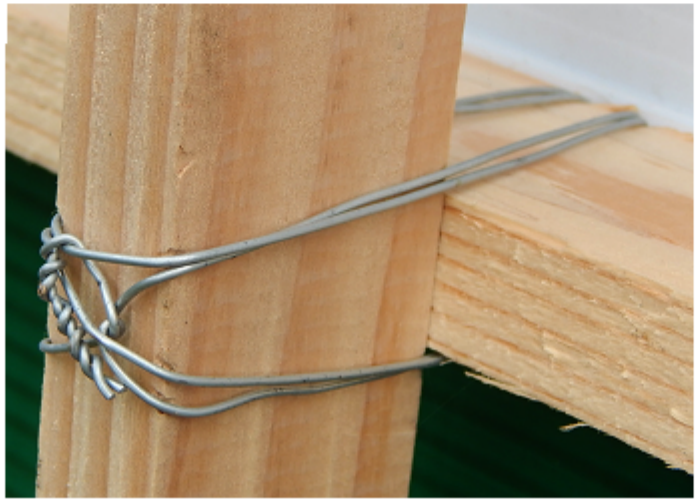


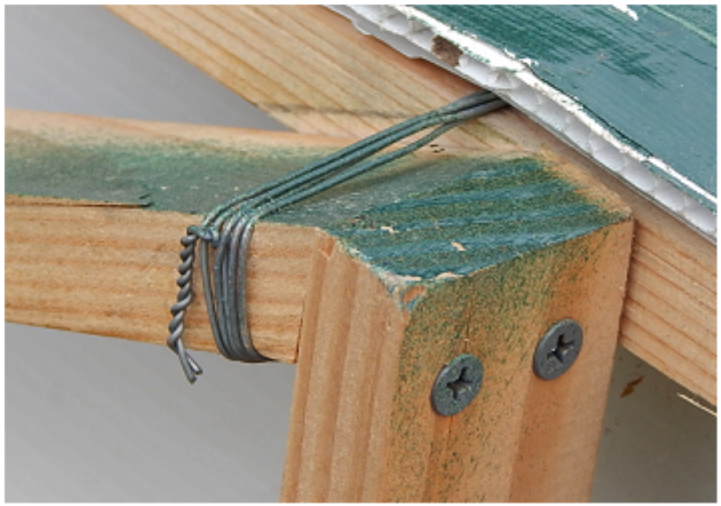
To prevent splitting, the screw holes are pre-drilled with an undersized drill bit.



Tow bar

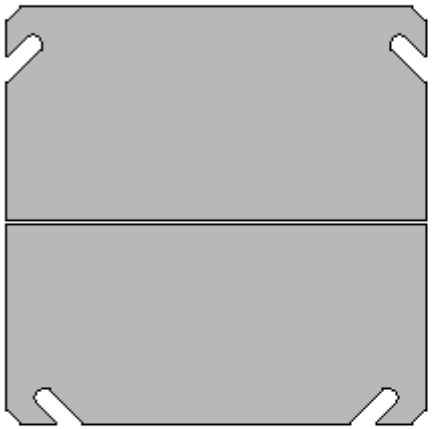
The triangular tow bar is attached under the main frame to allow clearance when weight is put on the double layer hammock floor.
Instead of drilling holes for screws or bolts to attach the triangle, steel wire was used. This helps prevent week points to the thin boarded main frame.



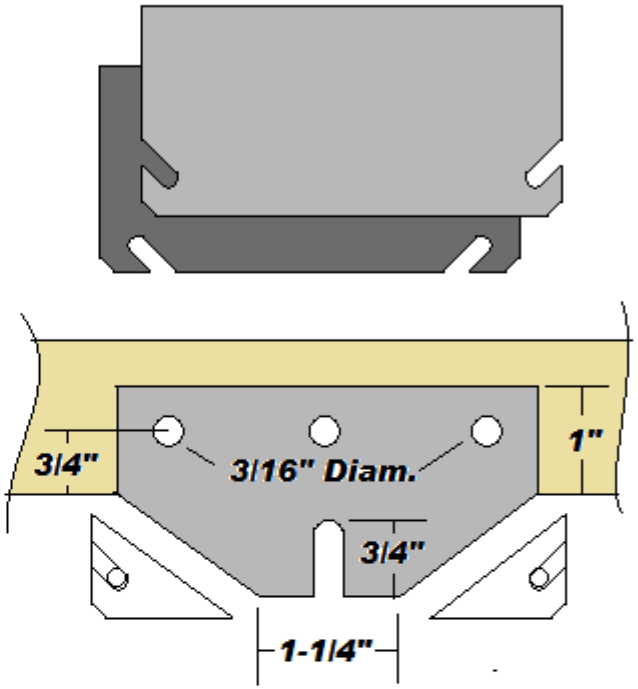


Wheel mounts

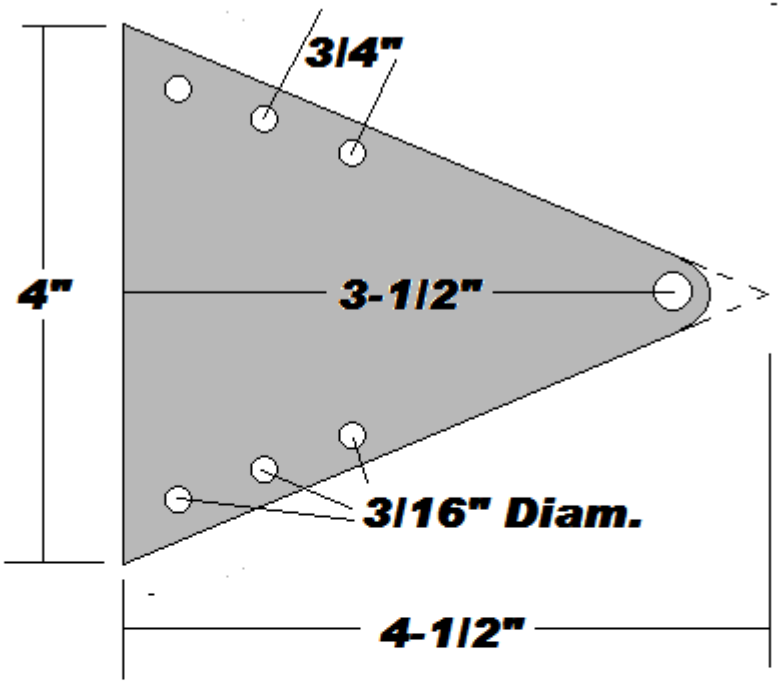
Each 4" square electrical plate makes on wheel mount. You will need 4. Cut the plate as shown in the drawing below.



Fold one half onto the other. Tape together around the edges before cutting and drilling holes.

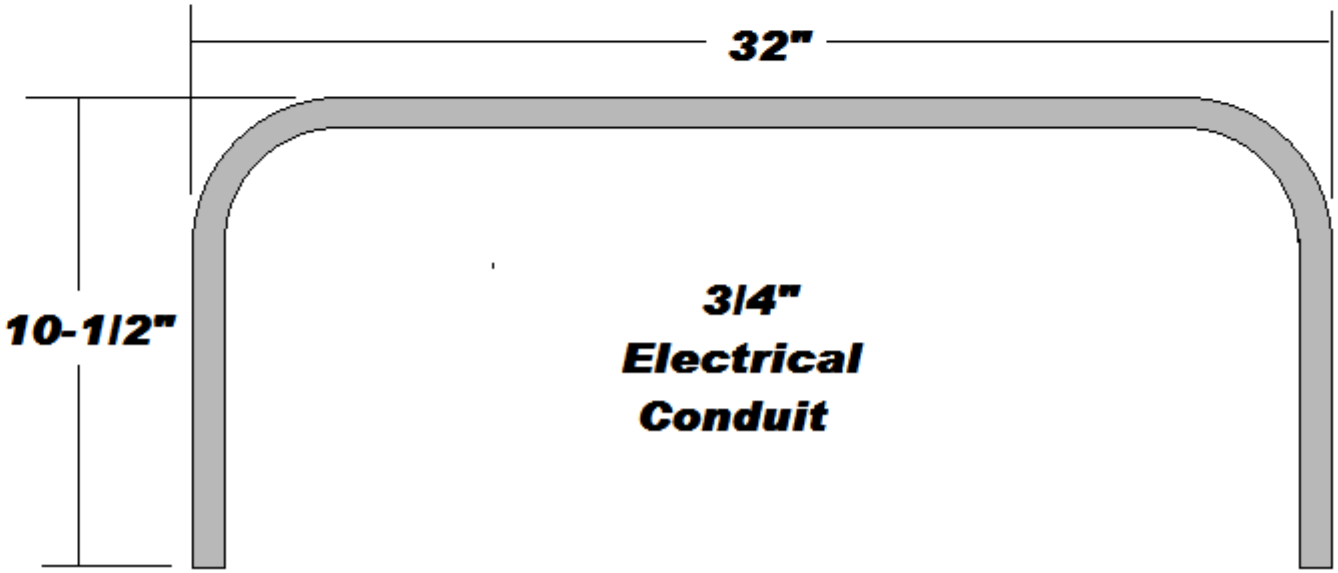


Towing tounge



Support legs

You will need a 3/4" conduit hand bender to bend your tubing. The conduit comes in 10ft lengths. Cut the piece in half and practice on one section, getting your angle, rotation and distance between bends correct before making the final piece.

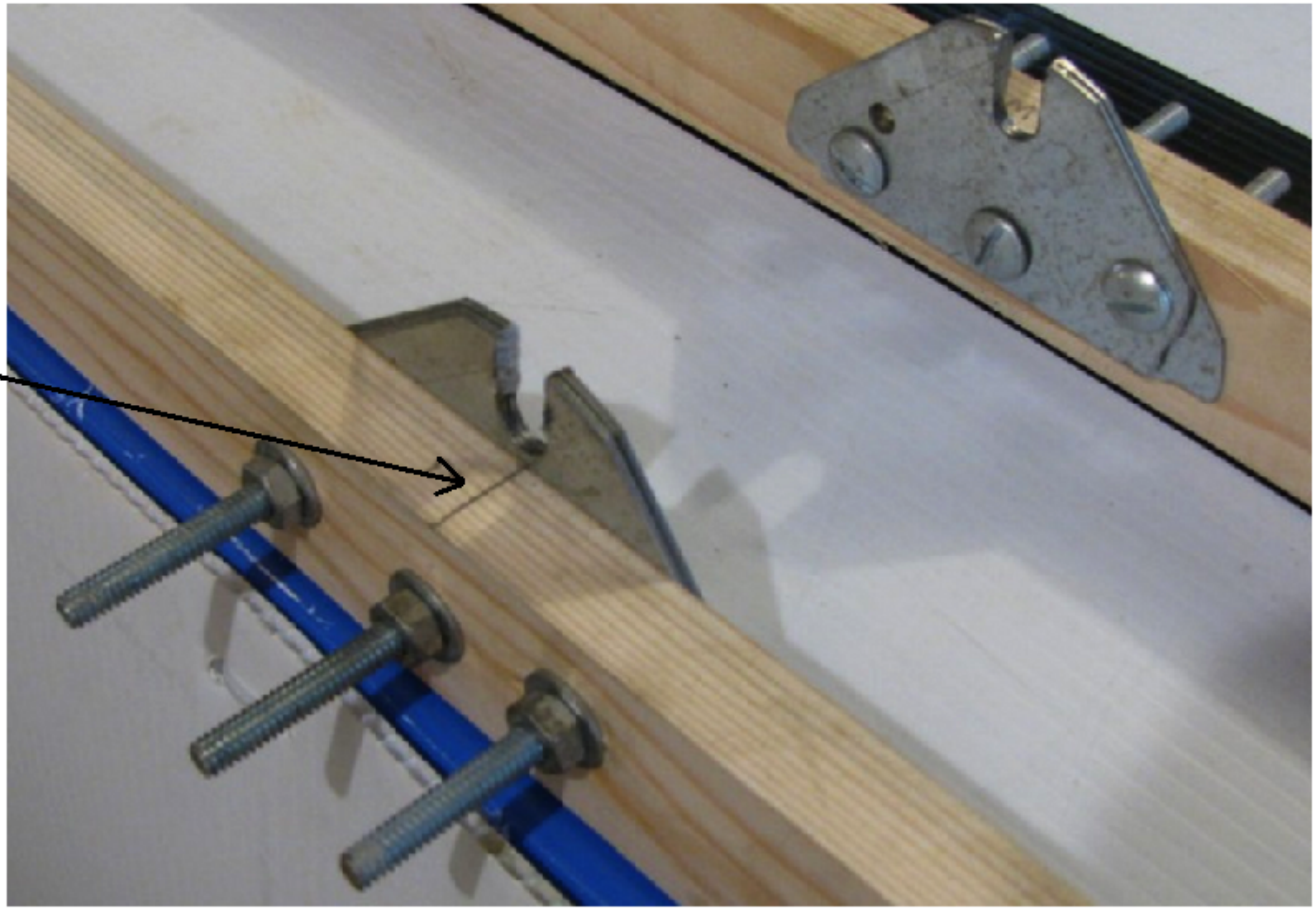


Electrical plate wheel mounts

Use a square and make axle location marks on the adjoining frame.

Alignment is critical so be as precise as you can.

Also, install the plates as low as you can, but still being able to get a wrench around the axle nut.



Installing the support legs

Learning from my first bike camper, I wanted to have a single strong support leg sitting up front and use the wheels to support the rear end.

After much consideration to simplify the leg attachment I came up with this, and along with the wheel chucks it works rather well.

I wrapped and taped sandpaper around the conduit at the contact points of the wood frame.

By swinging the leg back and forth a trough or groove was formed at each point.

The tension between the trangle and main frame pinch the legs in place.

Support legs

Wall mounted Broom handle holders were used on both legs to keep them stored when not in use.

These particular ones have wood screws on the ends.

Ball Hitch

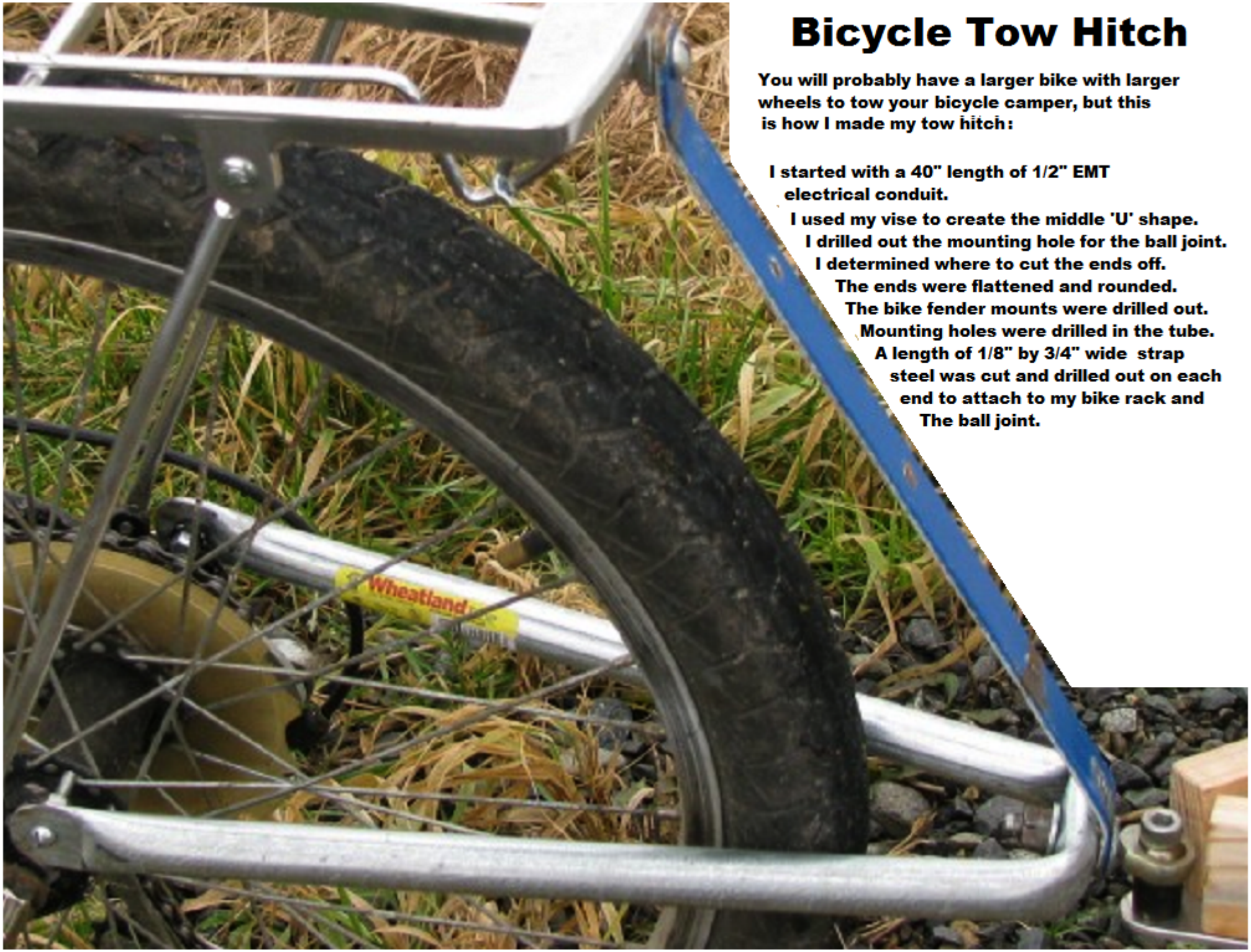
I used a 5/16" inside diameter Hymen ball joint with a 1-5/16" long shaft plus a few washers and lock nut for the ball hitch.

The lock nut is tightened snug, but also enough to allow the ball joing to swivel with the movement of the camper.

A two inch long allen bolt with a 1/2" long by 5/16" spacer and a lock nut are used to attach the ball joint to the camper.

This set-up allows for a lot of movement between camper and bike.

Bicycle Tow Hitch



You will probably have a larger bike with larger wheels to tow your bicycle camper, but this is how I made my tow hitch:

I started with a 40" length of 1/2" EMT electrical conduit.

I used my vise to create the middle 'U' shape.

I drilled out the mounting hole for the ball joint.

I determined where to cut the ends off.

The ends were flattened and rounded.

The bike fender mounts were drilled out.

Mounting holes were drilled in the tube.

A length of 1/8" by 3/4" wide strap steel was cut and drilled out on each end to attach to my bike rack and The ball joint.

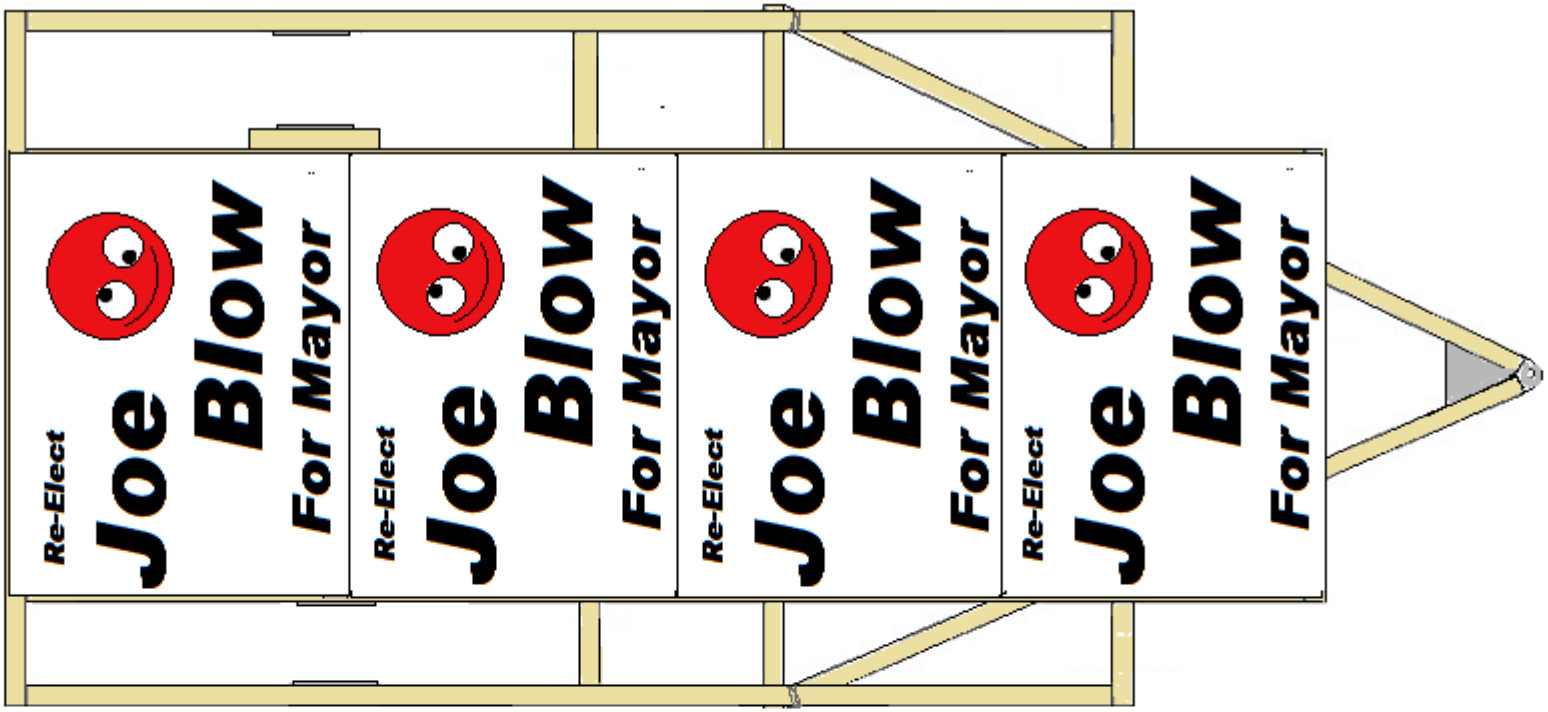
Adding the Foor pan

I used 4 recycled campaign signs for the first layer.

