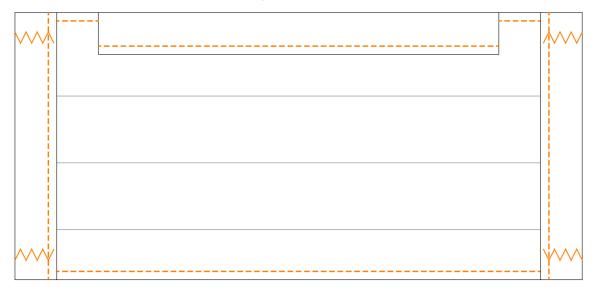


DIY Rectangular Face Mask



Since everyone has been asked to ware face masks in public, YouTube and the Internet has become flooded with DIY instruction for making one's own face mask. There are a lot of great videos out there and I have watched a bunch of them. However no matter how hard I tried I could not get the pleats right. That and the thing kept sliding off my big nose. So I decided to enter the fray by drawing my own pattern so that I could better understand my problem. I also wanted to share a few of the things that I have learned along the way ... mostly from my failures and mistakes (there were plenty of both).

This is NOT intended to be a N95 medical mask. The goal here is to produce a reusable, washable mask for 'the rest of us' to wear in public to reduce that chance of either spreading or catching the disease. I will leave the more complex and critical masks to the industrial experts and/or very skilled home crafters. Note also that a comfortable face mask offers better protection because it will have more regular use.

This document/file is placed in the **PUBLIC DOMAIN**.

<u>Disclaimer</u>: The author assumes no liability for the accuracy, fitness or application of the information or design(s) herein. Lewis Balentine, Houston, Texas, 5 April 2020



Fabrics

What to use. It seems the one of the most common fabrics is common 100% woven cotton quilting fabric or similar fabric salvaged from old shirts, dresses, sheets of pillow cases. These tend to be 'breathable' and offer protection from droplets. Stretch knit fabrics like cotton T-shirts make the most comfortable masks but may be harder for in-experienced sewers to work with. However: walking around with two layers of heavy T-shirt knit material on your face in <a href="https://doi.org/10/bit/10/b

For most of my 'trial and error' efforts I used scraps of an old cotton-polyester weave bed sheet. It worked but it is not what I would consider very breathable. I have a couple of yards of 8mm (mommes) habotai silk that should be very breathable and block smaller particles than woven cotton. ... turns out to be too sheer. Need at least four layers.

"Outside the box" Idea: Most of the DIY face masks project instructions tell one to cut the material along the grain of the fabric weave. However people that 'roll their own' bias tape always cut the fabric on the 'bias' (45 degrees to the weave). They do that to give the finished folded tape a bit of 'stretch' so that it works well along curves and corners. So if 'stretchy' masks are more comfortable why not cut the mask rectangle on the bias? It does require more material. Ironically the folded fabric 'tapes' used for the pockets for this project do not need to be cut on the bias ... in fact they are much better suited to be cut along the weave.

Having said all that I made an experimental mask cut on the bias. It did not make any significant difference to the fit. The straight stitched sides, bottom and top seams take up most of the tension. So my recommendation is "not worth the effort". Learn from my mistakes.

Thread

Use what you got. Any 50 weight cotton, polyester, cotton-polyester or all purpose sewing thread and a standard 80/12 needle should be fine. Avoid nylon, rayon and other synthetics as they may have problems with hot irons or laundry dryers. Silk is also suitable but those threads tend to be much finer (*thin diameter*) and thus may require special needles or other considerations.

Straps

First of all one needs the strap to be adjustable. The easiest thing to do is to make a mask that ties in back. Those are inconvenient if one wants something that can be quickly removed and replaced. Most people would prefer something that they can hook over their ears. While some people have what might be considered 'normal' ears, there are those of us that have such huge ears that they would make Jumbo blush with envy. One can try to circumvent this problem by using some form of elastic but alas demand alas has exceeded



supply resulting in said material to becoming hard to come by. The best alternative that I have found is 'no-tie' shoe laces. Each lace is about 40 inches (1 meter) long and about ¼ inch wide and very stretchy. Another excellent alternative is to use some sort of string or chord with a pair slip knots tied around the chord at each end. Thus common parachute chord becomes an excellent and plentiful resource option.

Avoid anything that uses neoprene, latex or natural rubber (*like used in inner tubes or bungee chords*). When this stuff gets hot (*from a iron or hot laundry drier*) it tends to chars, burn or worse yet stink. Small diameter (*1.5 or 2mm*) polyurethane drive belts also do not work well (*not enough stretch*). Something that uses silicon rubber is best. It can withstand both high heat and caustic chemicals like chlorine bleach. I made some straps by cutting 7.5mm wide strips from a silicon cooking mat.

This design uses a pocket at each end to run the straps through so that one may use whatever alternative strap material or style is available or change the chord out for something else. Those pockets can be made from 1/2 inch double folded fabric tape if you sew it very carefully and close to the edge (*i.e.* 1/8 inch). It may be difficult to thread a strap through this size so I decided to use 5/8 inch double folded fabric tape. If you 'roll your own' then there is no need to cut this material on the bias as there are no curves or corners.

