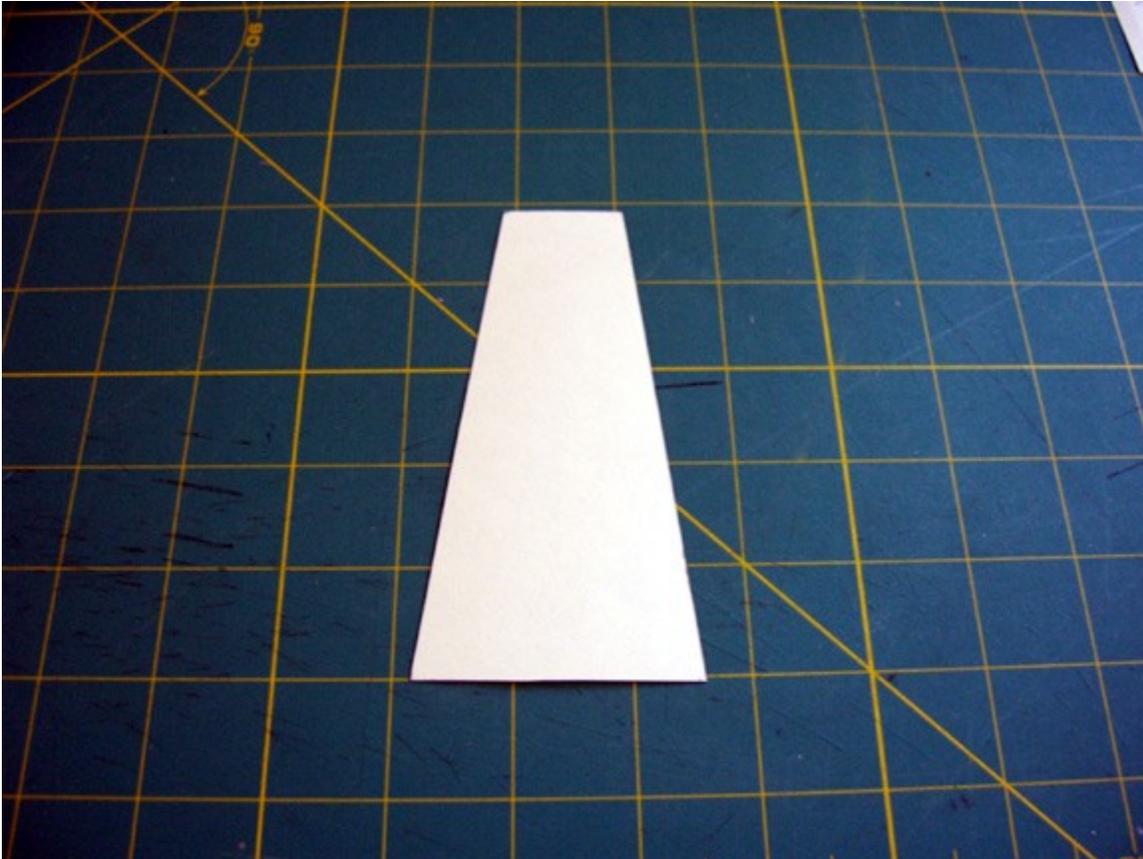


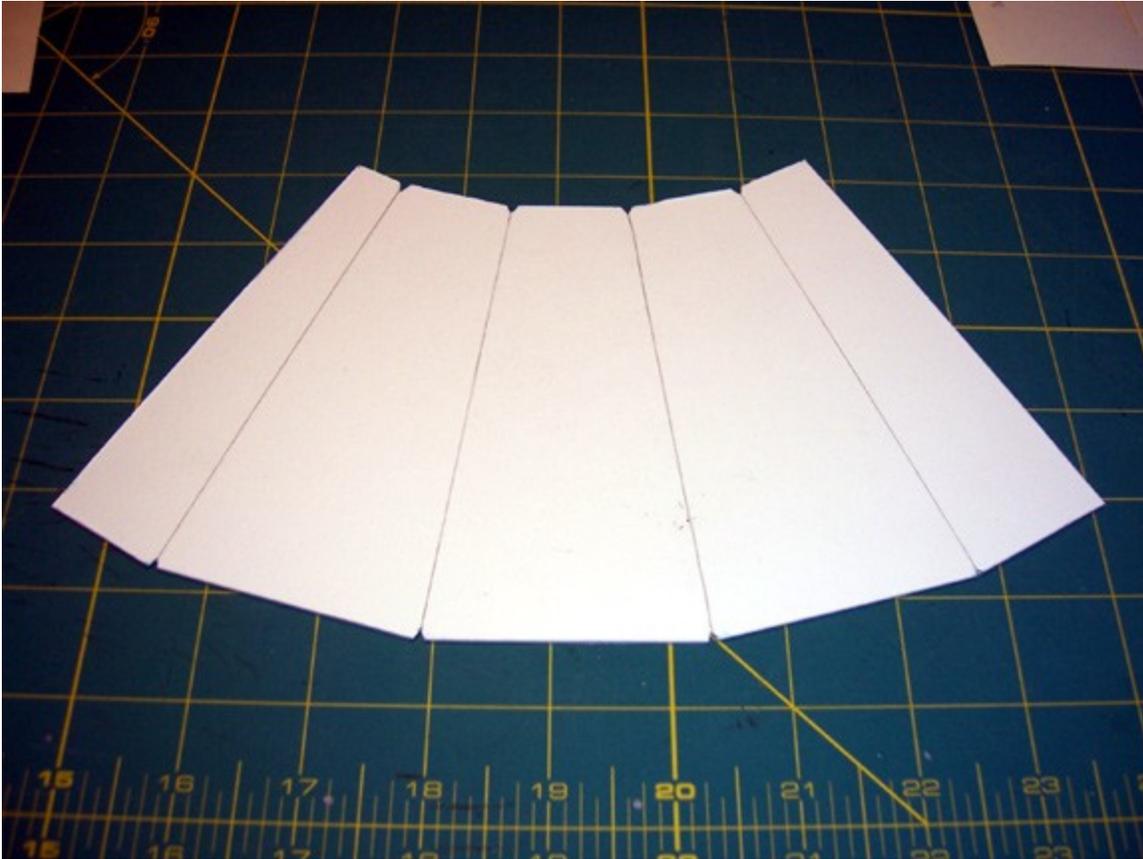
My process for making bellows for an Agfa Isolette 6x6 or similar camera

1. First thing is to make some templates so that you can have a repeatable process.
2. The base template is a trapezoid that is the size of one side of the bellows. In this case it measures 32mm wide at the top, 62mm wide at the bottom, and 125mm in length. This template is not used in making the bellows but is the basic starting point for all other templates.

