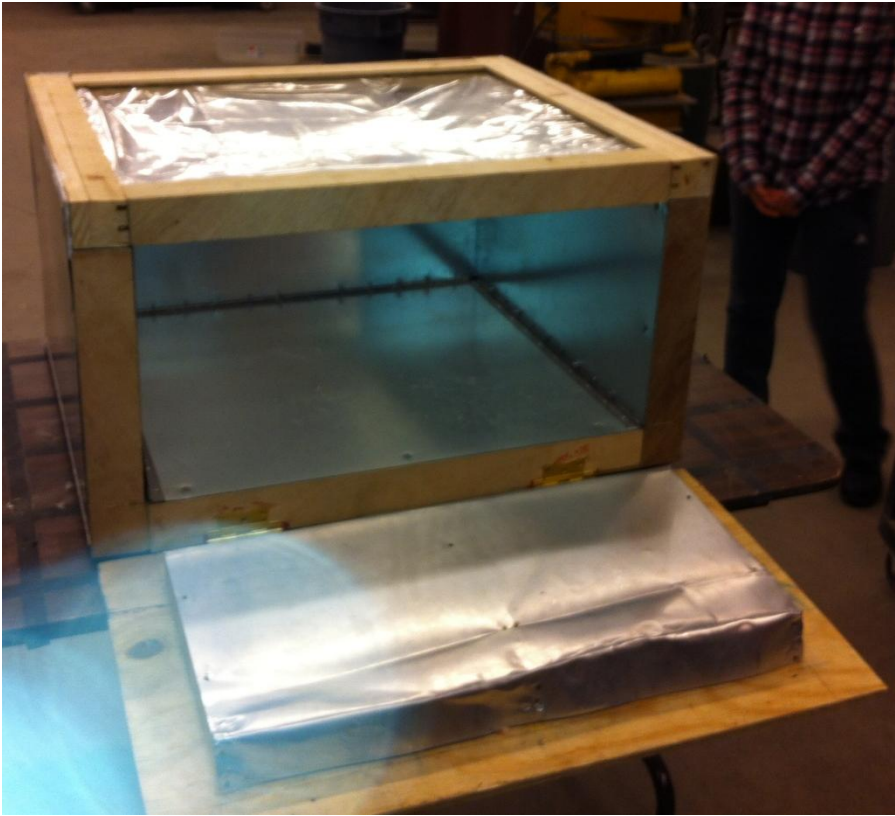


Prefabricatable Oven Construction Manual

Prototype 1



Materials

The materials consist of the following:

Sheet Metal

| Part Name | Material | Quantity | Size (inches) |
|------------------------|----------------|----------|---------------|
| Outer Box Back Panel | 26 Gauge Metal | 1 | 30 x 16.25 |
| Outer Box Bottom Panel | 26 Gauge Metal | 1 | 30 x 25 |
| Outer Box Side Panel | 26 Gauge Metal | 2 | 25 x 16.25 |
| Inner Box Back Panel | 26 Gauge Metal | 1 | 25 x 12.5 |
| Inner Box Bottom Panel | 26 Gauge Metal | 1 | 27 x 23.5 |
| Inner Box Side Panel | 26 Gauge Metal | 2 | 22.5 x 12.5 |
| Door Box | ??? | 1 | ??? |

Wood

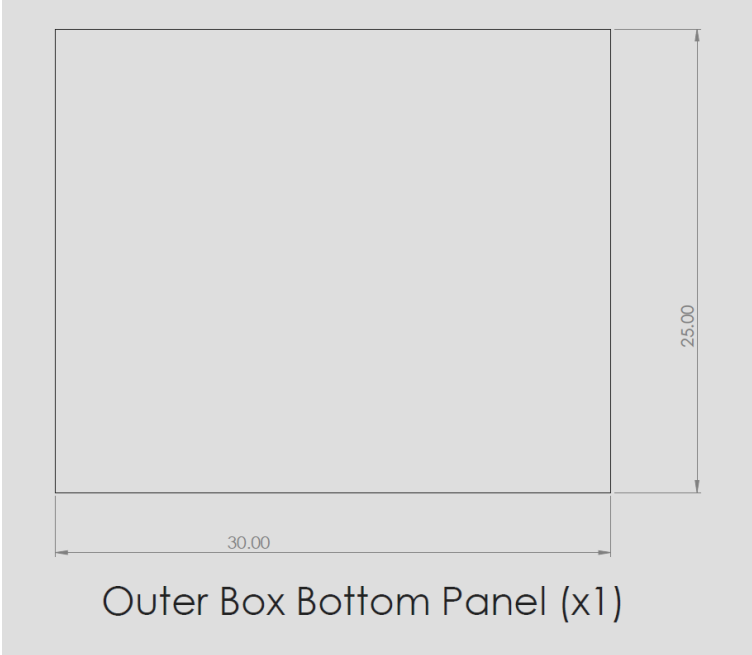
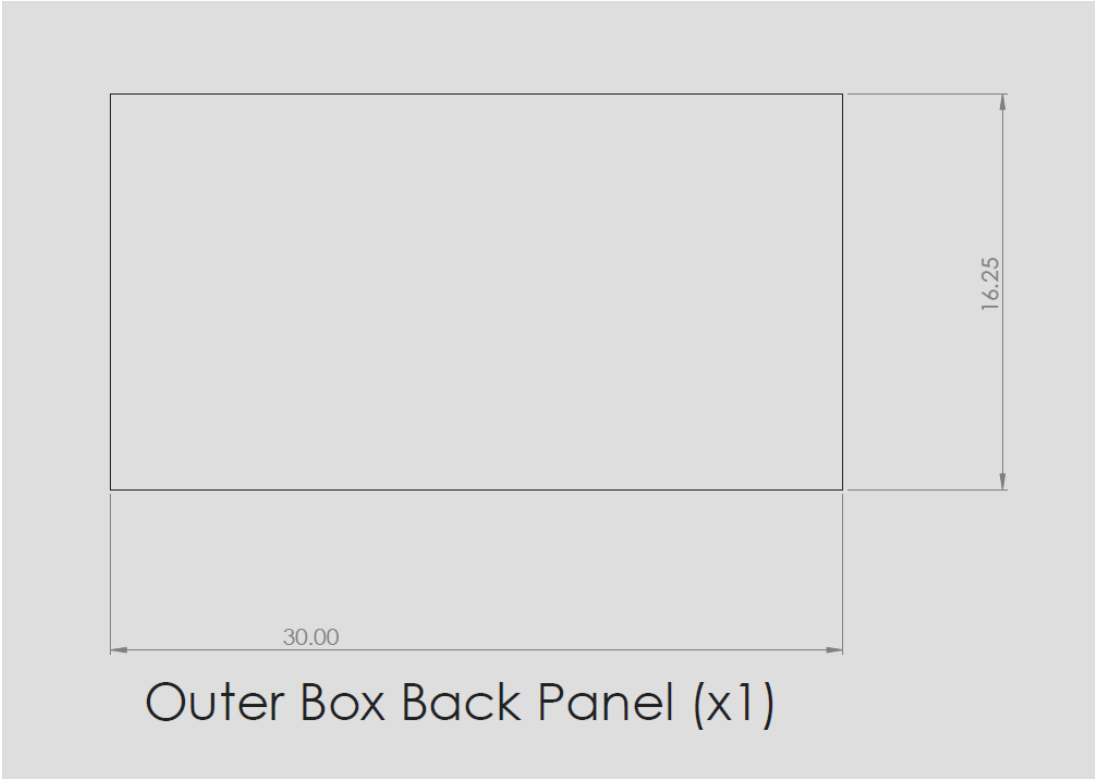
| Part Name | Material | Quantity | Size (inches) |
|--------------------------|----------|----------|-------------------|
| Door Bar- main | Wood | 1 | 27 x 2.5 x 1.5 |
| Glass Frame- main | Wood | 4 | 25 x 2 x 1.5 |
| Glass Frame- added depth | Wood | 8 | 25 x 2 x 0.5 |
| Base Blocks | Wood | 5 | 2.5 x 1 x 1 |
| Columns | Wood | 6 | 14.5 x 1.5 x 1.5 |
| Column Blocks | Wood | 12 | 1.225 x 0.8 x 0.8 |
| Door | Wood | 1 | ??? |
| Door Trapezoids | Wood | 3 | ??? |

