

Cowper

From Steve Wolverton on the T&TTT forum, Feb 2005

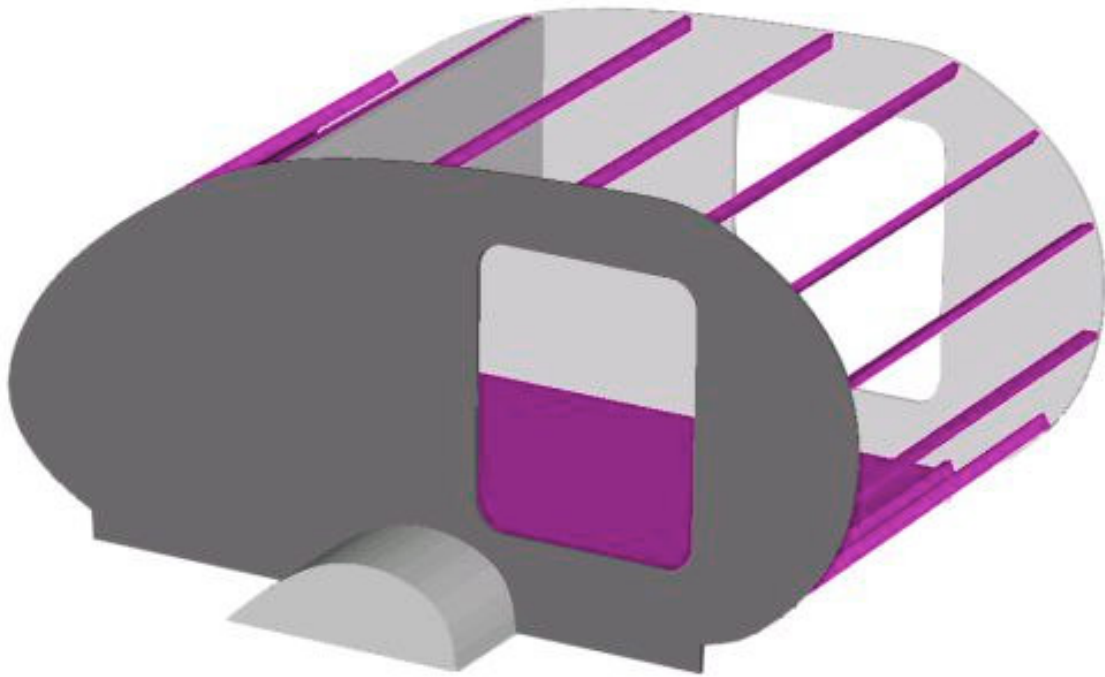
For Reference Only... Do not use to build a trailer.

Check on Teardrop and Tiny Travel Trailers for up to date building information;

<http://www.mikenchell.com/forums>

-THESE PLANS ARE NOT COMPLETE OR EDITED -

-LAST UPDATED 2/20/05



TeardropTrailerPlans

Wooden frame encapsulated in fiberglass

T A B L E O F C O N T E N T S

Tools

Creating the Profile.....

Cutting out the Profile.....

Cutting out the Floor.....

Cutting out the Doors.....

Mounting the Sides to the Floor.....

Installing the Stringers.....

Installing the Cupboard.....

Skinning.....

Doors.....

Fenders

Fiberglass Exterior.....

Interior Epoxy Fillets.....

Installing Inspection / Power Hatches.....

Painting the Camper.....

Attaching Trim Edging.....

Insulating.....

Interior Details (upholstery)

Resources.....

Below is a list of tools that I used. Not all tools are required, and you may wish to use ones I didn't. This should give you a good idea of the tools needed for the

project.

Circular saw Router Drill motor Cordless drill motor Jig saw Belt Sander Orbital Sander Bar Clamps Drills with countersink Hand plane

M A T E R I A L L I S T

(2) 4' x 8' x 1/2" BCX plywood

(2) 4' x 8' x 3/8" BCX plywood

(4) 4' x 8' x 1/8" Hardboard

(24) 1" x 2" x 8'

(1) 2" x 4" x 8'

(4) 1" x 4" x 8'