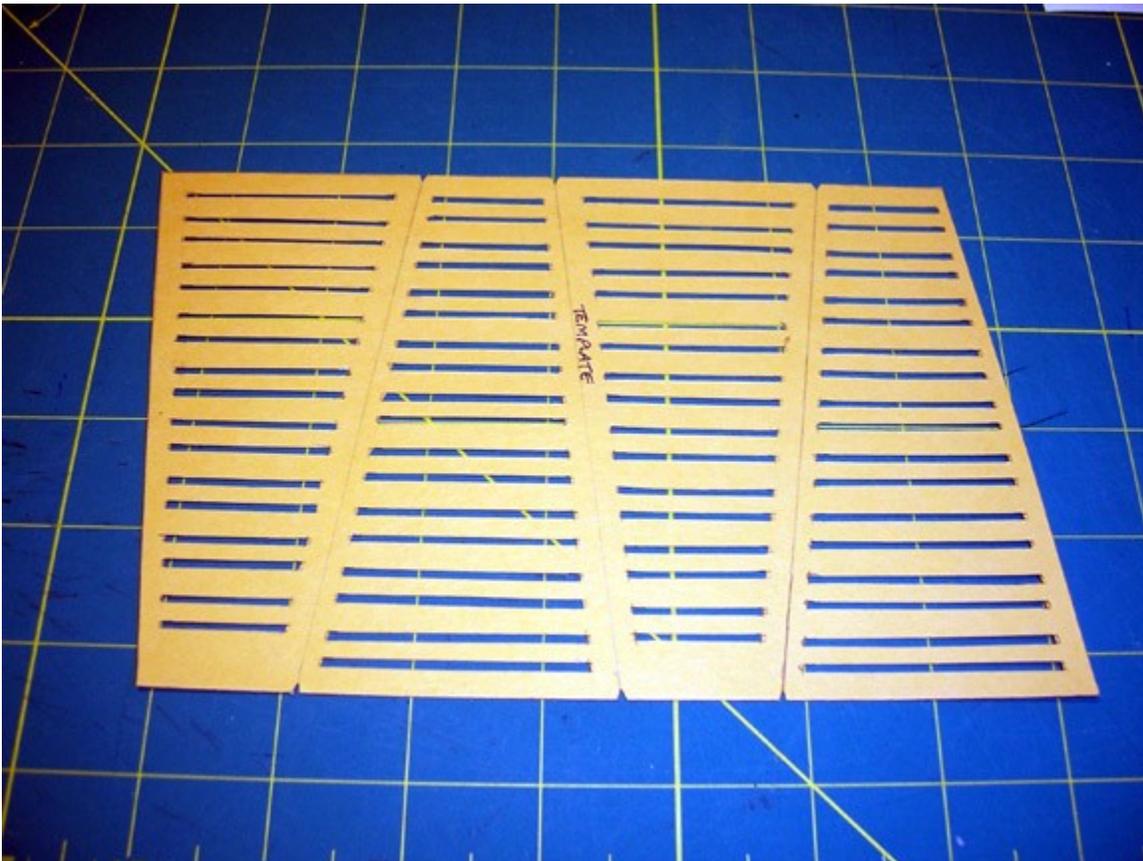


3. The second template is made by tracing three of the base template side by side and then half of the basic template on the left and half plus about a $\frac{1}{4}$ inch for overlap on the right. Notice that I make small notches in the template where the pieces meet. This is so that when I cut the bellows material using this template I have a guide as to where each side ends. You'll see this later on.

I made this template from 4-ply photo mounting board so that it had some 'body' to it.