These commonly measure out to 18" x 24".
Lay them together and you have a 24" x 72" bed.

To temporarily hold them in place I used staples, but you can also use tape.

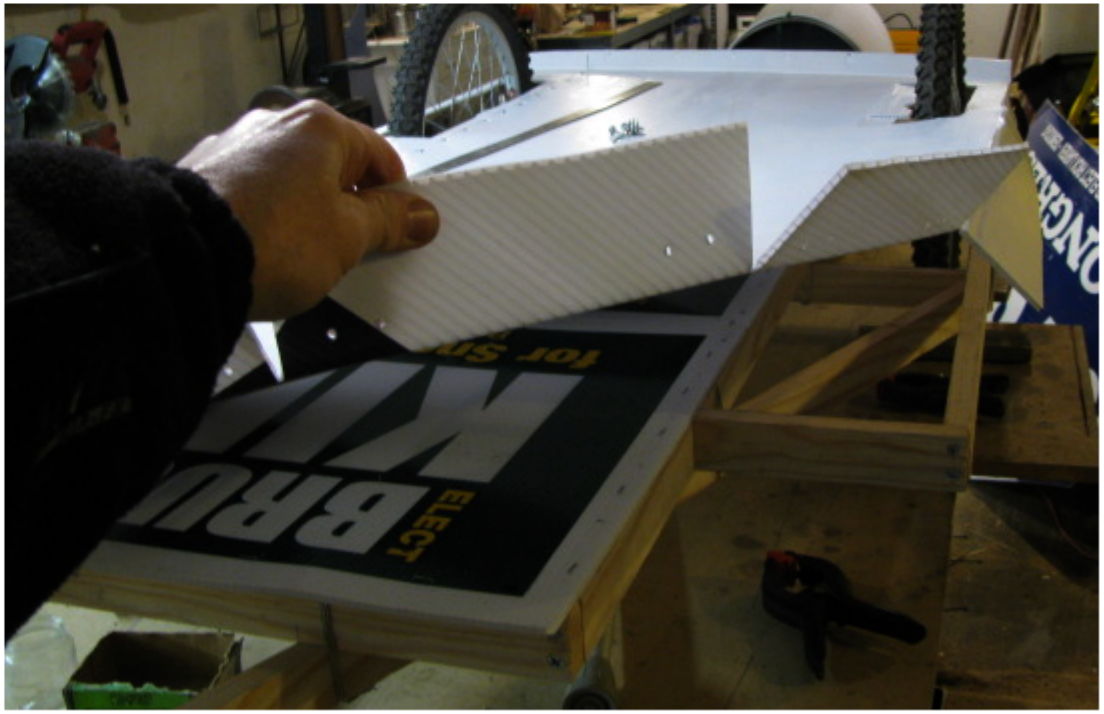
The second bigger layer will fasten both layers down to the frame.



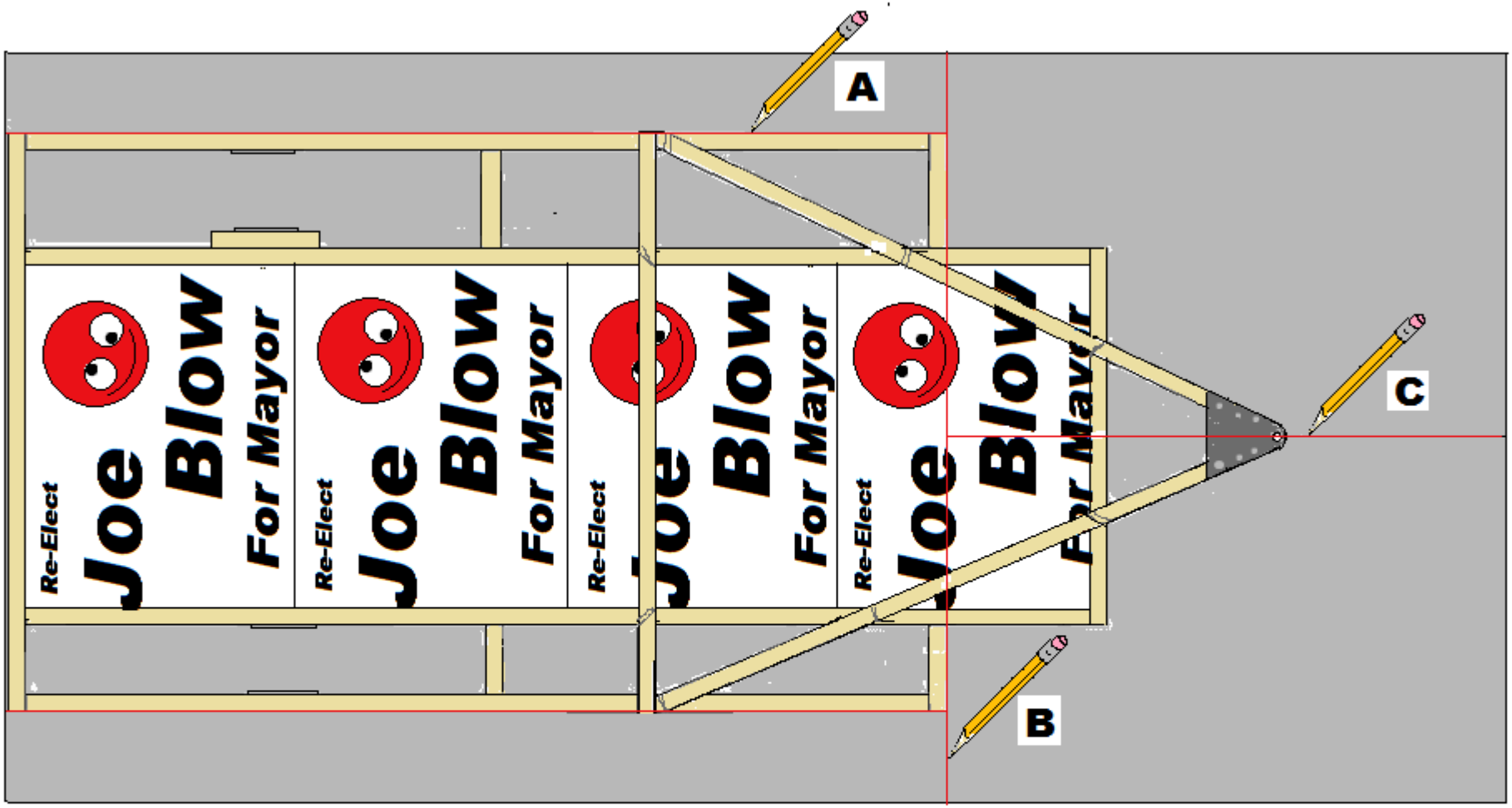
There are several ways you can attach the body to the frame. If you look closely at the photo on the right you will see my camper has the end flaps bent up while the side flaps are down.

Once the floor pan was screwed down to the frame, the body was then attached to the floor pan flaps using zip ties. This was not that easy seeing the flaps ride against the frame, but this way the body and floor pan are one unit and can be seperated from the frame by removing the floor pan screws. In this way, you won't disturb the finished look of the exterior body. I also felt this arrangment would add a bit of shock absorbtion for the body. However, screwing the body to the frame sides would simplify the build.

As you can see the rounded front part of the body does not attach directly to the frame perimeter, but is supported by cable ties to the floor pan flaps.
I also chose to lower the body flush to the bottom of the frame to facilitate rain runoff.



Floor pan *second layer* (Continued)



These instructions are how I would do it if I were to do it again:

Lay a full sheet on a flat surface.

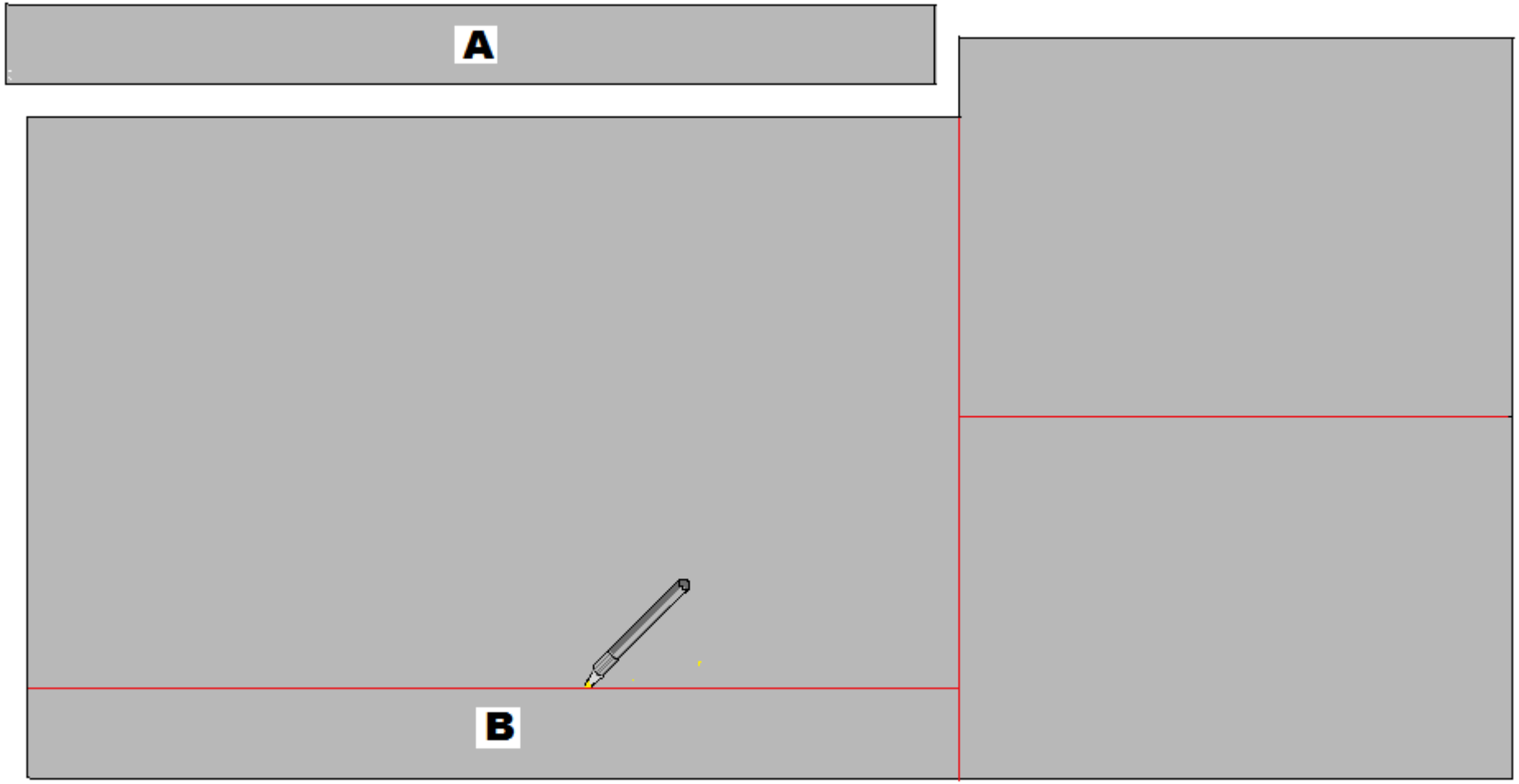
Place the wood frame upside-down on the sheet as shown.

Trace around the widest parts of the frame (A)

Draw a line across the sheet (B)

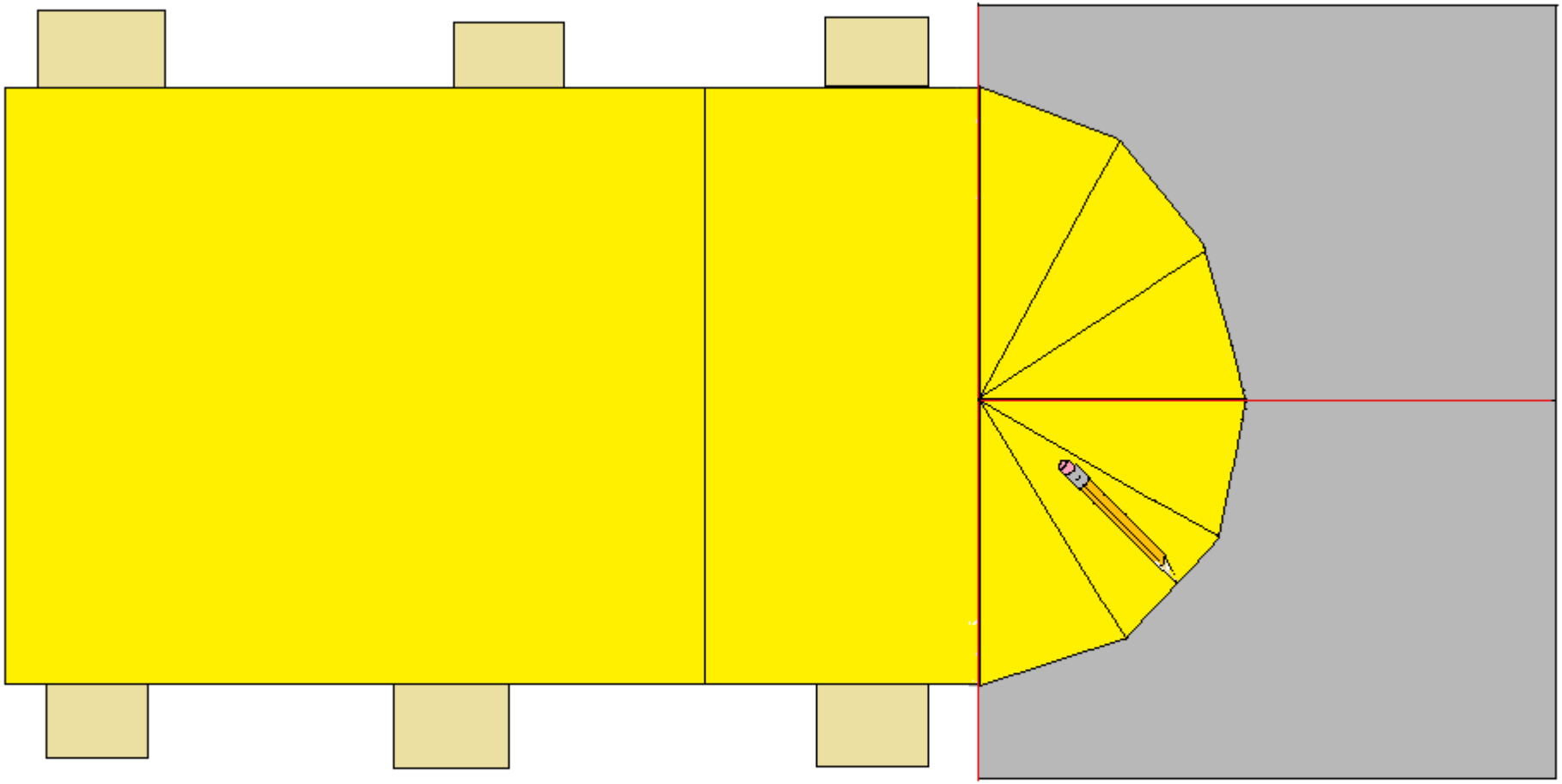
From the hitch hole, draw a line down the length of the sheet ending at the previous line (C)

Floor pan *second layer* (Continued)



Cut out the pieces (A) and (B)

Floor pan *second layer* (Continued)



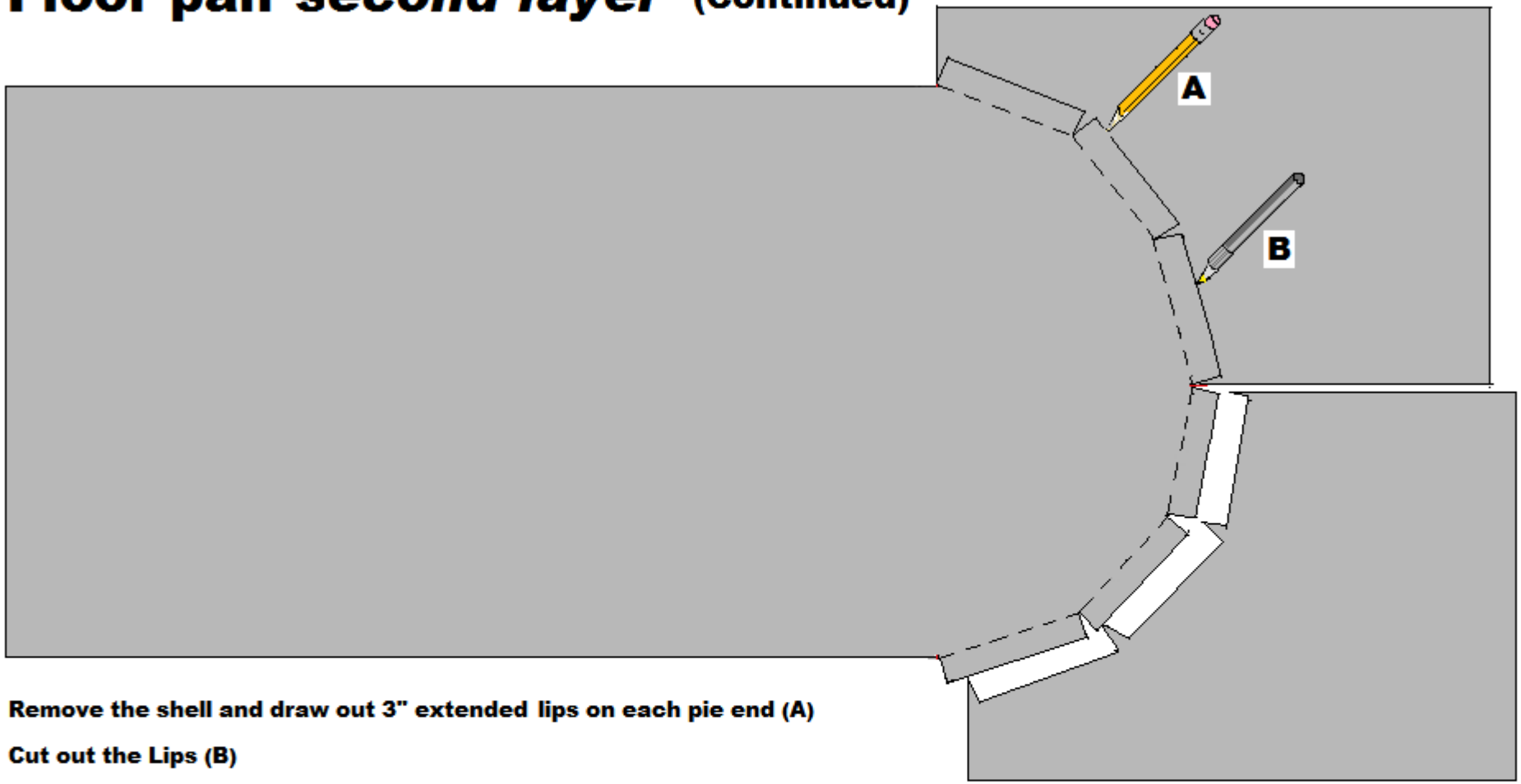
On a flat surface lay the shell over the sheet positioned as shown.

Take books and secure the shell against the pan edges.

Line up the center of the shell with the drawn out center line.