The top and bottom of these pockets are where most of the stress occurs on the mask. For this reason the ends are folded over (*single fold*). Be sure that to make the transition on the inside fabric edges very smooth to ease threading the straps through. This can be accomplished by using a tight 'zig-zag' stitch on the inside edges or using 'no-sew' hem tape or permanent fabric glue ... or some combination of those. I used 'Elmers Glue stick' and a zig-zag stitch.

Nose piece

Does one really need a nose piece. If one wears glasses that is a very big affirmative. Otherwise one's hot, moist exhaled breath tends to fog the lenses. Others may want a nose-piece in order form a better, more comfortable fit around the nose. I found that 3 inches (75 millimeters) was the best length to bridge my rather large protrusion. One can order aluminum nose-pieces via Ebay or Amazon that are between 3 and 4 inches long (75 to 100 millimeters) but delivery time may be as long as two months. Other alternatives are pipe cleaners, '2 Inch capacity prong report binder' bases, heavy duty twist ties, millinery wire, small gauge copper wire or paper clips. What did not work well was wire coat hangers or heavy gauge residential copper wire. I found that the 'report binders' worked excellent if I cut them down to about 3 inches in length and then used a hammer to flatten the centers a bit. The nose-piece can be wrapped with tape or cloth to adjust the stiffness and/or act as a cushion.





Report Binder: clipped, bent and flattened

This design uses a pocket along the top to enclose the nose-piece so that the nose piece can be removed for laundering or replaced if a better alternative is found. The two ends of the pocket are left open to insert and remove the nose-piece. Be sure that you FINISH the nose-piece pocket before doing the pleats to avoid "oops ... I just accidentally sewed my top pleat shut".

Patterns and Templates

At the end of this document are a series of patterns and templates that can be printed and used to cut out or mark the fabric. Each sheet was drawn in a CAD system and exported as a single US letter size page to the PDF file format before being appended to this document. Therefore they have a different numbering system that goes from sheet 1.1 to 11.2. Some sheets are Templates for marking the pleats. Others may be cutting patterns or instructions. A few of the cutting patterns are so large that they had to be split across two sheets. Each cutting pattern has a ruler so that you can verify the print comes out to scale. Stitching is shown with a orange color.

Question: Can one attach these patterns to the cloth and sew through the stitch lines?

Answer: I printed one out on 18 pound bond paper and tried that with a 2mm long straight stitch using a titanium coated 80/12 top-stitch needle. It worked and I could detect no damage to the sewing machine but I am no sewing expert. It also offers no advantage except for the initial top and bottom seams of the tube.

Afterwards the paper has to be ripped off and thus the pattern is destroyed. I do not recommend it. I will however acknowledge that I got my straightest stitch lines this way.

Sheet Number	Description	Туре	Remark
1.1	1-1/8 inch Single Fold Fabric Tape and 5/8 inch Double Fold Fabric Tape	inllustration	
2.1	Nose-Piece Pocket Detail	instruction	
3.1	Small-Narrow Face Mask (7 x 3), 1/2 inch pleats, Pleat Template	template	
3.2	Small-Narrow Face Mask (7 x 3), 1/2 inch pleats, Cutting Pattern	pattern	
3.3	Small-Narrow Face Mask (7 x 3), 1/2 inch pleats, Mask Construction	instruction	
4.1	Small Face Mask (8.5 x 3), 1/2 inch pleats, Pleat Template	template	
4.2	Small Face Mask (8.5 x 3), 1/2 inch pleats, Cutting Pattern	pattern	
4.3	Regular Face Mask (8.5 x 3), 1/2 inch pleats, Mask Construction	instruction	
5.1	Regular Face Mask (8.5 x 3.5), 1/2 inch pleats, Pleat Template	template	
5.2	Regular Face Mask (8.5 x 3.5), 1/2 inch pleats, Cutting Pattern	pattern	
5.3	Regular Face Mask (8.5 x 3.5), 1/2 inch pleats, Mask Construction	instruction	
6.1	Regular Face Mask (8.5 x 3.5), 3/4 inch pleats, Pleat Template	template	
6.2	Regular Face Mask (8.5 x 3.5), 3/4 inch pleats, Cutting Pattern, Part 1	pattern	
6.3	Regular Face Mask (8.5 x 3.5), 3/4 inch pleats, Cutting Pattern, Part 2	pattern	
6.4	Regular Face Mask (8.5 x 3.5), 3/4 inch pleats, Mask Construction	instruction	
7.1	Medium Face Mask (8.5 x 4), 1/2 inch pleats, Pleat Template	template	
7.2	Medium Face Mask (8.5 x 4), 1/2 inch pleats, Cutting Pattern	pattern	
7.3	Medium Face Mask (8.5 x 4), 1/2 inch pleats, Mask Construction	instruction	
8.1	Medium Face Mask (8.5 x 4), 3/4 inch pleats, Pleat Template	template	
8.2	Medium Face Mask (8.5 x 4), 3/4 inch pleats, Cutting Pattern, Part 1	pattern	
8.3	Medium Face Mask (8.5 x 4), 3/4 inch pleats, Cutting Pattern, Part 2	pattern	
8.4	Medium Face Mask (8.5 x 4), 3/4 inch pleats, Mask Construction	instruction	
9.1	Large Face Mask (8.5 x 4.5), 1/2 inch pleats, Pleat Template	template	
9.2	Large Face Mask (8.5 x 4.5), 1/2 inch pleats, Cutting Pattern	pattern	
9.3	Large Face Mask (8.5 x 4.5), 1/2 inch pleats, Mask Construction	instruction	