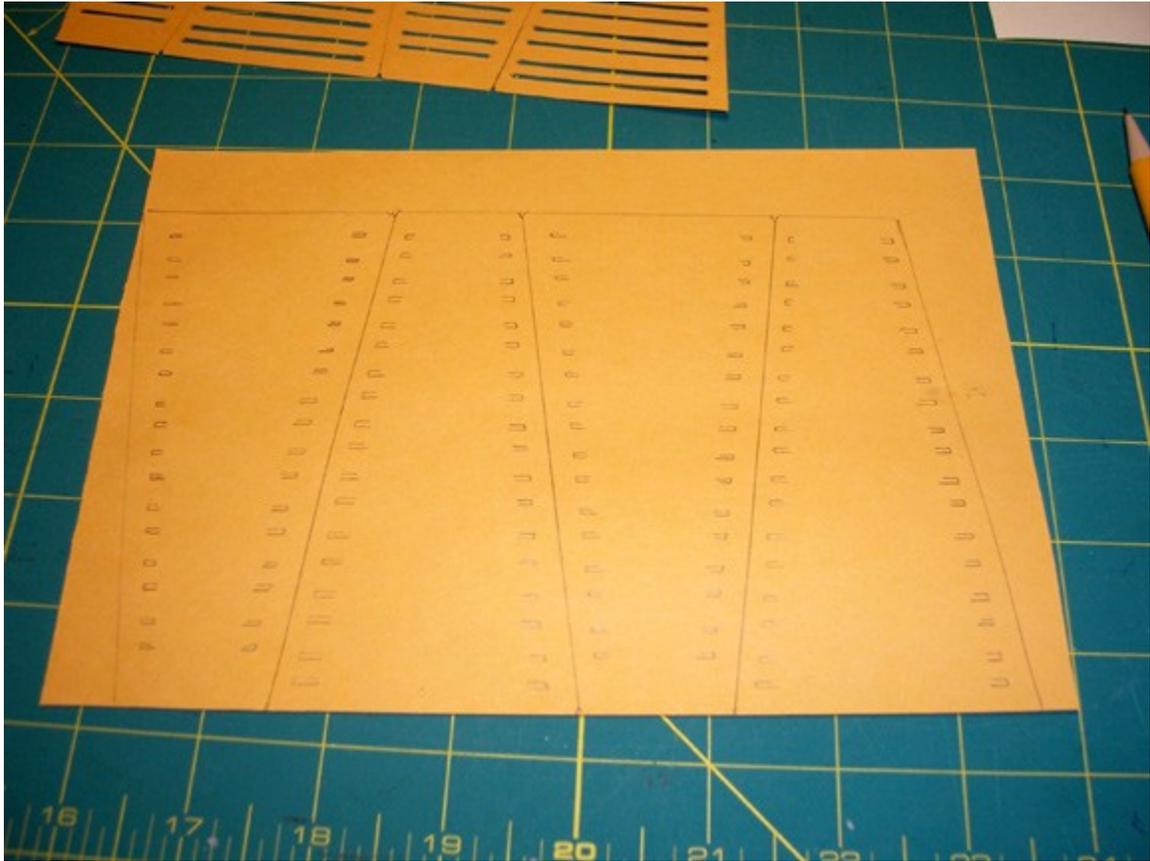


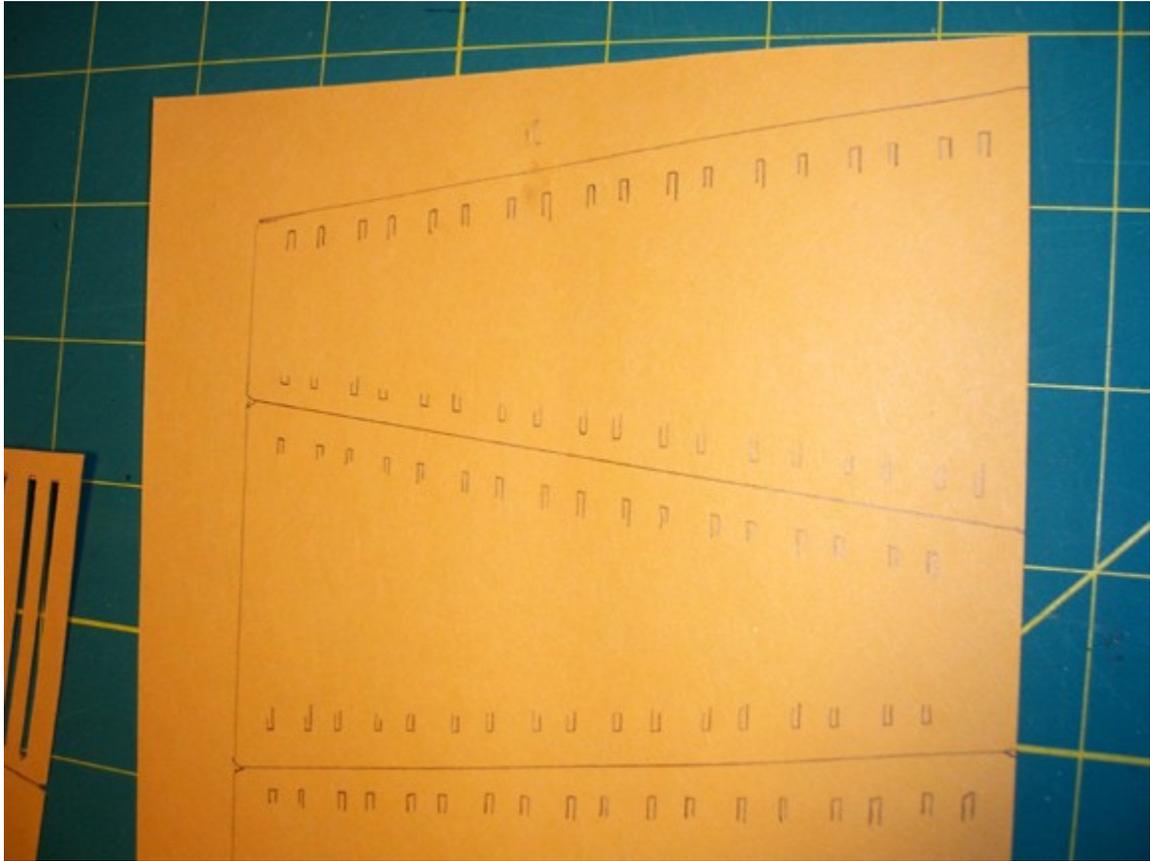
4. The third template is for cutting the ribs that are glued between the liner and the cover of the bellows. The ribs are really what dictate the folding process. This is a little difficult to explain but:
 - (a) I use the base template to draw 4 trapezoids next to each other. I use mailing envelope paper or card stock for the template. Try to use the thinnest material but something with enough stiffness.
 - (b) I then mark where the ribs need to be. On a tapered bellows you need a smaller rib followed by a wider rib so that the bellows will be smaller at the front than at the back.
 - (c) I use 6mm as the width of the larger rib, followed by a 2mm gap, followed by a 4mm narrow rib, followed by a 2mm gap. Just repeat the pattern for the length of the side.
 - (d) As you can see from these pictures, two of the sides start with the wide rib (these are the top and bottom of the bellows when viewed from above) and two sides start with the wide rib farther down.