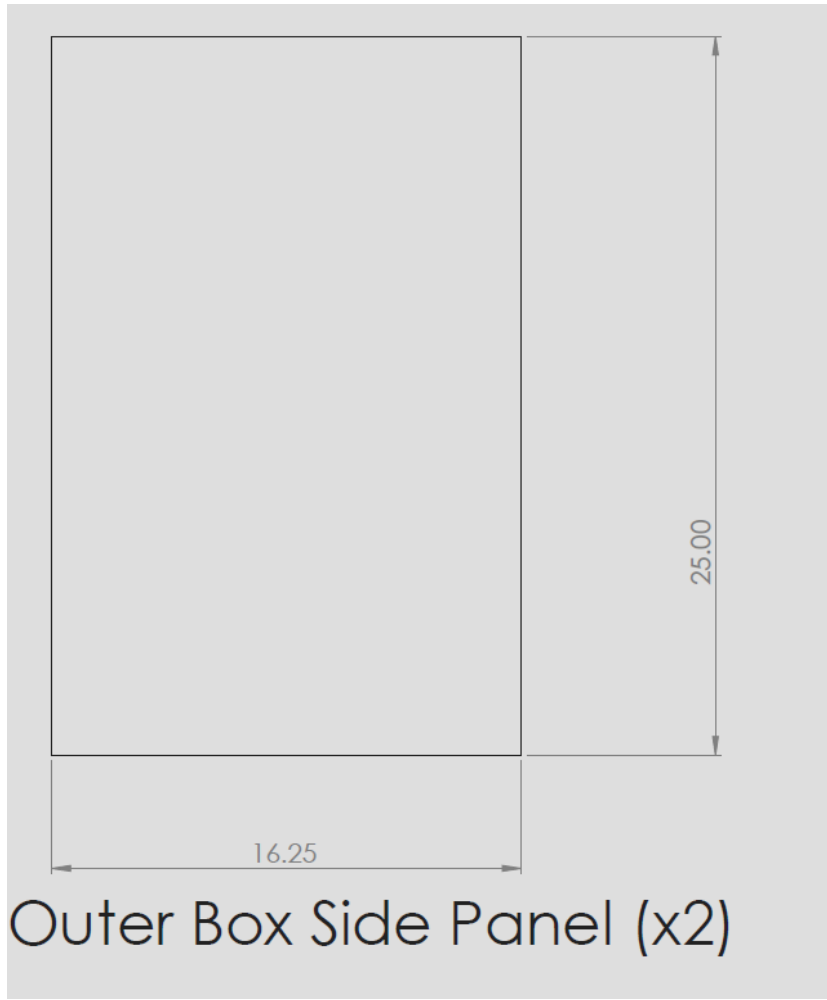
Hinges

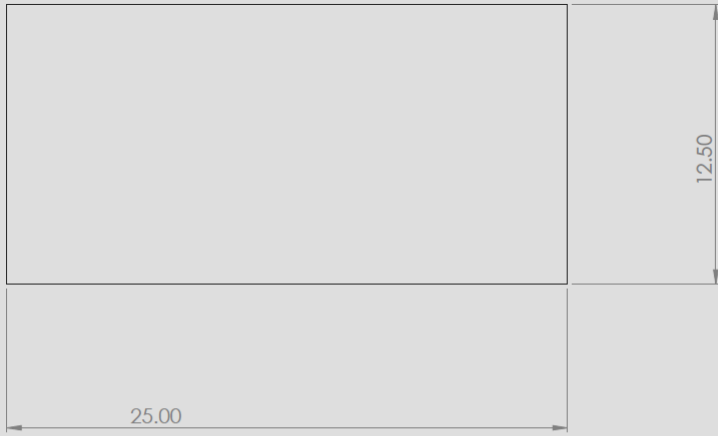
| Part Name | Quantity | Size (inches) |
|----------------------------|----------|---------------|
| Door Hinges | 2 | 3-1/2 |
| Outer Box Rear Piano Hinge | 1 | 30 |
| Outer Box Side Piano Hinge | 2 | 25 |
| Inner Box Rear Piano Hinge | 1 | 25 |
| Inner Box Side Piano Hinge | 2 | 22.5 |