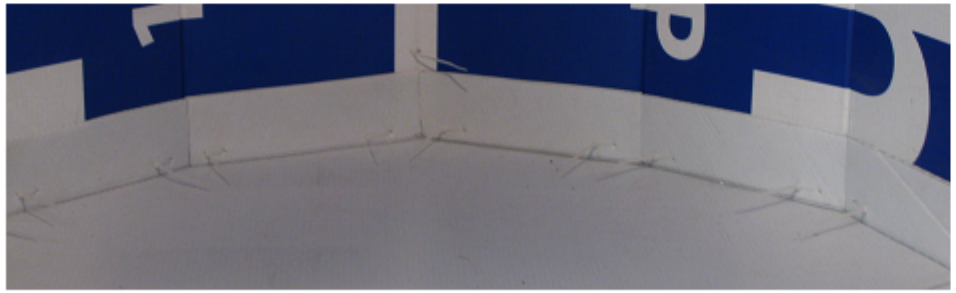
Either trace around the inside of the dome or trace arond the outside and bring the line in 1/4"

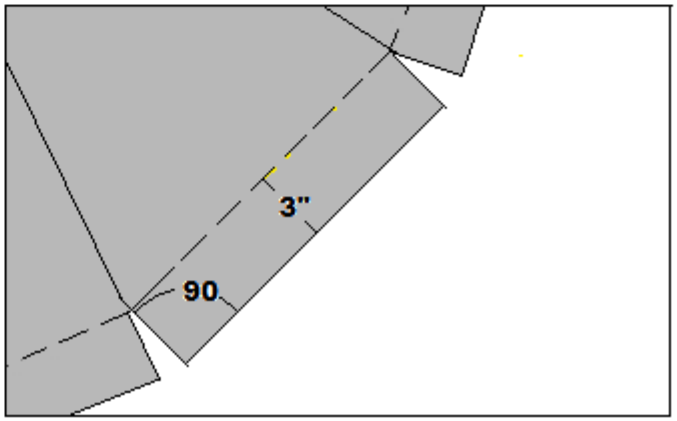
Floor pan *second layer* (Continued)



Remove the shell and draw out 3" extended lips on each pie end (A)

Cut out the Lips (B)

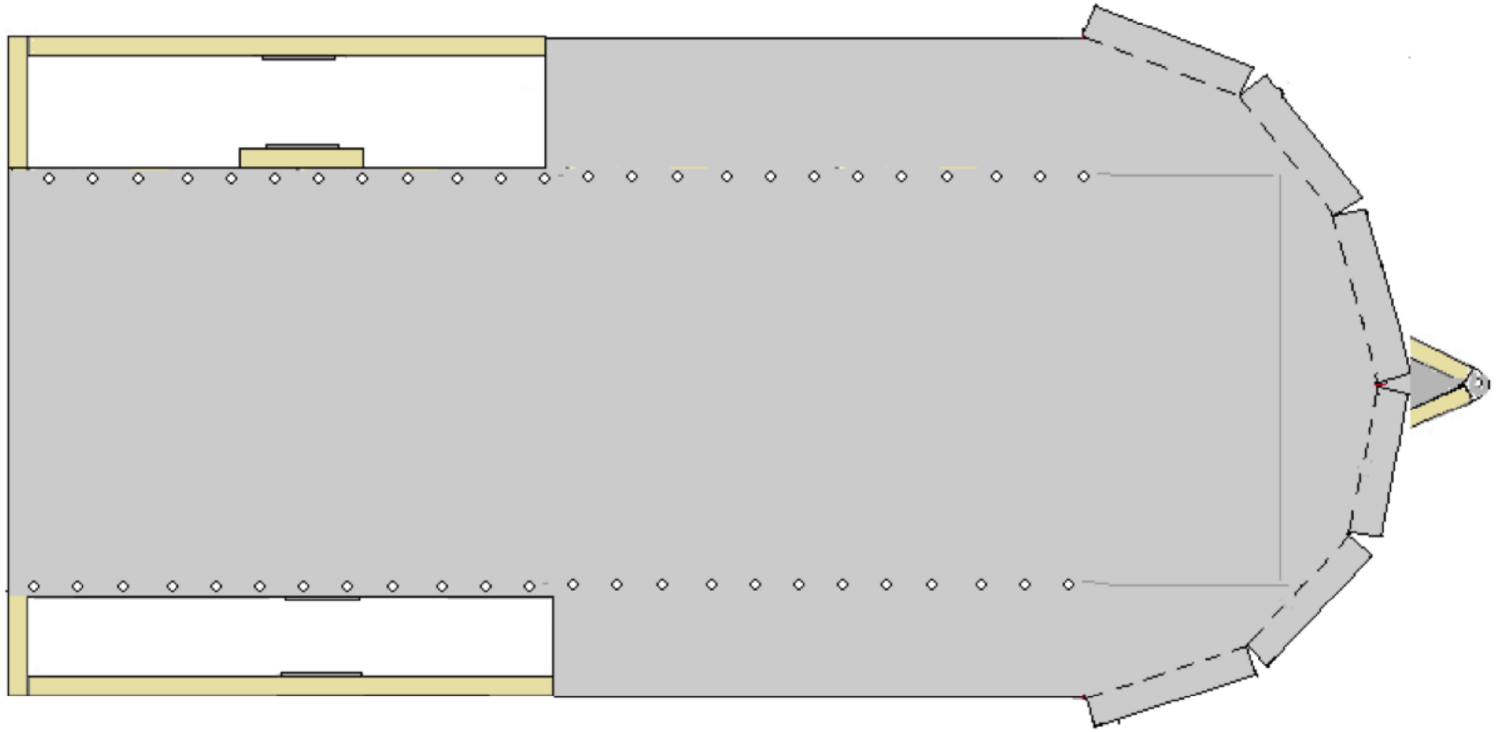




On the top side, crease on the dotted lines and bend the lips upward.

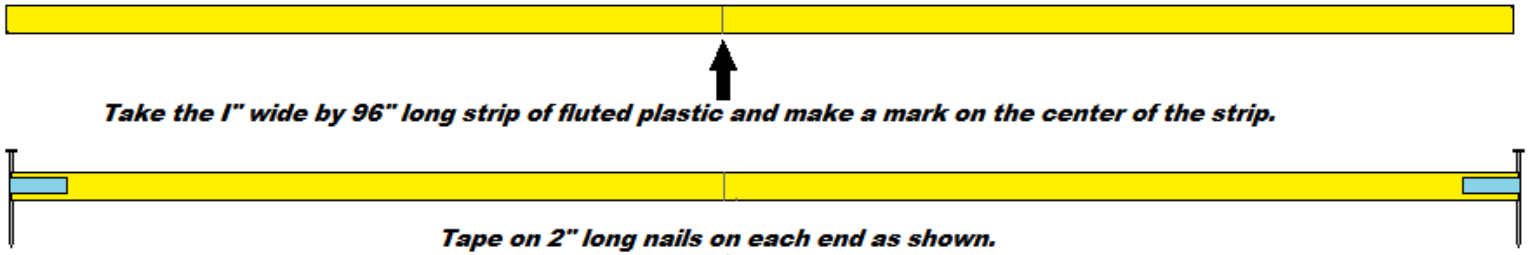
The goal is to have the lips fit tight to the inside base of the shell.

Attaching the panel



Space your washer head screws 3" apart.

Making and drawing out the arc



Take the 1" wide by 96" long strip of fluted plastic and make a mark on the center of the strip.

Tape on 2" long nails on each end as shown.

Measure and mark out the frame width on the bottom of the panel.

Find the mid point on the frame width, make a mark and from this point take a pencil and lightly draw a vertical center line to the top of the panel

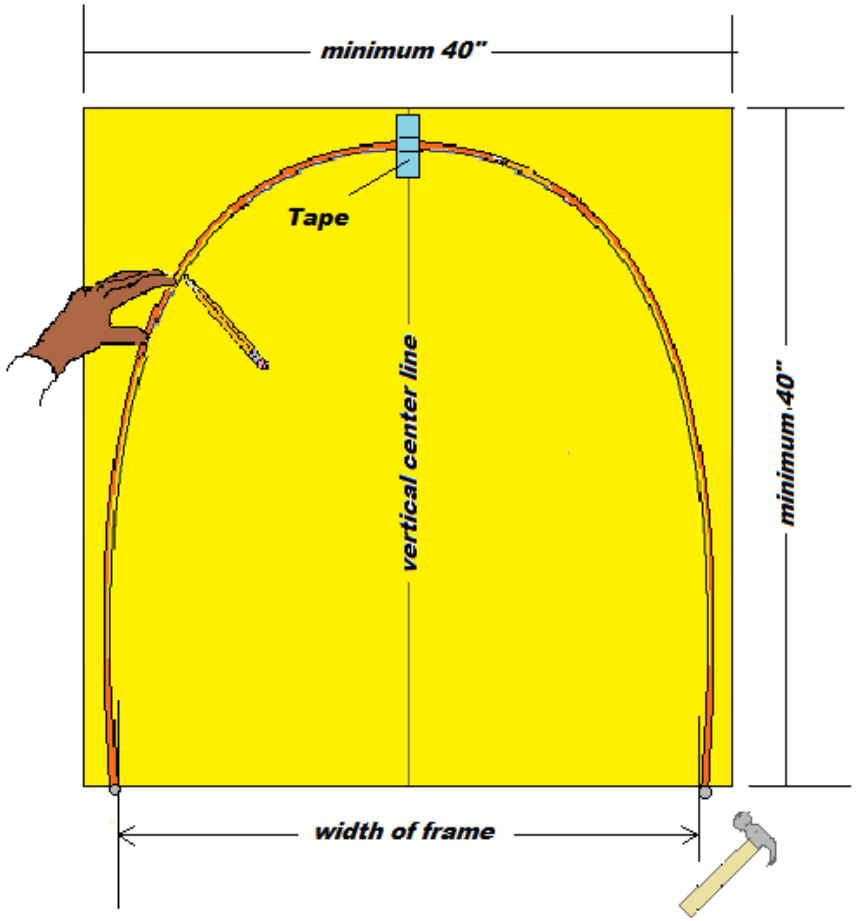
Nail down one end of the strip as shown in the detail box.

Arc the strip and nail down the other end.

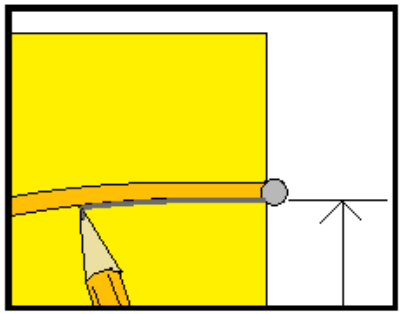
Place the arc center reference mark in line with the panel center mark.

Tape the arc in place.

Hold down the arc and trace around the inside.



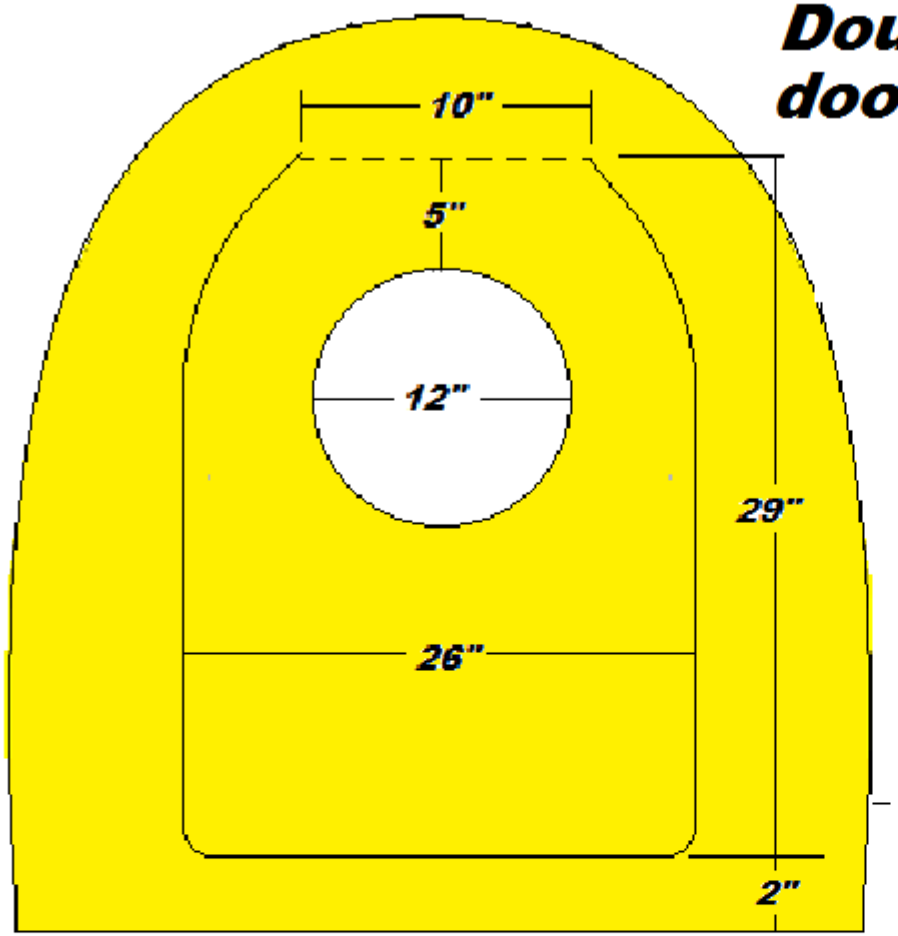
Take your door panel and measure and mark out the frame width on the bottom.

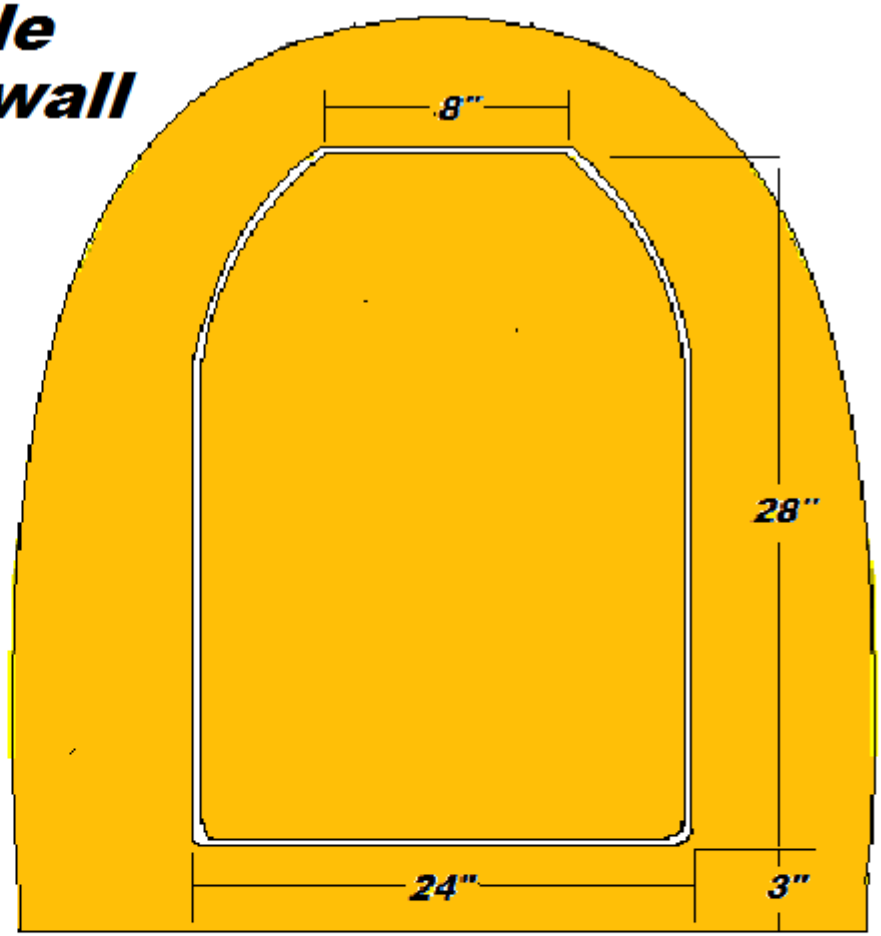


This is a double layered wall, so once you cut out this panel use it as a template to draw out your second panel.

Carefully cut out the second panel, doing your best to match the first panel.

Double door wall





The door wall has two layers. This is the outside layer.

You may notice the door dimensions on this layer are 1" wider on the top and bottom.

This was done so the protruding door edges on the back layer act as a door stop.

Center the door and draw out the measurements.

Cut out the sides and bottom of the door and the window, but only cut the back layer on the top horizontal hinge.

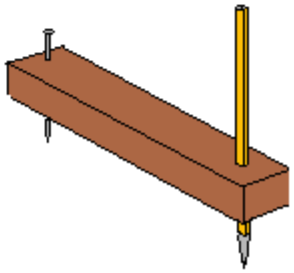
(Dotted line)

This is the back layer.

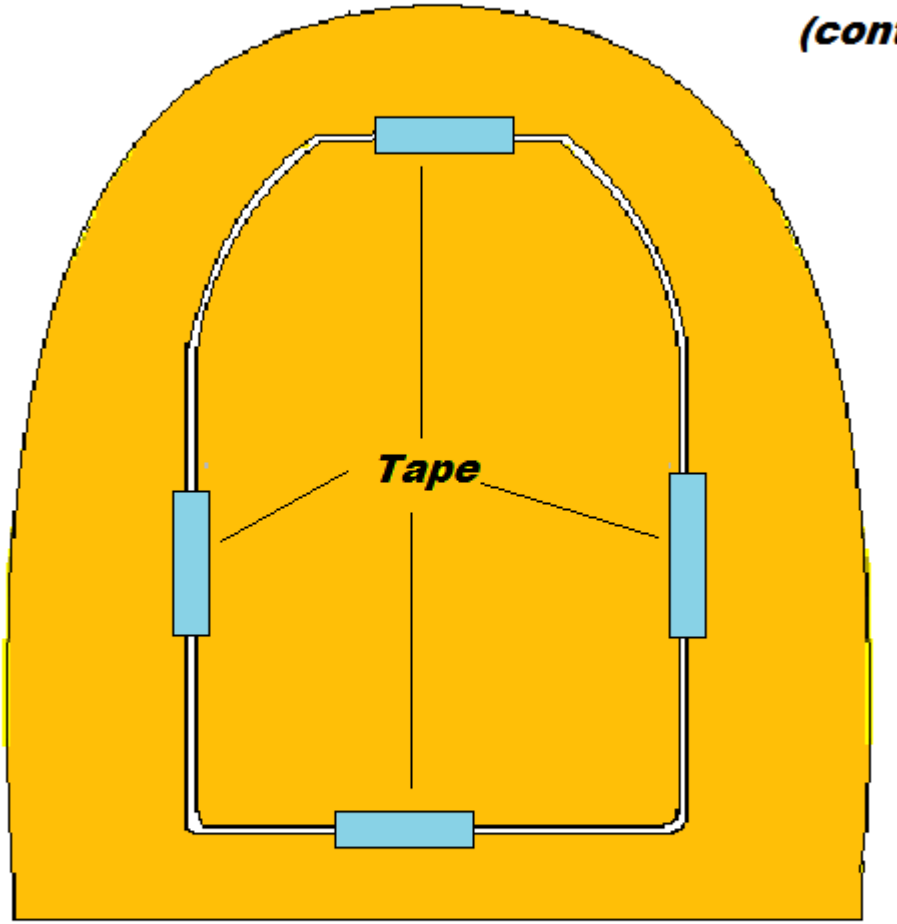
Center the door and draw out the measurements.