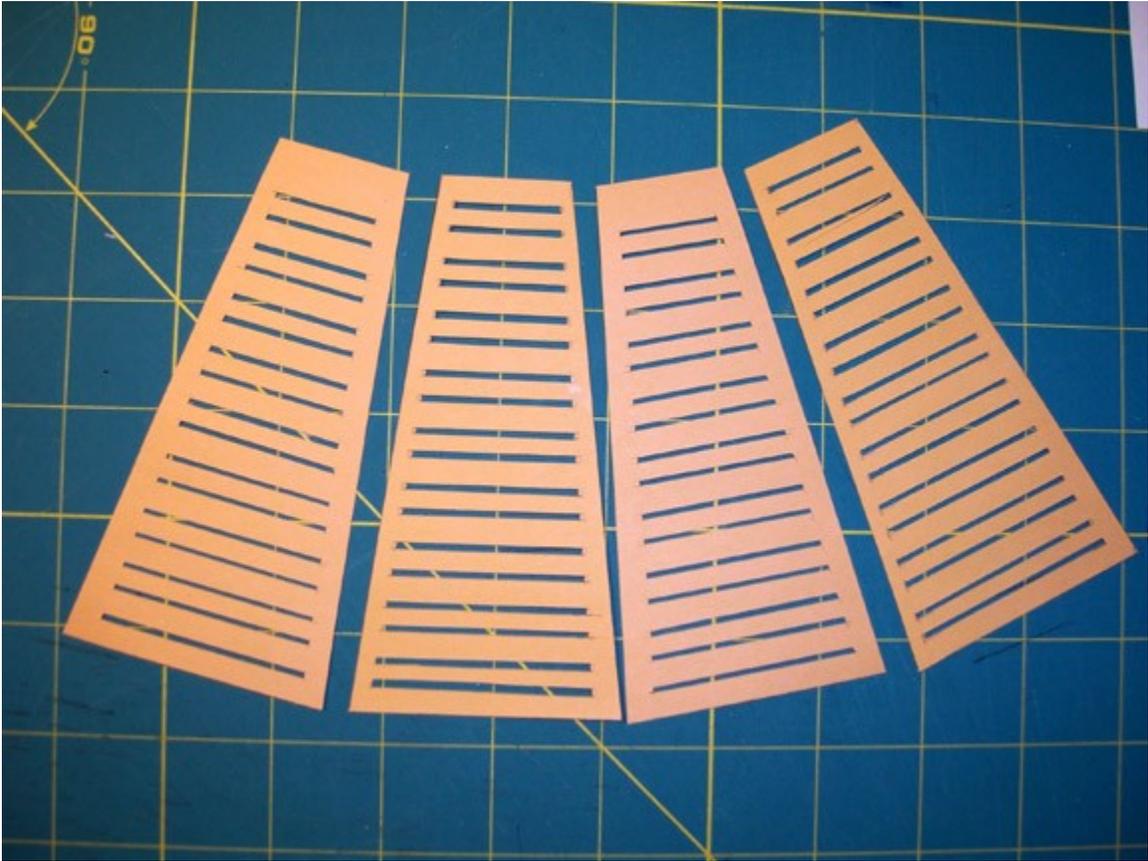


5. Next I transfer this pattern to a clean sheet of the envelope paper. I only need to transfer the outer edges of the gaps and then use a metal straight edge and x-acto knife to cut out the gaps.

See the following pictures.

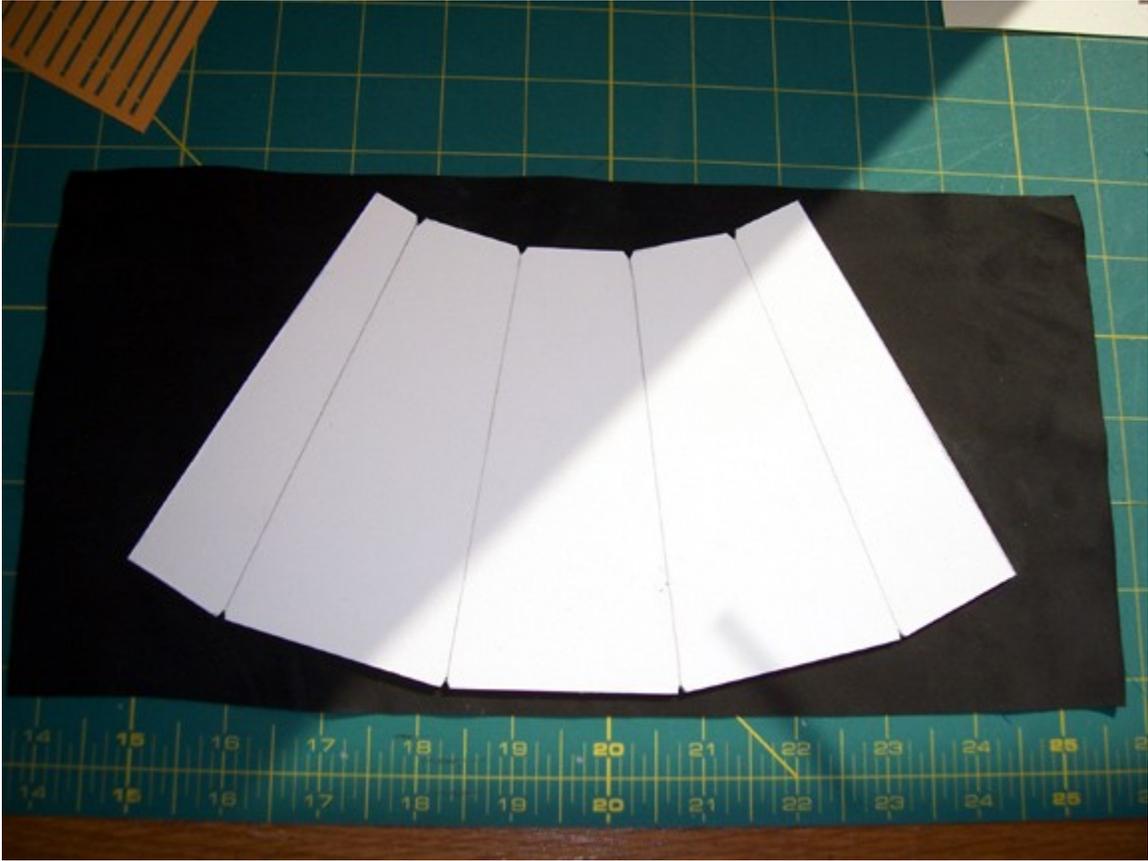






Then I cut the finished sheet into the four pieces. In the picture above, rib structures 1 and 3 (from the left) are for the sides and rib structures 2 and 4 are for the top and bottom.

