

Cornell ESW – Foldable Oven Construction Manual

Overview of Design



Dr. Lynn Schlager, PE, from University of Wisconsin Platteville, created this design. The intention was for the oven to be easily assembled and disassembled. The design is manifested through the use of hinges, pegs, and hooks. When disassembled, the side walls will fold on top of the base and the back wall and front door fold underneath.

Materials (all materials in inches unless otherwise specified)

Part Name	Material	Quantity	Dimensions
Base- bottom metal	Aluminum Sheet	1	17x20
Base- top metal	Aluminum Sheet	1	17x17.5
Rear Wall- outer metal	Aluminum Sheet	1	7.5x20
Rear Wall- inner metal	Aluminum Sheet	1	6.25x17.5
Side Wall- metal	Aluminum Sheet	4	6x17
Door- outer metal	Aluminum Sheet	1	9x20
Door- inner metal	Aluminum Sheet	1	6.5x17.5
Base- frame- short side	Wood	2	17x1.5x1.5
Base- frame- long side	Wood	2	20x1.5x1.5
Rear Wall- frame- short side	Wood	2	1.5x1.5x7.5
Rear Wall- frame- long side	Wood	2	1.5x1.5x20
Side Wall- frame- short side	Wood	4	1.5x1.5x6
Side Wall- frame- long side	Wood	4	1.5x1.5x17
Door- frame- short side	Wood	2	1.5x1.5x9
Door- frame- long side	Wood	2	1.5x1.5x20
Top Frame- short side	Wood	2	1.5x1.5x18.5
Top Frame- long side	Wood	2	1.5x1.5x20
Reflector- frame	Wood	4	1.5x1.5x20
Base- insulation	Insulation	1	1.5x14x17
Rear Wall- insulation	Insulation	1	1.5x4.5x17
Side Wall- insulation	Insulation	2	1.5x4x14
Door- insulation	Insulation	1	1.5x6x17
Clear Covering	Reynolds Hi-Temp Bags	2	20x21.5
Reflector- steel	Steel sheet	1	22x22
Reflector- mylar	mylar	1	21.5x21.5

Procedure

Cut and assemble the wood

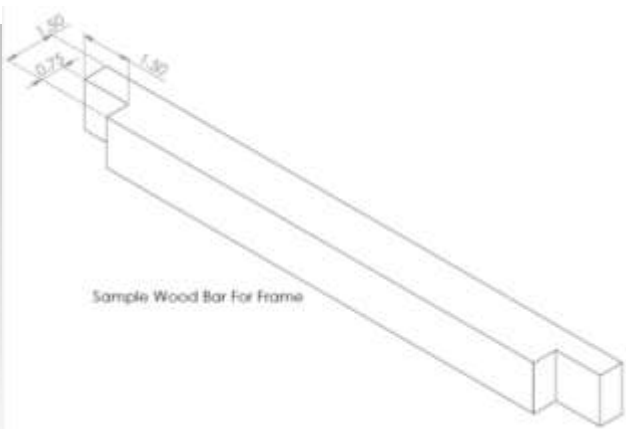
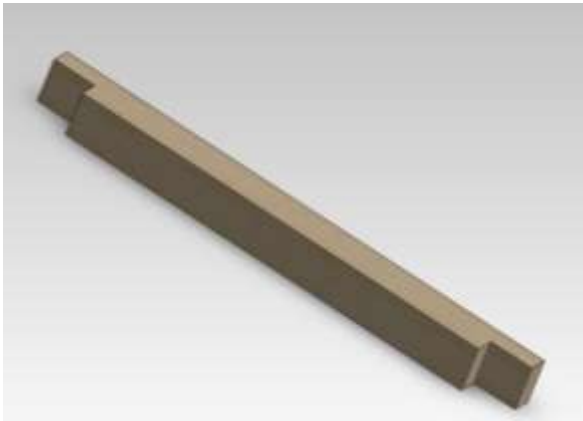
1. The wood frame pieces are connected in lap joints. A notch corresponding to the width and half the thickness of the overlapping pieces is cut into each of the frame pieces. The method used in Sabana Grande was to: 1) remove the blade cover, 2) set the table saw blade at a depth of half the thickness of the wooden frame pieces (3/4"), 3) set the guide for the width of the frame piece being overlapped (1 1/2"), 4) repeatedly cut the width of the saw blade to cut multiple notches in the underside of the piece, and 5) sand the notched surface smooth. This is a potentially dangerous task. You must take great care to keep fingers away from the blade and move the wooden piece being cut smoothly. A number of alternative methods are possible: 1) use hand saws to cut the notch, 2) use a joiner to cut the notch, and 3) use a router to cut the notch. The hand tool methods require great care to get a good fit. The other power tools were not available at the Solar Center in Sabana grande.