	Туре	Remark
arge Face Mask (8.5 x 4.5), 3/4 inch pleats, Pleat Template	template	
arge Face Mask (8.5 x 4.5), 3/4 inch pleats, Cutting Pattern, Part 1	pattern	
arge Face Mask (8.5 x 4.5), 3/4 inch pleats, Cutting Pattern, Part 2	pattern	
arge Face Mask (8.5 x 4.5), 3/4 inch pleats, Mask Construction	instruction	
End Pocket Detail, Standard	instruction	
End Pocket Detail, Optional Button Hole	instruction	
	arge Face Mask (8.5 x 4.5), 3/4 inch pleats, Cutting Pattern, Part 1 arge Face Mask (8.5 x 4.5), 3/4 inch pleats, Cutting Pattern, Part 2 arge Face Mask (8.5 x 4.5), 3/4 inch pleats, Mask Construction nd Pocket Detail, Standard	arge Face Mask (8.5 x 4.5), 3/4 inch pleats, Cutting Pattern, Part 1 pattern arge Face Mask (8.5 x 4.5), 3/4 inch pleats, Cutting Pattern, Part 2 pattern arge Face Mask (8.5 x 4.5), 3/4 inch pleats, Mask Construction instruction and Pocket Detail, Standard instruction

Construction

There are roughly six (6) steps in construction.

- 1) Cut out the mask panel material
- 2) Prepare the Nose piece pocket
- 3) Sew the tube panels and nose piece pocket together
- 4) Turn inside out
- 5) Sew the nose-piece pocket down and form the pleats
- 6) Attached the end pockets

However the first thing one needs to do is prepare some folded fabric tape because nothing else can be sewn without this material.

... Folded Fabric Tape

This is almost exactly the same as common bias fabric tape. The only difference is there is no need to cut on the bias. You can use bias tape if you have some the right widths ... I did not. For the 1-1/8 inch single fold fabric tape cut you cloth 2 to 2-1/2 inches wide. Bring the long edges together with the 'right side' out and iron the fold in middle. Make the 5/8 inch double folded fabric tape from the single fold tape. However this time you need to be careful to make the finished width 5/8 of an inch. Start with one edge and fold over to the inside and iron the edge flat. Then do the other side to match.



... Nose Piece Pockets

You need to make these first because they have to be 'sandwiched' between the fabric panels for the mask. For the 8-1/2 wide masks you will want a 6 inch long pocket (check the mask pattern). That will provide plenty of length for your nose piece without the chance of it dropping out accidentally. Start with a piece of 1-1/8 inch single fold fabric tape about 7 inches long. Open it up and fold the ends to the inside so that pocket is exactly the length you need. Now refold the tape along the center line of its length and iron it flat. Stitch both ends closed about 1/8 of inch (or as close as you can get) from the end.

.... Face Mask Tube

<u>UPDATE:</u> I tried making some masks with patterned material for the front panel. In order to 'pattern match' the material I discovered that the nose piece pocket needs to be sewn to the front panel (*right side to right side*) before the panels are sewn to each other. Do this along the bottom folded edge of the nose piece pocket only. The top seam will be done when the two panels are seam together. This change is NOT shown in the pattern pages attached to the end of this document. Increase the offset by 1/16 of an inch.

Cut two pieces of fabric for the face mask panels. Put the panels together with the 'right sides' facing each other. Insert the Nose Piece-Pockets with the folded edge between the two panels. The face mask pattern has marks for the location of the corners of the pocket. There are also marks in each of the seam allowance that line up with these marks. These are sized to provide a 1/2 inch wide pocket for use with report binder base (those are 3/8 inch wide). If you are using something narrower (i.e. pipe cleaners) then you may want to make the pocket a bit narrower. A bit of extra nose piece pocket fabric will be left hanging out along the top edge. No worries. You can trim that off afterwards or leave it there for extra padding. Carefully check that all the edges are aligned and pin it together. Then sew the seam along the top 1/4 inch from the edge (be sure to back stitch each end to lock the thread in place). Repeat for the bottom edge. Lastly turn the 'tube' inside out and iron it flat. While you are at the ironing board fold the nose piece pocket down over the front of the face mask and iron the fold into a crease.

... Nose Piece Pocket and Pleats

Fold the nose piece pocket out of the way and Over-stitch all around the rectangle 1/8 of an inch from the edge. The stitching on the end is not necessary but it helps hold the panels together when forming the pleats. Now fold the nose piece pocket over the front of the mask and sew it along the bottom 1/8 inch from the folded edge.

