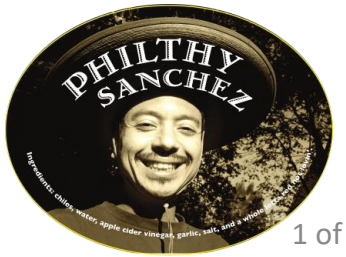
Philthy's solar powered pico grey water evaporator—Free and Open-Source design

The concept is based on reading about folks who used laundry drying racks with strips of towels extending downward into a reservoir. They noted that the towel only wicked water up a few inches. The design also draws from the "evapotron," but rather than a large cylinder of wire mesh and a high-capacity pump, this uses a smaller column and a slower drip pump

The current design uses terry cloth as the evaporator and a solar powered pump in a small bucket. The pump pushes water up a tube. There are wooden planks at the top and bottom to which the terry cloth is attached with staples. At the top, the vertical tube connects with a "T" to a second tube that has perforations made with a leather hole punch.

Water drains down the terry cloth back into the bucket, passing through a bar towel as a filter.

Details follow.



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Materials:

solar powered water pump (I used AISITIN 5.5W Solar Fountain Pump with auto shutoff if it runs dry)
2 x 2 lumber: 10 ft piece
- 32" (2 pieces)
- 16" (1 piece)
- 13" (1 piece)
- 4" (4 piece)

2 x 4 lumber (10", 2 pieces)
1/2 x 6 lumber: 2 ft piece
- 9" (1 piece)
- 7-1/2" (1 piece)

wood screws (2-1/2", 8 pieces)
plastic tubing (1/4" diameter, 50")
drip irrigation "T" for 1/4" tubing (1 piece)
small bucket (2 gallon, approx. 9" diameter, 1 piece)
plywood 1/2", 24 x 24 for base (1 piece)
corner braces, (6 pieces)
wood screws for corner braces (24 pieces)
black terry cloth (8" x 1 yard)
large staples (8 pieces to hold the tubing)
small staples (for staple gun, to tack down terry cloth)
small piece of flat stone (to keep the pump off the bottom but submerged)
heavy Romex wire (30")
zip ties (4 pieces)
bar towel (1 piece)
thin line for support, (approx. 6 ft)
hex bolt & nut, 1/4" x 4-1/2" (1 piece each)
washers (1-1/2", 2 pieces)

Tools:

circular saw
power drill
impact driver (optional)
staple gun
wire cutter
leather hole punch
hammer

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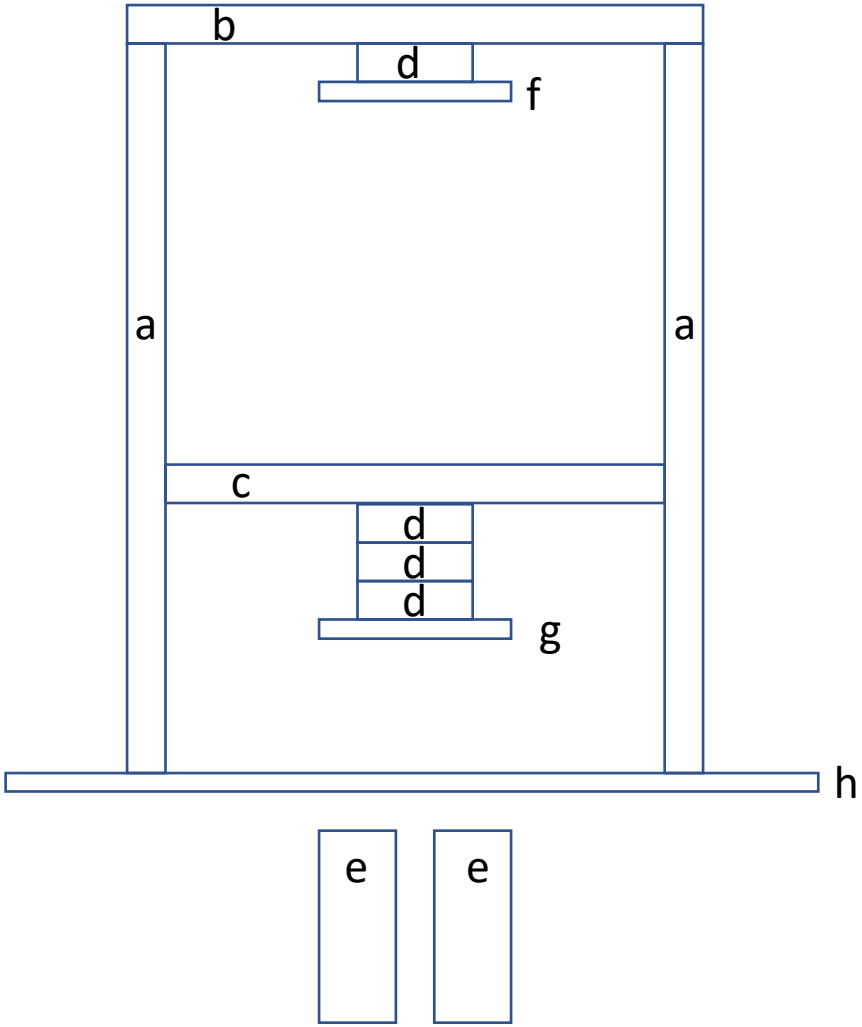
Methods:
Cut lumber into specified pieces, indicated by letter.