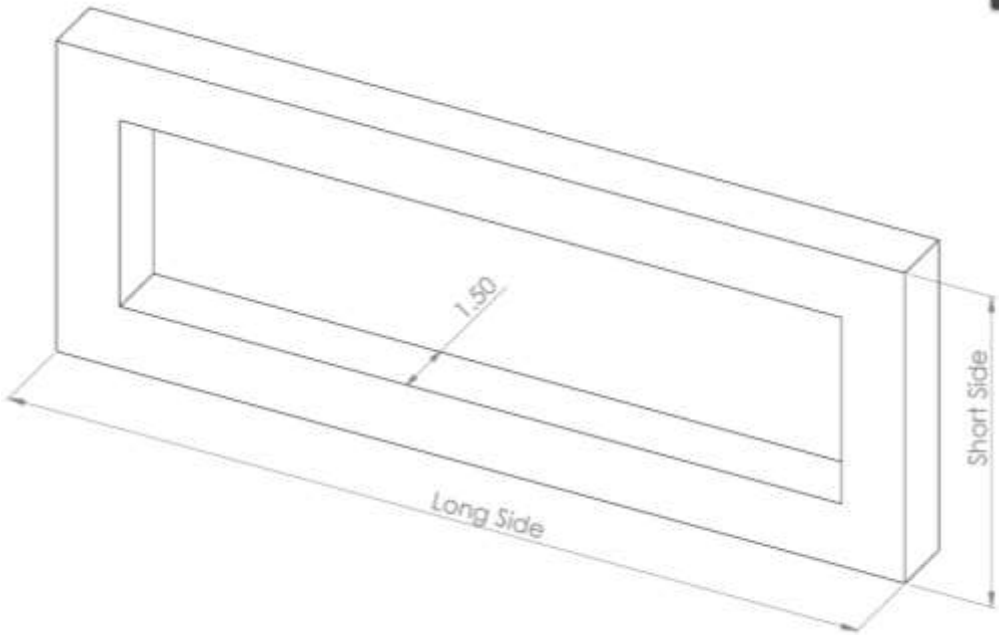
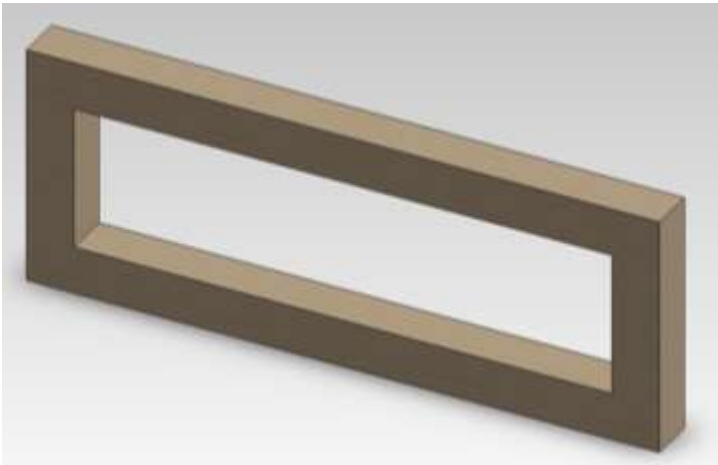
2. Fit together the corresponding pieces; glue and nail together. Glue the pieces first. Set one nail in the center of each corner and assure that the frame is square and well fitted, then add 3 or 4 more nails in a rectangular pattern around the 1st nail. Stay away from the edges of the wood, to prevent splitting.