I finally came up with a reliable method to producing nice even pleats. Check that pleat template width matches your overall top to bottom dimension. If not then balance the loss/excess between the ends of the pleat template. Carefully mark back panel with each pleat line as indicated by the red arrow points. Then pull these points together and tack them together with hand stitching or short



straight machine stitch 1/2 inch long (to the edge of the material). Do this for both ends of the tube being sure you have the pleats on the outside (front) face of the mask. Now you need to iron the edges along the both ends. Then sew a straight seam down each end 1/4 from the edge to hold the folds in place. The pleats should have the folded edged toward the bottom on the front face of the Mask. I have yet to find a foolproof way to iron the pleats along the length but depending on the material used you may not need to iron the pleats. I recommend completing construction of the face mask before making that decision.

... Nose Piece Pocket and Pleats

Almost done! Cut piece of the 5/8 double folded fabric tape about 1/2 to 3/4 of an inch longer than the height of the face mask. Unfold it and then fold the ends to the inside such that the length matches the height of your mask. Iron those ends down. You want the edges of these ends smooth against material so that they do not interfere with threading the straps through the completed mask. You can use permanent fuse-able fabric tape, fabric adhesive or some other means to accomplish this goal. I used a simple tight zig-zag stitch. Refold the pocket along the length and fit over the end of the face mask. Sew them together about 1/8 inch from the edge. I like to pivot and sew back along the same line to give a strong double line seam.

Some people find the mask fits better if the straps are closer to the center of the mask. There is an alternate end pocket design that uses button holes to provide that capability. The buttonholes also fastens the end flaps down. You will need to adjust the length of the flaps to match the button hole location.

... Laundry and Finish

Put the completed mask through the laundry cycle with bleach and fabric sofener. Then you can tell if you need to iron creases in the pleats. Now all you need to do is slide the nose piece in and thread whatever material you choose for the straps. My favorite is 'no-tie' shoe laces. Once the optimum length is determined (*by fitting the mask to the wears face*) these can be cut to length and fused together. You will find using a piece of stiff wire (old coat hanger) helpful in threading the straps through the pockets.



Last Minute Notes (11 April 2020)

If you find the masks are a bit too wide or too short then changing the width should be fairly simple. Note the difference between the "SMALL-NARROW" and "SMALL" masks in the attached patterns.

"Smart Air" has a good reference "What Are The Best Materials for Making DIY Masks?" that can be accessed at the following URL:

https://smartairfilters.com/en/blog/best-materials-make-diy-face-mask-virus/#

The original **PDF** file for this document can be found at my website on the page:

http://www.keywild.com/facemask

There is also a ZIP file with all the original CAD files in AutoCAD V13 compatible **DWG** format. Those CAD files were produced with the cad software "**BricsCAD Pro**" Version 18.2. This is one of the few professional CAD systems available that runs under Linux.

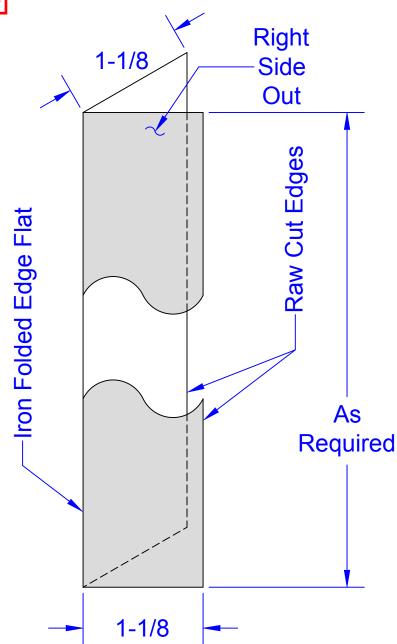
https://www.bricsys.com/?site=en_US

Separate PDF files were combined into a single PDF document using the software "Master PDF Editor" build 5.3.22

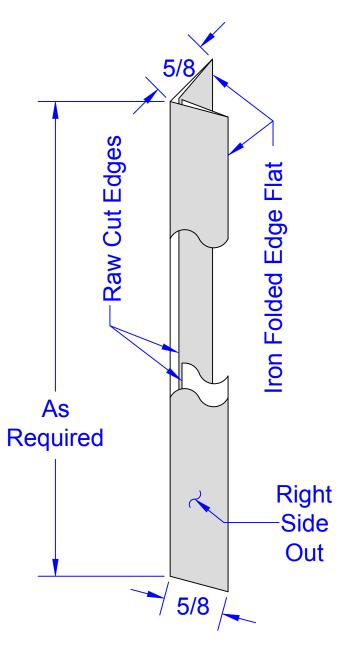
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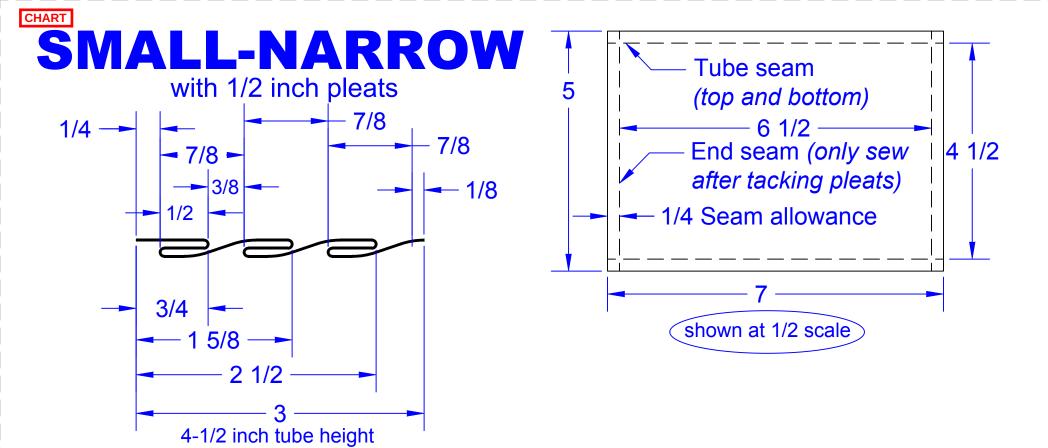