Diagrams of Materials

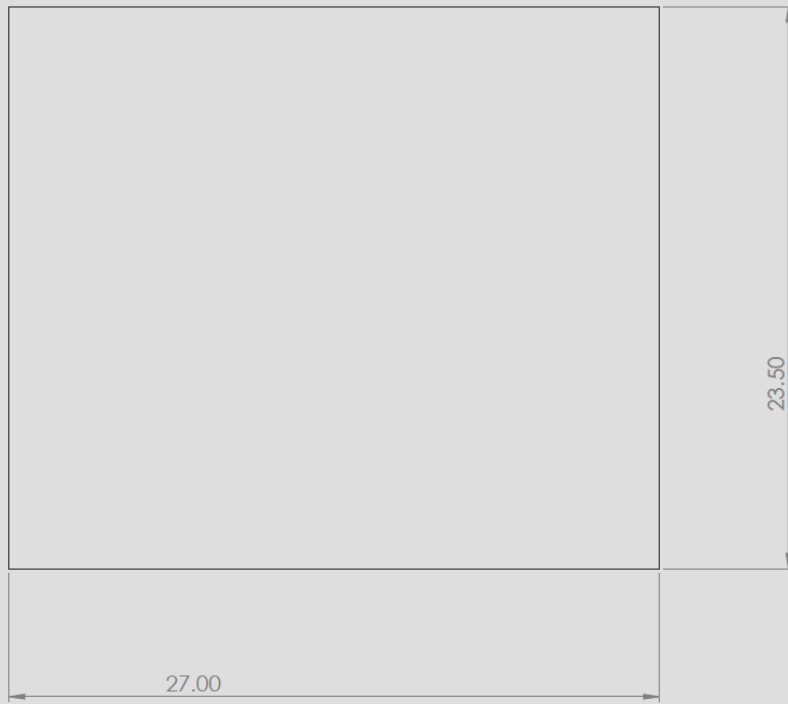
Sheet Metal



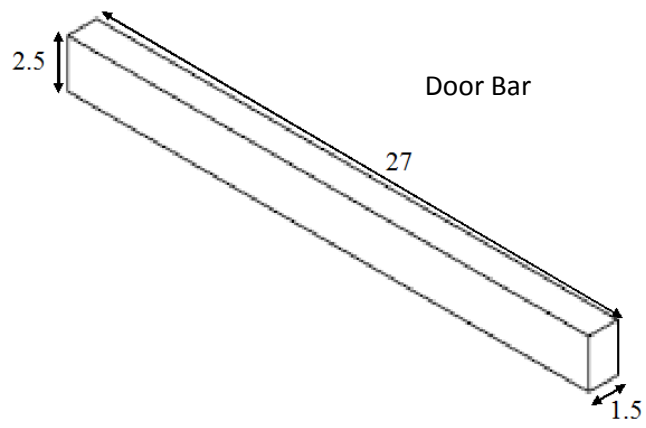
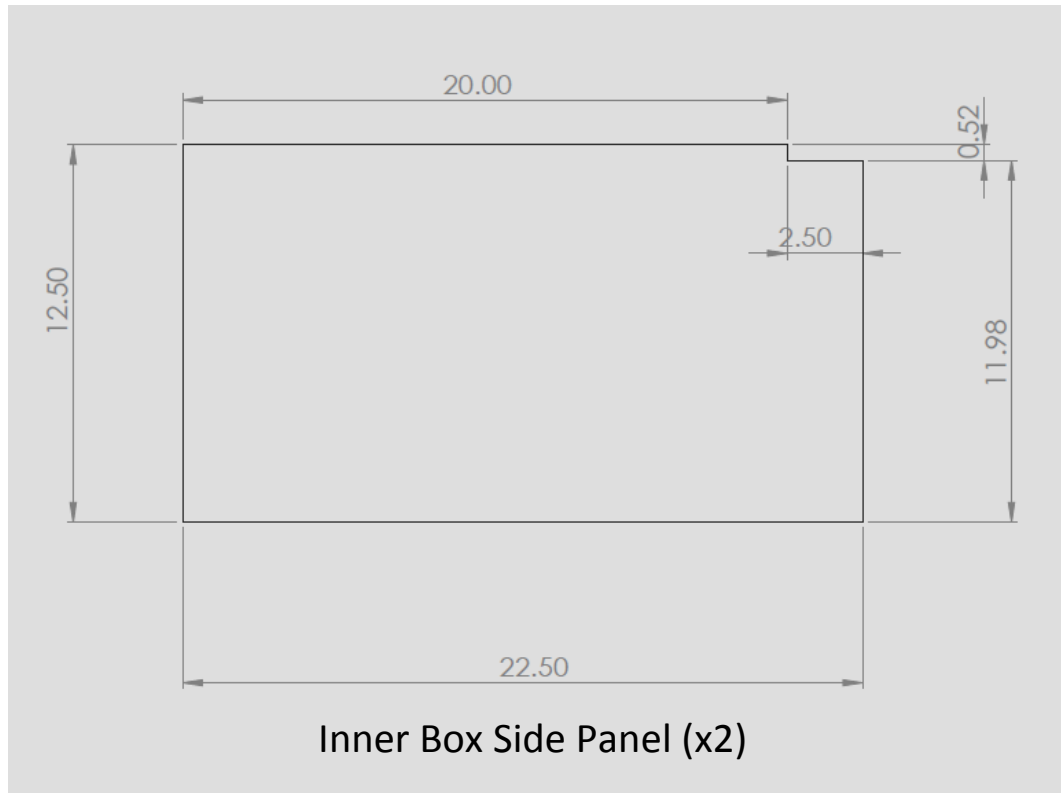


