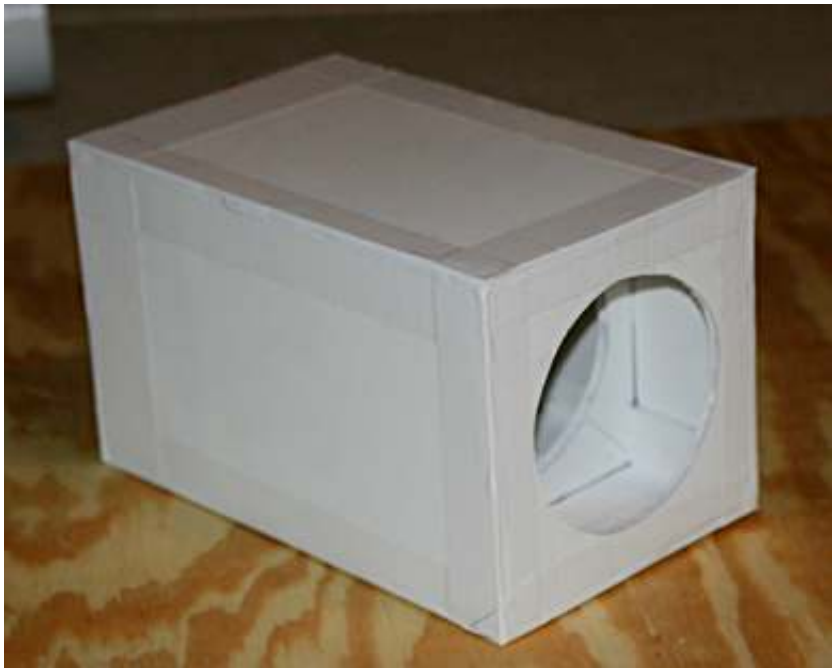
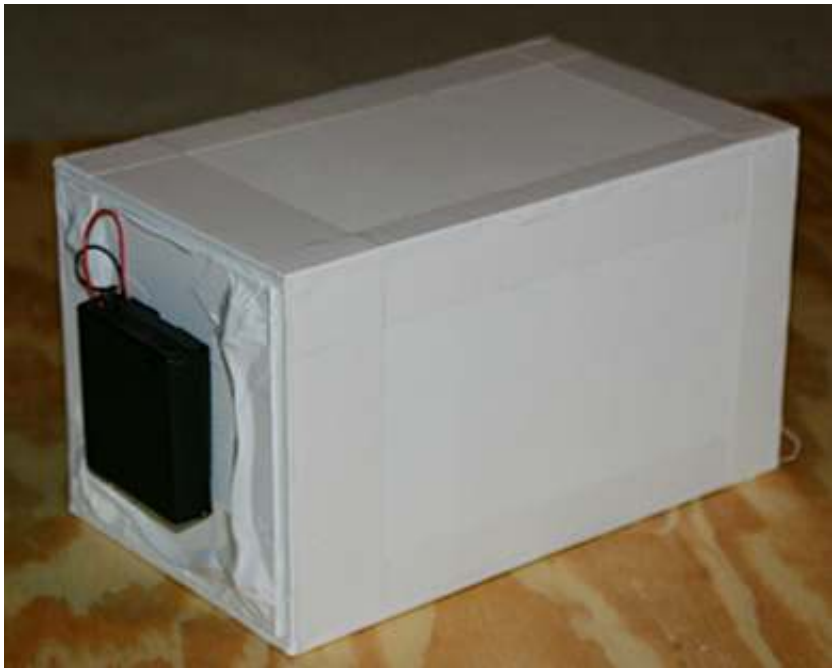
LightBox Construction Project

Stephen P. Hamilton





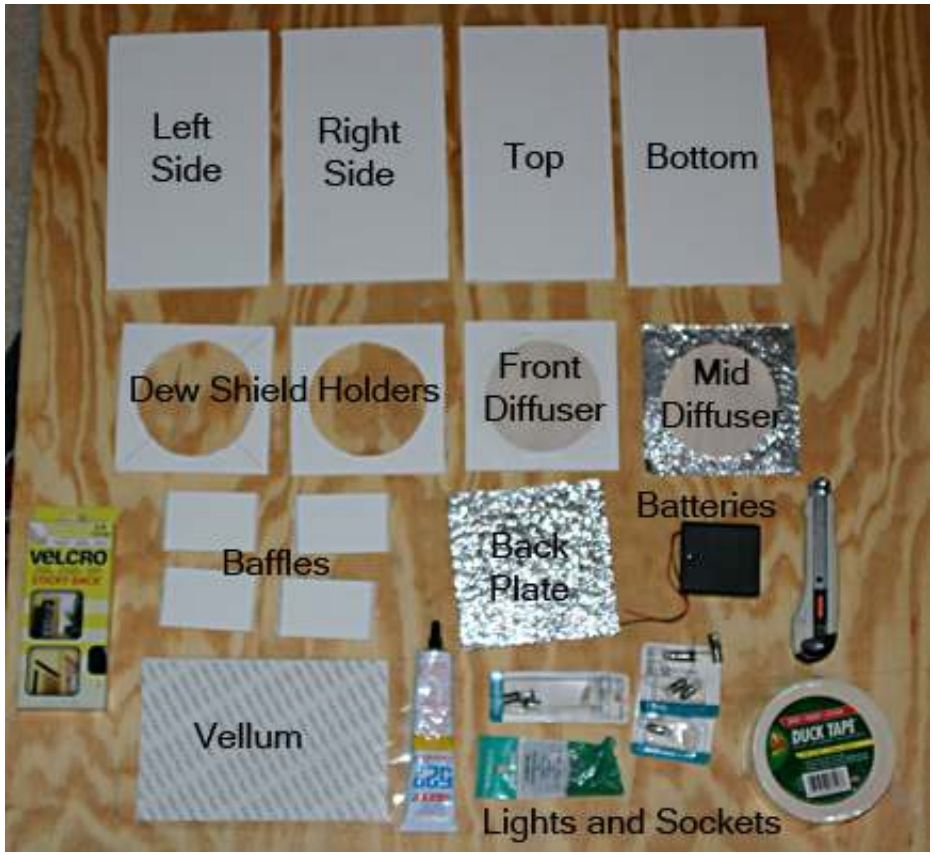
Objective: To build a light weight, inexpensive, and durable LightBox to be utilized to create Flat Frames for Deep Space Imaging. I also wanted it to slip over the dew shield and be held on without external support.

This LightBox design can be used for any small 3" - 4" refractor or other scope of that aperture. Depending on what parts you already have, the entire construction costs should be less then $20.