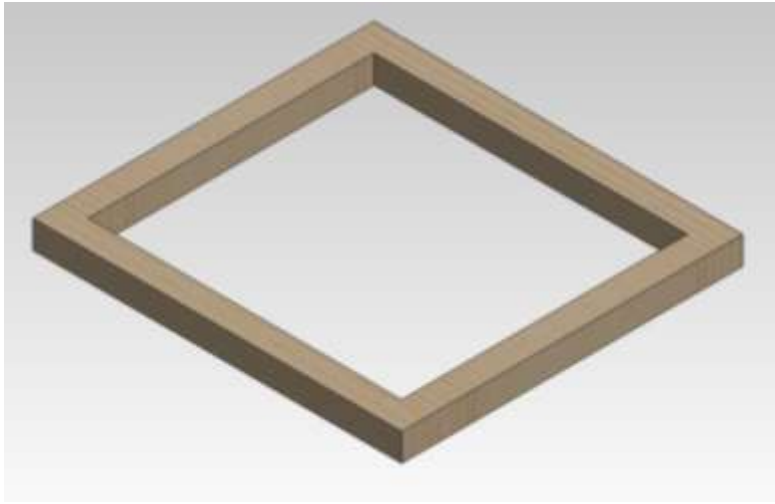
Wood- single bar



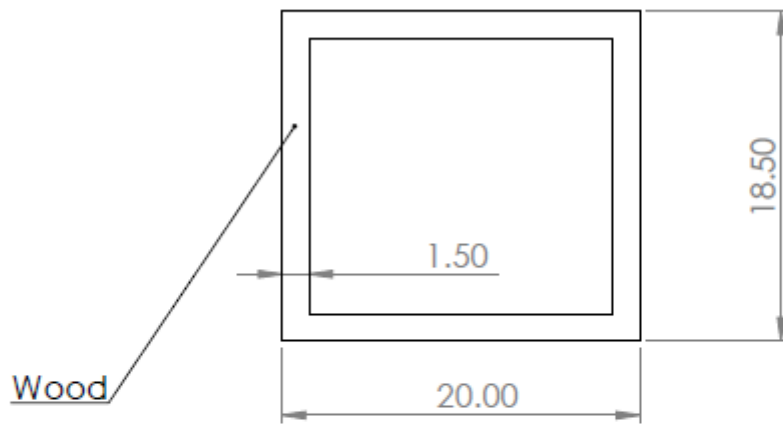
Wood frame



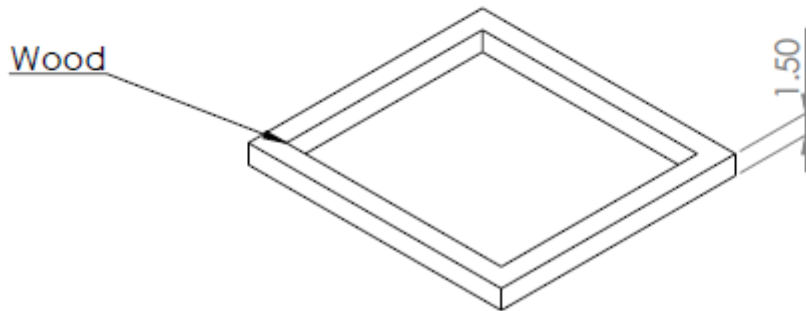
Top Frame



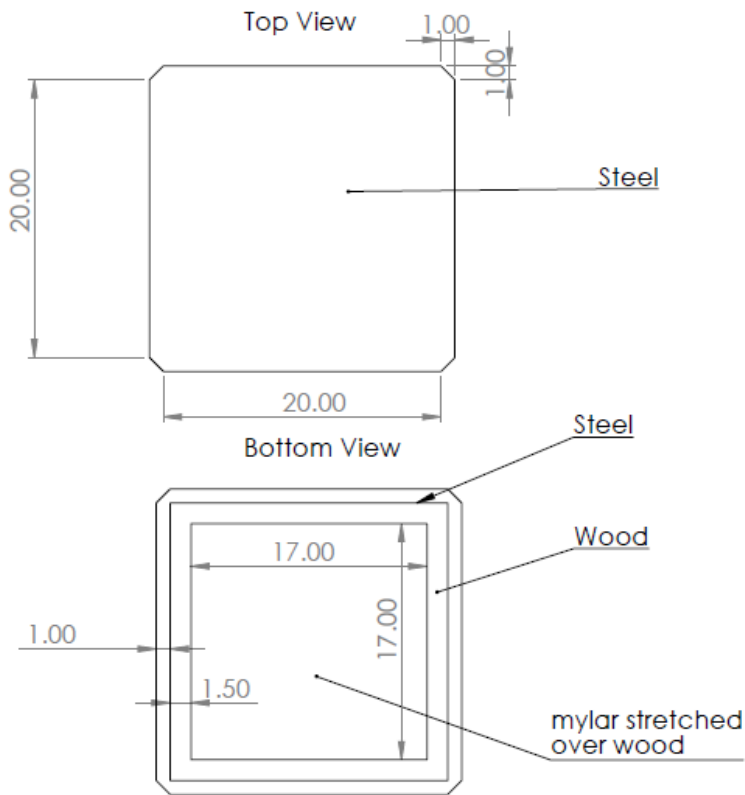
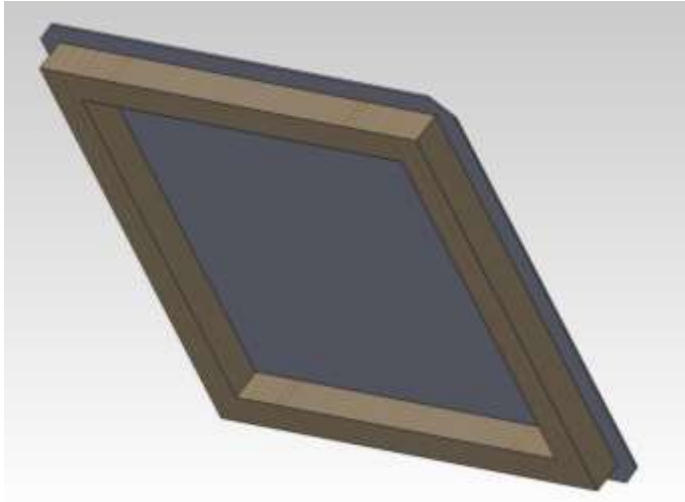
Top View



Isometric View



Reflector