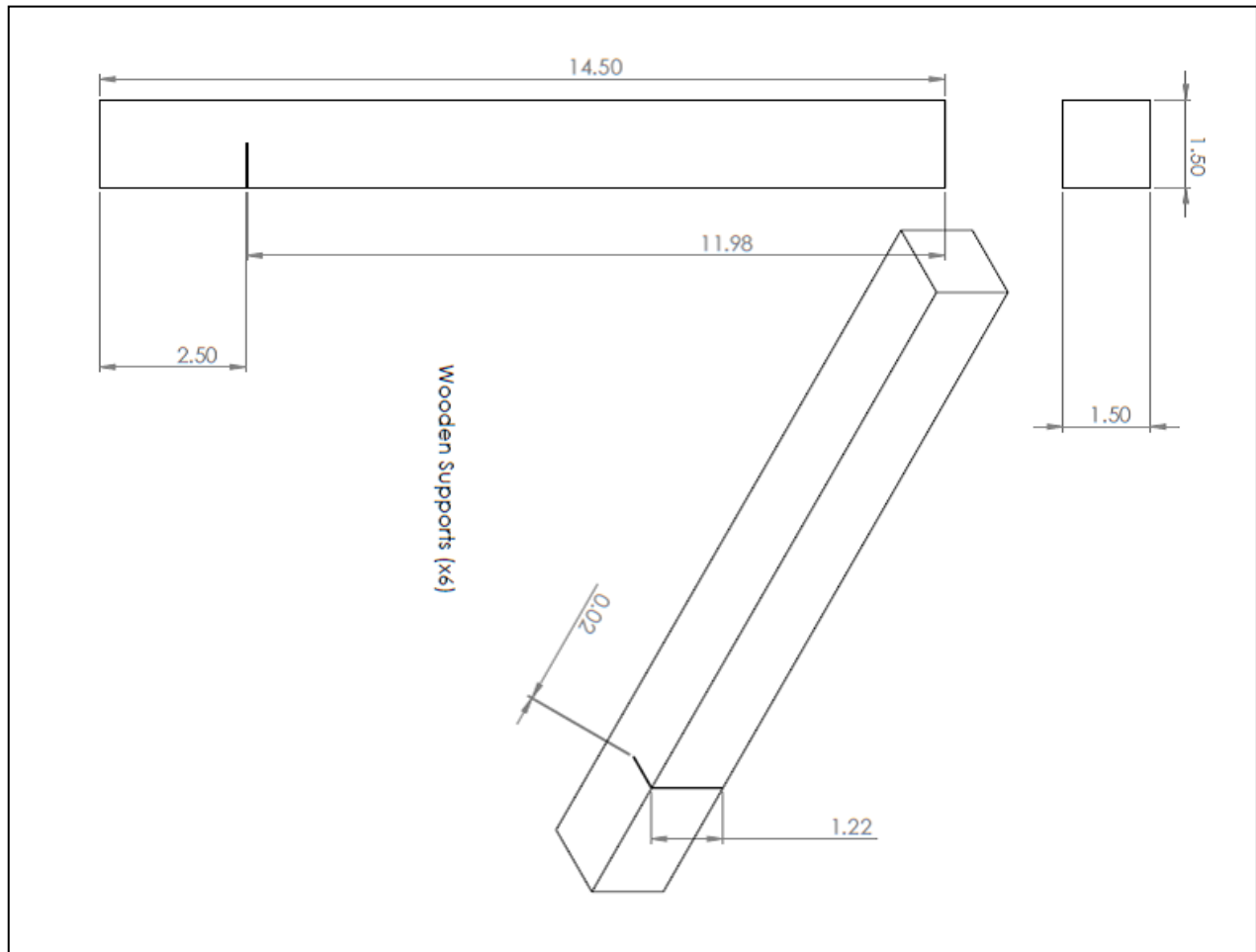


Inner Box Back Panel (x1)



Inner Box Bottom Panel (x1)





Construct the Wooden Column Supports

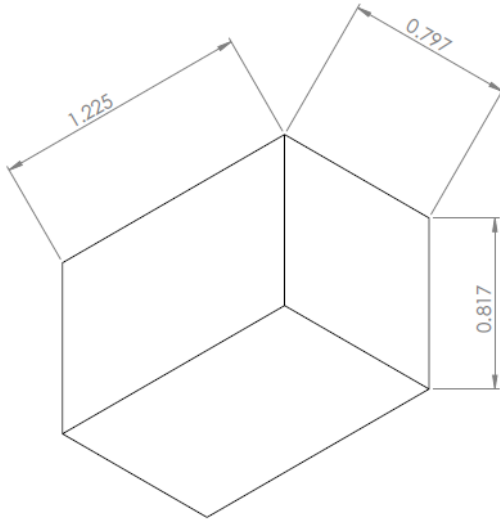
The 6 columns to support the inner box were made of wood cut down to the following dimensions:



Since a beam that is 1.5" x 1.5" isn't available as a standard size, we created the above part by cutting down a 2" x 2" into 6 pieces that are 14.5" long and sliced off any excess to the width of the columns.

The notches in which the inner box would slide into were made by using a saw to create a slit as shown in the diagram above. To create a space for the inner box walls to attach to the wooden columns, we had to attach two intermediary column blocks (seen in the figure below) to the top and middle of the colu

Column Blocks

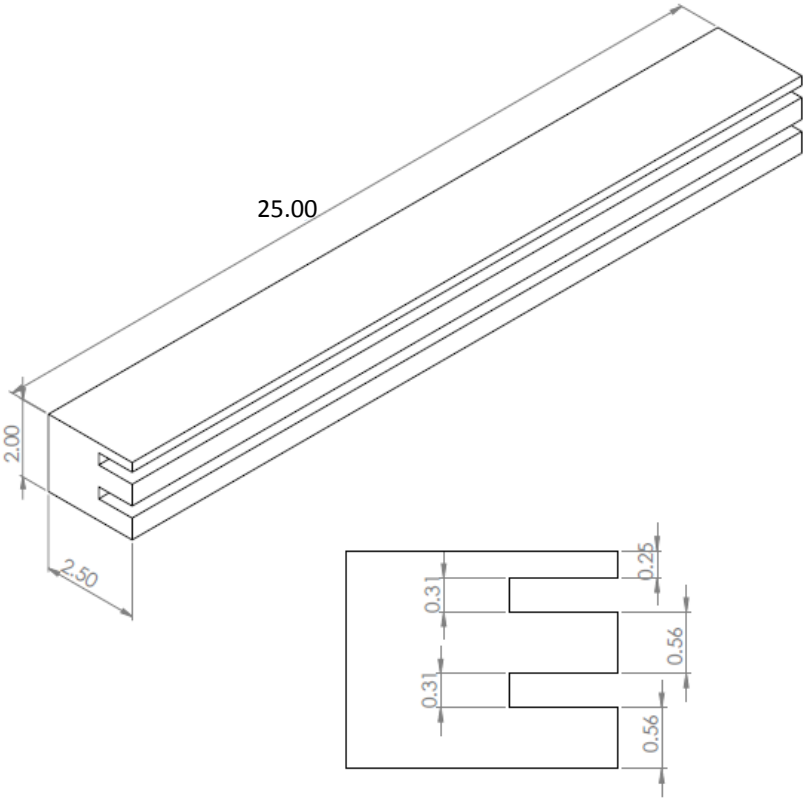


The only critical dimension is 1.225 inches.