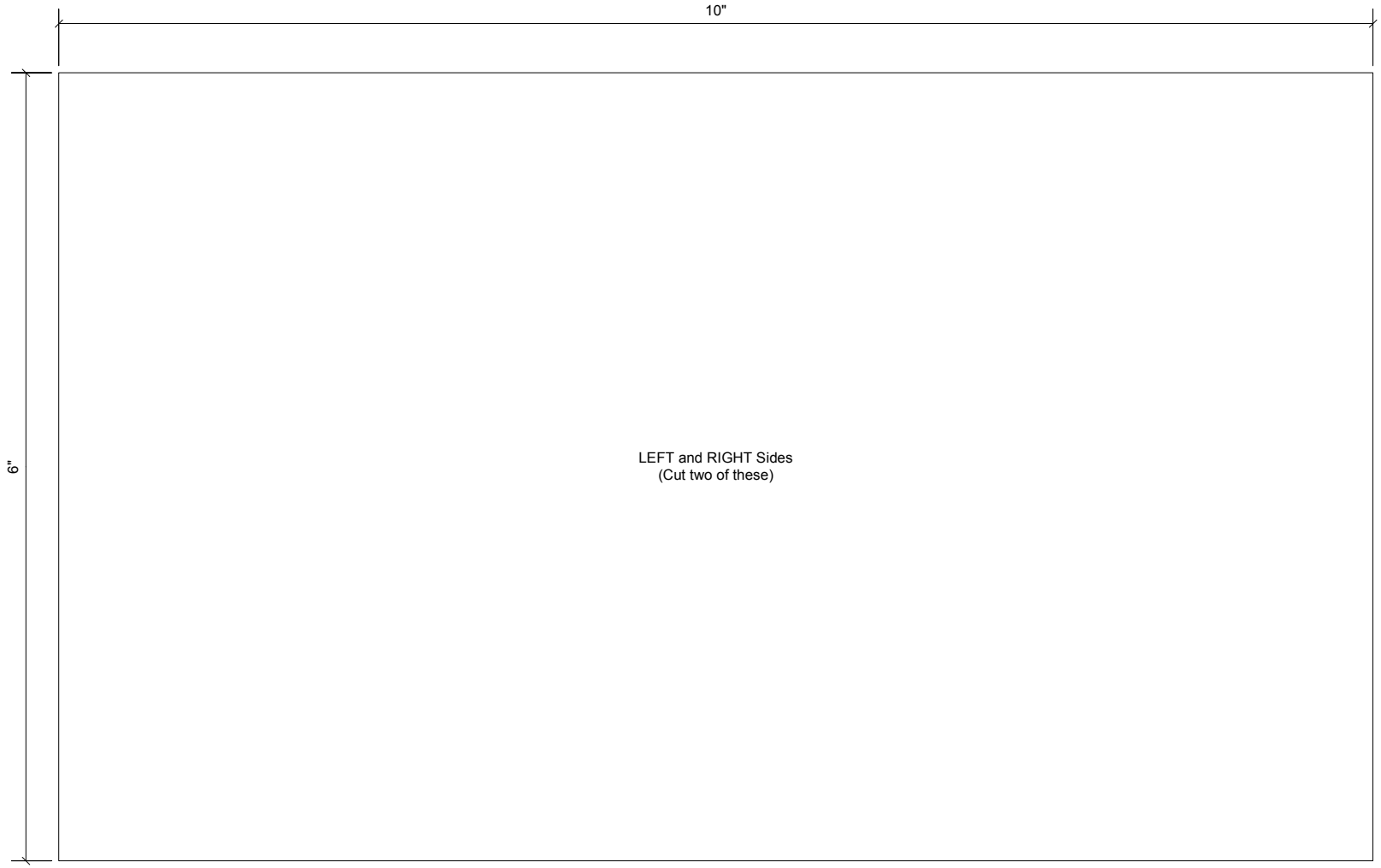
Parts

1 20x30" x ¼" Foam Board (with Paper Backing)
1 Package of Velcro Strips (½" width)
1 Package of Vellum Paper (Scrapbook Supplies)
1 Battery Pack with On/Off switch (and batteries)
1 Roll White Duct Tape
1 Roll of Household Foil
1 Craft Knife (Exacto or similar)
4 Light Sockets (Radio Shack Lamp Base 272-360)
4 Lights (Radio Shack Screw-Base Lamp 272-1133)
1 Roll 24 Gauge wire (2 conductor if possible)
1 15-30 Amp Soldering Iron
1 Roll .015 Diameter Solder
1 Tube of Glue (I used Bond 527, found in Craft Section)

Suggested Items:
1 20" straight edge, preferably metal
1 board, plywood or other to cut and assemble on
1 Roll Scotch Tape (for temporary holds and vellum)