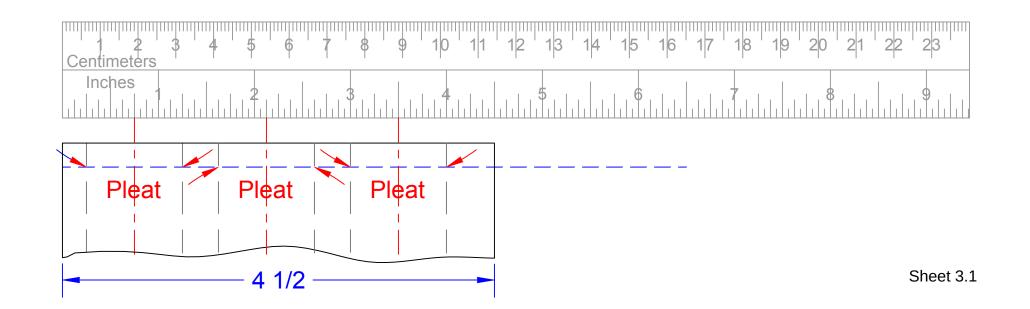
1-1/8 Single Fold Fabric Tape (fabric cut width = 2-1/4 inches)



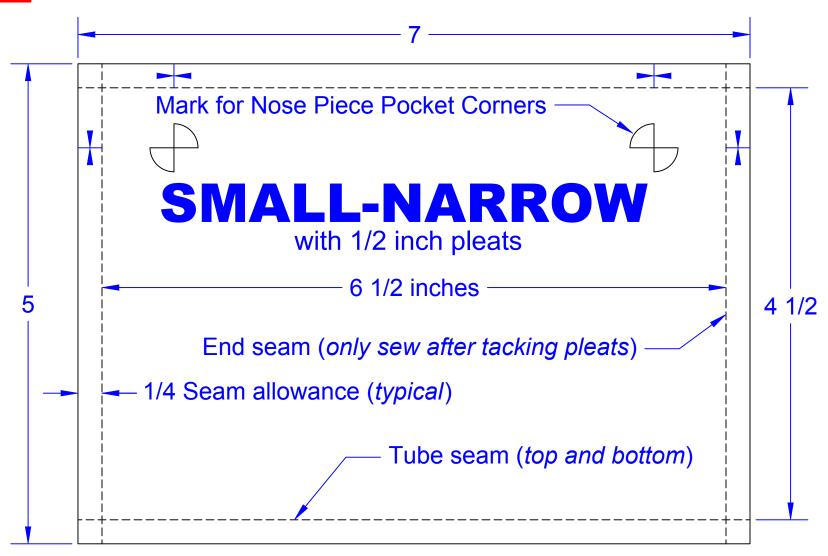
5/8 Double Fold Fabric Tape (make from 1-1/4 single fold fabric tape)