(200) 1-1/4" wood screws #8

(50) 2" coarse drywall screws #8

(100) 3/4" wood screws #8

3 Gallon Epoxy Kit (2 gallon resin / 1 gallon hardener)

1 Gallon wood glue

10 yards 60" 4oz. Fiberglass cloth

(1) pound glass bubbles

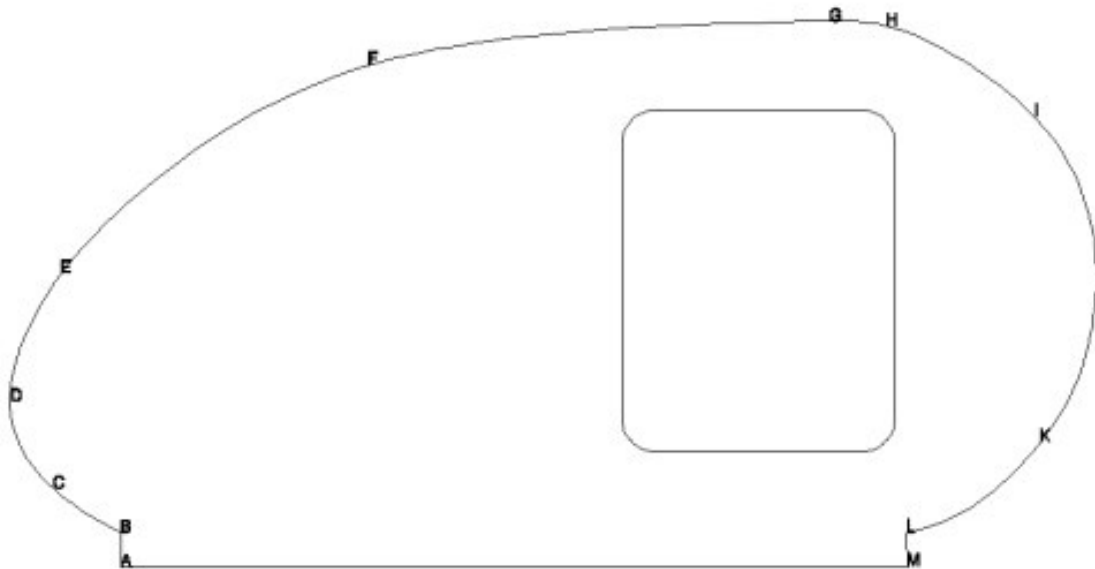
(1) pound wood flour

(1) gallon primer – exterior latex

(1) gallon white paint – exterior latex semi-gloss

20 mixing cups

The profile is the side shape of your camper. This is the shape that your camper will take. To create the profile you will need to loft the coordinates on your 3/8" plywood. As an alternative, you can do this on a cheap piece of masonite and use it as a template.



To loft the coordinates, you will take a nail or screw, and place it at the following locations. Assuming the bottom left is 0,0 on your plywood, if you moved 12" to the right on the bottom, but didn't go up, you'd be at 12,0. If you moved 12" to the right and went 12" up, you'd be at 12,12. This is how I provide the location for the plots to get the shape above. The plot points for the profile are below:

- A = 9-3/4" X 0
- B = 9-3/4" X 3"
- C = 3-3/4" X 7"
- D = 0" X 15"
- E = 4-1/2" X 25-3/4"
- F = 31-1/2" X 44"
- G = 72 X 47-7/8"
- H = 77 X 47-1/2"
- I = 90 x 39-1/2"
- J = 95-1/2" x 25-1/2"
- K = 90-1/2" x 11"
- L = 78-3/4" x 3"
- M = 78-3/4" x 0"

So to plot location A – measure 9-3/4" to the right of the 0,0 or bottom left corner, then measure 0" up and that will be your first point. To measure to the next location (B), measure 9-3/4" to the right of the 0,0 or bottom left corner, and then measure up 3". Place a nail or screw at that location, that is plot point B. Always measure from the 0,0 or bottom left corner for all the plot points.

After you've measured all plot points, you can then connect them. Place a batten

(a long flexible piece of wood, plastic, etc.) below the nails or screws. Bend the batten so that it makes a nice fair curve at the points. Trace the curve onto the wood with a marker and you now have the profile for your camper. Make sure the curve is nice, and has a shape to your liking. If a mark looks like it doesn't line up, double check your measurements to make sure it's in the proper location.



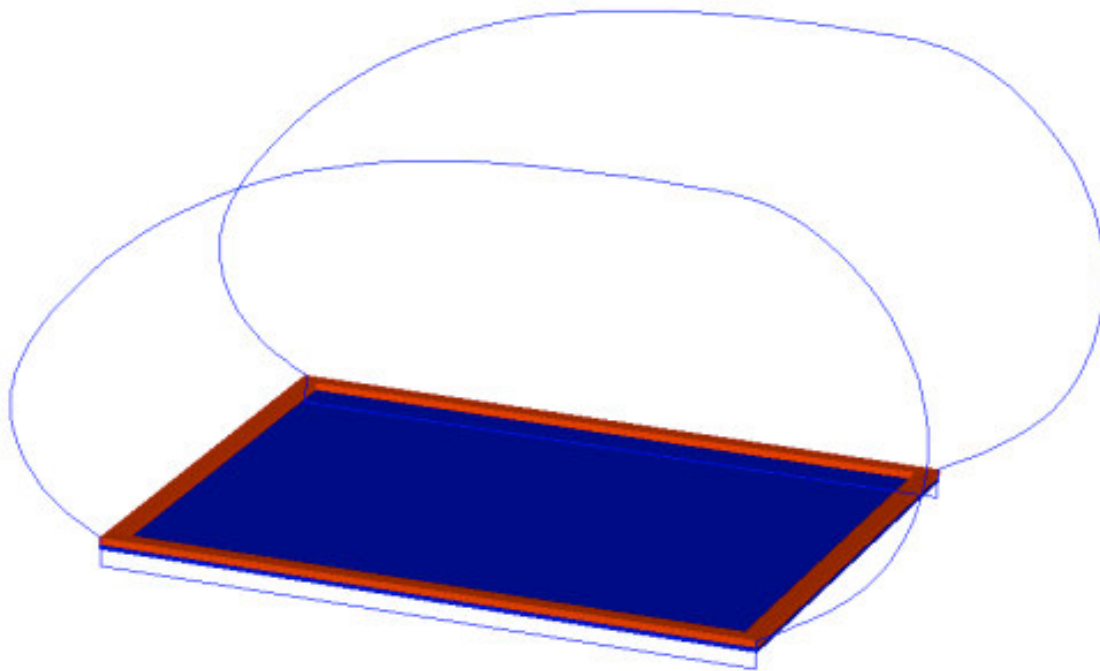
The above photo is my first attempt at creating a profile for the camper. One of the first things I did was to freehand a nice shape that I liked. You can see it took a few tries to come up with a fair curve, and a shape that appealed to me. After tracing your profile, you'll need to cut it out. If you created a template, you can use a router and the template to cut the profile. If you chose not to create a template, cut out one side, and then use the one you just cut out to trace the profile onto the other piece of plywood. You can use a jig saw, router, or a circular saw. I used a circular saw with the depth set just deep enough to cut the plywood. After cutting out the sides, it's a good idea to clamp them together to make sure they're the same – sand any irregularities to make them identical.