2 x 2 lumber:

- 32" (2 pieces) [a]
- 16" (1 piece) [b]
- 13" (1 piece) [c]
- 4" (4 pieces) [d]

2 x 4 lumber (10", 2 pieces) [e]

1/2 x 6 lumber:

- 9" [f]
- 7-1/2" corners cut off [g]

plywood 1/2" x 24 x 24 for base [h]

Note: drawing is not to scale!

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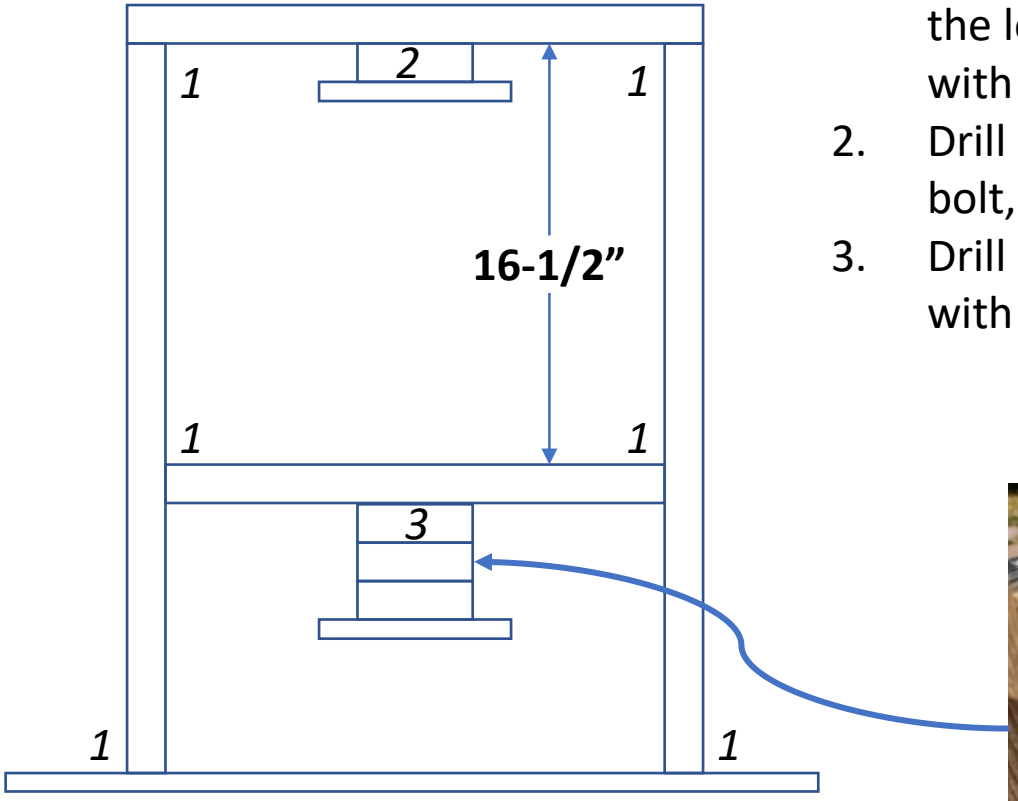
Methods:



1. Drill pilot holes and place angle braces in the locations indicated with [*1*], fastened with small wood screws.
2. Drill a vertical hole and fasten with hex bolt, nut, and washers at [*2*].
3. Drill pilot holes and fasten 2 x 2 sections with 2-1/2" screws at [*3*].