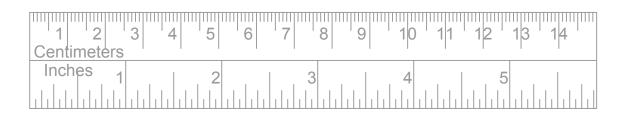
Sheet 2.1



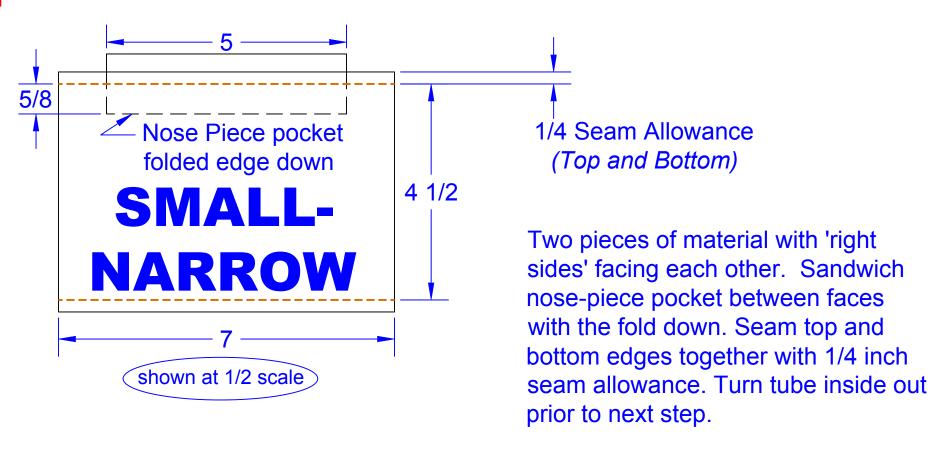


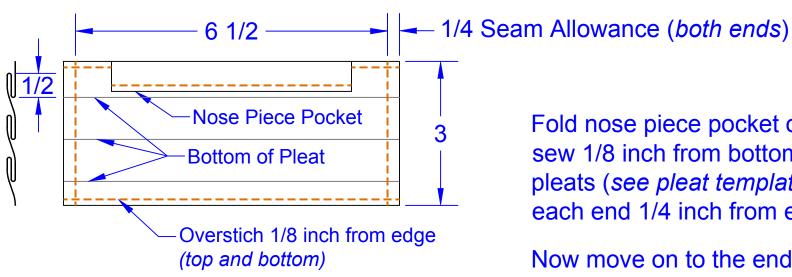






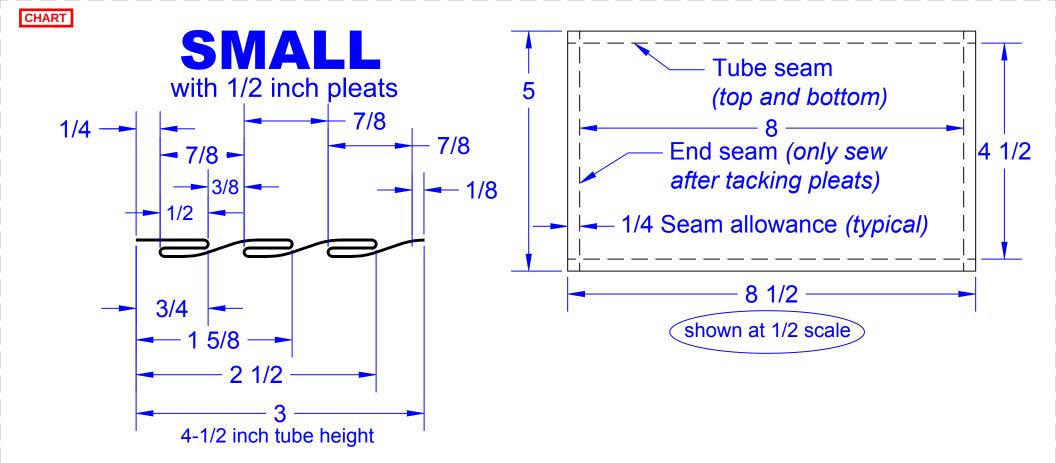


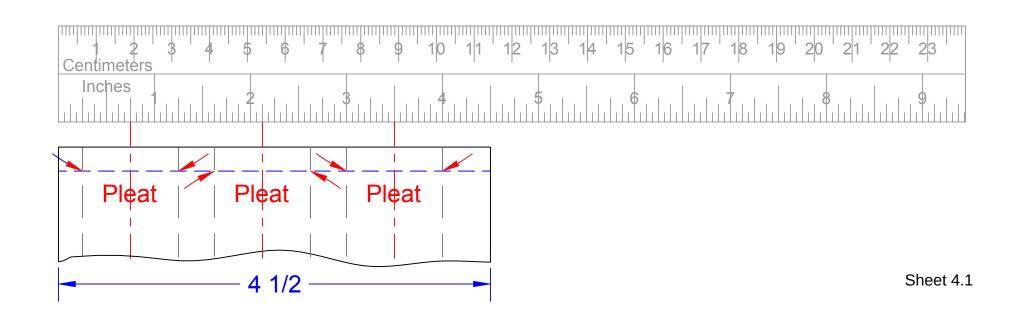


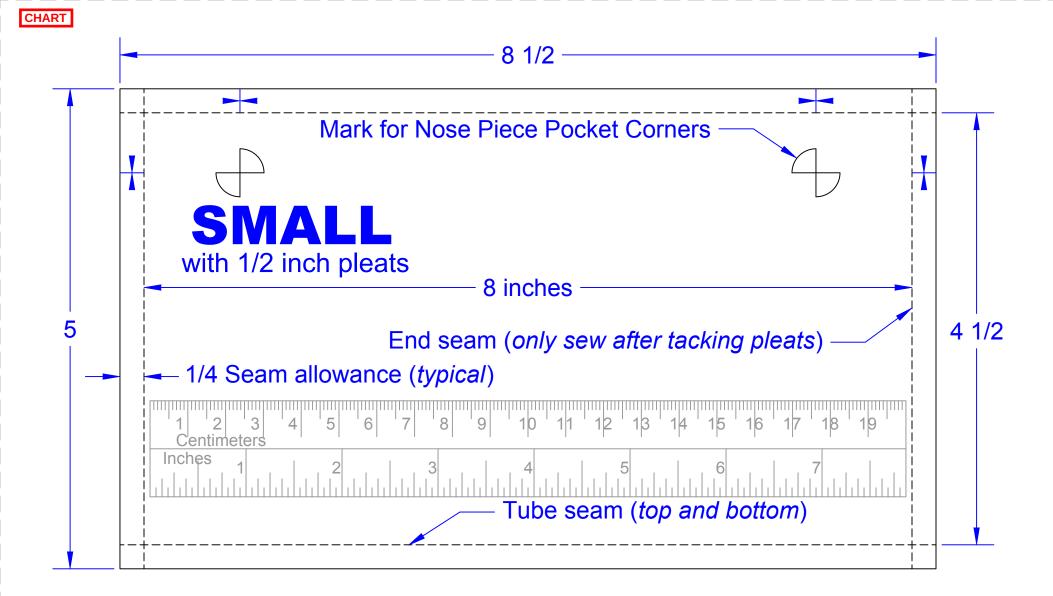


Fold nose piece pocket over front and sew 1/8 inch from bottom edge. Form pleats (see pleat template) and sew each end 1/4 inch from edge.