Pay attention to which side of the plywood you scribe. You will want to be careful to display the better side outward.

It is also a good time to mark the location of the 14 stringers now. Space them evenly, and while you have the sides together, go ahead and mark them so they'll be located at the same points of both sides. (see installing the stringers) The floor of the camper measures 52" x 69". To do this, cut one sheet of $\frac{1}{2}$ " plywood 48" x 52" and the other sheet of $\frac{1}{2}$ " plywood 48" x 21". Place the floor on the trailer.

I joined the two pieces of the plywood floors together with a 2" x 4" x 52" screwed to the underside of the floor.

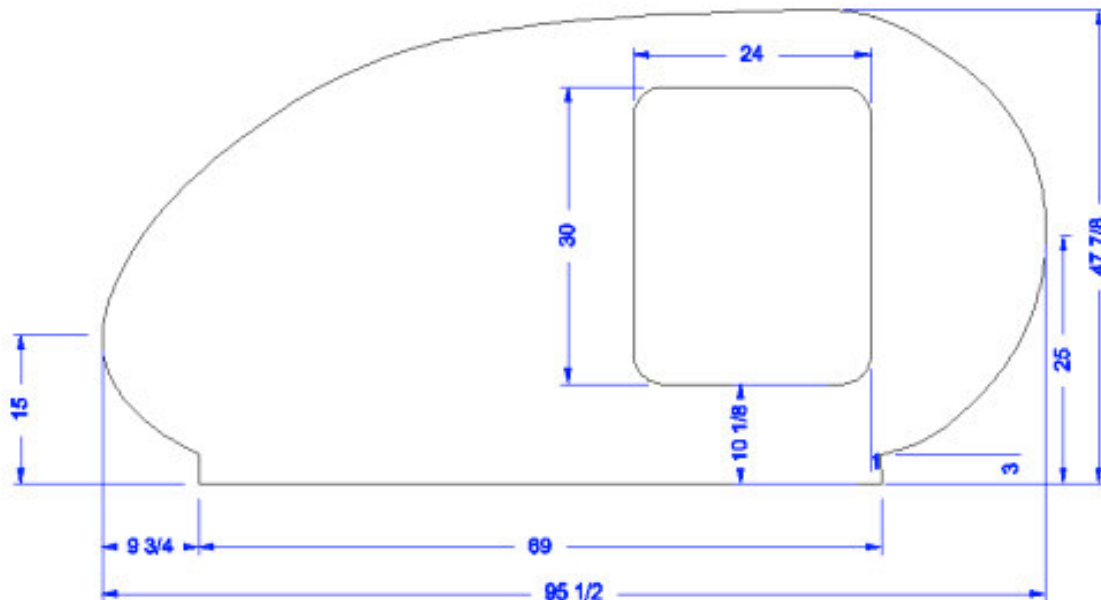


Toe rails (shown in red) are then cut from 1 x 2 stock and screwed to the floor (shown in blue) using 1-1/4" #8 wood screws. I placed a screw approximately every 6 inches. You will need to cut the toe rails:

- (2) 1 x 2 x 69"
- (2) 1 x 2 x 48 1/2"

It's a good idea to apply wood glue or epoxy to the toe rails before screwing them to the camper floor.

The doors on the camper measure 30" x 24". The doors also have a 3" radius on the corners. It is much easier to cut the doors out before they're mounted to the trailer floor.



The doors measure 1" back from the front straight part of the camper which covers the trailer, and 10 1/8" from the bottom of the camper. If you decide to use a flush fitting door, then you will have no clearance problems with the fenders. If you use the overlapping doors, then they'll need to be modified to allow for the fenders. (This is assuming your trailer axle is in the same location as mine.)

Use a drill to cut an access hole for the jigsaw. Use the jigsaw to then cut out the doorway. Save these pieces of wood because you will reuse them later for your doors.

I would highly recommend working with another person for this part of the job. Have one person hold the side while the other attaches it to the toe rails on the floor.