Side Sections



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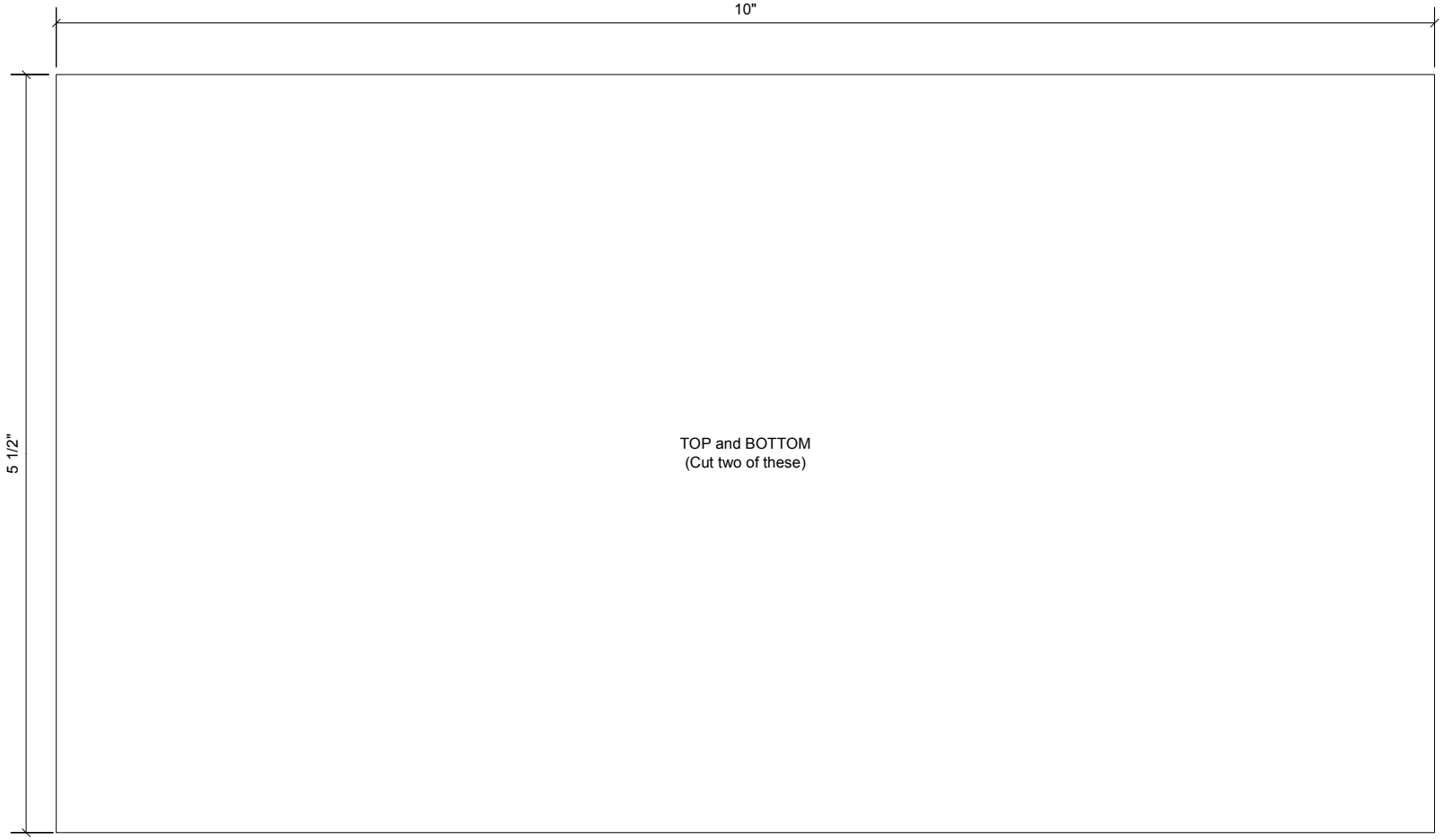
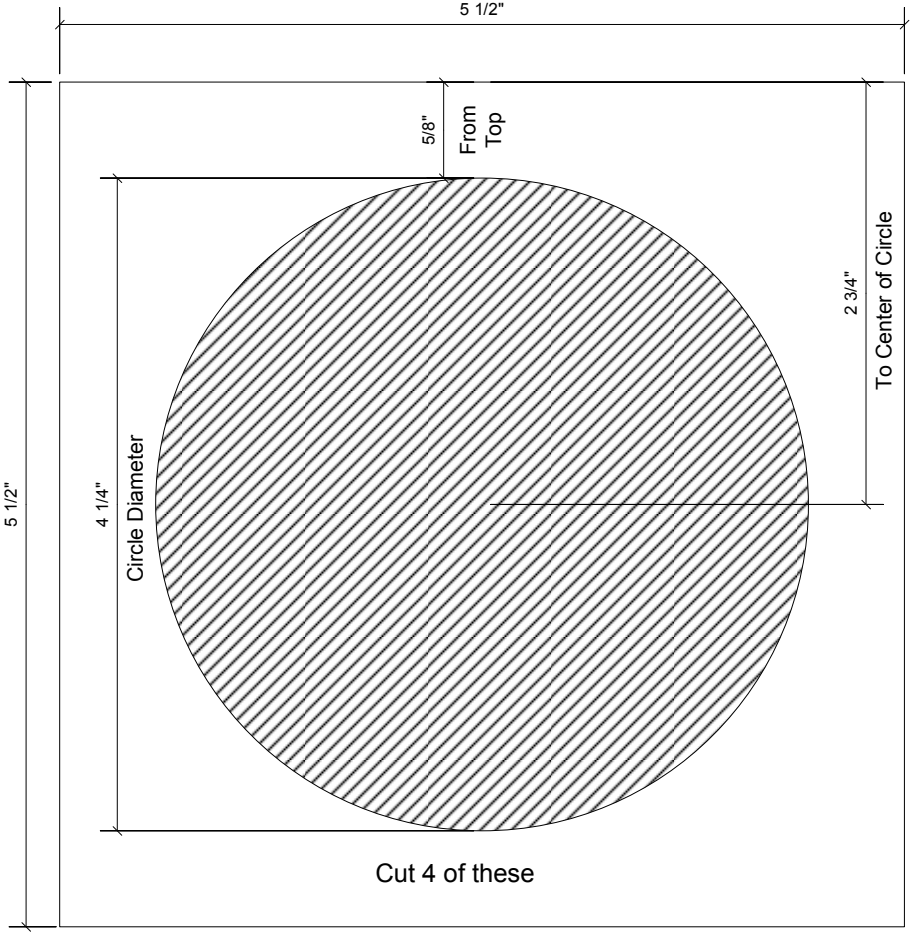
Top and Bottom Sections

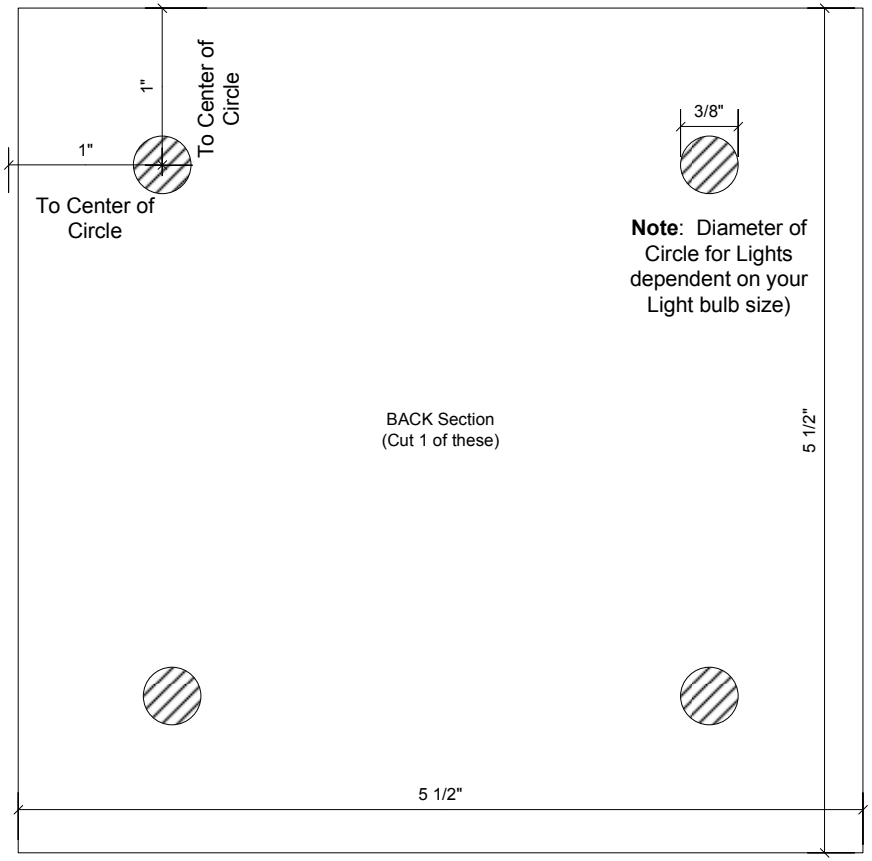
Note: These are 5½" in height vs 6" for the Sides