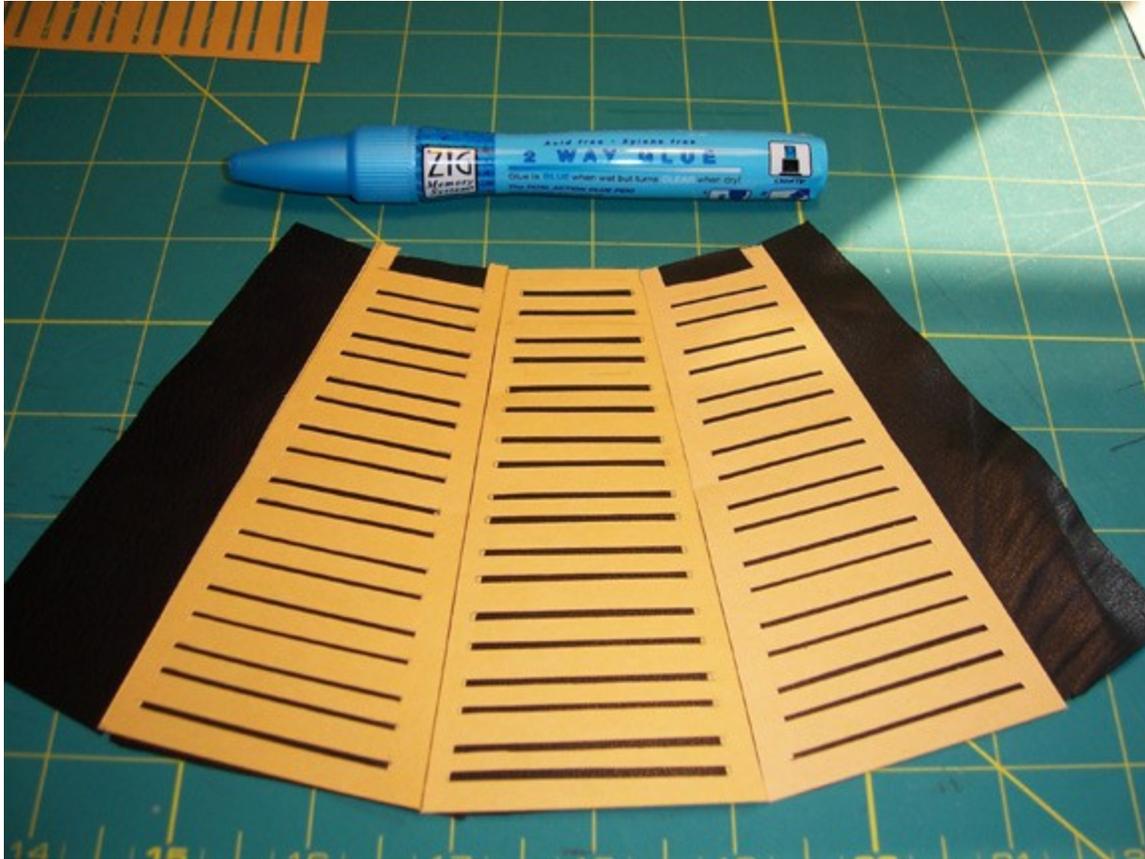
6. Next step is to cut the liner material using the the template created in Step #3.



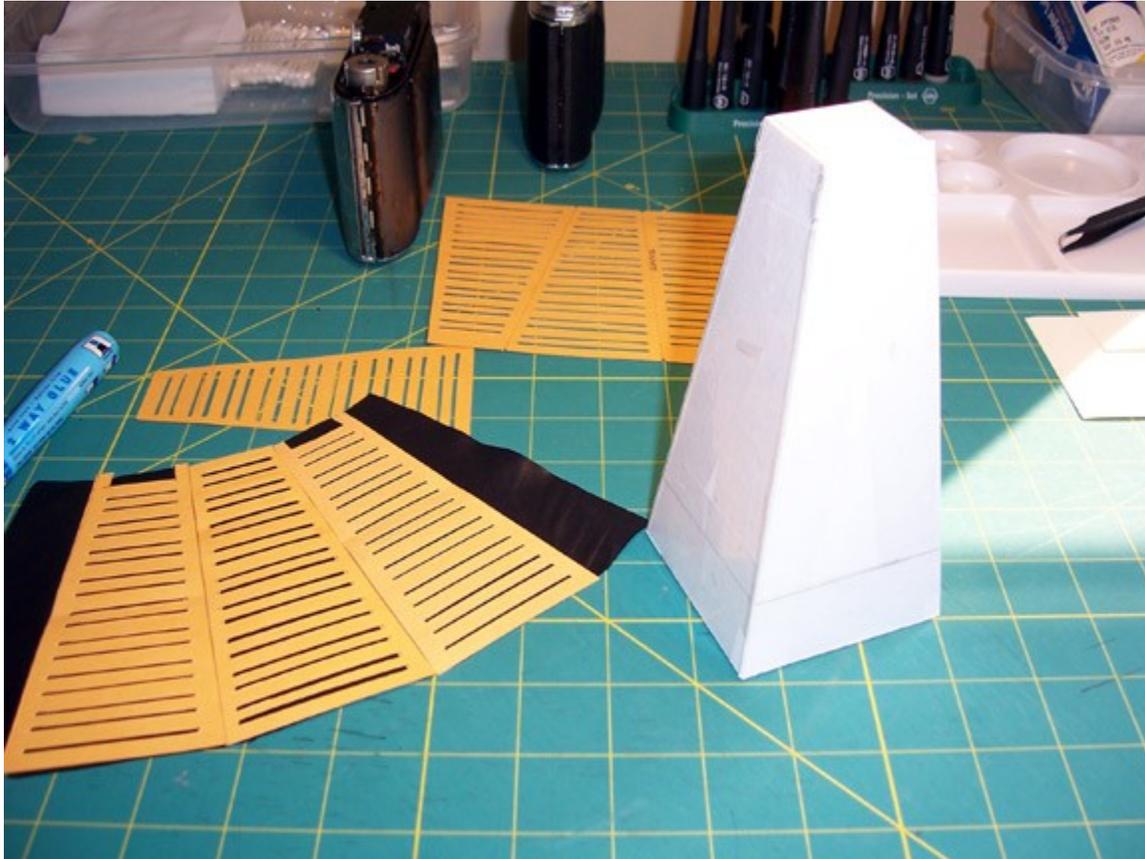
For both the liner and cover I use a very thin leather (.007") that I can get in sheets that are 6" x 12" which is a good size for these bellows.