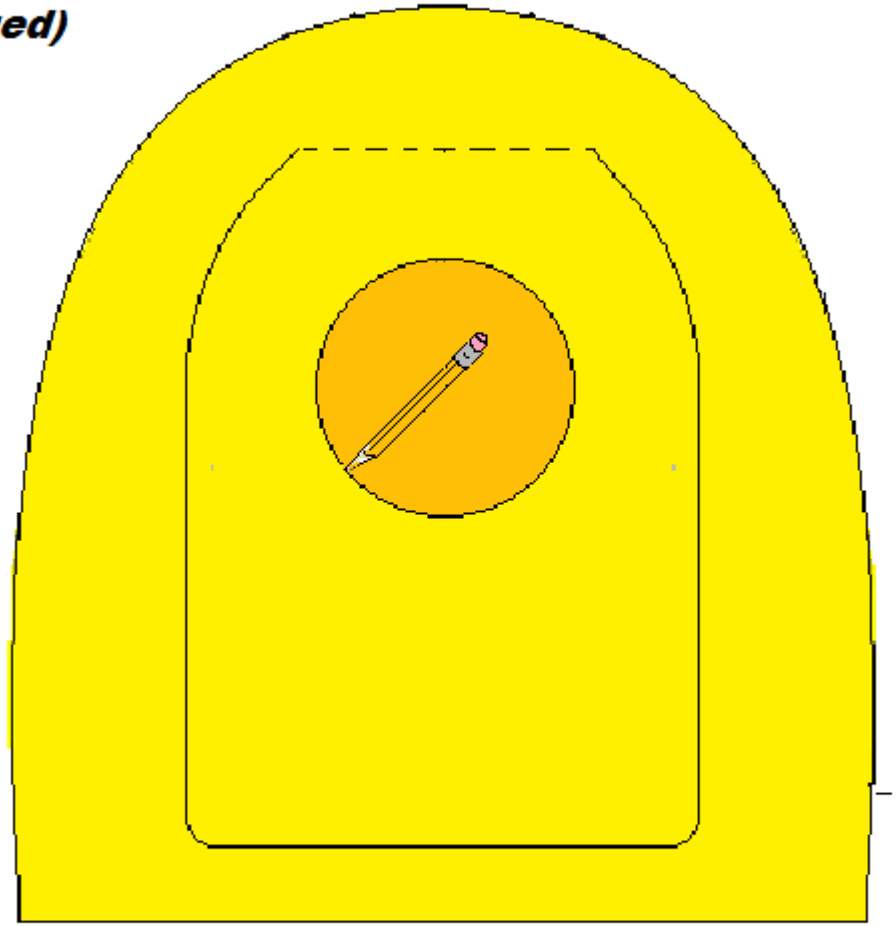
Once the door is cut out, take the door piece and trim a quarter inch around all the edges.

On the right is a handy drawing campass for the window outline. Take a small board, drill a hole the diameter of a pencil, slide in a pencil, measure out 6" and pound in nail.



Double Door wall
(continued)





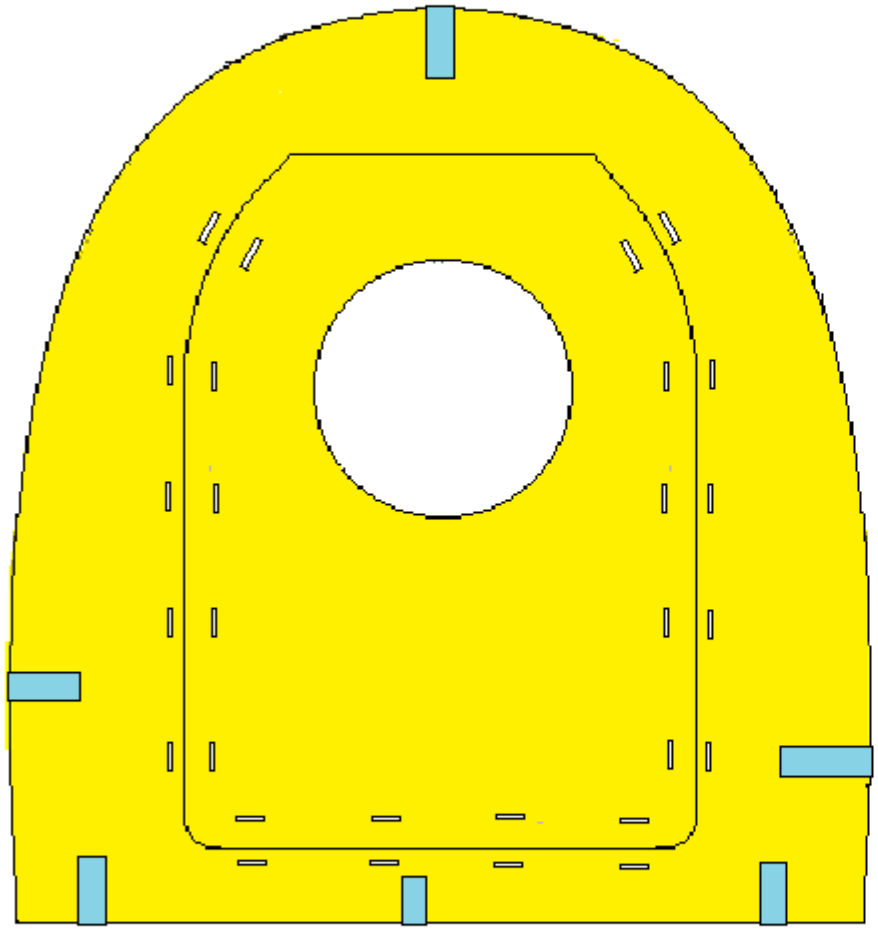
To make the window holes match up, tape down the door on the back panel as shown above.

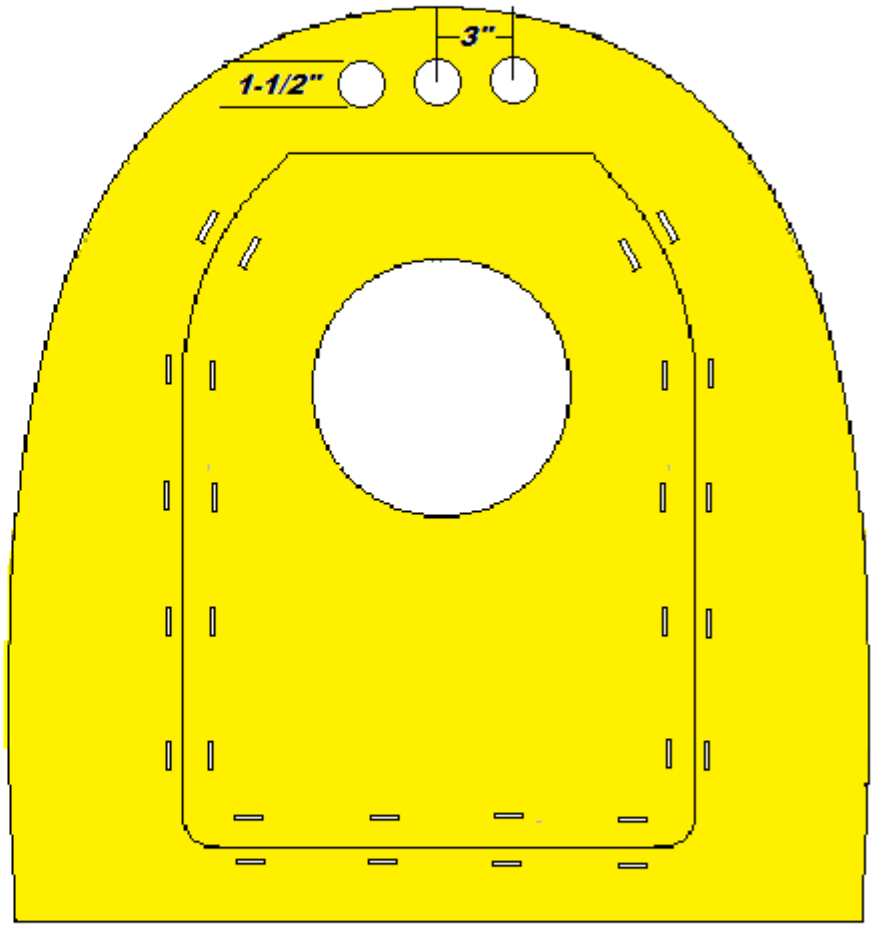
Lay the top layer over and trace around the window opening

Remove the top layer and cut out the window opening.

If you choose to sandwich bubble foil insulation in between the walls be warned that the insulation would get in the way of a sliding pocket window when retracted.

Double Door wall
(continued)



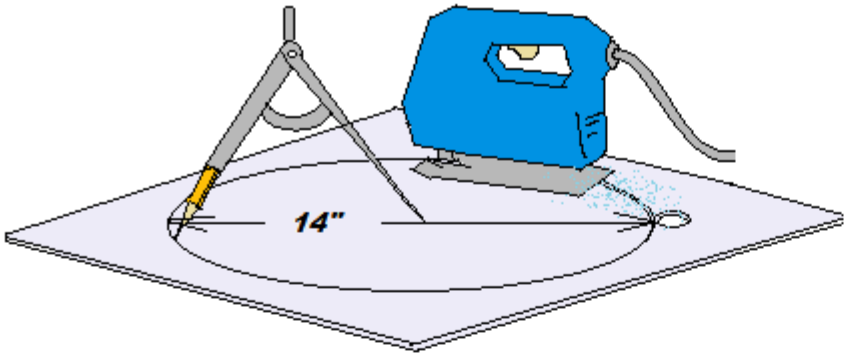


Tape the walls together and install the zip ties as shown above. Do not add ties above the door yet.

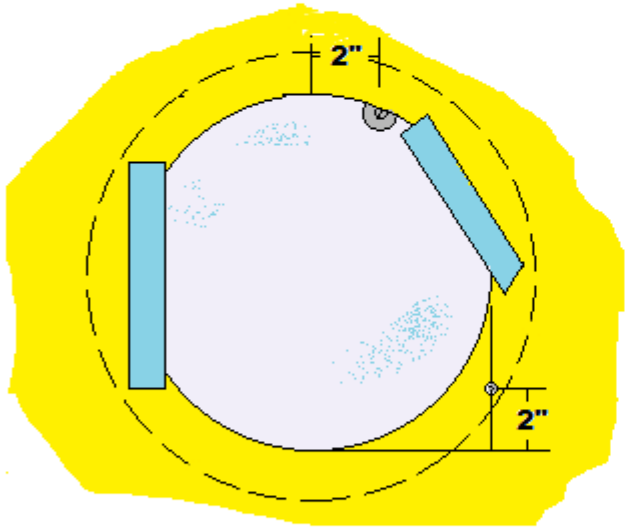
Remove the tape.

Measure and cut or drill out the 1-1/2" diameter vent holes with a hole saw.

Finishing the door wall



Take you 16" square 1/8" thick Plexiglas, draw out your 14 diameter window, cut a starting hole and cut out the window with a jigsaw.

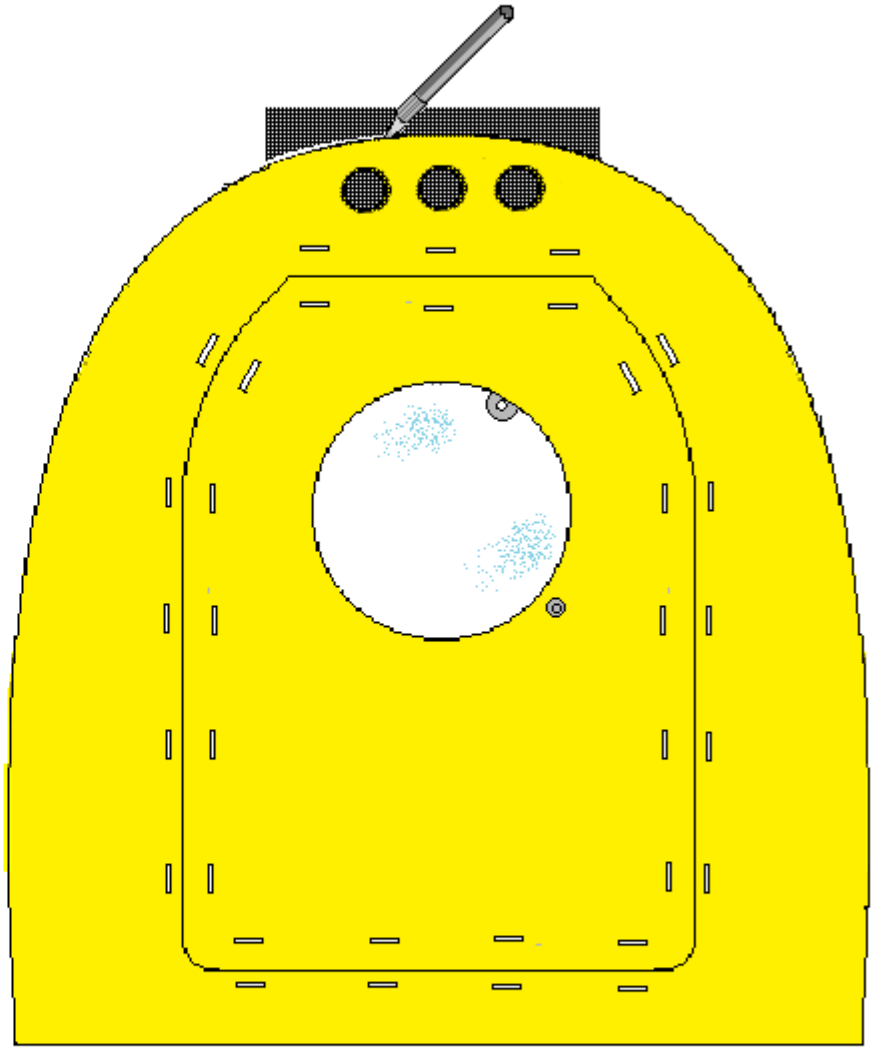


Once you've cut out your plexiglass, slip it between the two layers and center it.

Tape the plexiglass to the panel.

Locate and drill the handle and pivot holes.

Install the handle (facing in) and pivot bolt.

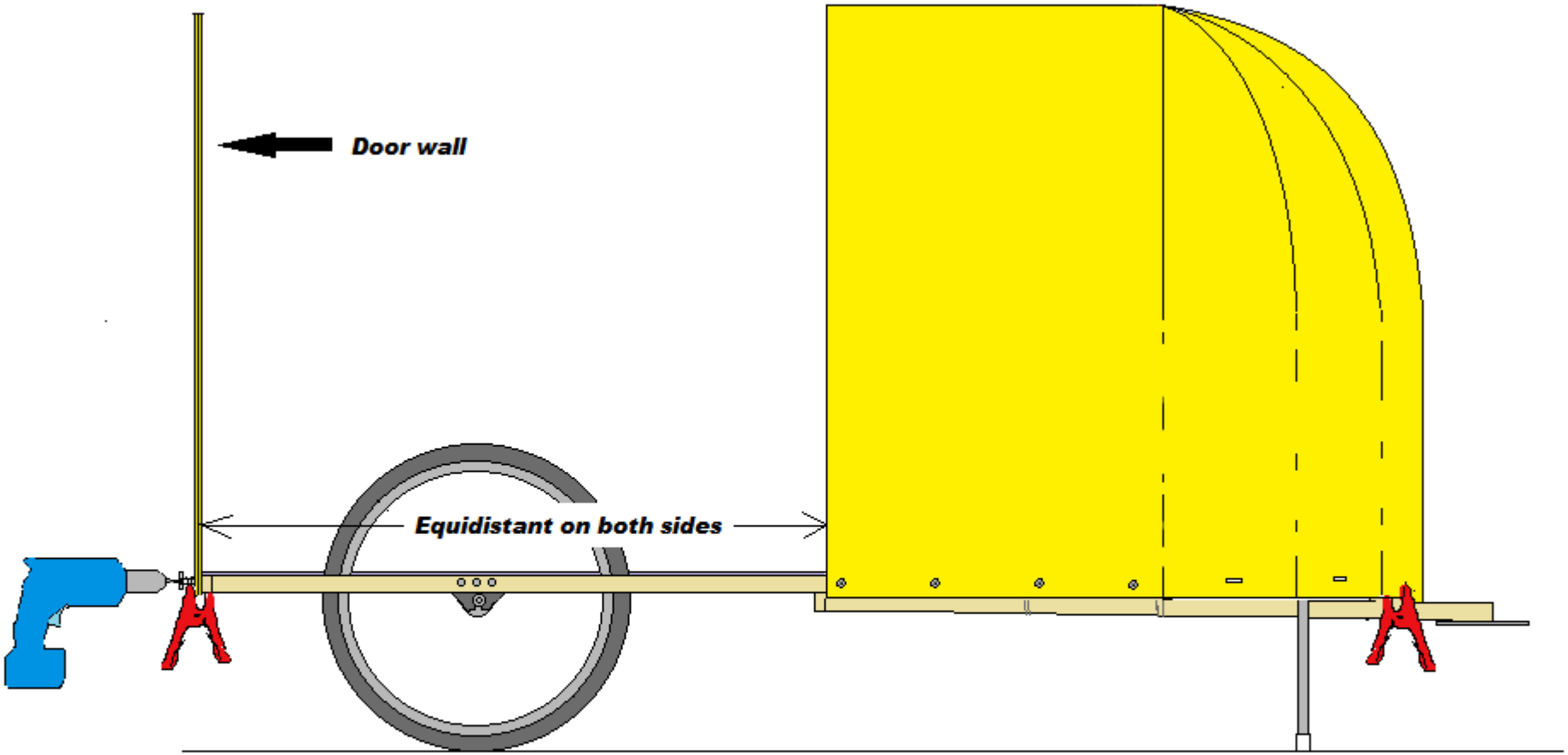


Slide a piece of bug screen between the two layers with the screen stopping just above the door hinge.

Install the zip ties on the top and above the door, making sure the ones above the door go thru the bug screen.

Cut off the excess bug screen material.

Joining the body to the frame



Once the frame, dome and door wall are compete you're ready to attach the body to the frame.

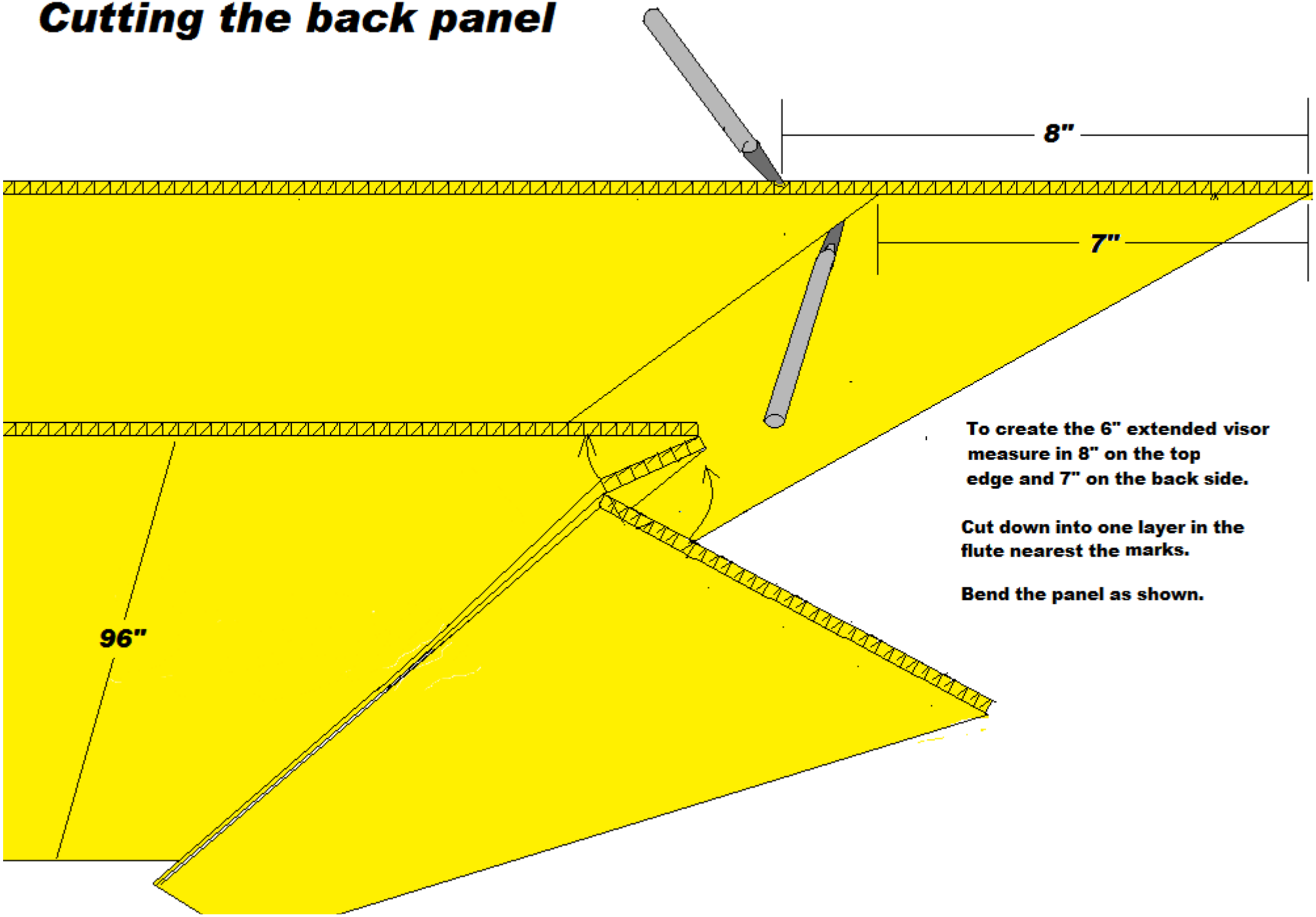
The bottom edges of the body hang down 1/4" past the frame which helps keep the wood frame from getting wet.