Cut the aluminum, steel, and insulation

1. Cut aluminum in dimensions specified above.

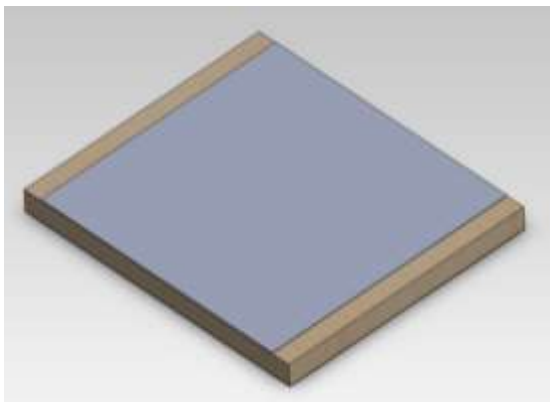


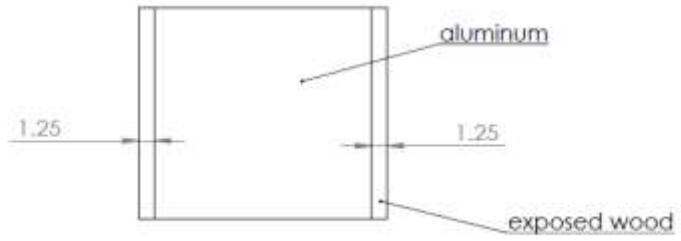
2. Cut galvanized steel; dimensions above. Using square nosed pliers or a sheet metal break, fold back edges and corners of the steel.
3. Cut insulation.