7. Attach the three full rib pieces with the top in the center and the two sides adjacent. I use a glue stick for this step. It is easy to control and has a tip about the width of the ribs.

IMPORTANT NOTE: Only glue on the rib portion and NOT the edges that connect the ribs. And do not glue the ribs all the way to the edge. You will see why further down in Step #11 why this is important.



8. Now you need another template. This is best described as a pyramid with a flat top. The sides are the same measurements as the template shown in Step #2. They are made a little longer at the base so that it is easier to work with (you can see a line toward the bottom of the structure. That is where the bellows ends). I made this out of 4-ply photo mounting board and packaging tape. Be sure to make an insert at the bottom and top to make the structure rigid.



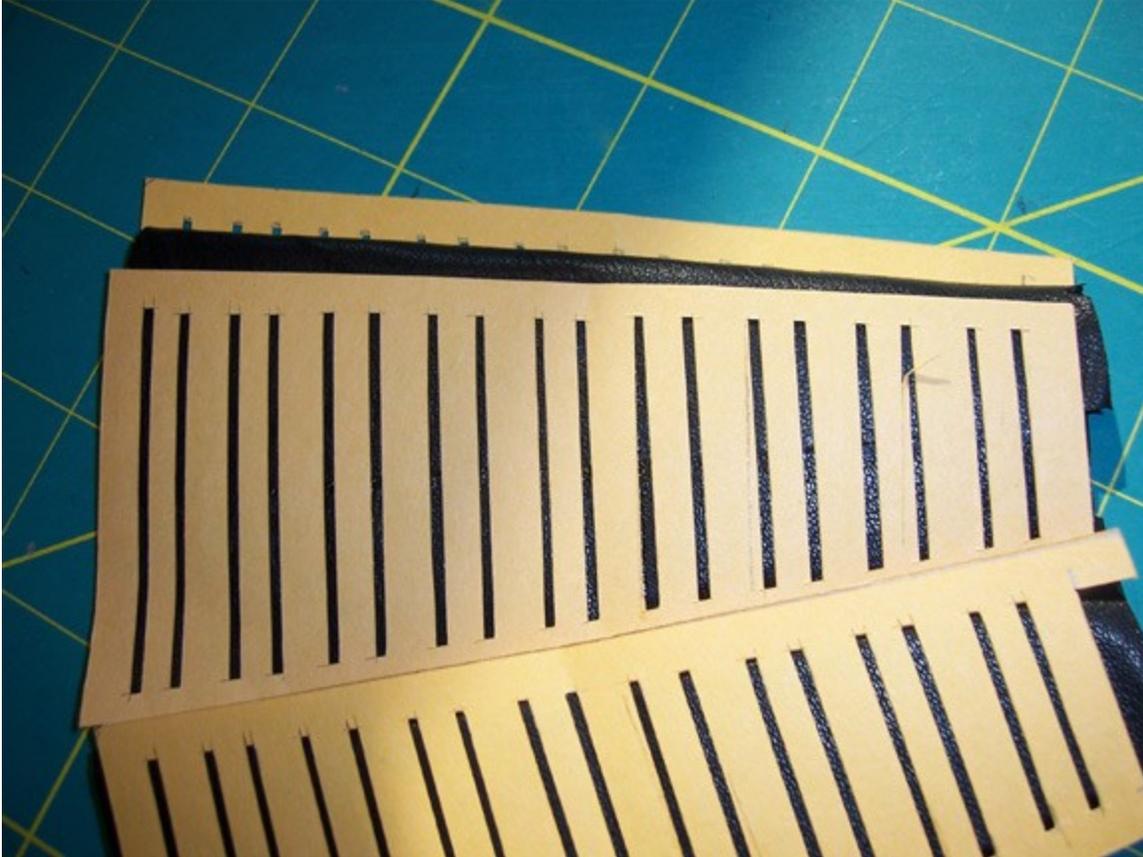
9. Position the liner with the three rib sections on the template and glue the liner to itself where it overlaps.



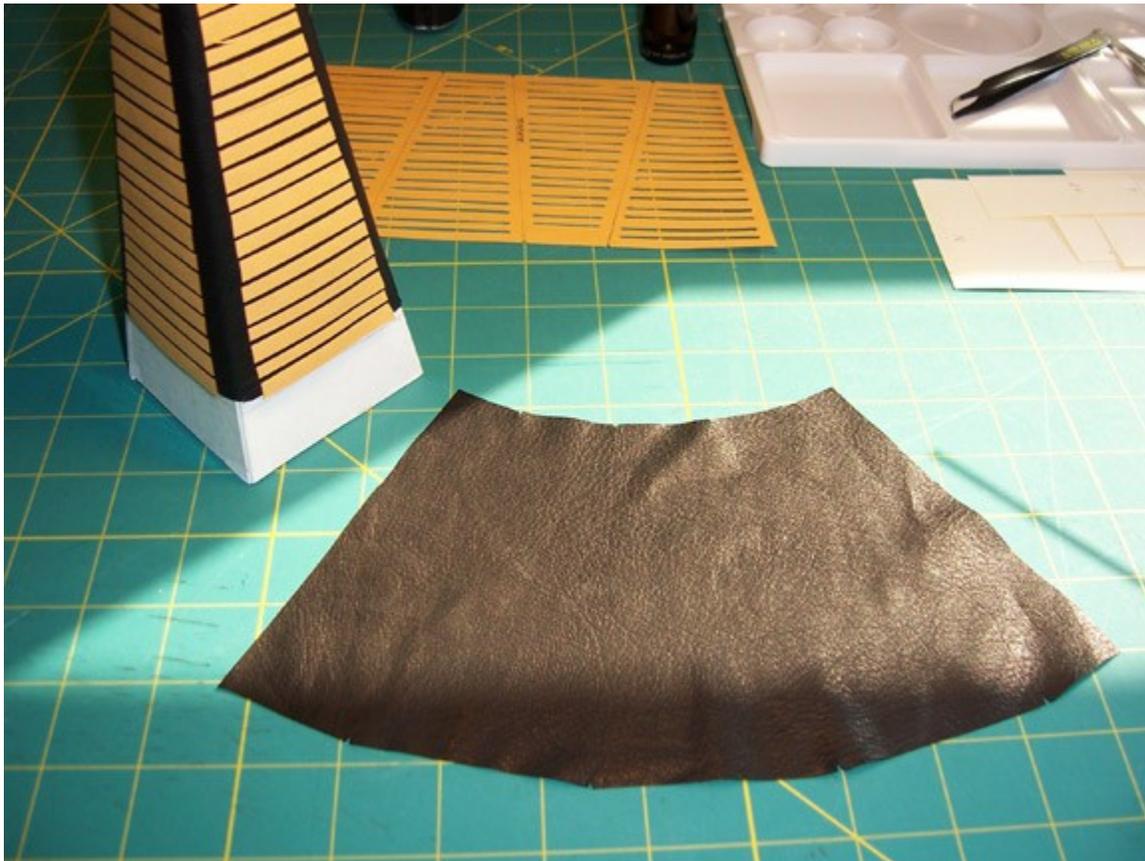
10. Attach the fourth rib section. It should be the same design as the one on the opposite side.