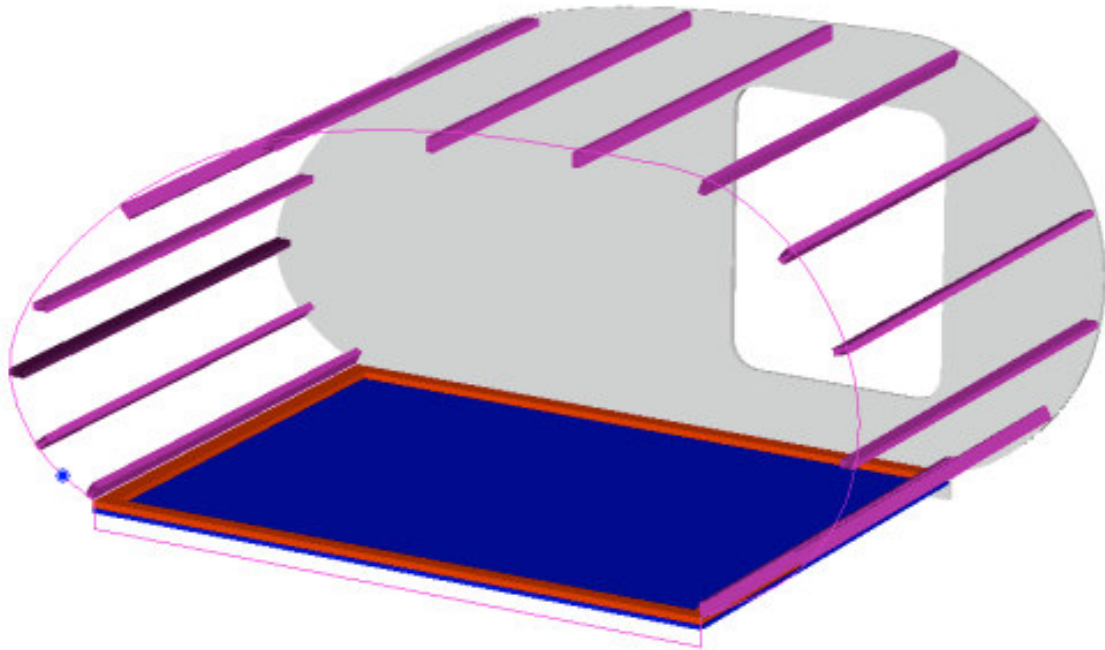


It's easier to scribe a line across the bottom location where the side will mount to the bottom. The straight line from the back of the camper to the front should be mounted so that the top of the floor (not the toe rails) is flush with the scribed line. Start from the back and pre-drill the holes. You will need to use a countersink/drill for this. Use the 2" coarse drywall screws to attach the sides to the toe rails.

Repeat for the other side.

It is also a good idea to temporarily support the sides until the stringers have been installed.

The stringers are 1" x 2" x 52", and you'll need to cut 14 of them. The stringers are used to stiffen the sides of the camper, and more importantly to be used as a mount for the top skin and give it shape.



The placement of the stringers is not crucial. Space the stringers evenly throughout the camper. However, it is crucial that the stringers are located at the same place on both sides. The stringers should be mounted so they are flush with the edges of the camper.

When installing the stringers, make sure to pre-drill the sides and countersink. Use 1-1/4" wood screws to attach the stringers to the sides. I used 1 screw per side. You may use two or more, but it's not necessary as the top skin will keep the stringers from shifting.

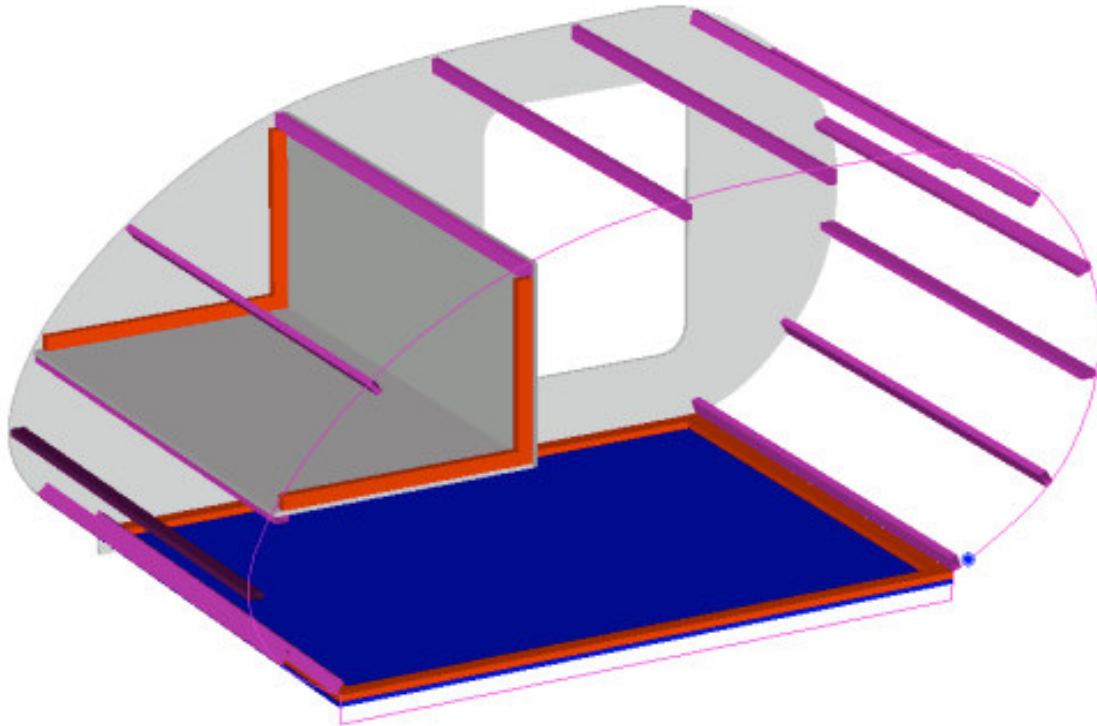
Installing the cupboards is a completely personal thing. The use of a cupboard is essential for strength of the camper. You can make the cupboards as large as you'd like – but keep this in mind: The larger you make it, the heavier it will be, and you'll also be more likely to bump your legs while rolling over.