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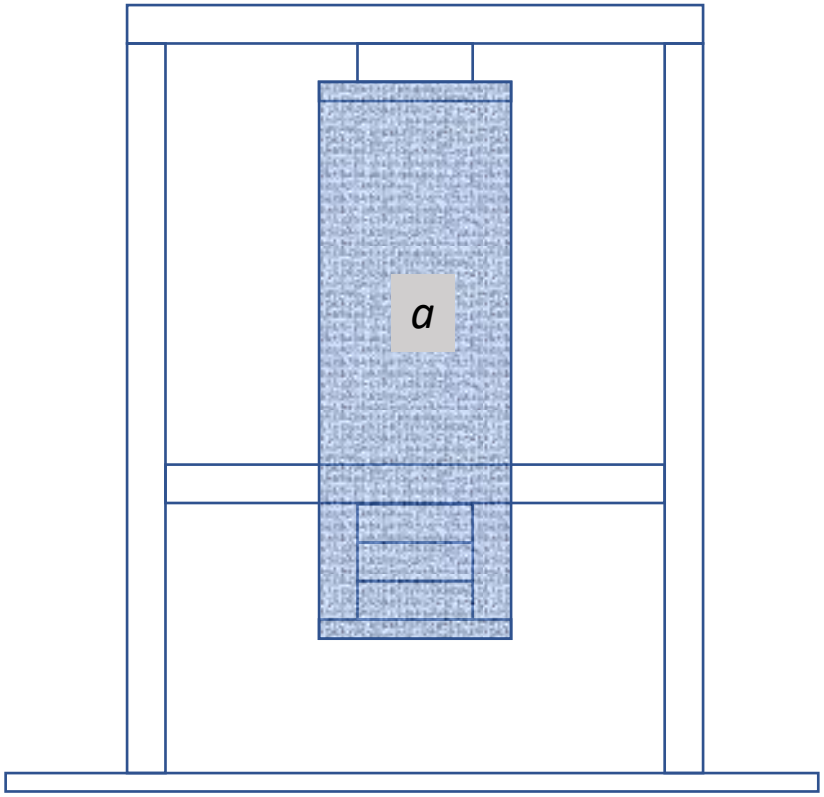
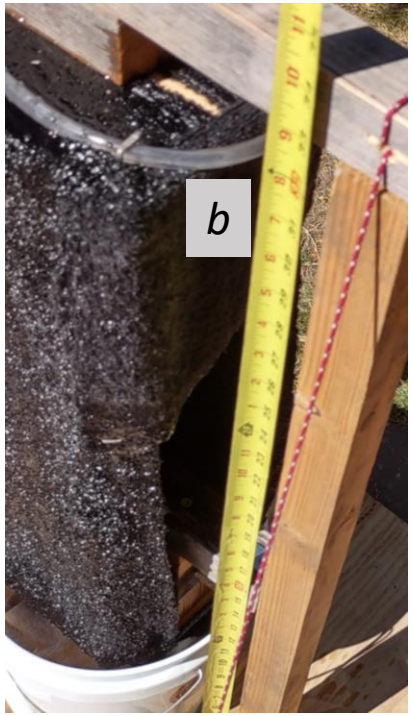
Methods:



1. Cut terry cloth [*a*] to length and attach to the top and bottom 1/2 x 6" planks using staples). Corners were cut off the lower plank to allow it to fit in the bucket.
2. Cut a right trapezoid of terry cloth and attach to the sides [*b*]. This will prevent dripping from the edges of the 1/2" panels.