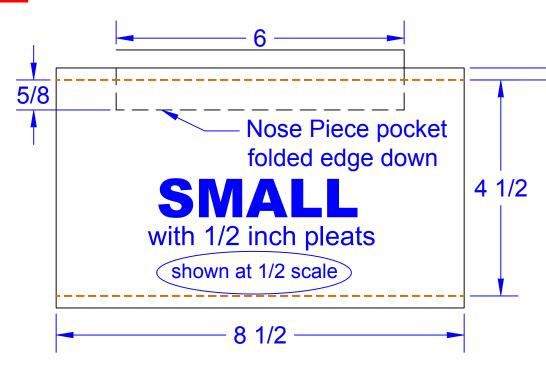
Now move on to the end pockets.





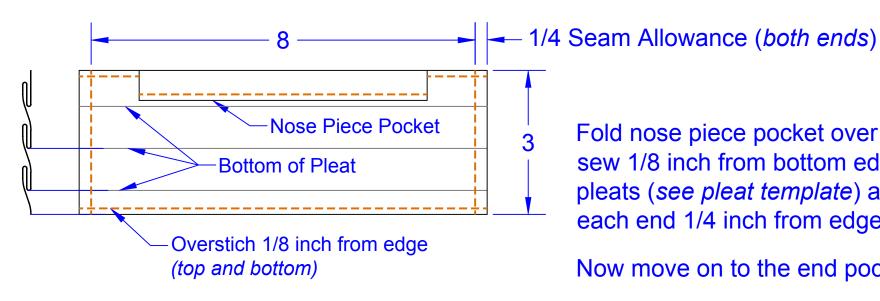






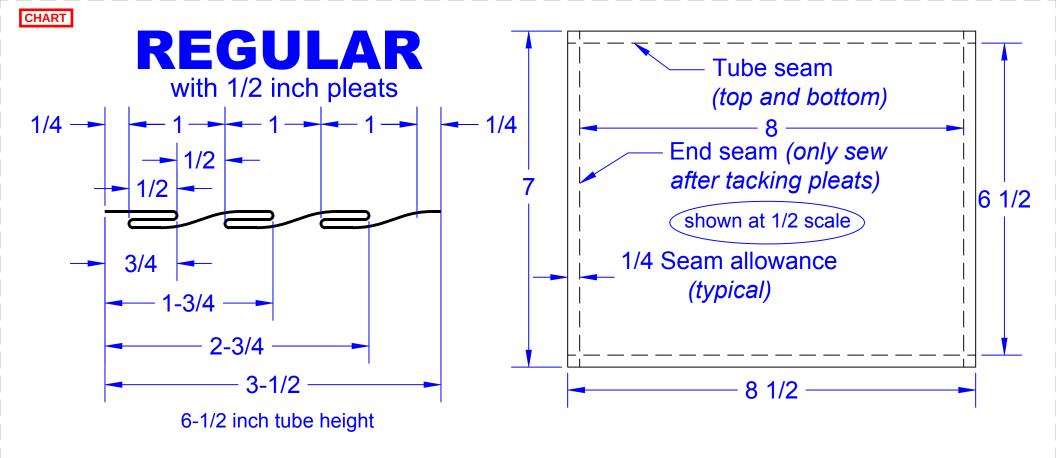
1/4 Seam Allowance (Top and Bottom)

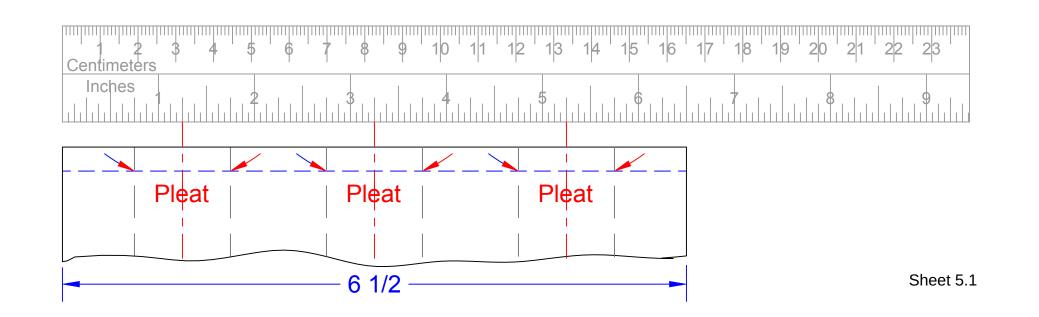
Two pieces of material with 'right sides' facing each other. Sandwich nose-piece pocket between faces with the fold down. Seam top and bottom edges together with 1/4 inch seam allowance. Turn tube inside out prior to next step.