The best way to build your cupboard is to measure your stringers and use them as guides. You will also need to add four more stringers to mount the cupboard.



The cupboard is constructed from the leftover ½" plywood that was used in constructing the floor.

It is recommended that there is at least 18" of clearance from the bottom of the cupboard to the top of the trailer floor. You should also account for the thickness of the mattress that will be used.



The cupboard stringers (shown in red above) will vary in length according to your setup. The cupboard stringers are constructed from 1" x 2" leftovers from the main stringers (shown in purple) of the camper. The cupboards (shown in dark gray) are attached to the stringers using 1-1/4" wood screws.

You should cut the cupboard doors before installing the cupboard in the camper. Recessed doors, overlapping doors, no doors, or flush doors are all personal preference. The cupboards strengthen the rear of the teardrop and should not be omitted.

I used 4' x 8' x 1/8" sheets of hardboard for my exterior camper skin. Hardboard is notorious for falling apart if it gets wet, so it has to be sealed from moisture. I would recommend using 4' x 8' x 1/8" sheets of plywood if you have it available in your area. It's much more waterproof, but it's also much more expensive. If you completely seal the hardboard, then you won't need to worry about it delaminating.

Cut four sheets of the hardboard 48" x 56". You will have a little overhang on both sides of the camper that will need to be trimmed off later.



To join each section of hardboard to the previous, cut a 1" x 4" x 52" board and use $\frac{3}{4}$ " wood screws to mount it. You will need (3) 1" x 4" x 52" boards to join the 4 sections of hardboard. Use a countersink to keep the screw heads flush with the hardboard. Be careful not to countersink too deeply as the screws can pull through the hardboard.

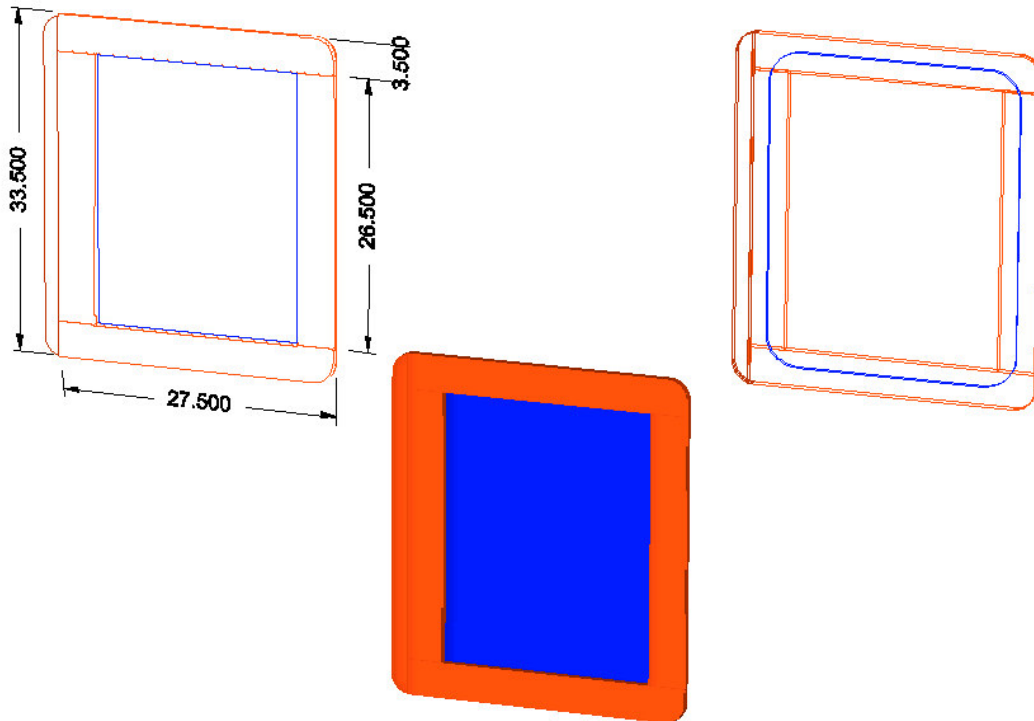
Place a screw every 6"-12" along the stringers to mount the $\frac{1}{8}$ " hardboard skin to the camper. It's easier to locate the stringers if you mark them on the sides of the camper before attaching the skin. The curve on the back of the camper is the most difficult part of skinning.