Dew Shield Holders and Diffusers

Note: These are 5½" in height vs 6" for the Sides





2 - Cut with Holes only
2 - Cut and Vellum applied to one side (Cover opposite Side of one of the Vellum pieces with Foil prior to applying Vellum) - Wait to cover till all plans are read completely

Cover one side with Foil

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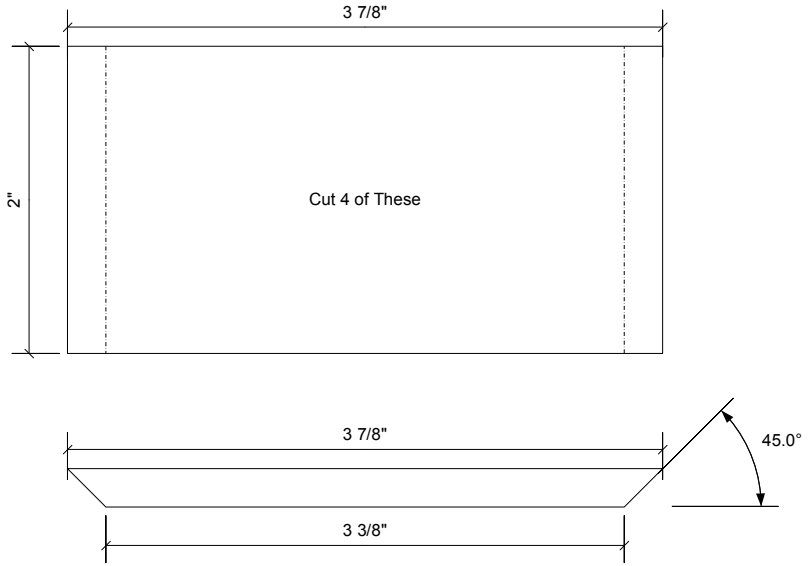
Baffles for Back Section
and Braces

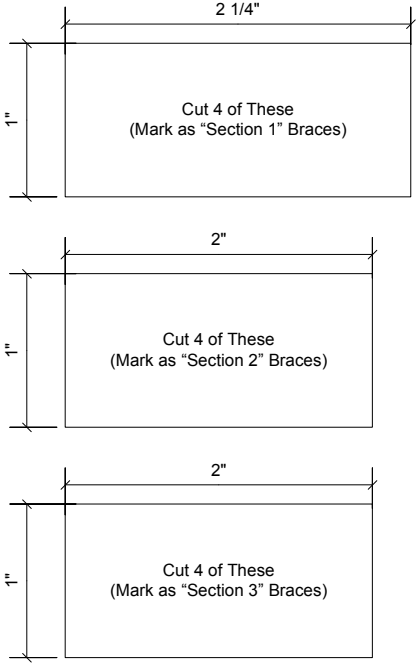
Baffles

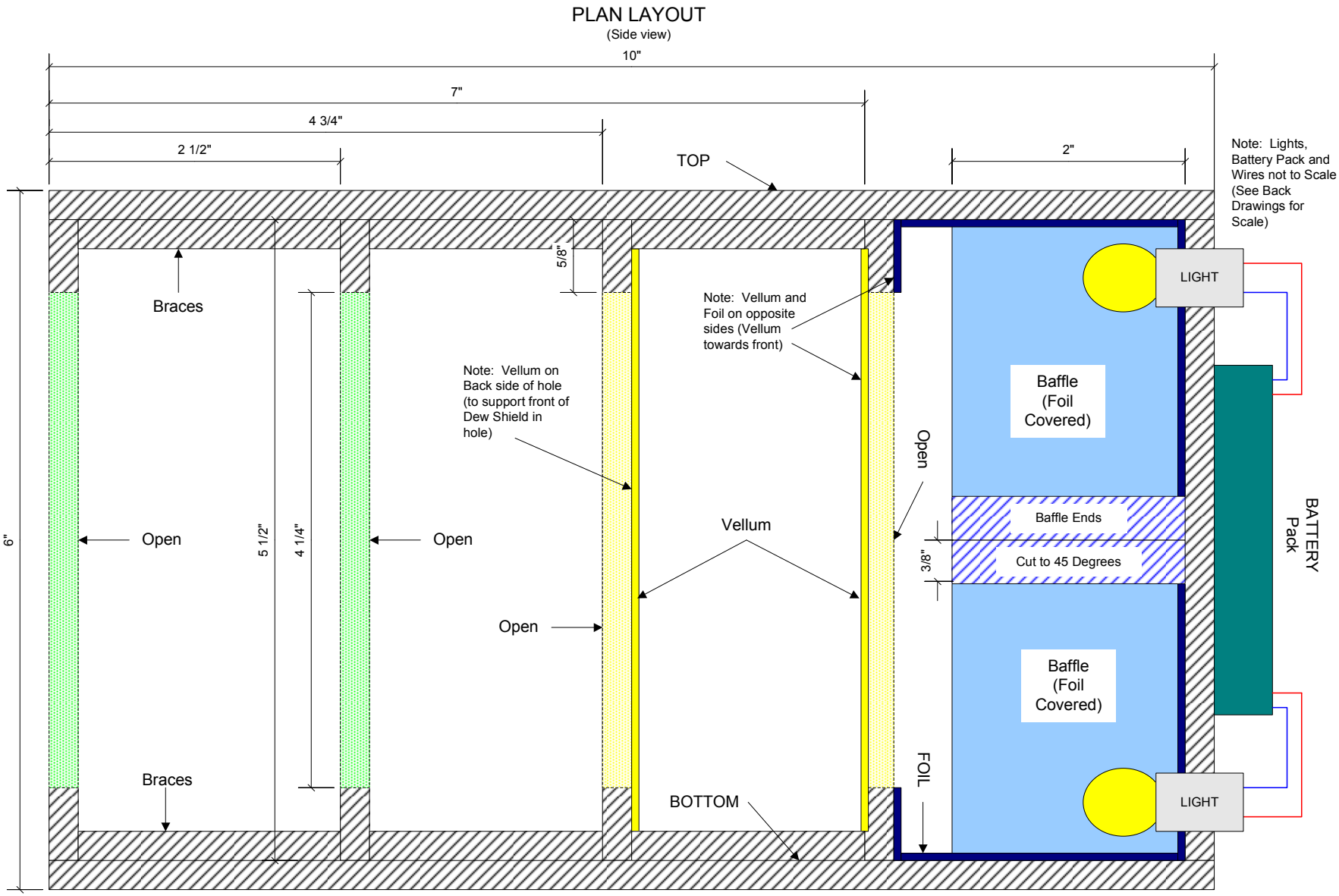
Note: These may be smaller depending on your telescope aperture