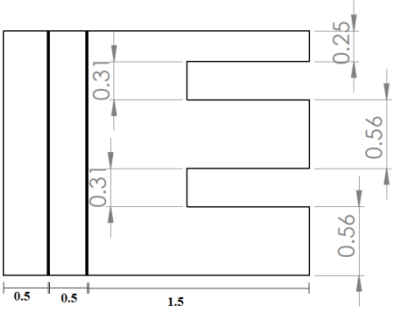


Construct the "Glass" Frame

The glass frame was made of 4 identical beams with the following dimensions:

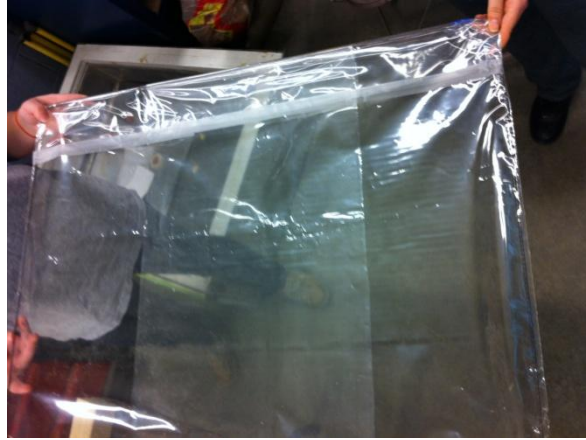


Since a beam with 2.50" thickness was not available, we created the above part by gluing together two 0.5 x 2 x 25" and one 1.5 x 2 x 25" bars, as shown below:



Construct the Plastic Covers

The following steps should occur to make the two layers of plastic sheets:



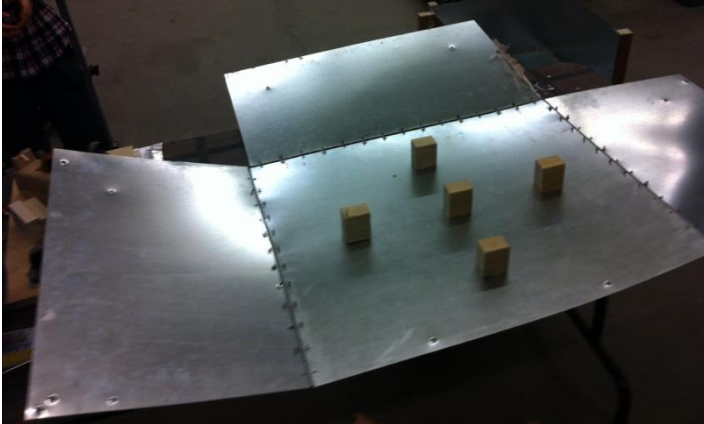
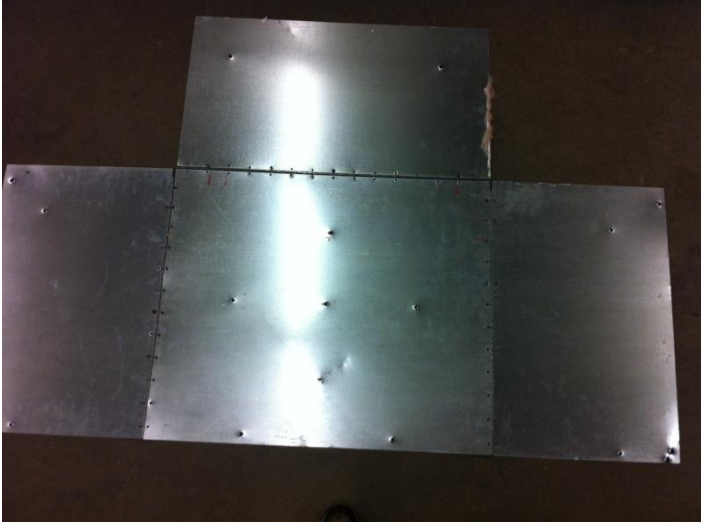
Construct the Outer Box

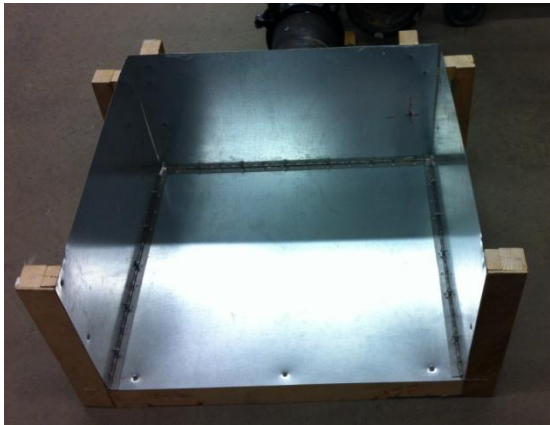
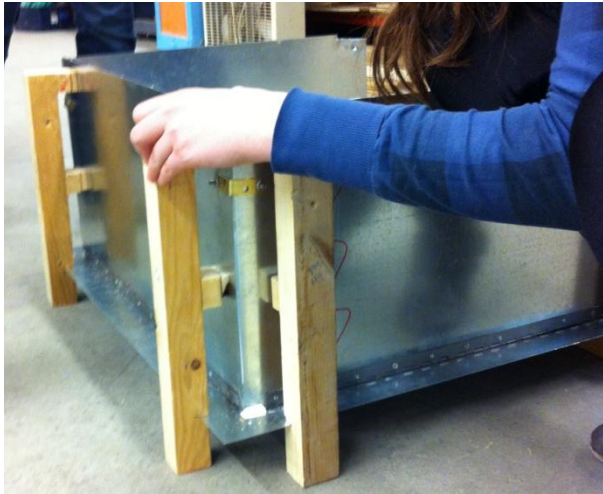
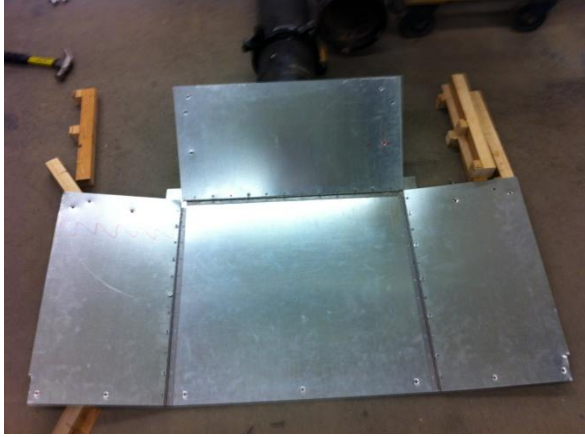
- 1) Using the piano hinges as a guide, mark and drill holes along the back and side edges of the outer box bottom plate.
- 2) Again, using the piano hinges as a guide, mark and drill holes along the bottom edges of the side and back sheet metals.
- 3) Using rivets, attach the walls of the outer box to the hinges and attach that assembly to the bottom plate.