You should get the hardboard to line up as closely as you can while attaching them. Do not worry about small gaps where they meet up at the joiners, this will be filled in with epoxy/wood flour mixture. It is important that the 3rd section of hardboard overlap the last section.



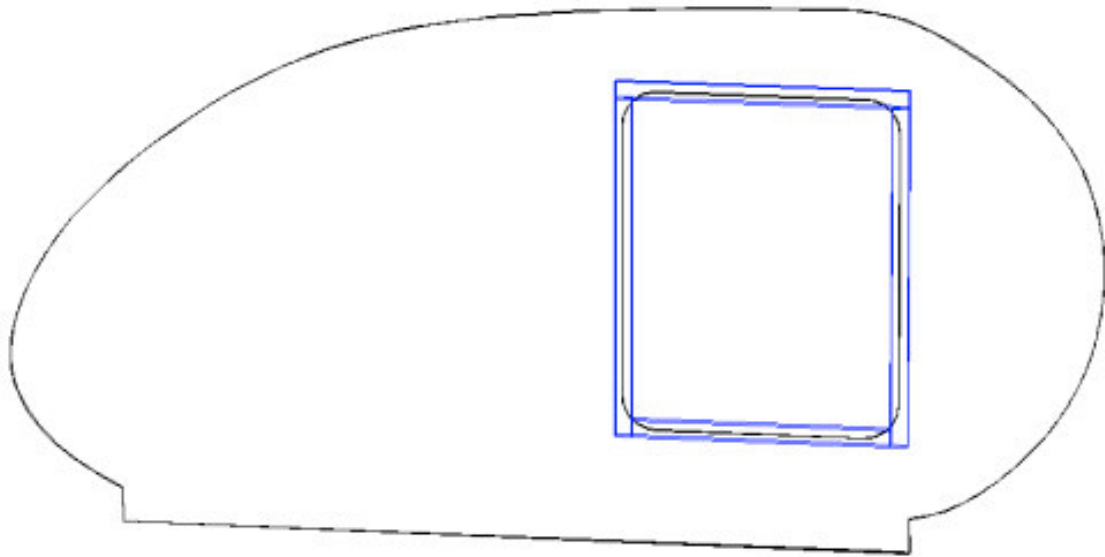
As you can see in the photo above, you should overlap the third section over the last. The reason for this is the last section of hardboard is under a large amount of stress from the steep curve around the back of the camper. It's best to screw the last section of hardboard in at the bottom, and bend it around as you apply screws to hold it in place. It's best to work with another person during this part of the install as the hardboard will pull from the screws if the entire width of the section isn't attached to the stringers. The overlapped section will get filled with epoxy/wood flour mixture and faired later.

The next step is to trim the sides of the hardboard flush with the sides of the camper. I did this by using a jigsaw and cutting close to the camper. I then came back with a hand plane and planed the hardboard flush to the sides. The last step was to take a belt sander and sand it smooth and flush with the sides. I changed up the doors from the original version to doors that overlap on the sides. The new door that I use on the camper has two seals instead of one. There is one seal on the outer perimeter of the door, and there is an inner seal that is formed with the door cutouts.



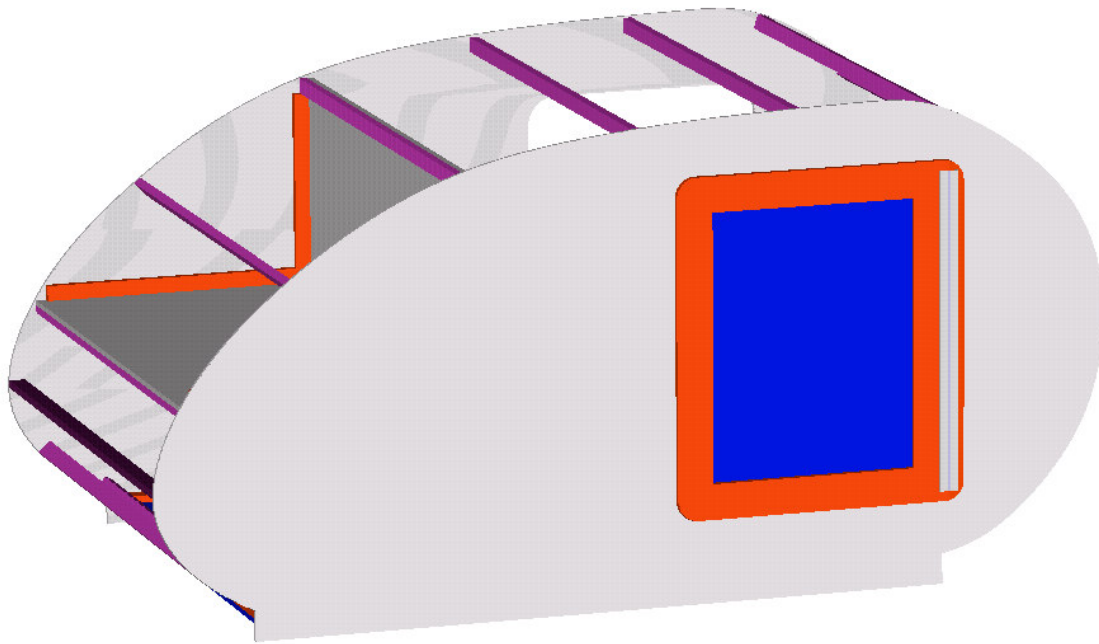
The doors are constructed from 1" x 4" stock. A 1" x 2" is also used for the hinge mount on the front of the door assembly. This will also act as a rain break while traveling. The frame dimensions listed above are 33-1/2" overall height, 27-1/2" width minus the 1" x 2" used for the front hinge. The framework (shown in red) has a 2" radius on all corners (make sure to radius the 1" x 2" in the front, and not the 1" x 4"). The 3/8" plywood door cutouts (shown in blue) are then glued and screwed to the back of the door framework using 1-1/4" wood screws.