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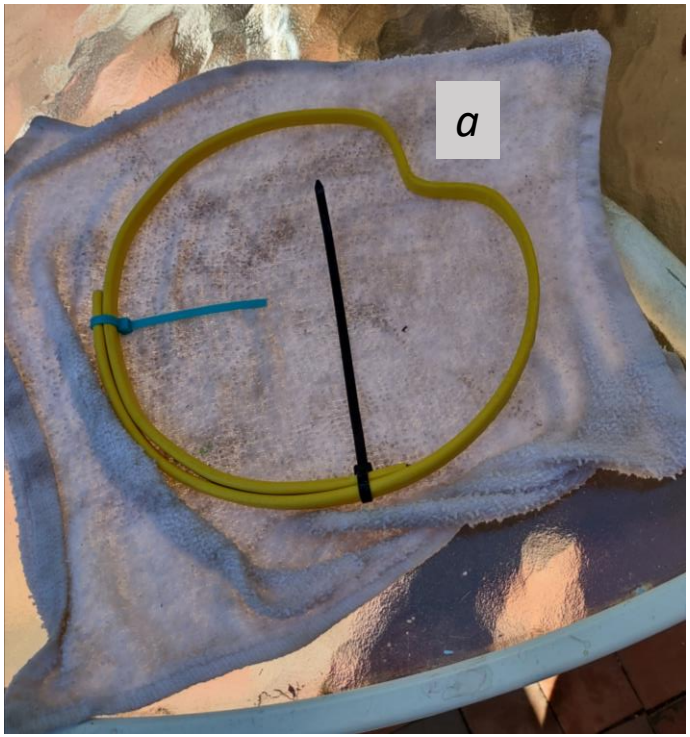
Methods (filter for bucket):

1. Cut the Romex and form it into a circle around the outside of the bucket.
2. Place the two zip ties so the Romex diameter can be easily adjusted.
3. Form a divot in the Romex [*a*], this is where the tube and pump wire will pass by the filter.
4. Attach the pump to the flat stone using a zip tie. This keeps the pump off the bottom of the bucket to avoid fouling with dust. Place the pump in the bucket.
5. Place a bar towel around the Romex and fit it snugly inside the bucket, with the water tube and power cord passing by the divot.



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Methods (filter for bucket):

1. Cut an approximately 20" length of plastic tube.
2. Place large staples in the plank to hold the tube in place. I put 3 on each side of the plank.
3. Place a staple in the vertical stud to hold the vertical tube in place.
4. Bring the vertical tube through the staple and attach the horizontal loop of tube using the drip irrigation "T". You may need to trim the tube to get it to fit. Support with thin line.
5. Cut holes in the horizontal loop of tube using the leather punch. This is where the water will drip onto the terry cloth.

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Methods:

1. Bring the bucket under the drip column and support it underneath with the 2 x 4 pieces. The configuration will direct the dripping water into the bucket with minimal dripping outside the bucket.
2. Droll holes in the corners of the plywood plank and in the ends of the top stud. Use the thin line to support the frame using a midshipman's hitch or trucker's hitch so you can easily tighten as needed.
3. Pour highly filtered and bleached grey water into the bucket and put the solar panel in the sun.

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Caveats:

This design worked fine in my Seattle back yard. ***It has not been Playa tested!*** Testing will happen at Burning Man 2022.

Potential problems:

- The pump may clog and fail. I bought a pump that will automatically stop if it goes dry, but if the pump fails for any other reason, we will need to develop an alternate plan.
- The terry cloth may become fouled with Playa dust, which may impact evaporation.
- The water will flow too quickly and not evaporate quickly enough. We may need to tape over some holes to decrease flow. There is likely an optimal rate based on temperature, humidity, albedo, and water flow rate.
- We will generate more grey water than the capacity of the system. In this case we may need to use a larger bucket, which may negatively affect air circulation around the terry cloth and decrease evaporation at the lower part of the evaporation column.

Water conservation and grey water handling tips:

1. ***Use a garden sprayer to rinse dishes or other items needing rinsing. This is my #1 water tip for Burning Man!***
2. Strain the grey water well. I have a 3-stage filter with nested wire mesh strainers, first layer just wire, second layer bar towel, third layer paper towel.
3. Treat grey water with bleach before evaporating.
4. Spit your toothpaste into a paper towel and trash/compost/burn; do not spit into grey water.
5. Put the contraption on top of a vehicle or trailer, secured with compression straps. This will put the device in areas of greater wind speed and less shadow. Also, it will deter someone peeing or dumping a warm beer in your grey water.

Come by "Sweater Farm Presents" at the Space Virgins, 8:30 and G to see the evaporator in action.
Feedback welcome! philthy@philthysanchez.com