Install the Door wall to the back side of the frame using 5/8" long washer screws spacing them at least 5" apart.

Make sure the front floor pan flaps are facing up before installing the dome.

It's important to adjust the dome so the distance between the lower corners of the dome to the door wall are equidistant on both sides.

Cutting the back panel



To create the 6" extended visor measure in 8" on the top edge and 7" on the back side.

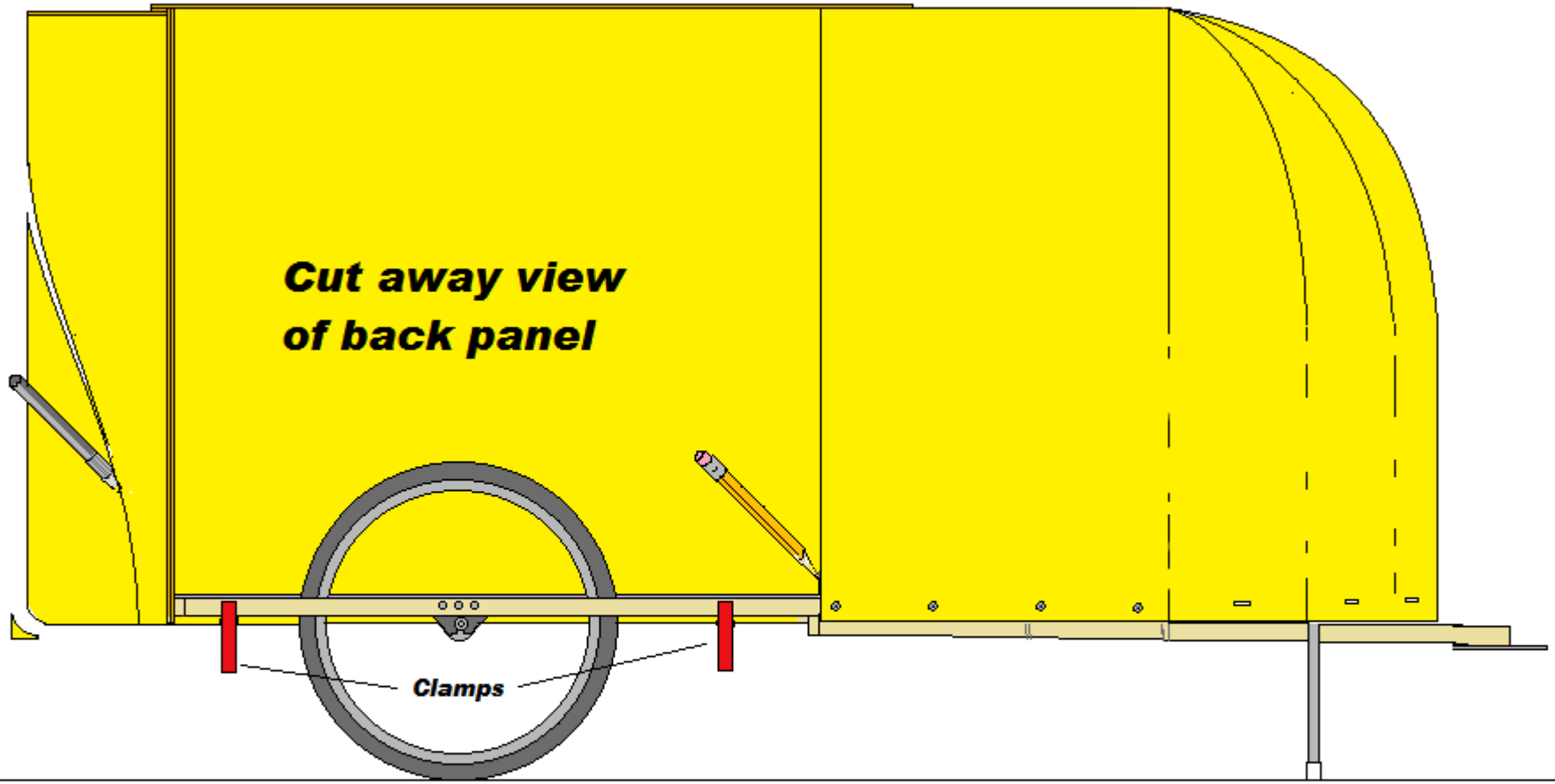
Cut down into one layer in the flute nearest the marks.

Bend the panel as shown.

Arcing the rear panel

Joining the body to the frame

(Continued)



Arc the back sheet and place it on top of the door wall and rear section of the dome.

Slide the lip forward until tight against the exterior door wall. Add clamps at the bottom to secure the sheet to the frame.

With a pencil, trace along the lower edge of the dome.

This will be the cut- off mark for the back sheet.

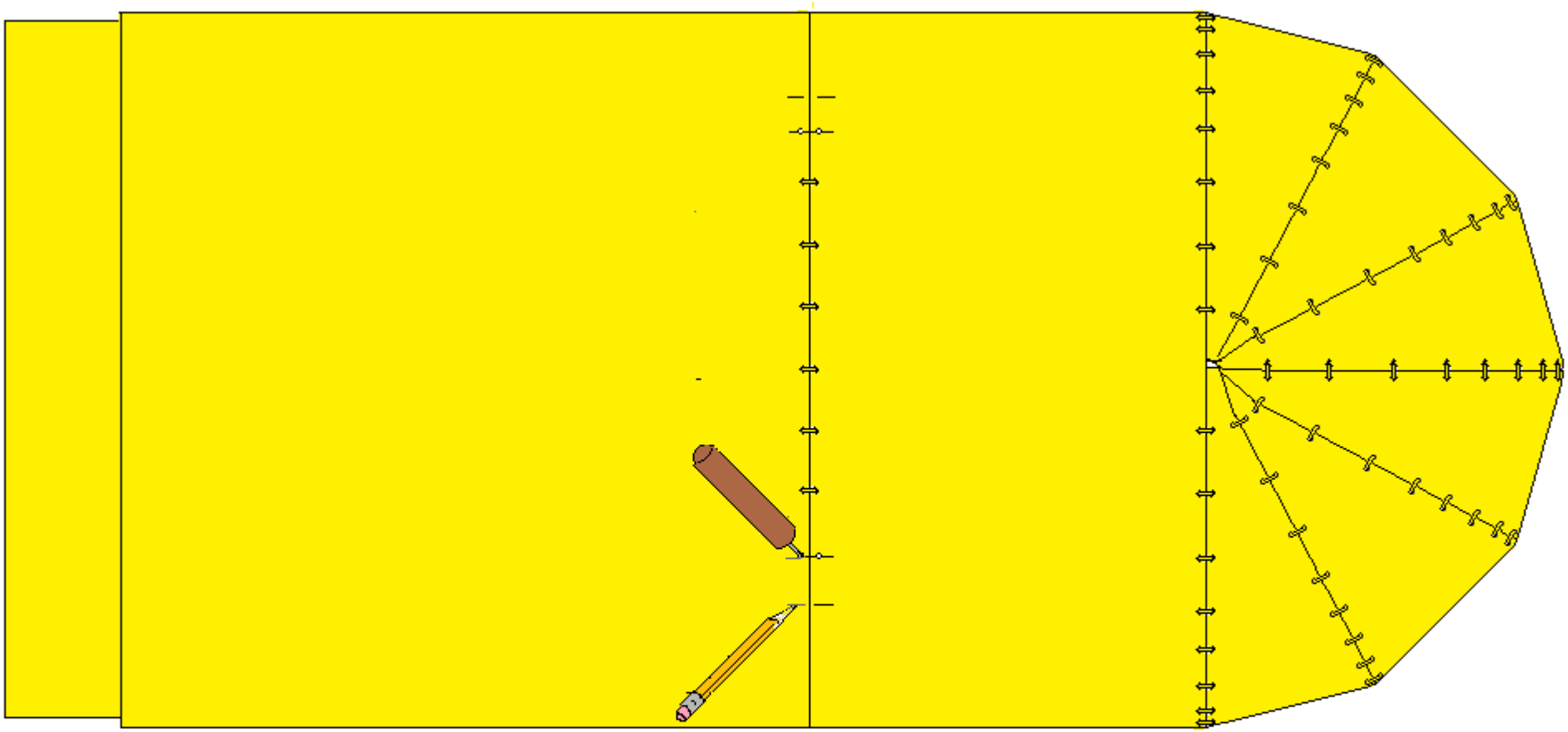
Take the back sheet down and run your knife down the flute closest to the trace mark.

This cut will butt up against the rear dome edge.

You can also trim the rear overhang to your liking, or leave it full lenth.

You should however round off the two lower corners.

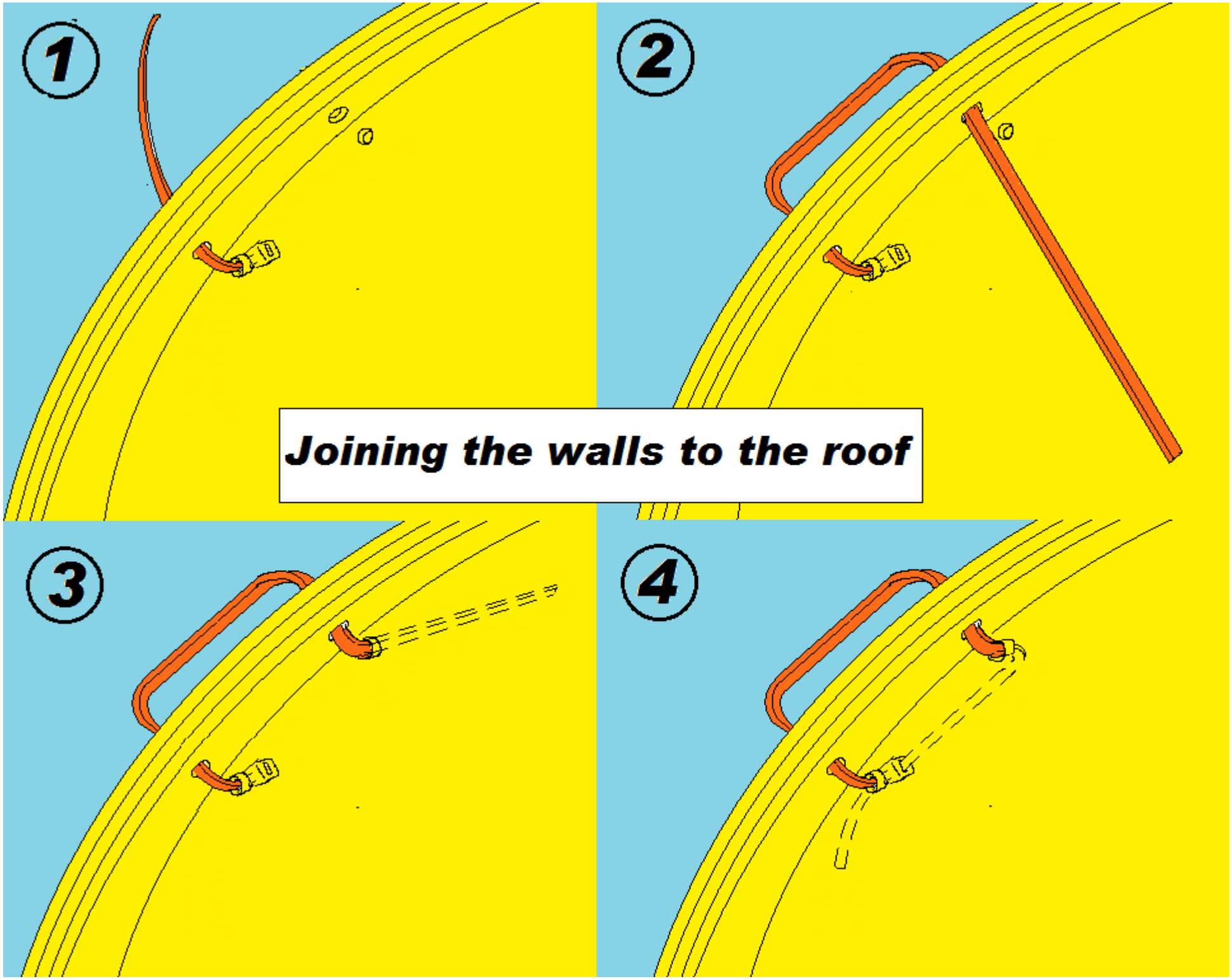
Attaching the body panels



If you measured correctly the butt joint, or where the two panels meet, should be nice and tight.

Before securing the back panel to the frame, attach the two panels together at the butt joint starting at the top and working your way equally down the sides.

This technique will eliminate any hump that might develop in the seam due to the panels not being the same length.


1
2
Joining the walls to the roof
3
4

Overhead Storage Bins

The two storage bins are identical.

Start with a 38" by 19" sheet.

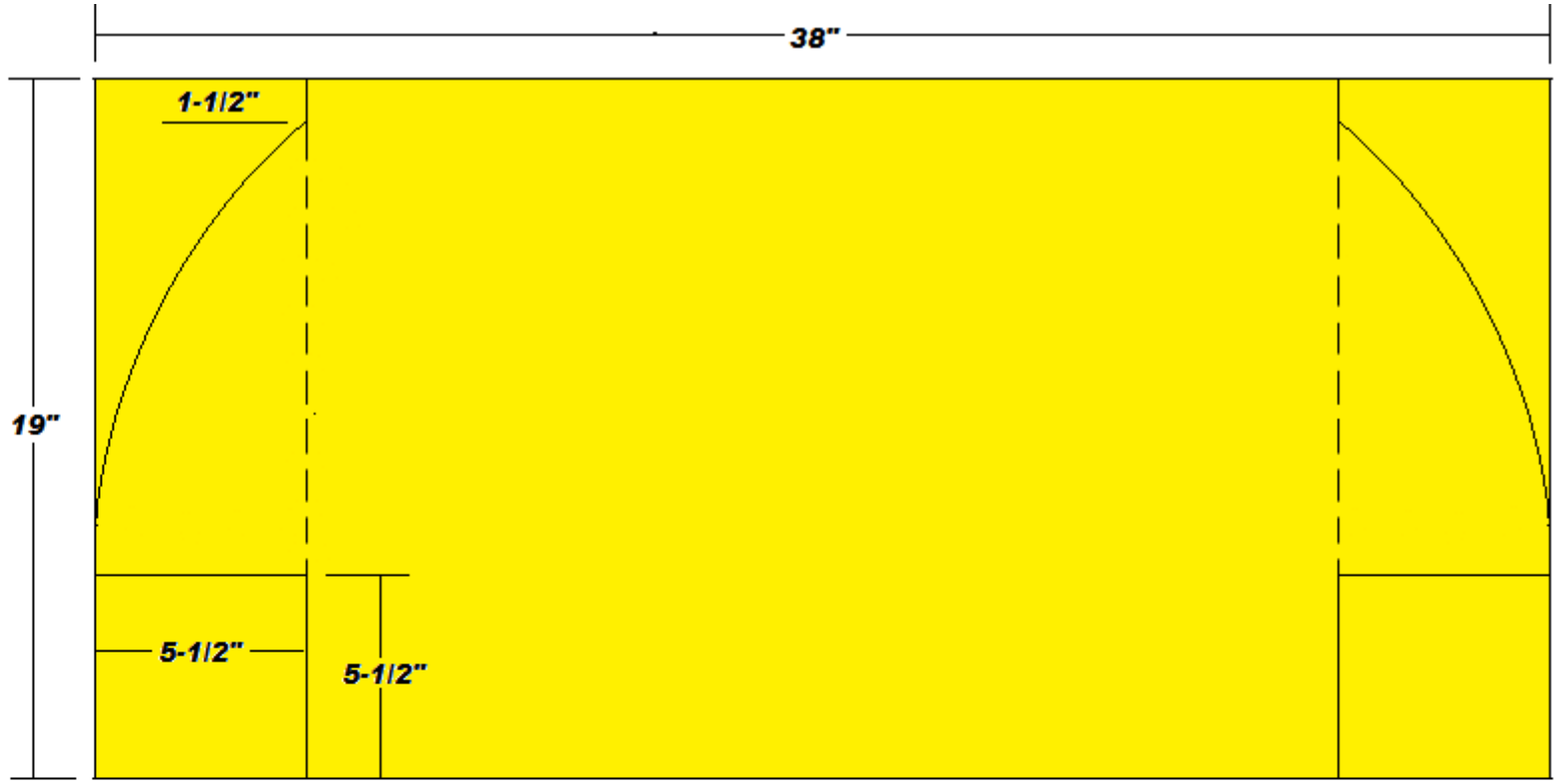
Plot the measurements.

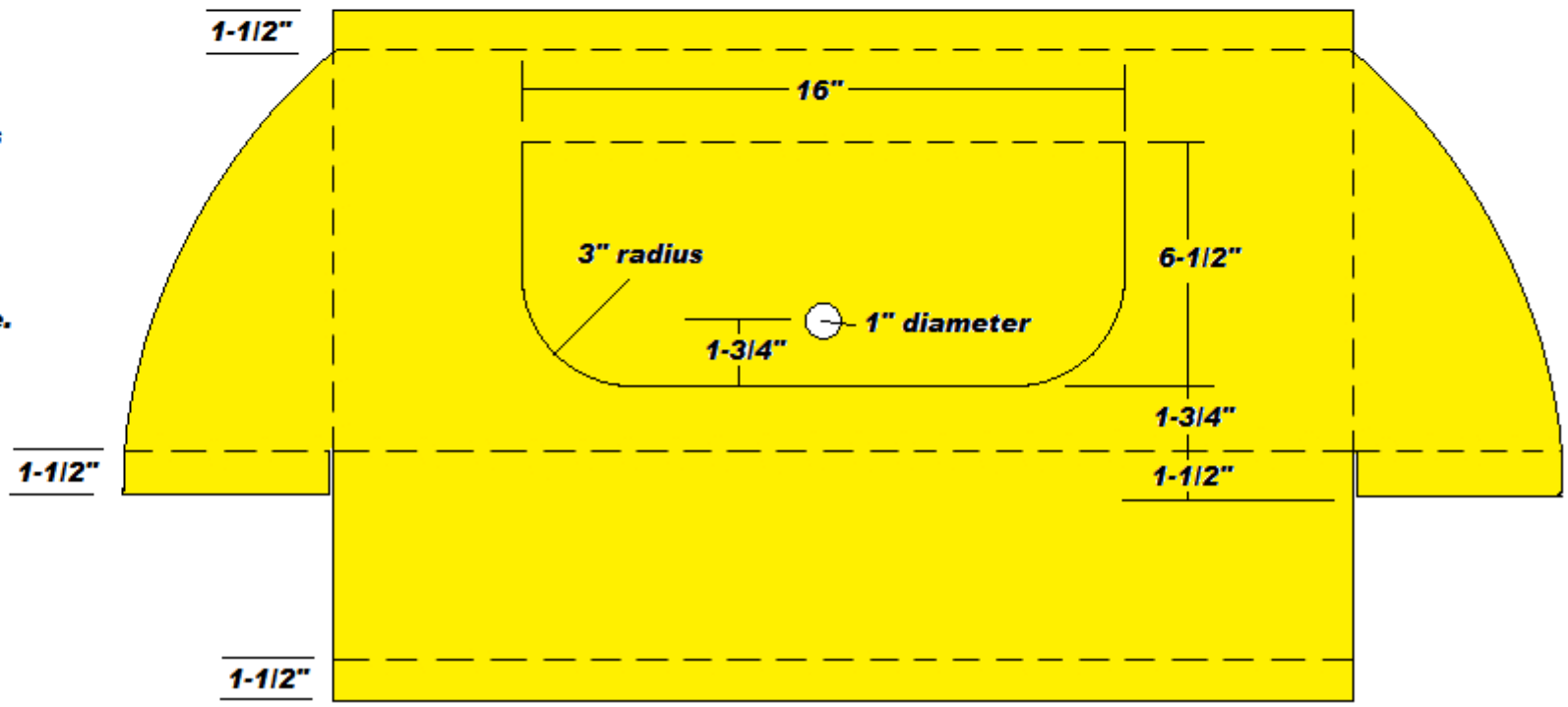
The curved lines should match the curve of the roof.

The solid lines are cuts. The dotted lines are creases.

The top and bottom folds plus the door hinge are creased face up.

The remainder are creased on the back side.