Construct the walls and base

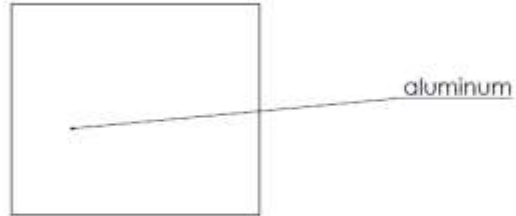
1. Using silicon, glue the aluminum cutouts to the corresponding wood walls (only 1 side of each wall initially). Nail into place.
2. Fit the appropriate section of insulation into each wall. [reflective side facing exterior]
-mention sides that don't need insulation?
3. Glue and nail aluminum onto the other side. If cut out correctly:
 - The side walls should be completely covered on both sides by the aluminum.
 - The door panel _____
 - The back wall _____
 - The base _____

Base

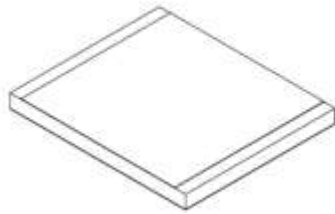




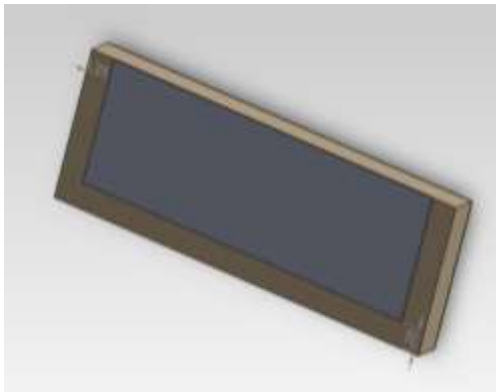
Bottom View

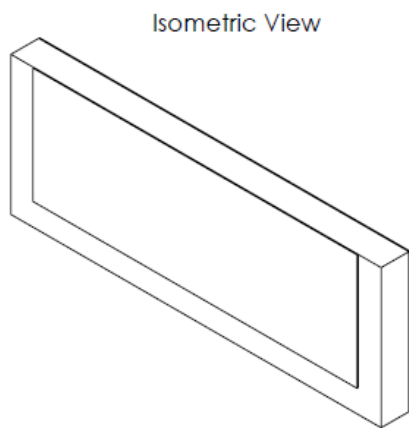
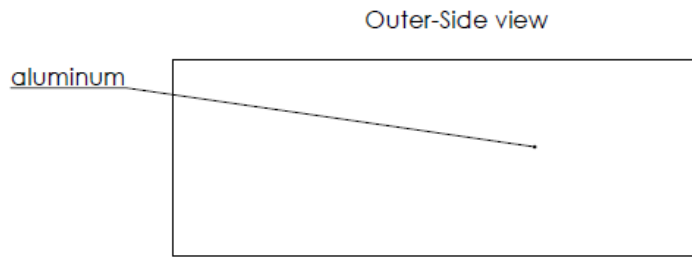
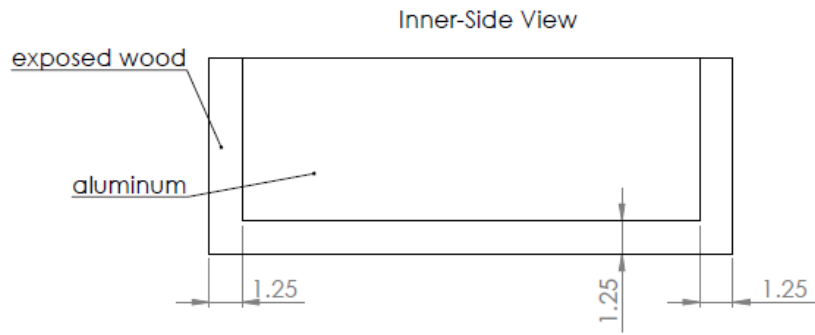