I chose an RV door latch that is similar to what is used on popup camper for its ease of use, easy installation, and low cost.

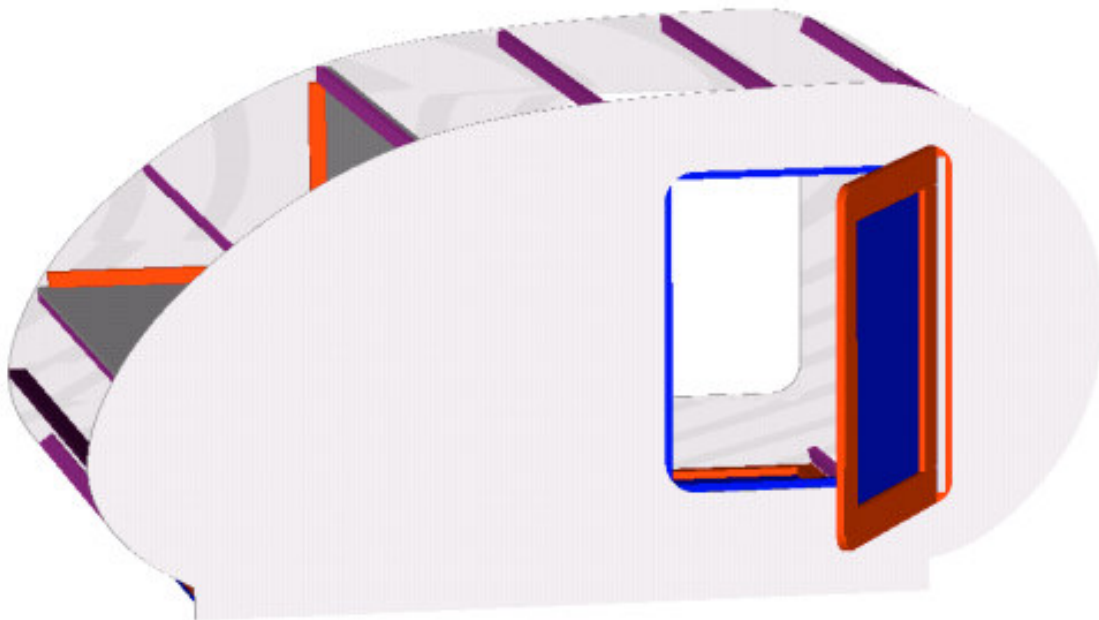


The next step in the door construction is to add the door jambs to the sides. The door jambs are constructed from 1" x 2" and are centered in the doorway so there is 3/4" overhang for the door to close on to. Countersink the holes on the camper sides, and screw the door jambs to the sides using 1-1/4" wood screws.

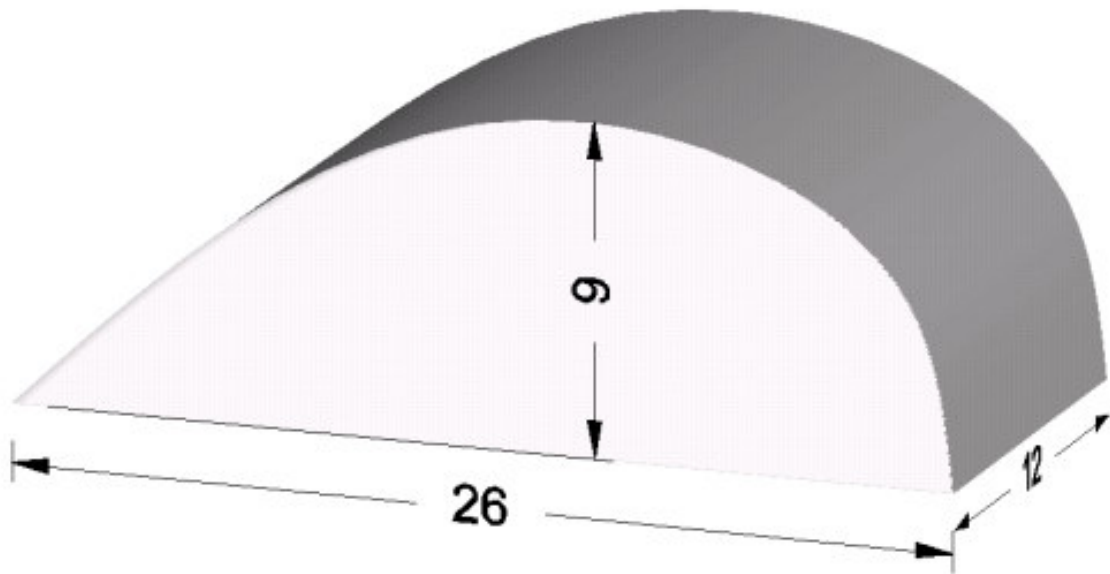
The door jambs need to be sealed or painted to keep water from penetrating the wood.