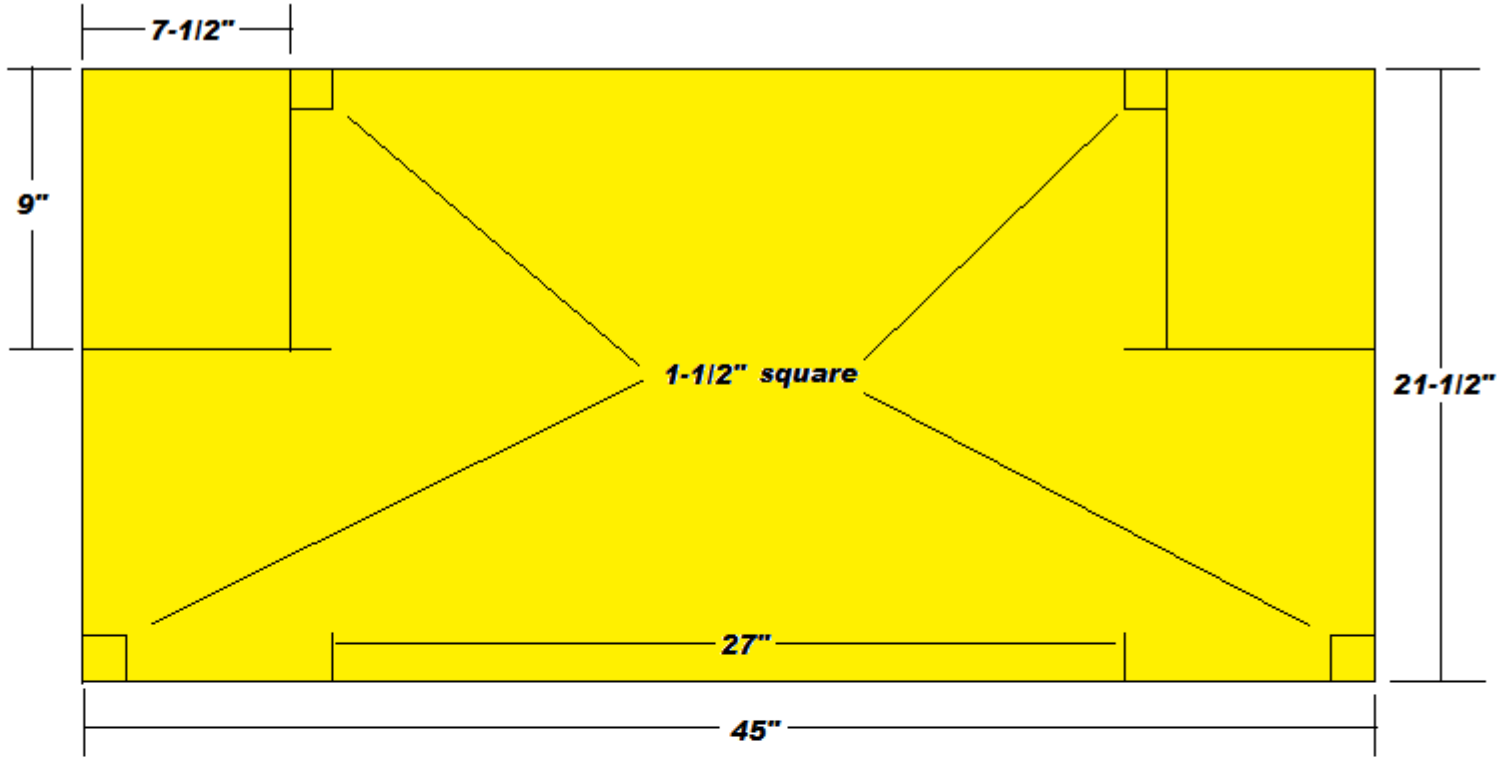




Left wheel well

This is the side where the 5" by 9" bread pan resides.

The dark lines are cut lines.



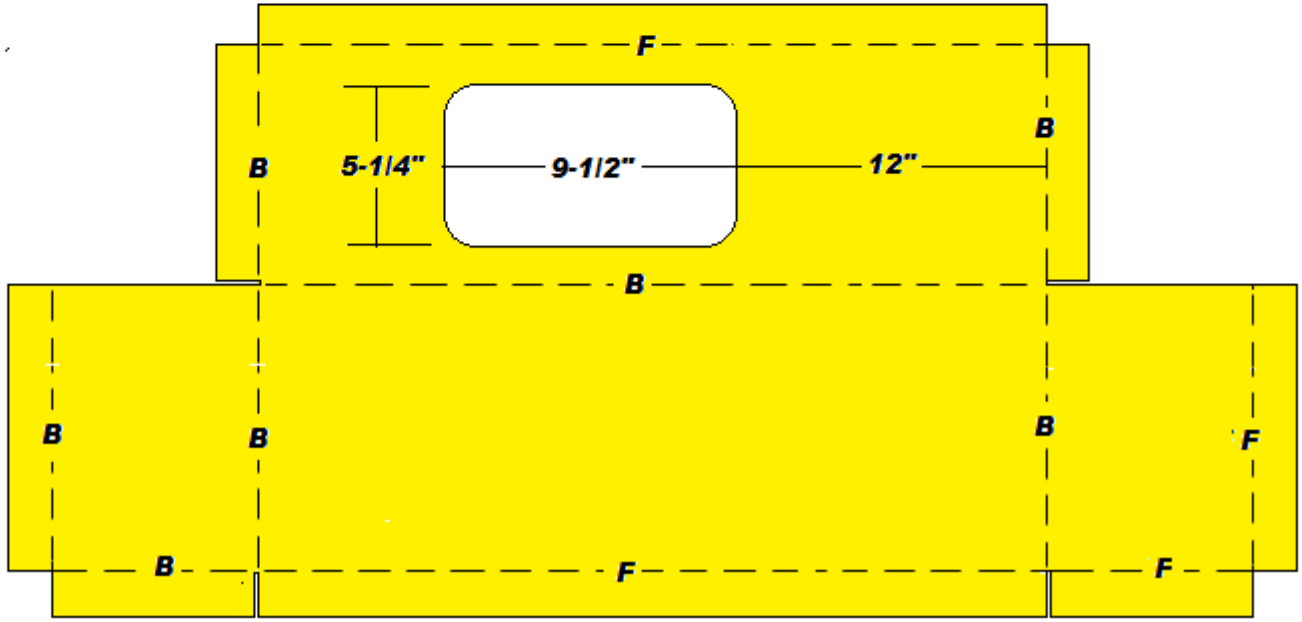
The dotted lines represent crease lines.

After making a crease, bend as if you were closing a book.

'F' stands for front side.

'B' stands for back side.

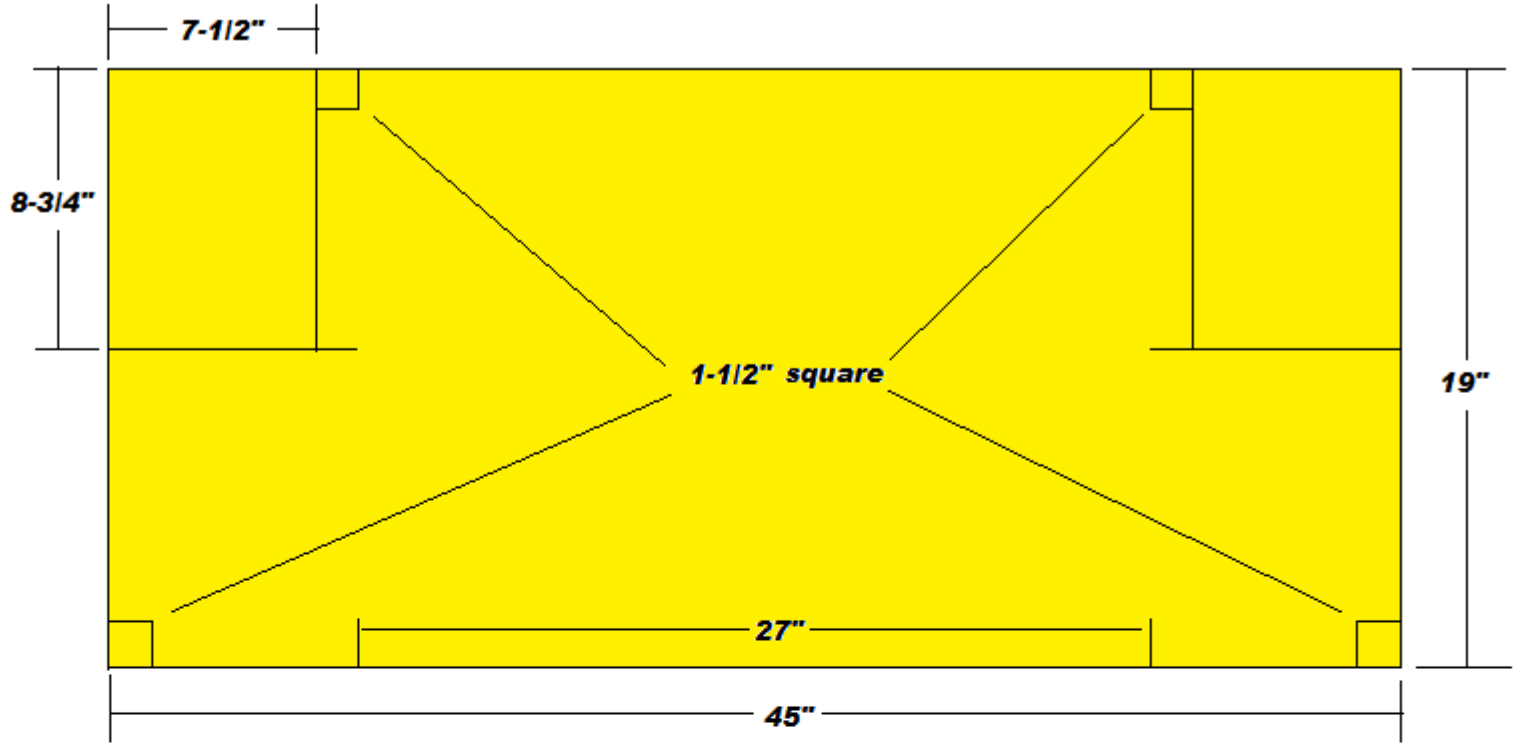
The hole is the cut-out for the bread pan.



Right wheel well

This is the side where the propane stove resides.

The dark lines are cut lines.



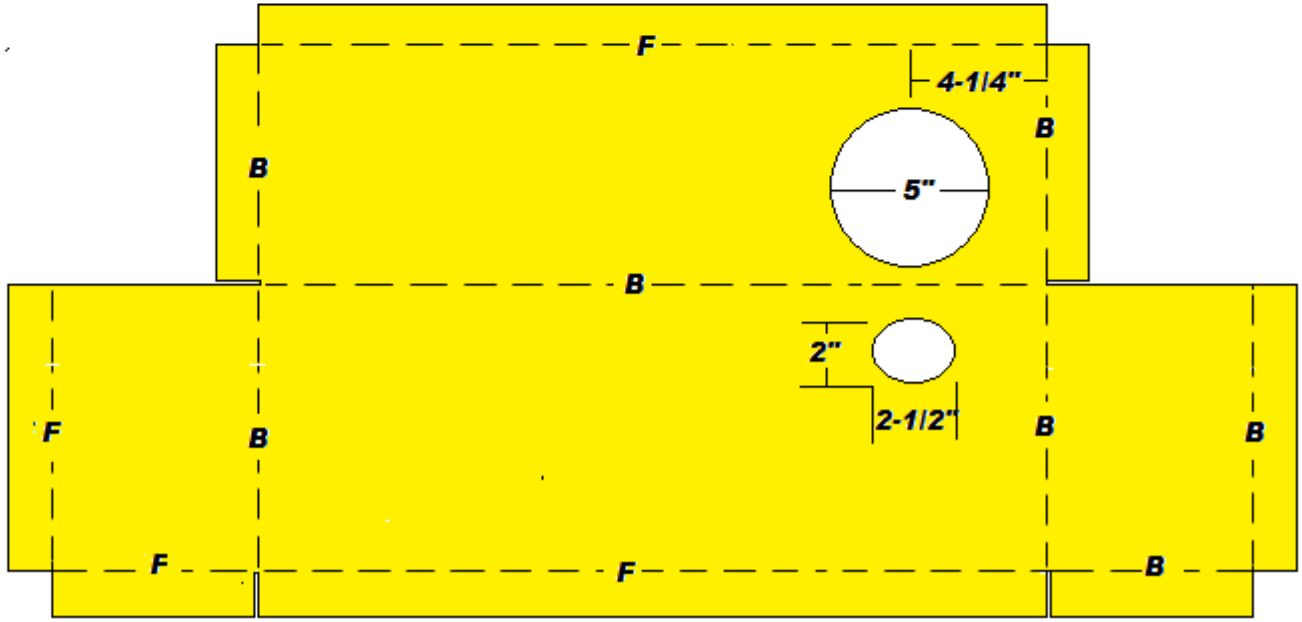
The dotted lines represent crease lines.

After making a crease, bend as if you were closing a book.

'F' stands for front side.

'B' stands for back side.

The hole is the cut-out for the propane stove.

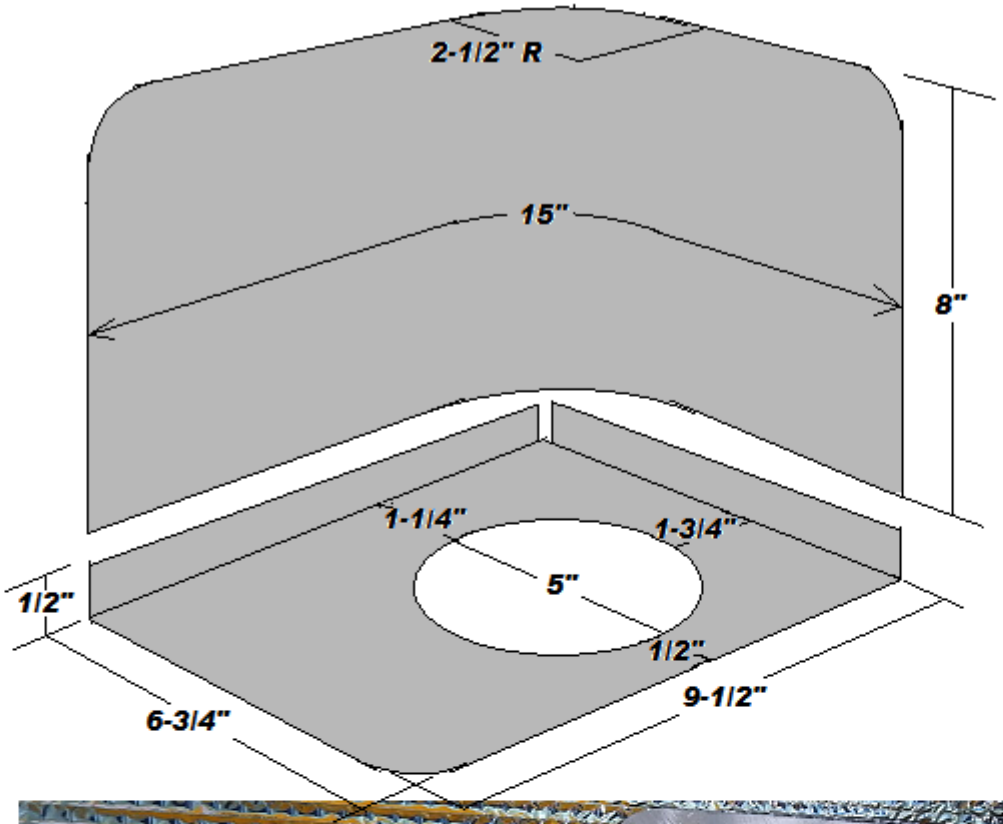


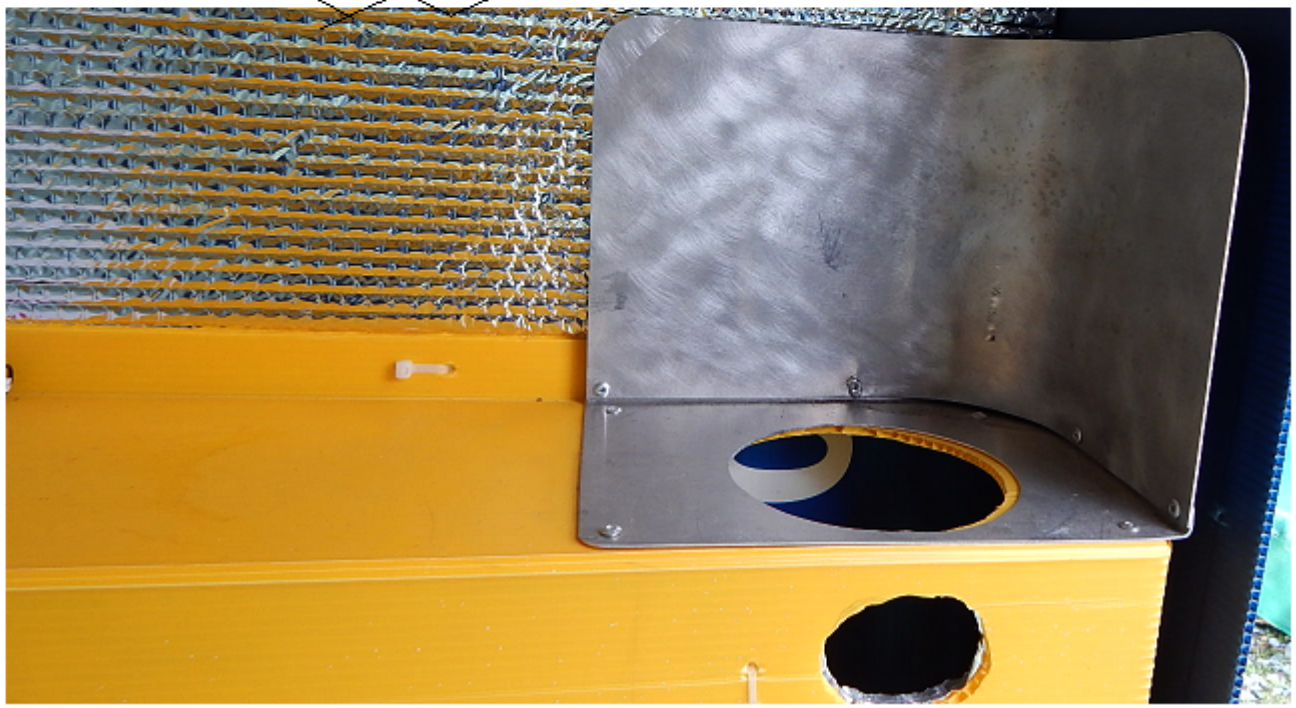
Stove shield

The shield is made with 1/16" thick aluminum sheeting.

A few pop rivets were used to attach the two pieces together.

To mount the shield to the wheel well I used long rivets with washers on the back side.





Making the skylight

The skylight is made using a one gallon bucket

Measure down 1-1/2" from the top.

Make a mark and carefully cut around the bucket.

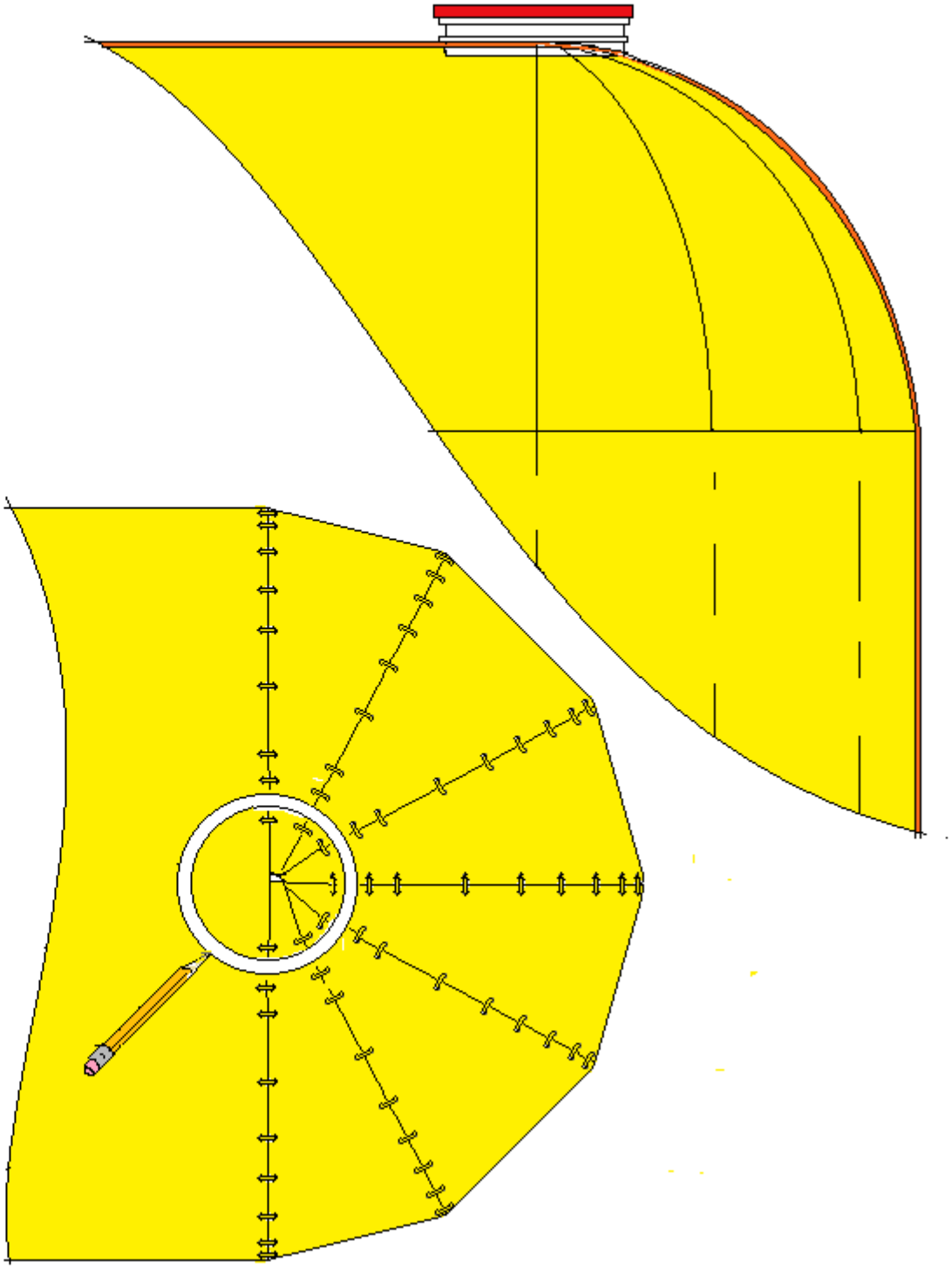
Use this ring as a drawing stencil.