Both Sides are covered with Foil (Leave Ends open without Foil)

Braces





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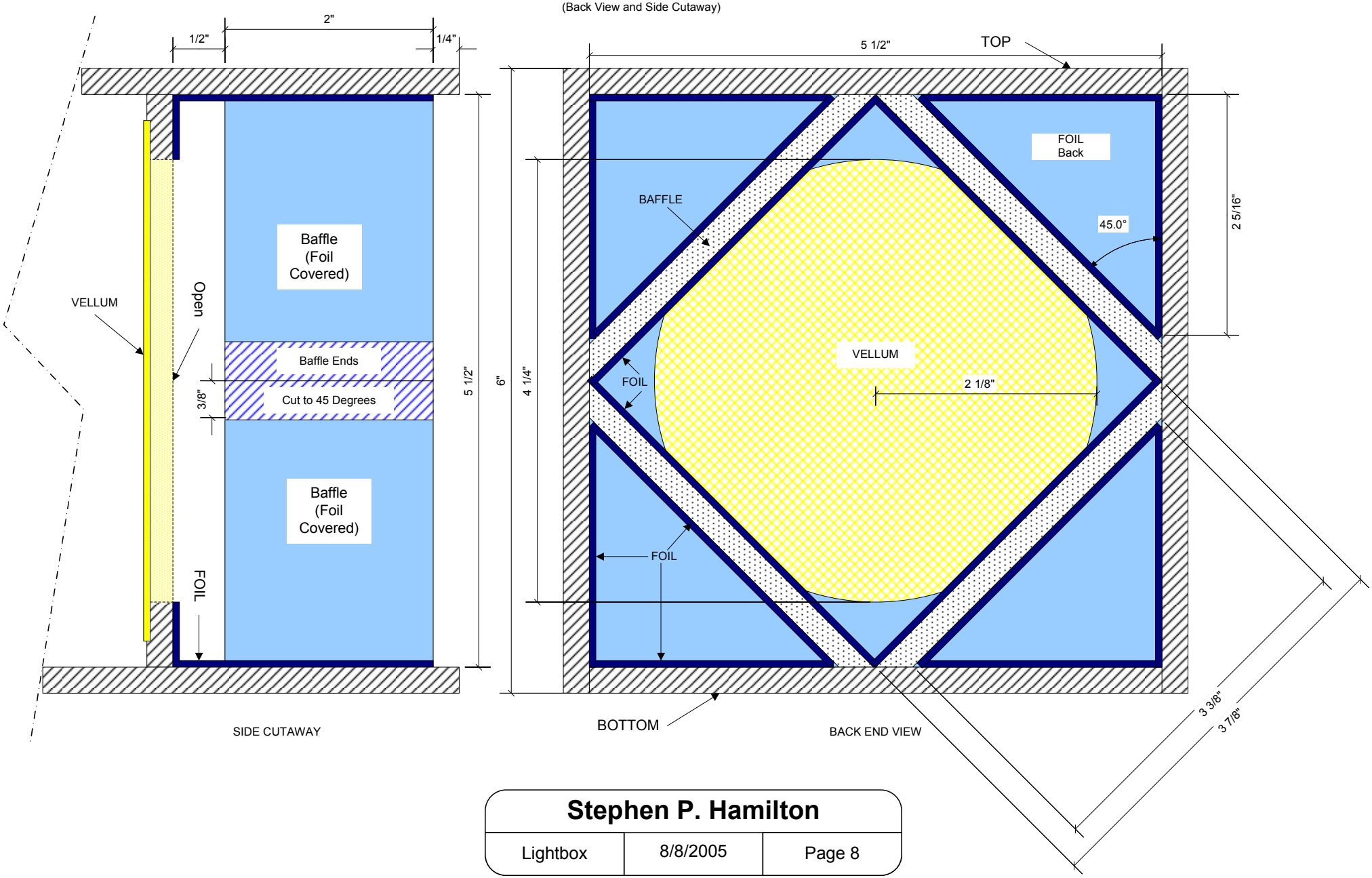
BAFFLE LAYOUT

(Back View and Side Cutaway)



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BAFFLE Pictures

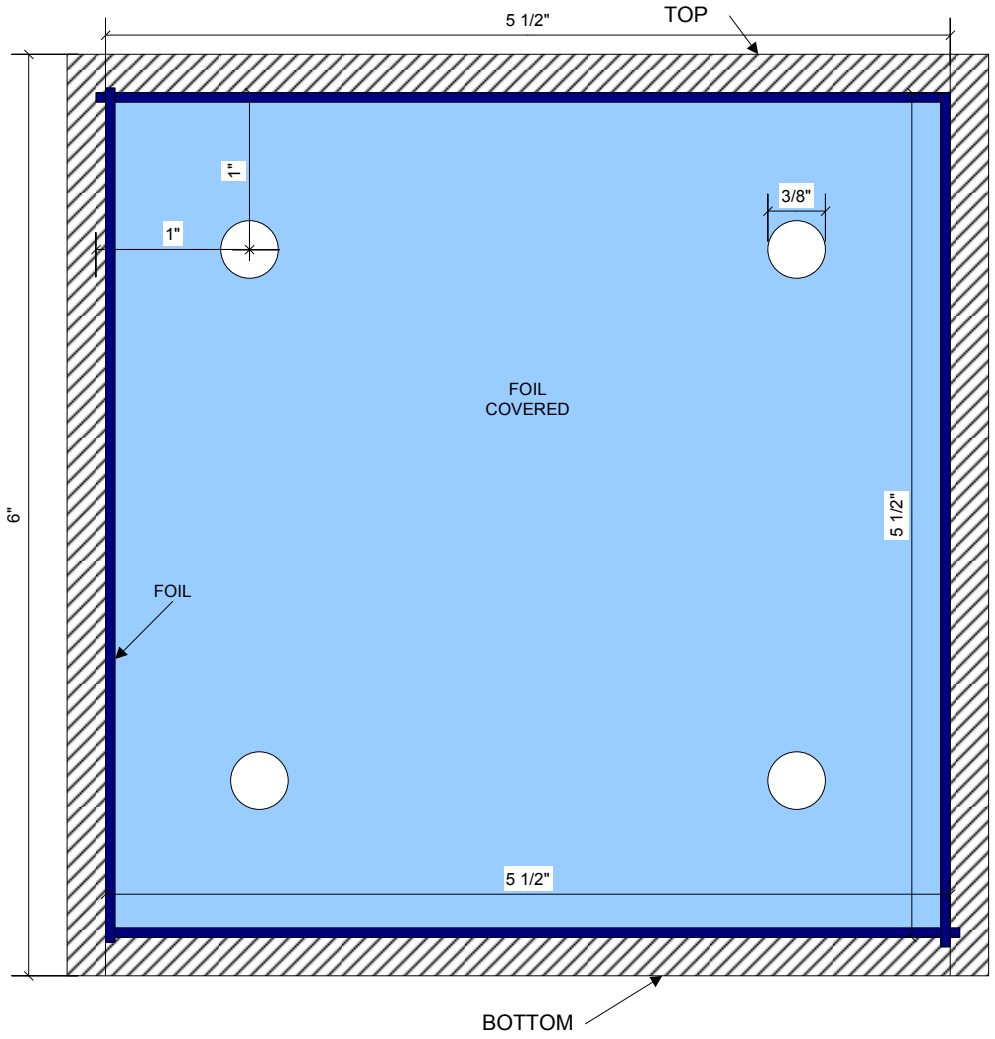
Note: When actually constructing the baffles, I ended up cutting them slightly smaller then planned. This was to ensure the baffles would be completely outside the vellum so no light went directly thru.