The 3/8" plywood doors should sit flush with the camper sides when the door is closed. The 3/4" door frame should sit tightly against the camper sides. The doors should always be hinged at the front of the camper.



The fenders are constructed from 1/2" leftover plywood and 1/8" hardboard. The dimensions for the fenders are below:



The dimensions shown above is for a 12" wheel and tire package.

The easiest way to construct the fenders is to cut the 1/8" hardboard first. Cut a 12" wide strip of the 1/8" hardboard approximately 36" long. Lay out the shape of your fenders on your 1/2" plywood and cut four sides, two sides for each fender. Screw the hardboard into the 1/2" plywood with 1-1/4" wood screws. It's best to pre-drill all the screw holes because it is easy to split the plywood. You do not need to countersink the hardboard because all of the screws will be removed.

Mix some epoxy and thicken it using wood flour. Apply 1/8" bead of the thickened epoxy to the inside seams of the fenders. Allow epoxy to dry and remove all screws. You can now trim the excess hardboard from the fender. You now can mix more thickened epoxy and fill the screw holes.

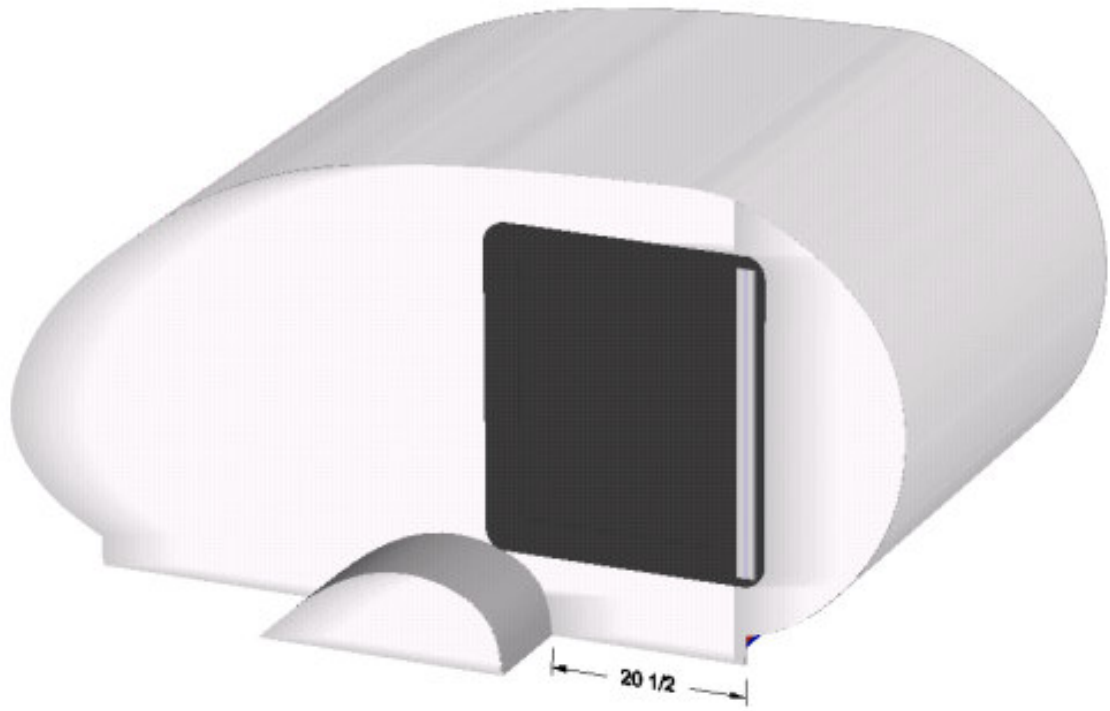
You have a couple of options for sealing the inside of the fenders. You can fiberglass the inside of the fender, you can coat it with asphalt emulsion tar, or you can coat it with a truck bed liner material. I recommend the truck bed liner material, and you can coat the bottom of your trailer at the same time.



The photo above shows the fender constructed, and the excess waiting to be trimmed. One way to trim the hardboard is the same method for trimming the overhang of the skin material. Take a jig saw and cut the majority of the excess material away. Next use a hand plane to take the hardboard down, and clean up with the belt sander.

You need to protect the fenders exterior from moisture as well as the inside. You can fiberglass the exterior, coat it in epoxy, or apply paint.

The fenders are mounted using (3) 5/16" x 2" bolts per side. I used wingnuts that would allow me to remove the fenders without special tools. Depending on your trailer, you may be able to jack up the trailer high enough that you won't need to remove your fenders to access the wheel/tire.



The fender is mounted 20-1/2" from the front trailer cover of the camper. This measurement will depend of the trailer used.