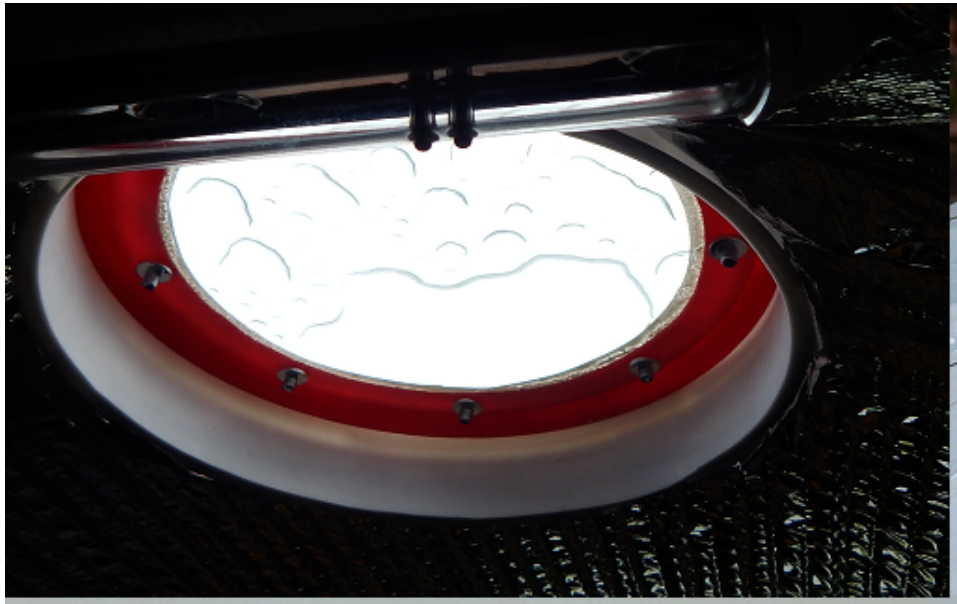
Center the ring as shown and trace around it.

Cut out the circle with your razor knife.

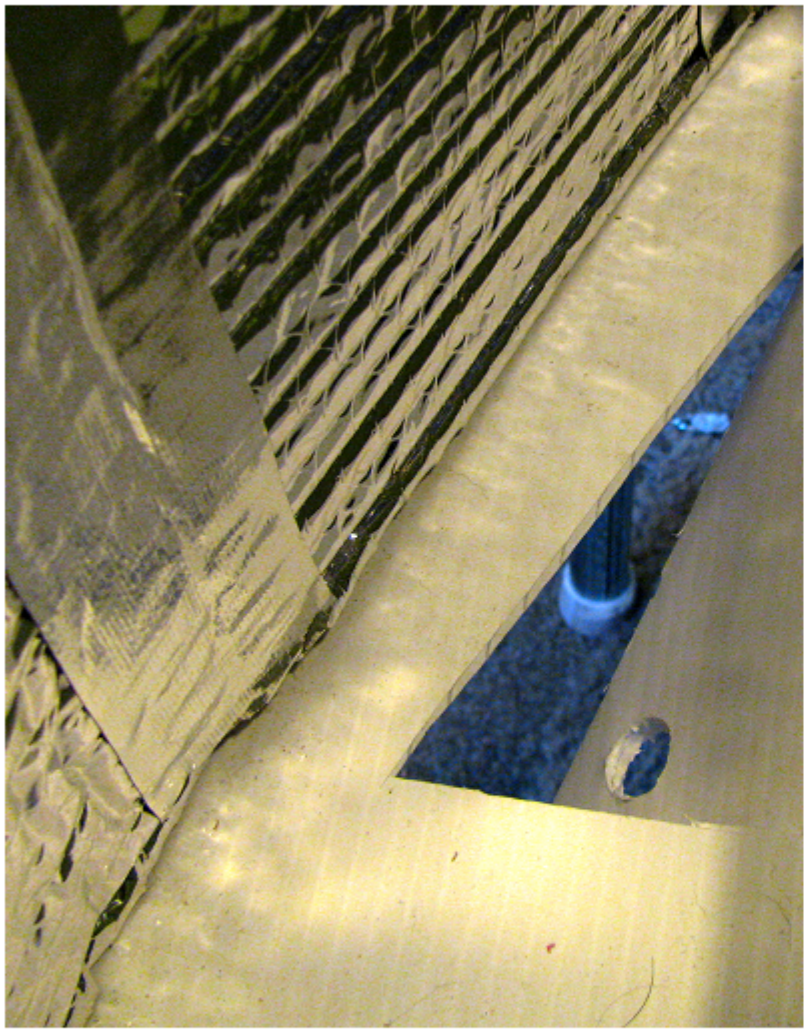
Install the ring so the collar rests on the body.

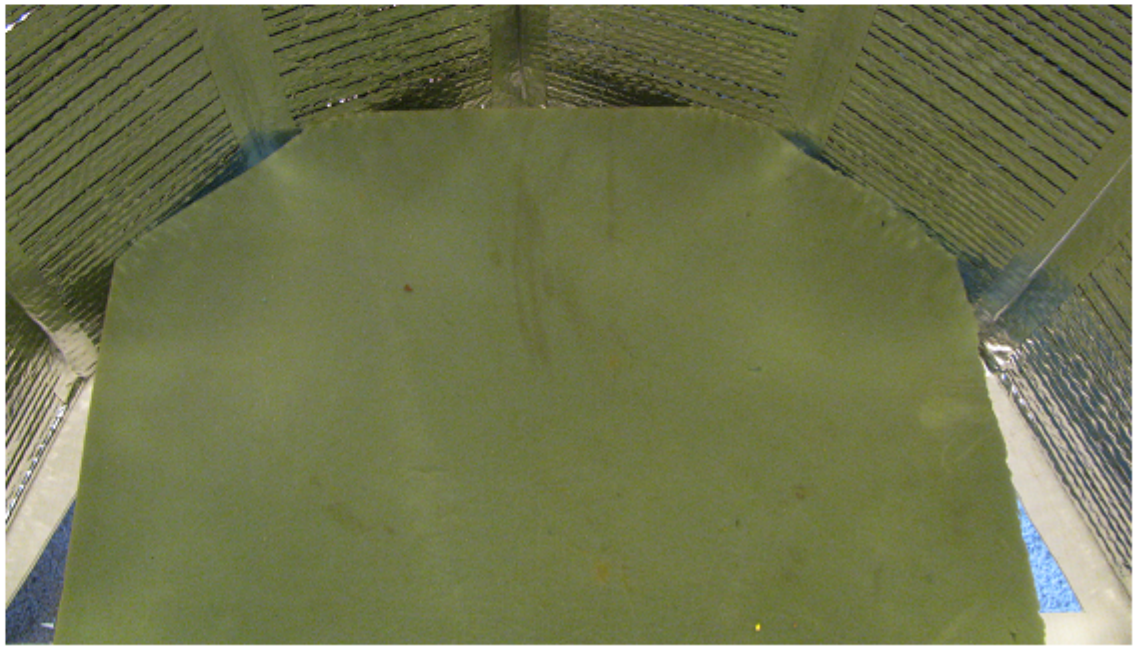
Rejoin the pie ends together with zip ties, installing them 1/2" from the bucket ring.





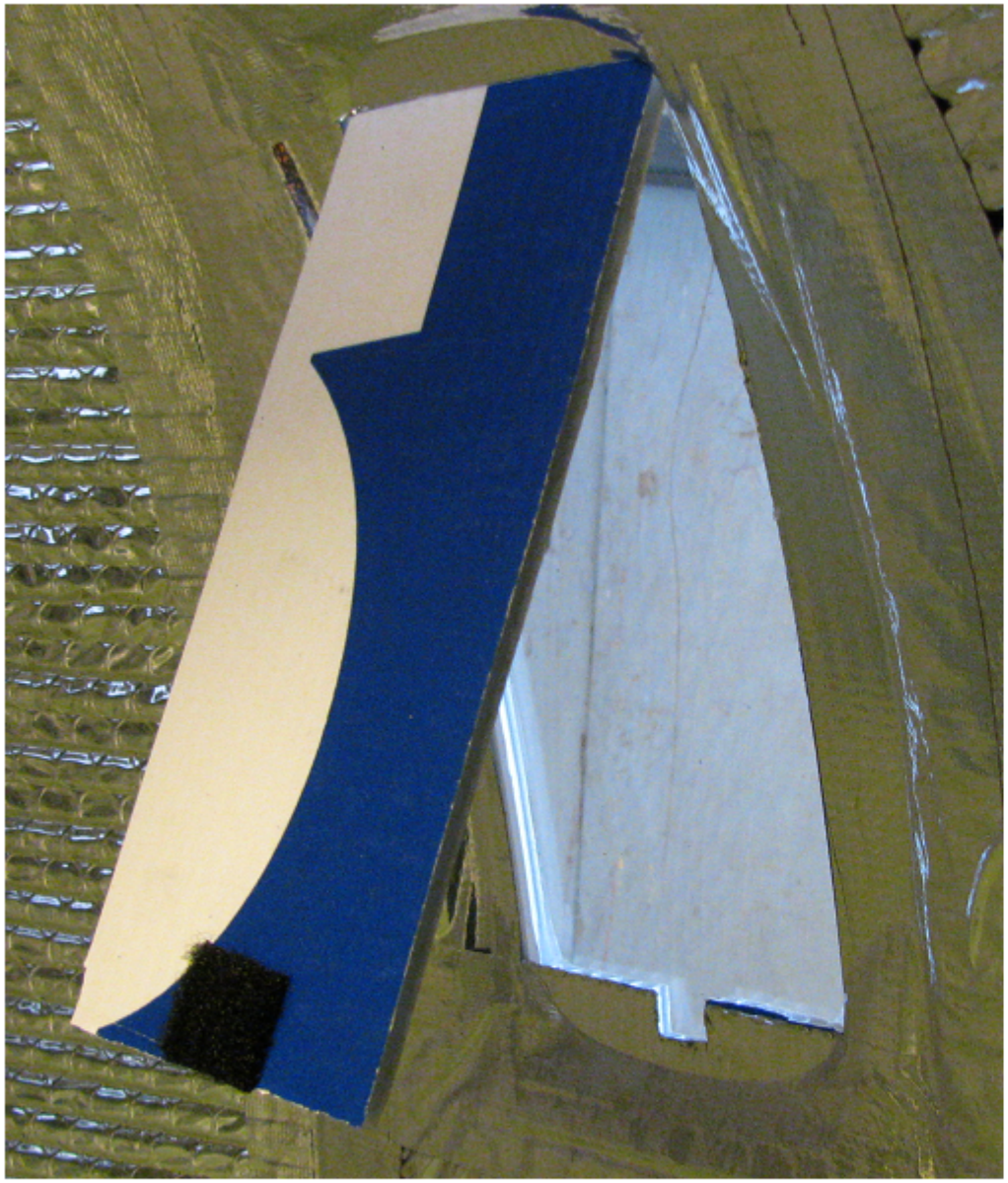
Vent flaps





For added ventilation I added these two flaps on either side of the mattress.
For the hinge I cut only the inside flute so they open outward.

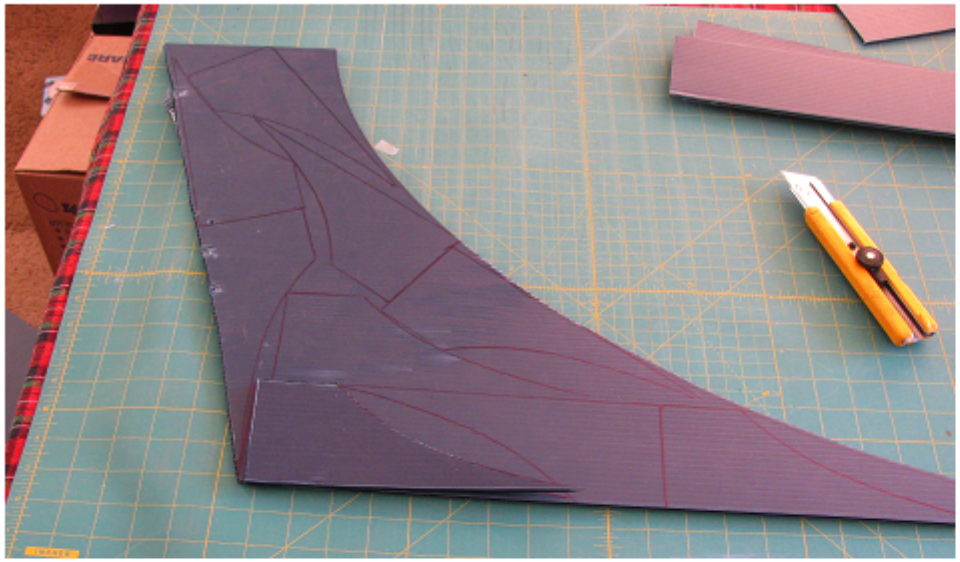
View windows

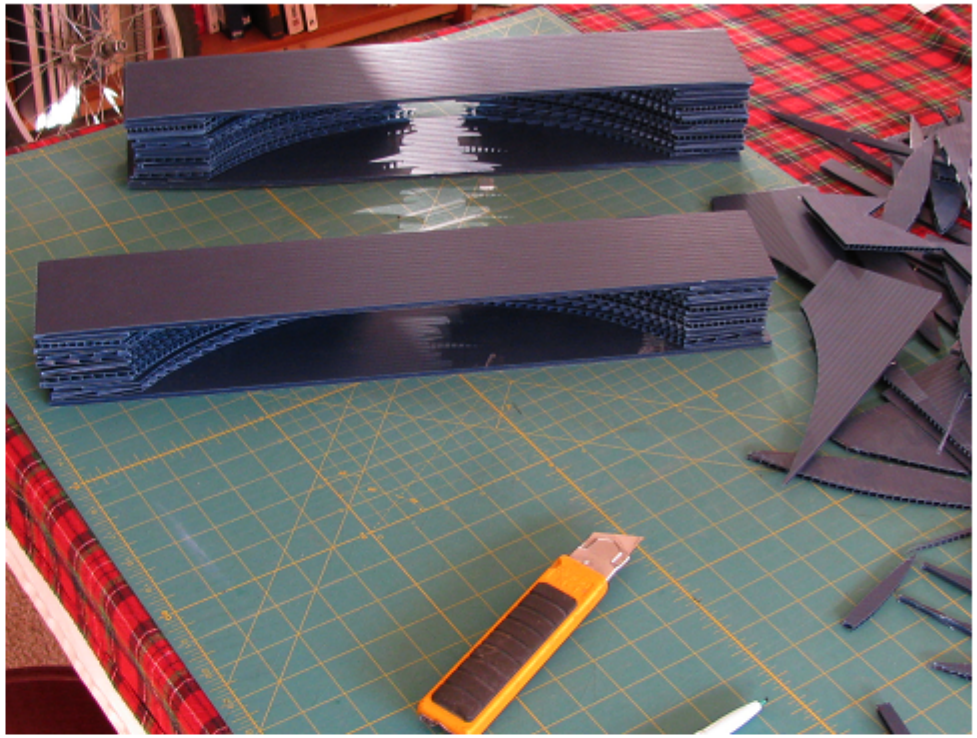


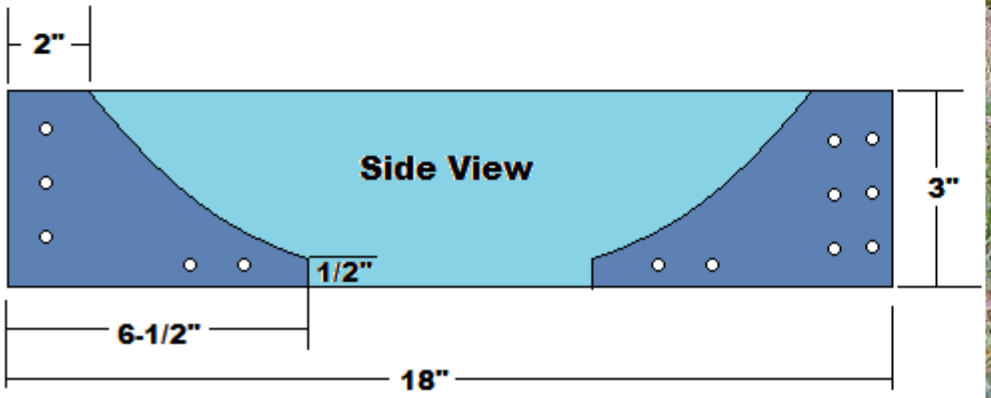
These are about 3" wide by 8" long. I used thin plexiglass and silicone sealer securing it down with pop rivets.

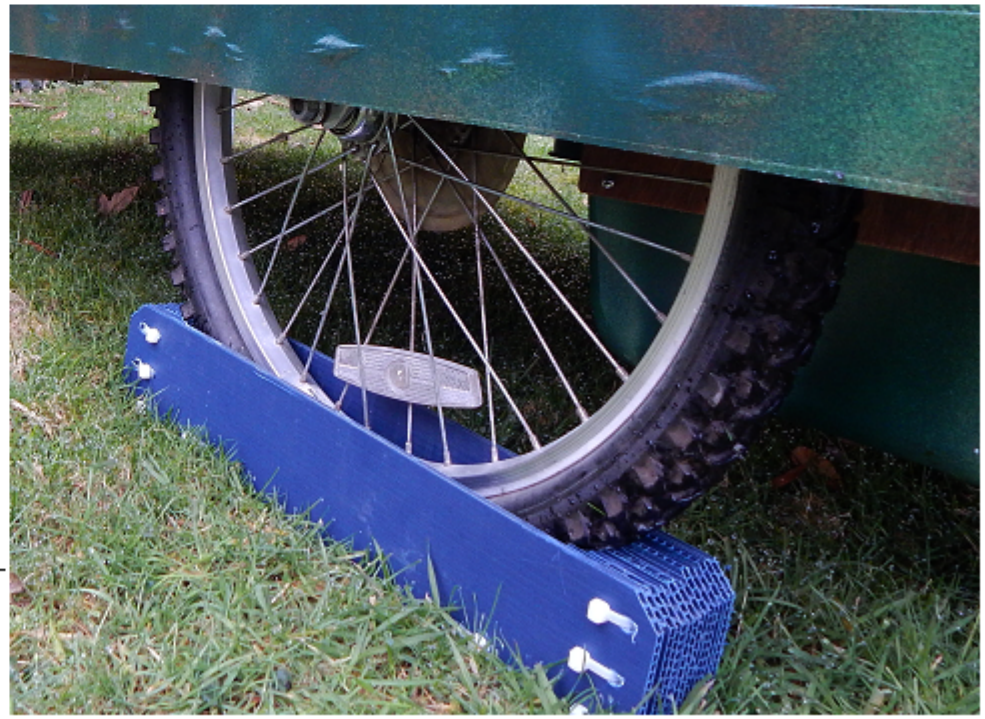
To open, a finger notch is added at the bottom.