Note: Foil has been deliberately "Crinkled" to force light to reflect at multiple angles

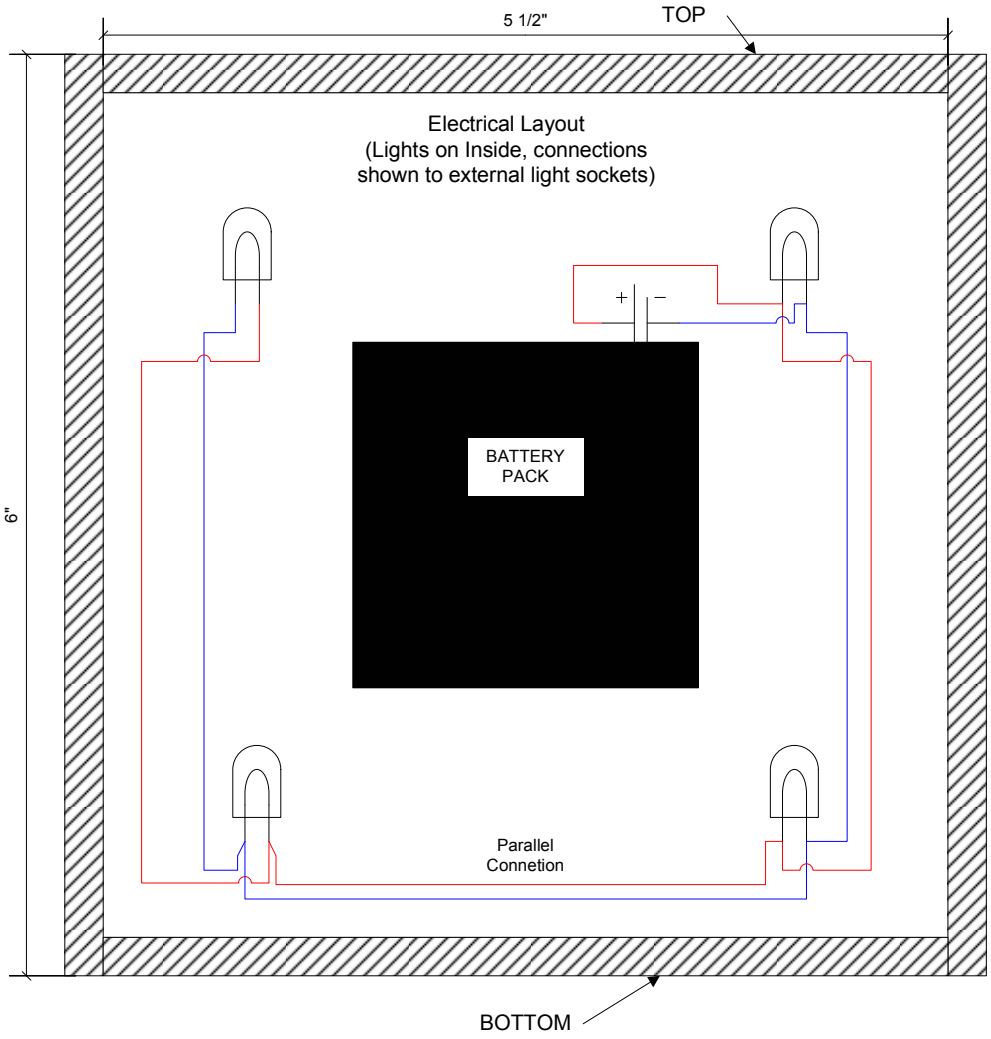
LIGHTS LAYOUT

Inside and Outside Views)

INSIDE VIEW



OUTSIDE VIEW



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LIGHTS PICTURES
(Inside and Outside Views)

INSIDE VIEW

Note: Foil has been deliberately “Crinkled” to force light to reflect at multiple angles

OUTSIDE VIEW

Note: White Duct Tape has been used to cover all wires; Battery Pack is attached with velcro