Construct the Inner Box

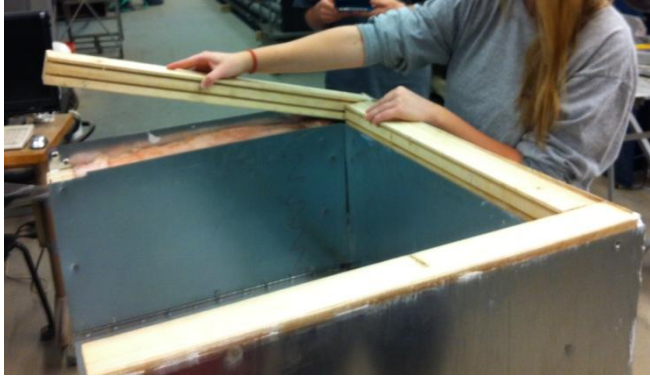
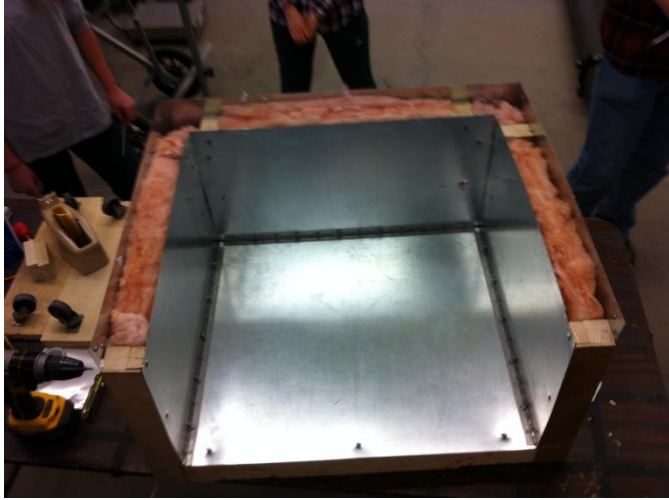
- 1) Using the piano hinges as a guide, as well as marking out where the piano hinges should go, drill holes as necessary on the inner box walls and the bottom plate (NOTE: The walls of the inner box should NOT line up on the edge of the bottom panel of the base plate of the inner box)
- 2) Use rivets to attach the walls to the hinges and the hinges to the base plate.
- 3) Slide in the 6 columns
 - 2 per each side (left, right, and back)
- 4) Mark where screws should go based on the column blocks that touch the outside of the inner walls.
- 5) Drill holes where you marked in step 4 and screw in screws.
- 6) Measure out a length of 2x4 piece of wood and cut out a length of 27 inches. Trim down the size of the bar to 1.5 x 2.5. This will be the door bar on which the door hinges will be attached.
- 7) Drill holes and screw in the door bar to the front of the inner box.

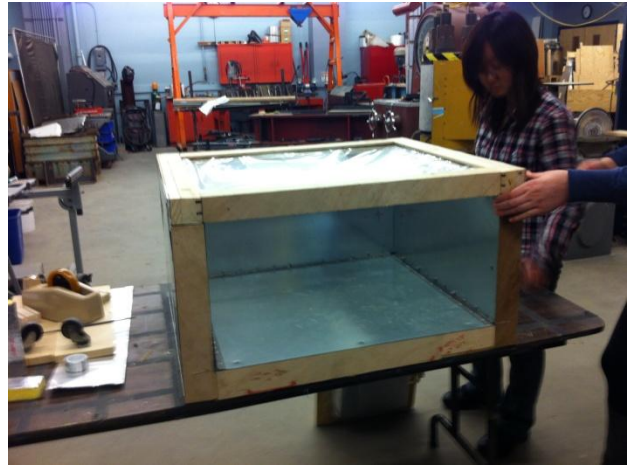
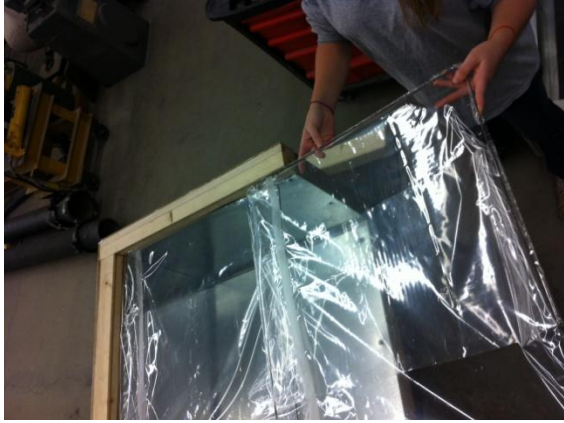
Assembly