11. Once the glue is dry, remove the liner from the template. It is flexible enough to bend at the edge of each rib section. As you fold the material away from the rib structure, you can see the edge of the cut outs. Carefully cut the edges off each section. If you've glued too much of the rib or any part of the edge this will be difficult if not impossible to accomplish.



12. Now it's time to cover the liner and ribs. Cut the cover using the template from Step #3.



13. Return the liner/rib assembly to the pyramid. Take note where the seam for the liner is since you don't want the seam for the cover to be in the same side (adds thickness).

For attaching the cover I use a glue from the company where I purchase the leather, but I'm sure that any white glue would work.

Glue one side of the cover at a time and finish up by connecting the seam of the cover. See the following pictures.

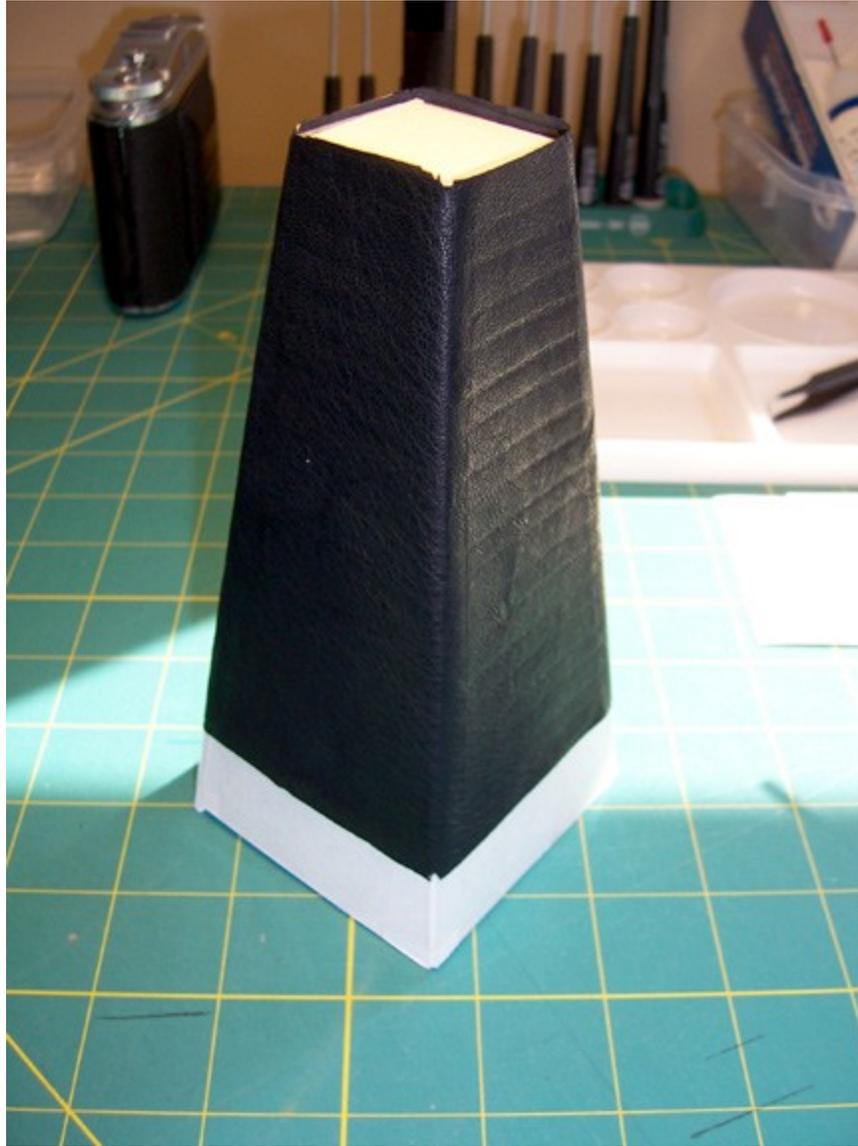








Bellows is now fabricated. Wait until everything dries and we're ready for folding.



14. Folding the bellows is not difficult, it just takes a little time. If you've used thin material (.007") for the liner and cover, and the ribs are thin but of a stiff enough material, the bellows will almost fold themselves and all you need to do is guide the folds in the right direction.
15. The bellows will want to fold in the areas where there are no ribs.
16. There is no particular formula for folding the bellows and I'm sure each person probably has their own technique. Just remember that the smaller ribs are the 'in fold' and the larger ribs are the 'out fold'. That way the taper from front to back occurs naturally.
17. I usually start by trying to form the first few folds.