Construction

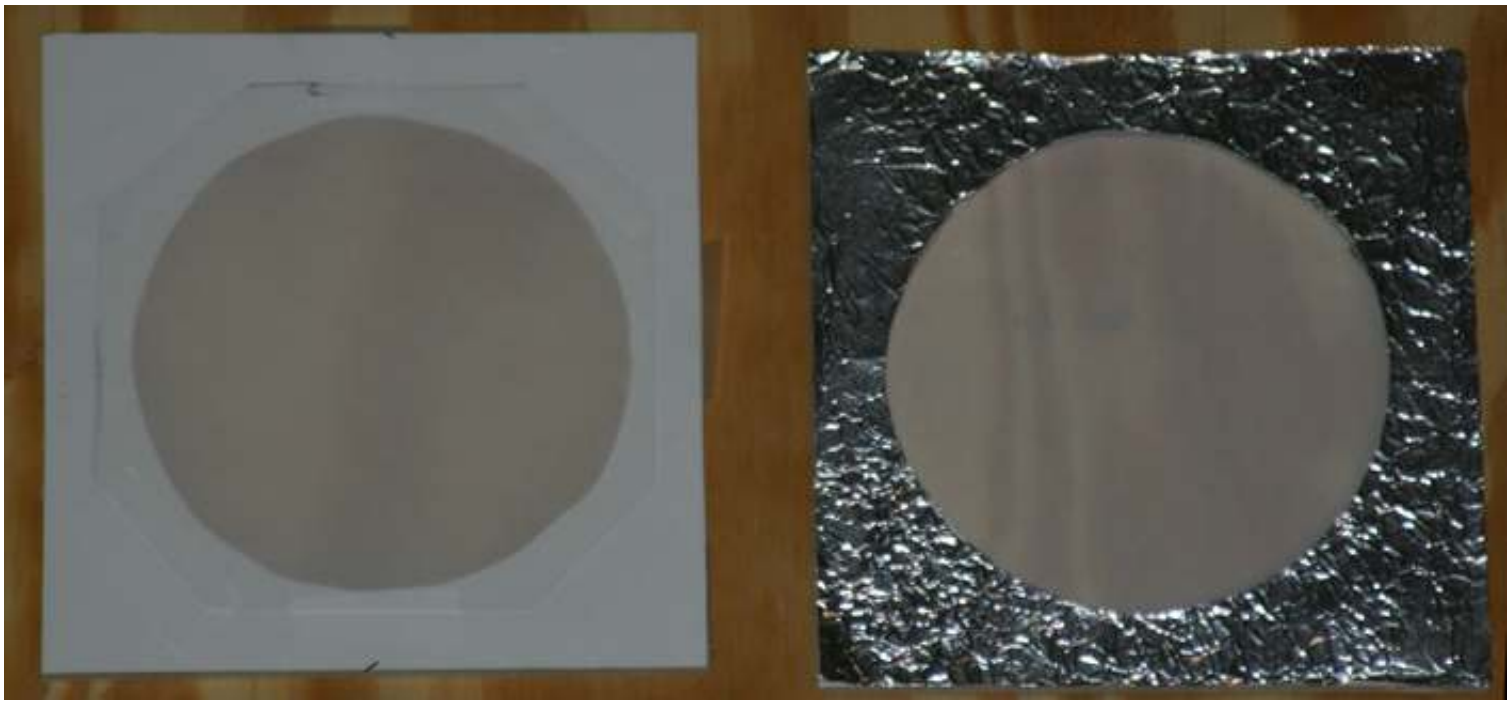
Part 1 - Cutting and Building Diffusers

Step 1 - Cut all Parts as described in Pages 3 - 6

Step 2 - Cover one side of one of the Diffuser pieces with Foil; Remove Foil from middle so hole is open (Ensure that the foil is crinkled prior to gluing)

Step 3 - Using the diffuser that was covered with foil, cover the opposite opening with Vellum (Vellum can be applied with Tape as seen in image below)

Step 4 - Cover the opening on one other Diffuser with Vellum (you should have two left over without vellum)



Step 5 - Cover both sides of the 4 baffles with crinkled foil (be sure to leave the ends open for gluing)

Step 6 - Line up the 4 larger pieces (top, Bottom, and 2 sides) and tape together so they are even)

Step 7 - Using the measurements provided on Page 7 (Plan Layout), draw lines on the 4 pieces marking the placement of the diffusers, Shield holders, and Back

Step 8 - For use as you continue, mark the front and back of each piece, also mark which piece will be designated as the top and bottom

Step 9 - Take the 4 middle sections and line them up so you ensure the circles line up correctly with each other. Mark the top of each of these pieces. Mark the top of the back section as well.

Step 10 - Apply glue to the Top and Bottom sections and to three sides of the front hole piece

Step 11 - Place the front piece on one of the sides and place the top and bottom sections on either side (you might want to hold these temporarily with some scotch tape on the outside). Ensure all sides are aligned with their edges and allow this to setup for a few minutes.

Step 12 - Place White Duct Tape on the three sides of the inside of the front section. This will be used on all diffusers and shield holders to help stop light from escaping and strengthen the sections.

Step 13 - Apply glue to the three remaining edges and place the other side on to complete the basic box. Place a piece of Duct Tape along this inside edge.

Step 14 - Glue the 4 braces marked Section 1 on the inside with the longer sides along the length of the box (they should go form the back of the first shield holder to the line for the next section).

Step 15 - Add the second shield holder on top of the braces and add the tape and braces marked Section 2 in the same manner as in section 1.

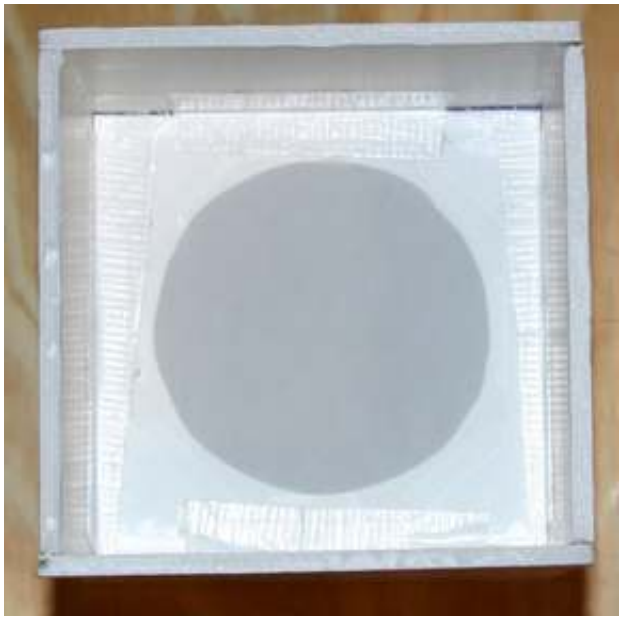
Step 16 - Take the first diffuser (without foil) and apply glue to the 4 sides.

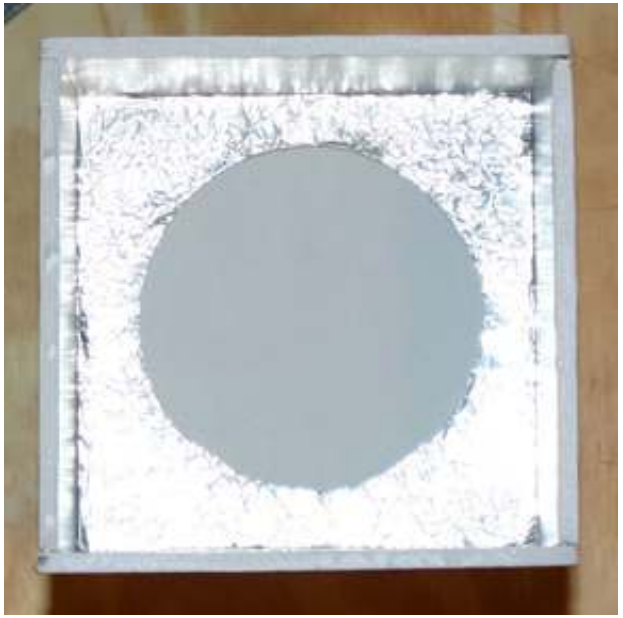
Step 17 - Ensure that the Vellum is facing you with the hole facing towards the front of the box (with the previously mounted shield holders) and place the diffuser on top of the previously mounted braces.

Step 18 - Glue the braces marked as Section 3 in place in the same manner as previously done. Tape the sides of the diffuser with White Duct Tape.