Isometric View

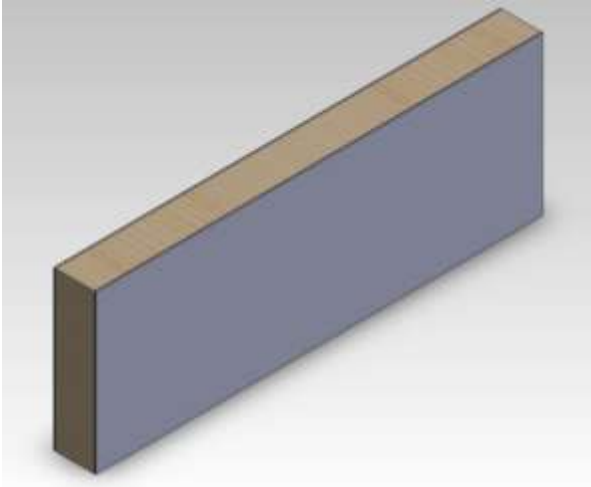


Rear Wall

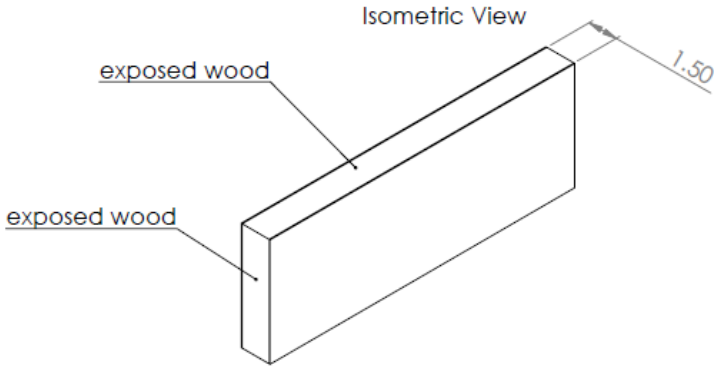
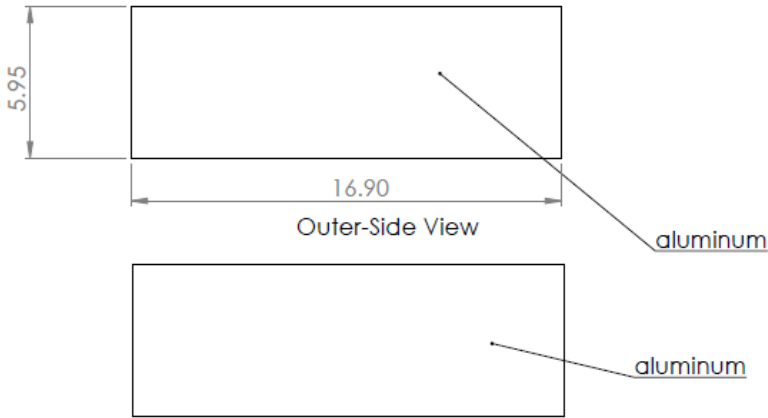