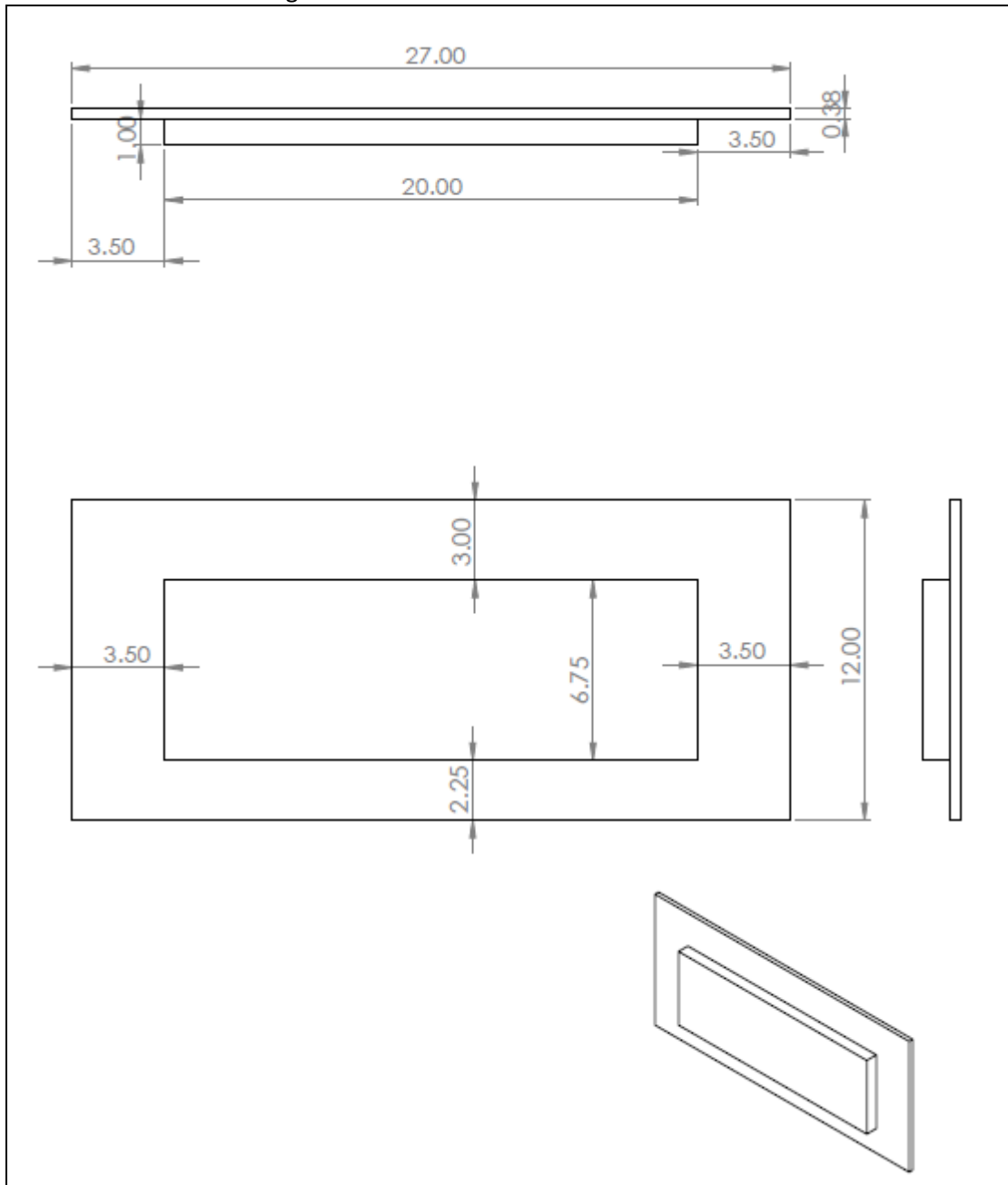






Construct the Door

The door had the following schematic and dimensions:



The following steps should occur to construct the door (these steps are based on "Grupo Fenix Manual - CJ Colovito - 4/2009"):

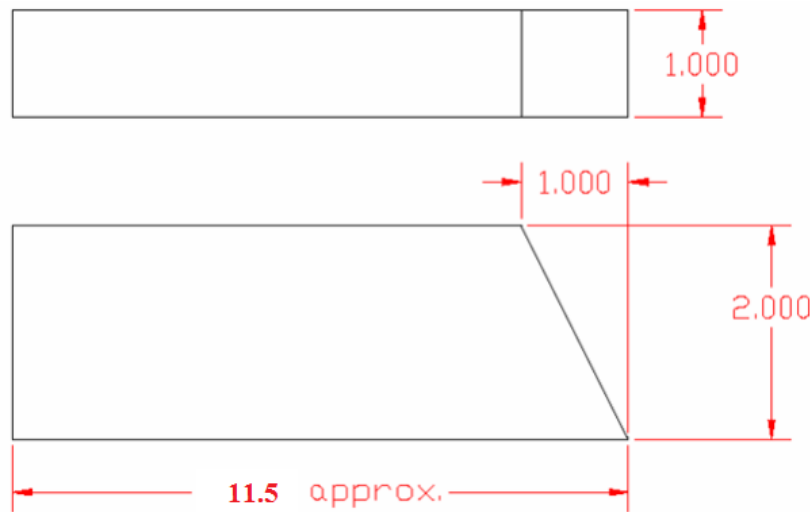
- 1) Measure the correct size and cut out the door.
 - (a) Measure the front of the cooker frame, height and width.

(b) Subtract $\frac{1}{4}$ " from the height and ADD $\frac{1}{4}$ " to the width and cut a piece of $\frac{1}{2}$ " thick plywood to these dimensions. (if the door is too tall it will interfere with the reflector when it is closed; we add $\frac{1}{4}$ " to the width to allow for a little extra room so we can make sure the door is flush with both sides of the cooker when it is attached. We need it to be flush with both sides so that the latches will work correctly.)

2) Make the inner door box

- (a) Place the plywood door over the front of the cooker and make sure it is centered from side to side and flush with the bottom of the cooker.
- (b) Carefully trace the opening of the door way on to the plywood. Use an arrow to mark which side is the top.
- (c) Measure the height of the door opening on the cooker frame, it should be about 12"
- (d) Cut 3 wood support blocks out of wood that is 1" thick by 2" wide. The height of each support block should be equal to the height of the door opening minus $\frac{1}{2}$ ". (about 11-1/2")

(i) Cut each block into a trapezoid shape as indicated in the drawing below.