Step 19 - Take the final diffuser and ensuring that the foil is facing you, apply glue to the sides and place it on top of the final set of braces

Step 20 - Since no tape will be added to this section, allow the glue to setup for a few minutes before continuing with the next steps





Construction

Part 5 - Adding the Baffles

Step 21 - Take the first Baffle and apply glue to both ends.

Step 22 - Using the lines that were drawn earlier indicating the placement for the back of the light box, place the first baffle at an angle in the back of the box as seen below. Ensure that the baffle is below the line for the back, there should be a space of about ½" between the bottom of the baffle and the top diffuser. (This ensures that the light does not go directly to the diffuser but will bounce around inside first)

Step 23 - Using a ruler, ensure that both sides are equal distances from the corner of the box

Step 24 - Apply the other three baffles in the same manner. You may want to allow the glue to dry for a few moments between each baffle.

Step 25 - Apply crinkled foil to the remaining sides of the box inside in the corners so the entire section is covered with foil. Ensure that all edges overlap sufficiently to keep all light inside the box and forced thru the diffuser ultimately.

Construction

Part 6 - Adding the Lights

Step 26 - Ensure the holes are drilled out of the back section correctly for your light bulb bases (they should fit somewhat tightly)

Step 27 - Press the Light Bulb Bases thru the holes so that the light bulbs can be screwed in on the side with the foil as seen below.

Step 28 - Using your soldering gun, solder 3 of the lights together in parallel (2 wires from each light go to the next light)

Step 29 - Solder the two leads from your battery box to one of the two bulbs at the end of the chain of wired bulb bases (see the diagram on page 10). Temporarily screw the bulbs in and test them with the battery box. Remove the bulbs so they are not damaged in the next step.

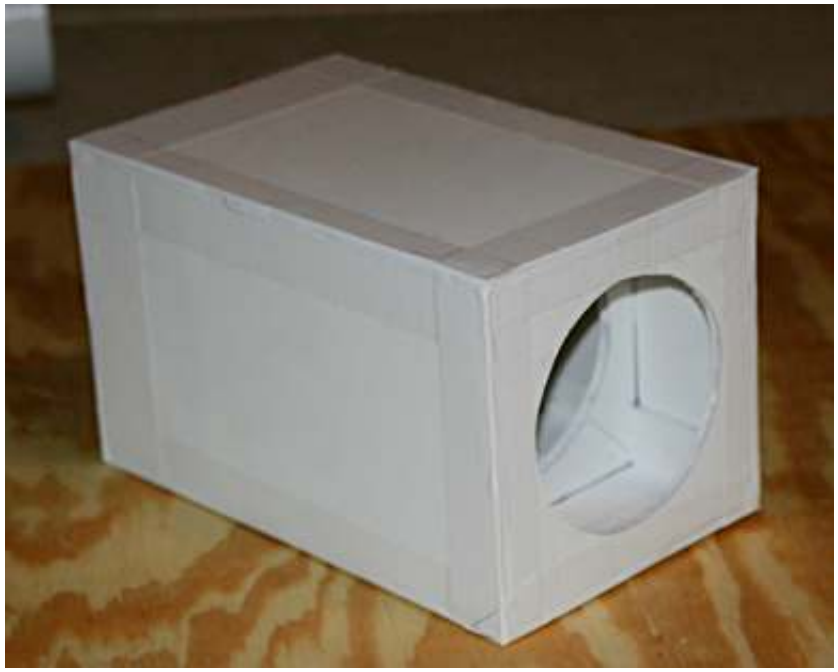
Step 30 - Using the white Duct Tape, tape the wires and the light bulb bases to the back of the cover. Ensure that enough overlap is allowed for to go over the sides of the foam to protect them from damage when the back is put on the box or removed.

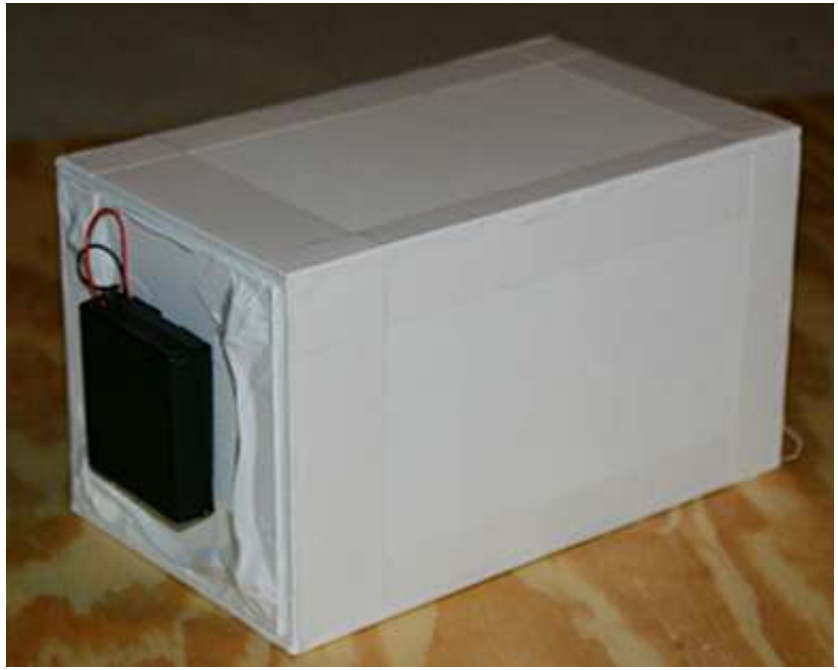
Step 31 - Apply two pieces of Velcro to the back of the box (centered) and the opposite pieces to the back of the battery box. Mount the battery box on the back section.

Step 32 - Place White Duct Tape along all edges of the box as seen in the images below. Ensure all exposed foam edges are covered.

Step 33 - Place the back in the box and ensure there is a snug fit.

Step 34 - Turn on the lights and ensure that there is little if any light escaping from the back of the box (it helps to do this in a dark room). If light can be seen escaping from the back, add more whit tape to the edges to ensure as little as possible light is able to escape.





Step 35 - Turn on the lights and examine the front of the box. The light should be evenly distributed across the front diffuser (note the shadow in the image below is from the flash on the camera)

Step 36 - With your telescope set up and the camera focused on a star, place the box over the front of the dew shield (it should support itself if the dew shield is pressed up close to the first diffuser, supported by the first 3 holes)

Step 37 - Take test exposures changing the exposure time until you are able to capture an image reaching approximately 40,000 to 42,000 in saturation (for a 16 bit camera, apx. 160 - 170 for an 8 bit camera)

Step 38 - Take a series of images for combining later (or combine on the fly) to create your flat frames. The image below shows a flat frame taken with a badly dusty filter.

Step 39 - Remove the light box and without changing the focus, camera angle, or filters, take your light frames.