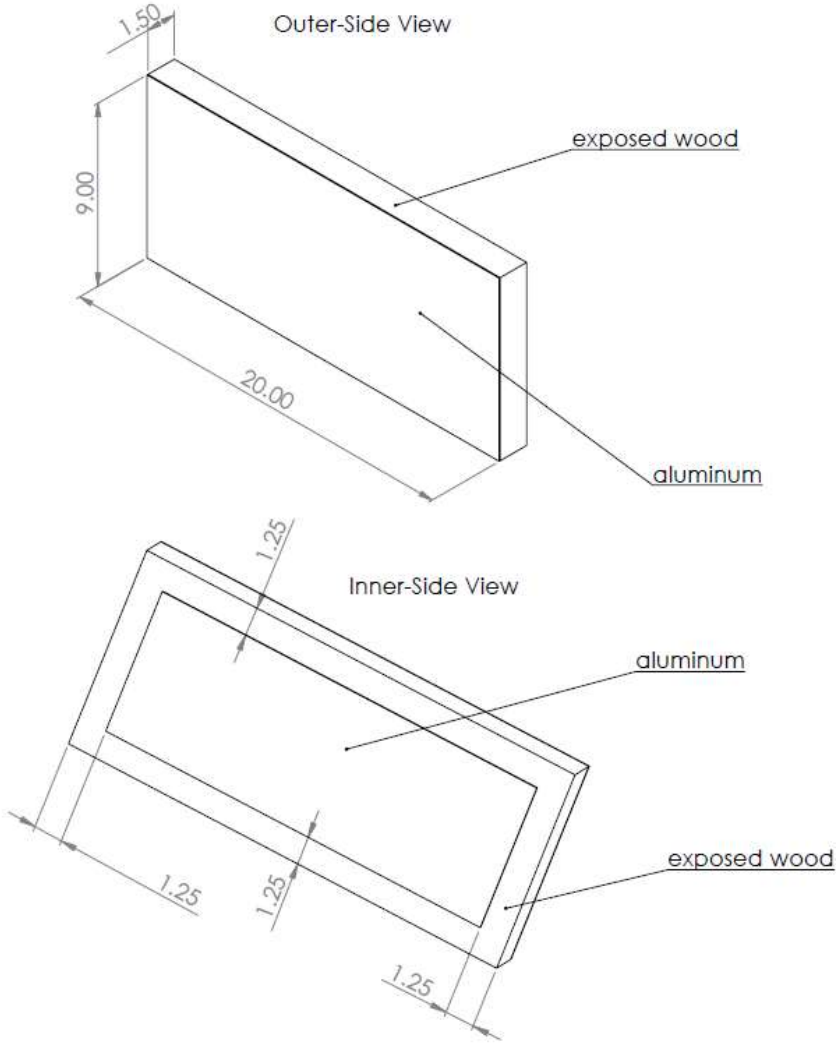
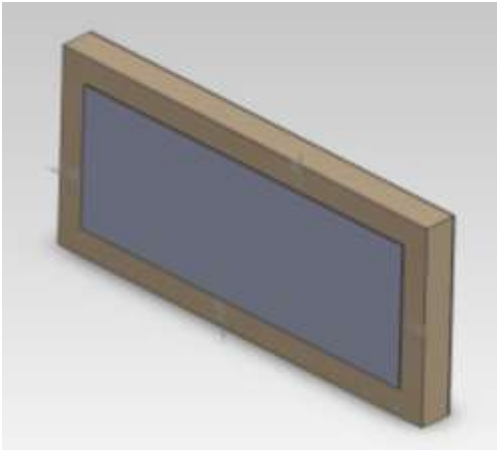
Side Wall (x2)



Inner-Side View



Door



Add pegs

1. Using power drill, create a small hole 1/2" deep) where each peg will go. The locations are as follows:

- 2 pins, one on each side wall, to mate with corresponding holes on door.
- 2 pins, one on each side wall, to mate with corresponding holes on back wall.
- 2 pins, one on the top of each side wall, to mate with the top panel.
- 1 pin on the back wall to mate with the top panel.

2. Using premade or homemade pegs (dowels), apply glue to the end of the peg and insert into the hole.
3. Mark tip of each peg and fit together walls to determine where the peg will mate with the wall.
4. Drill a hole at each marked area of about 1/2" deep. For areas where the walls will fold up to meet each other, also drill some vertical leeway as the sides will fold at an angle. (show pic?)



Add hinges

- longer hinges – the front and back will be mounted on hinges long enough to allow the full width of the bottom of the front or back to rest tightly against the bottom of the cooker.
- shorter hinges – small hinges go underneath the side walls
- cut portion of wall so base of hinge fits comfortably without interfering w hinges movement

Add hooks and eyelets

- 4 hooks and eyes

Add weather stripping

1. Cut weather stripping. Apply silicone to one side and using hands, gently press on to the following areas:
 - edges of each side and door against themselves or facing the base
 -
 -
2. Ensure that there are no areas where heat may leak; add more stripping as necessary.



Construct the top panels (glass frame and reflector)

1. *If using bags in place of glass:* Using stapler, staple end of each bag to the end of the wooden frame. Apply silicon to wood and stretch the bag flat over the length of the wood. Staple the other end. Repeat on the other side of the frame.



2. Nail galvanized steel to top of reflector panel.
3. Cut out Mylar reflective material. Apply to wooden frame (bottom of reflector panel) using silicone.



Construct prop rod

Construct black plate