18. Then I continue to form a few more folds. I don't worry too much about the corners since they will form themselves. If you want the corners to have crisper folds, you can do that after the whole bellows has been folded.



19. At this point I place the bellows face down on my work table and begin folding from the back. It is easier for me to do it this way since I can see how the folds need to occur and also allows me to use both hands to fold and push down on the table.



20. Here is the folded bellows (view from the back). After they are at this stage I recheck the folds and the corners and make any minor adjustments, then place a weight (not too much but just enough to hold them closed) on the folded bellows to set the folds.



21. The next step is to mount the brass front plate, but first we need to look at the trimming of the bellows for mounting. Even though our bellows was constructed with equal length sides, as you can see in the following picture of a bellows removed from a camera, the first fold of the front portion of two of the sides has been removed. This is because the mounting of the bellows on the front plate (and also on the back portion at the film plane) has to result in adjacent folds being opposite.



I usually trim the front of the bellows before inserting the brass front plate, but it can be done just as easily afterwards. I trim the back after mounting the bellows in the camera.

22. Here are the trimmed bellows before positioning the brass plate.



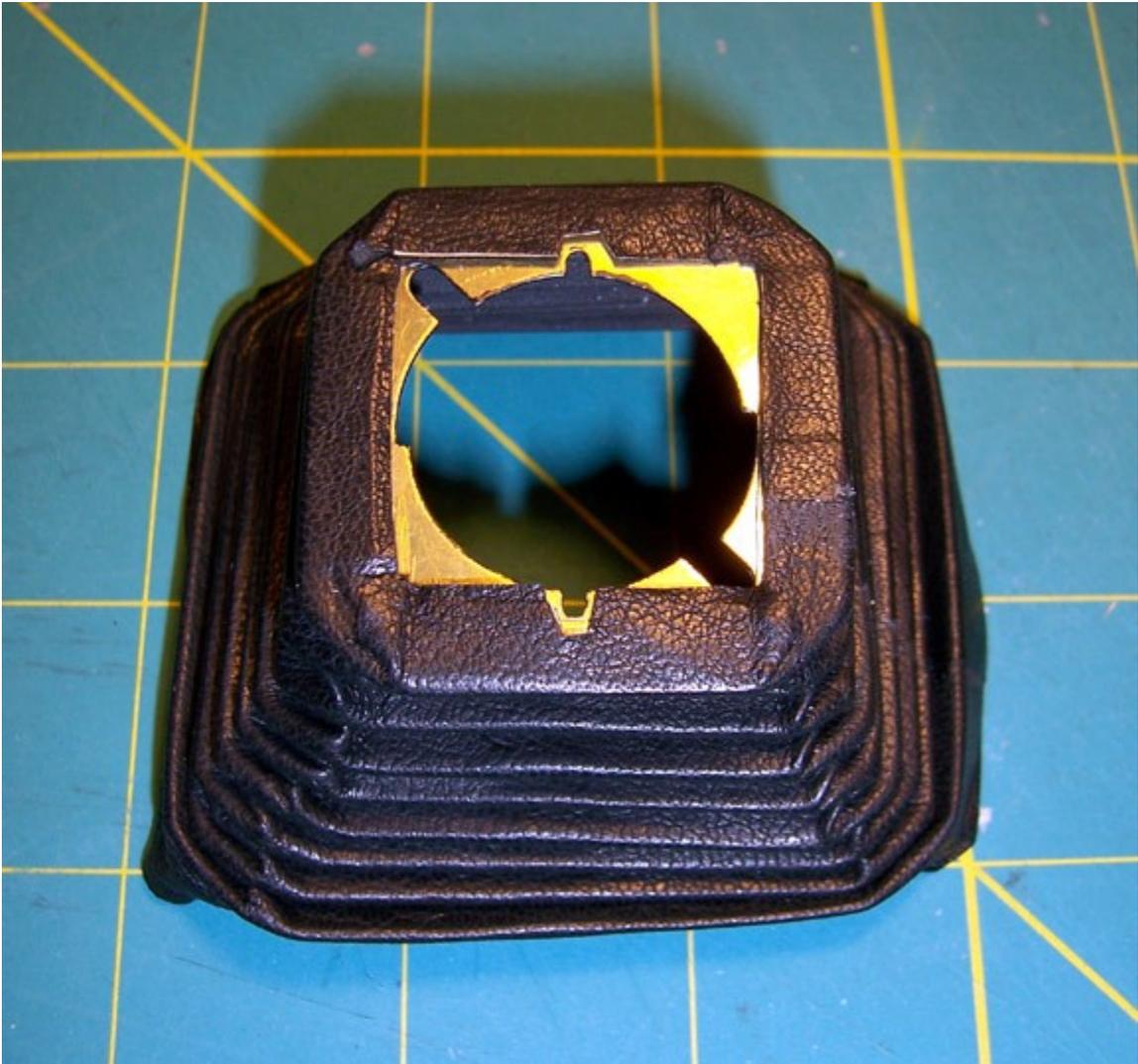
23. The brass plate is positioned in the bellows. Make sure the small notches in the plate are on the top and bottom of the bellows. These position the bellows on the screw that is on the back of the shutter assembly.



24. Glue the bellows to the plate, making sure the plate is positioned squarely. I have found a very useful product (shown below). It is a very thin glue strip attached to a waxed-paper backing. When you press the strip on a surface it adheres to that surface and you can peel off the paper backing leaving the glue strip ready to attach whatever you are gluing. I cut off the length I need then trim the paper off of one side. This allows me to slide the paper with adhesive strip under the bellows, push down and attach the strip to the plate, remove the paper, then [press the bellows into place. I also use this when attaching the bellows at the back. I'm sure there are many methods of gluing (a hot glue gun comes to mind) but this works for me.



25. Here are the bellows read to mount. I still haven't perfected the overlapping corners as you can see. I sometimes have to do a little more trimming of the corners after gluing to the plate so that I have a relatively flat result to attach to the shutter.



26. The new bellows on an Ansco Speedex Special R (same camera as Agfa Isolette III)