Wheel Chucks

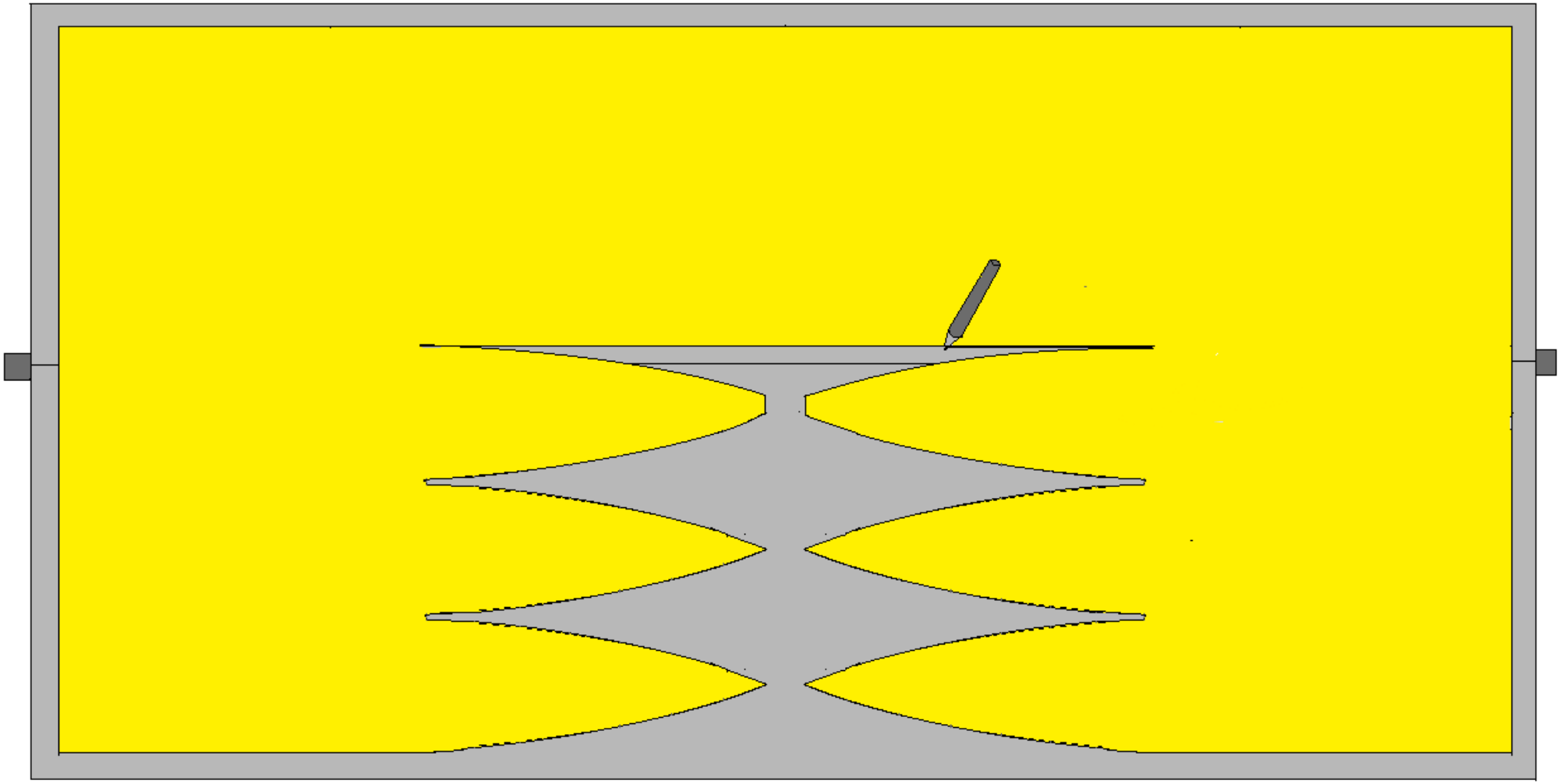








Measuring bubble foil insulation



If you decide to install bubble foil insulation, it's best to use the dome sheet as a template.

First, tape the two sheets together on the back side using duct tape. Place the sheet over the foil.

Trace around the perimeter using a small tipped black felt pen and cut out with scissors.

Bubble Insulation

I used Elmers spray glue to attach the insulation.

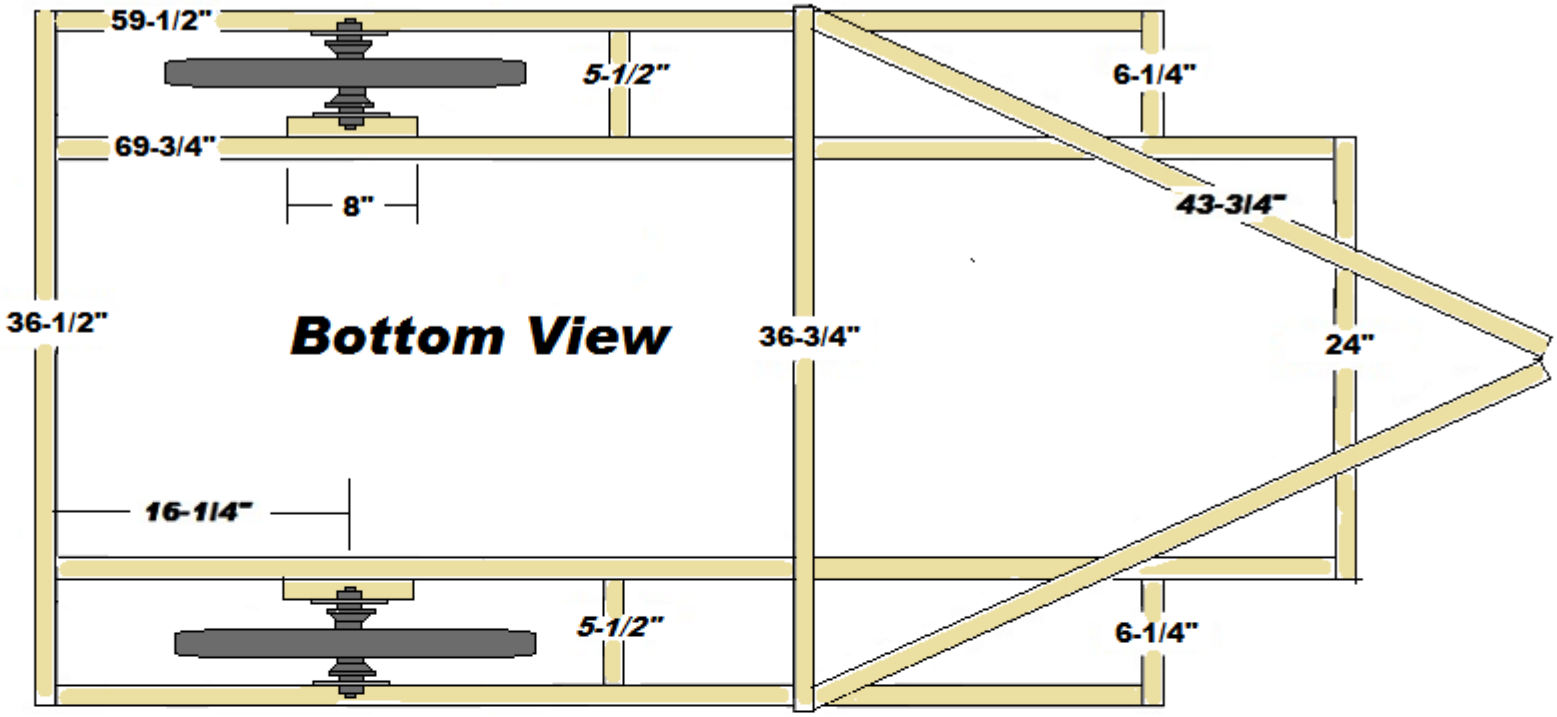
The temprature was not ideal for a real good bond, so it does sag in in some spots.

You could add 1" or 2" wide full length strips of fluted plastic on the inside, spaces every foot or so to help hold it up.

I also used Chrome duct tape to cover the seams, mostly for looks. This too is not holding up too well. A stickier tape and warmer conditions would probably do the trick.

Alternate wood frame

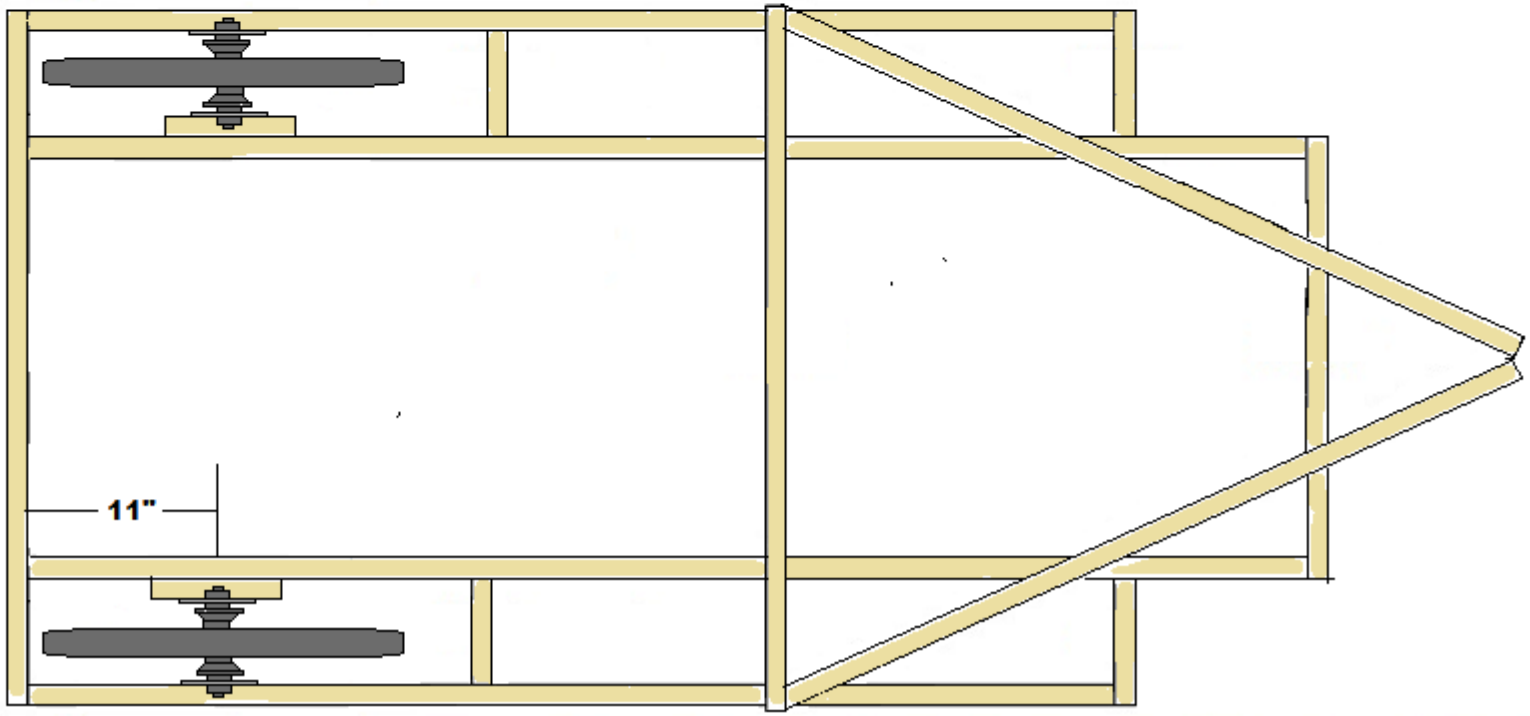
I was trying to save money on the original camper by using wheels from one bike.
As a result I had to make an unsymmetrical frame to accomidate the wider rear wheel.
This alternate frame design uses two front wheels which simplifies the frame and shaves off an extra pound using the lighter front wheel.



Alternate wheel placement

Placing the wheels further back would help prevent the front end from popping up every time you sat on the edge of the rear end.

Unfortunately this arrangement takes away room needed for the sunken propane stove and bread-pan sink that I've used, but you could get around this by use a smaller stove or a shallower sink.



Ipod speakers

These speakers were found at Walmart.
The backs of the speakers are smaller than the front face, so I cut out holes on the cabinet sides and wedged the rear part of the speakers into the holes.
Before installing the bubble insulation the left speaker wire that connects to the right speaker was taped to the ceiling.

A few last words

Fluted plastic is a wonderful material to play with.

Once you get the hang of how to form and bent the material your imagination is the limit as to what you can make.

I'm purposely not going into detail showing measurements and builds of the small shelves and drawer, as most of you will have other ideas of your own.

I encourage you to play around with your camper.

Remember everything you add has weight, and you will have to be towing that weight some day.

I believe a tricycle, be it tadpole or delta, would be the best vehicle to tow the camper. assending up steep hills will be slow going, and concentrating on balance would be tiresome with a two wheel bike.

Also you want to improve your brakes, be it changing them out for disk or at least getting longer brake pads for rim brakes.

Always be cautions when towing a camper of this size.

It's wide and sticks out.

Add as many lights and reflective bling as possible.

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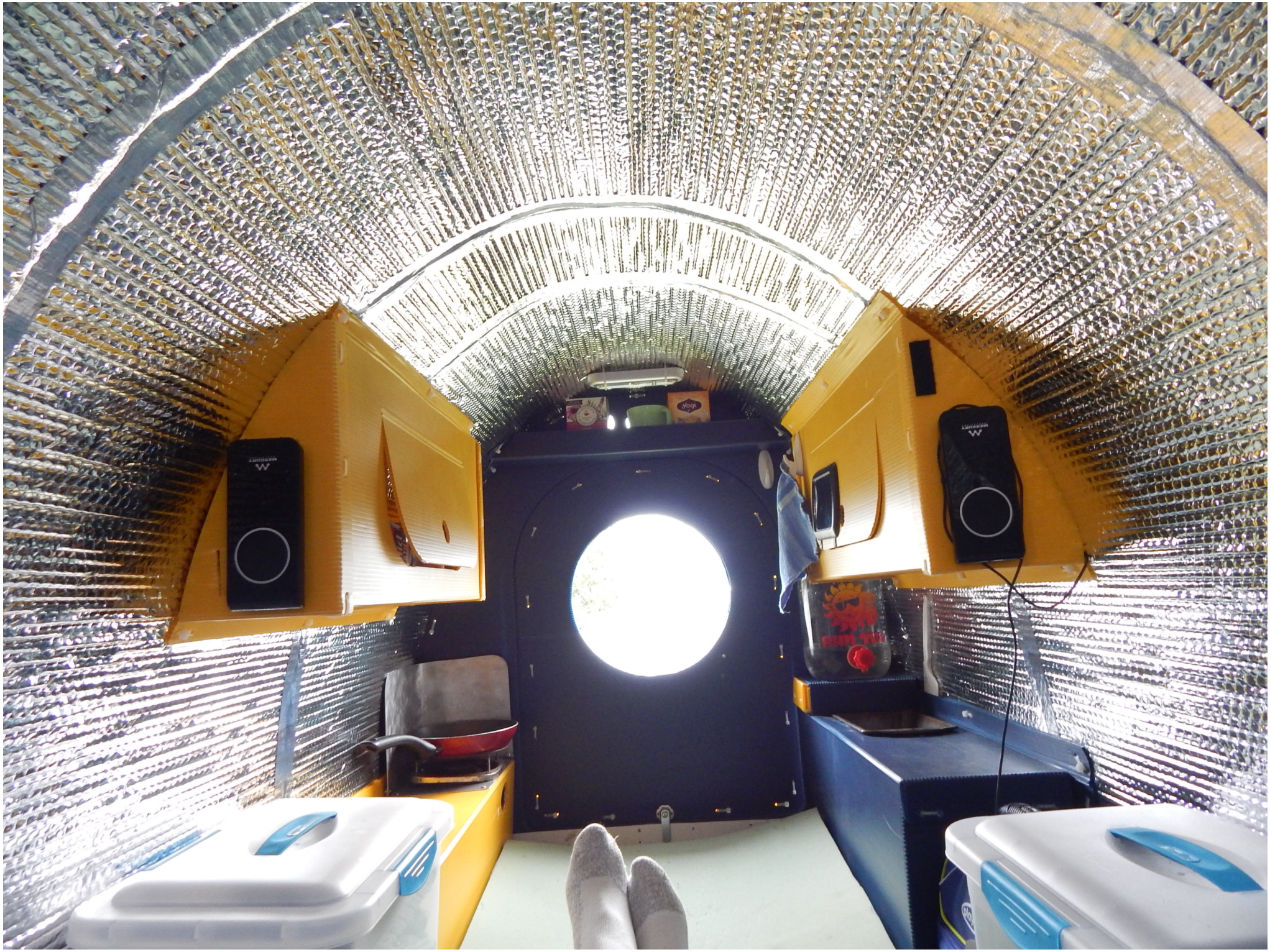

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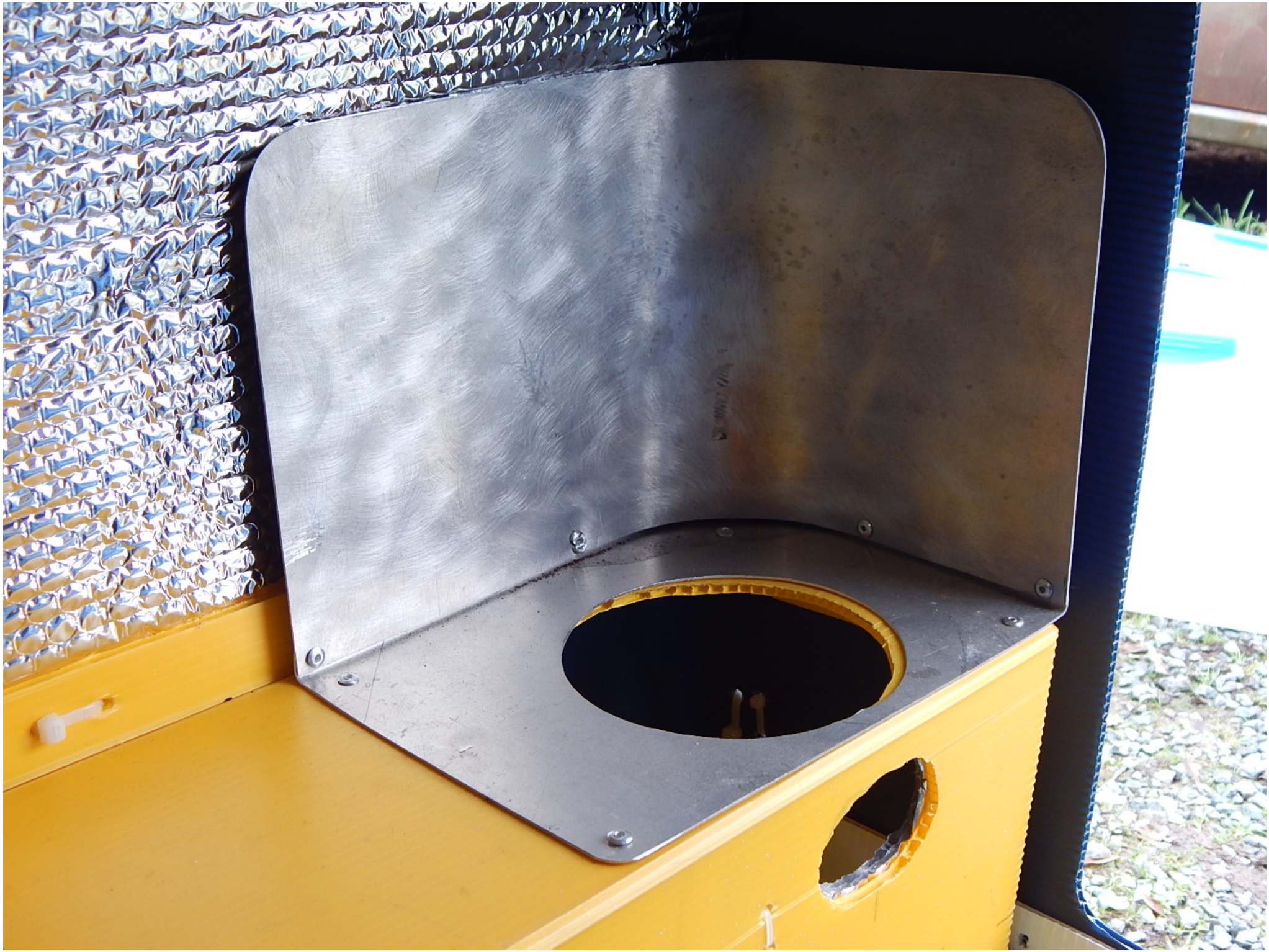
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