(ii) **Make sure all three are exactly the same height.**

- (e) Place the three wood support blocks onto the plywood door inside the trace of the door opening. Put one just inside each side line (about $\frac{1}{8}$ " in from the edge) and one in the middle. Center all of them from top to bottom. **Make sure the angled side is pointed at the top of the door.**
- (f) Trace each wood support block in its place and remove them as shown below



(g) Measure and mark $1\frac{1}{2}$ " down from the top of each traced rectangle of the wood support blocks and $\frac{1}{2}$ " up from the bottom of each one. Make your marks in the center of each rectangle from side to side.

(h) Drill a $\frac{1}{8}$ " hole at each mark to indicate where the screws will go as shown below.



(i) Glue each wood support block into its place over the traced outline. Let them dry for 10-15 minutes.

(j) Flip the plywood door over carefully and drive two $1\frac{1}{2}$ " screws into each wood support block from the front of the plywood door, using the holes previously drilled. Be careful not to shift or move any of the wood support blocks, they must be in their exact places or the door won't fit properly.



(k) Test fit the door on the cooker. If there is a problem, you can fix it by using a planer to shave own wood, or reposition the problematic wood support blocks.

(l) Measure the width from the outside edge of the left most block to the outside edge of the right most block.

- (m) Cut a piece of fiber board for the bottom of the inner door box that is $\frac{1}{4}$ " less than the width measured by $1\frac{7}{8}$ " high.
- (n) Nail the bottom of the inner door box to the flat side of wood support blocks using 1" nails. drive two nails into each block, one at the middle and one at the base of each block. You will need to leave space at the top for another nail later on.
- (o) Cut another piece of fiber board to the same with as the previous piece and a height of $2\frac{1}{8}$ ".
- (p) Nail the top of the inner door box to the wood support blocks. Drive two nails into each block, one at the middle and one at the base of each block. Again, you will need to leave space at the top for another nail later on.
- (q) Test fit the door onto the cooker again and make adjustments as necessary.
- (r) Use the silicon gun to place a small bead of silicon around the inside perimeter of the inner door box. This will seal the box, helping it to insulate.
- (s) Cut a piece of printing plate sheet metal to the same length as the two fiber board pieces and a width equal to the size of the opening on the front of the inner door box plus $1\frac{1}{4}$ ".
- (t) Lay the metal onto the front of the inner door box and make sure it is straight and centered. Bend the edges over both sides where there is fiber board, making a crease at the four corners of the box.
- (u) Take the sheet metal off and use the creases as a guide to fold it over the edge of the table to 90°.
- (v) Test fit the printing plate metal again to make sure it is straight and fits properly.
- (w) Remove the metal and fill the door box with insulation
- (x) Place a small bead of silicon around the perimeter of the opening in the inner door box
- (y) Place the printing plate metal over the opening and nail it into place with 1" nails. Use 3 nails across the front of each wood block and one nail in each side.



3) Attach the door hinges.

- (a) Measure and mark 6" in from each side of the door on the same side as the inner door box.
- (b) Place two 3" hinges on the door so that they are both just inside the marks.
- (c) Trace the hinges in place

(d) Use a chisel to cut out the rectangular area of the traced hinge. Cut it 1/16" deep, the thickness of the hinge.

(e) Screw each hinge into its recessed area with 1/2" screws, 3 for each hinge. If there are no 1/2" screws available use the shortest screw you can find and cut off the point that protrudes through the front of the door with a hacksaw.

(f) File down the points of the 6 screws that poke through the other side of the door with a metal file.



Figure 1: Left- Trace the door hinge in place. Right- use a chisel to cut out a recessed area for the door hinge.



Figure: Completed door. Left- inside of door. Right- outside of door.

4) Attach the door to the cooker

(a) Lay the cooker on its back side so that the door opening is facing upward.

(b) Fit the door into the front opening making sure that it is centered from side to side and flush with the bottom of the cooker.

(c) Screw in the hinges.



Figure 4: Attach hinges to door bar and inside of door

- (1) Make sure the hinges lay over the bottom side of the cooker.
- (2) Use a nail to puncture the sheet metal in the center hole of the hinge and then drive in a 1 ½" screw. There should be 3 screws for each hinge.
- (3) Screw in only the middle screw on each hinge first, and then check the door to make sure it opens and closes properly.
- (4) Test the door fit by closing and opening it.
- (5) Add the last two screws to each hinge.
 - (a) Make sure that the door is flush with both sides of the cooker because it has to be flat to attach the latches properly. If the door is too big on one side you can use the planer or file or sand paper to flatten the door down to the width of the cooker. Remember we made the door ¼" larger than the cooker to allow for room to plane here. If the door is too small on one side you may need to add some material to the side to make it flat for the latches. A strip of fiber board or cardboard works well.
 - (b) Check that the door fits again, if the door extends past the height of the front glass piece you will need to use a planer to plane it down. Otherwise, it will interfere with the reflector. The door should be about 1/8" below the top of the front glass piece.

5) Attach the sheet metal to the front of the door

- (a) Cut a piece of sheet metal to perfectly match the size of your door after you have attached the door to the cooker and made any needed adjustments with the planer/file.
 - (i) Round off the corners of the metal piece before screwing it to the door, cut a very small curve into the corner to take off the sharp point using the tin snips
- (b) Place the sheet metal over the door, be careful to center it and leave no sharp edges hanging off.
- (c) Use ¼" or ½" screws across the top and bottom, spaced 5" apart. On the sides only 3 screws are needed, at the top middle and bottom. Use a hammer and a nail to puncture the metal before driving in the screws.

(1) As you are adding screws make sure to maintain the sheet metal flat and start at one end of the door adding screws to both the top and bottom sides equally working your way towards the other edge. This will prevent bubbles in the sheet metal.

(2) If no $\frac{1}{4}$ " or $\frac{1}{2}$ " screws are available you can cut 1" nails down to size and use them. These nails will be very short and you will need to use some needle nose pliers to hold the nail while driving it in.

(d) Use a hammer and bend over any part of the sheet metal on the door that is hanging over the edge.