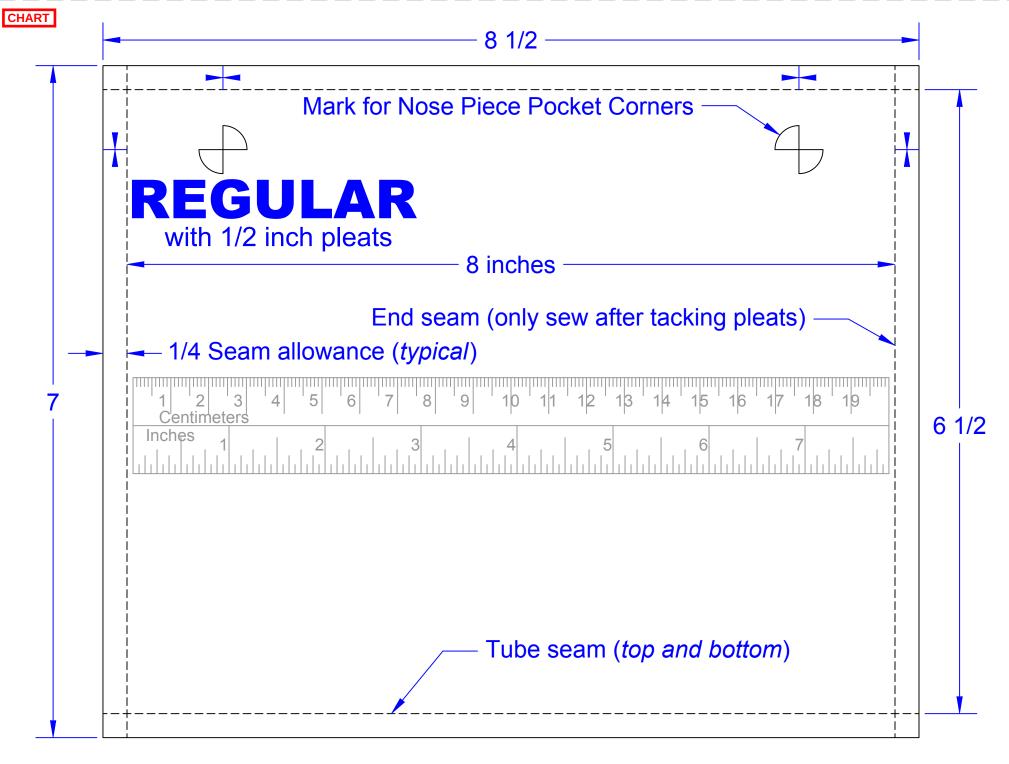


Fold nose piece pocket over front and sew 1/8 inch from bottom edge. Form pleats (see pleat template) and sew each end 1/4 inch from edge.

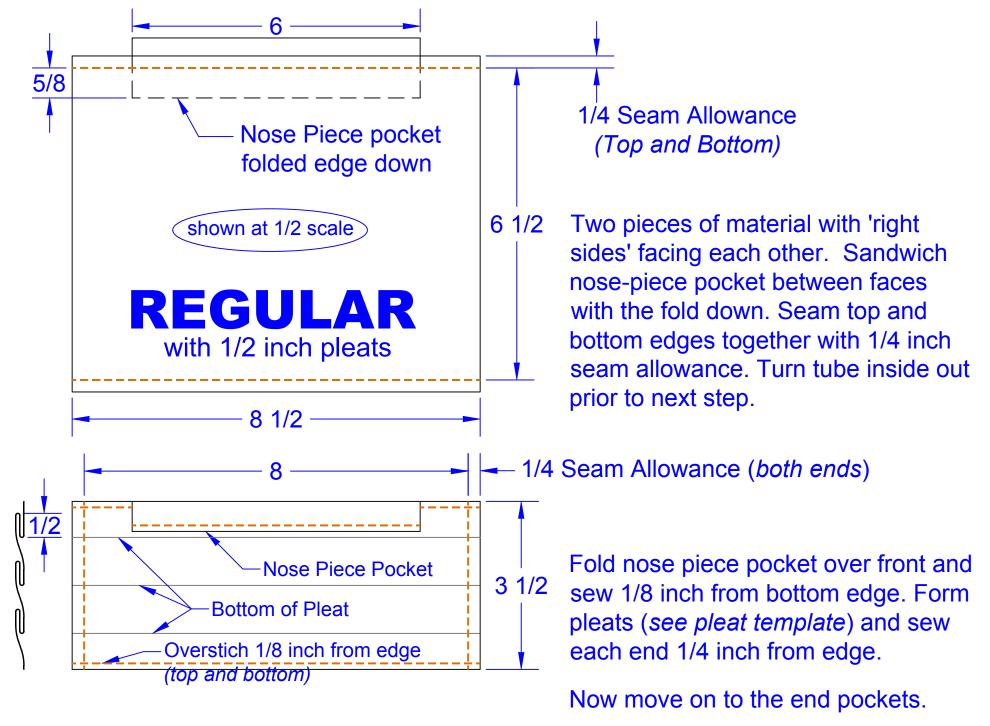
Now move on to the end pockets.



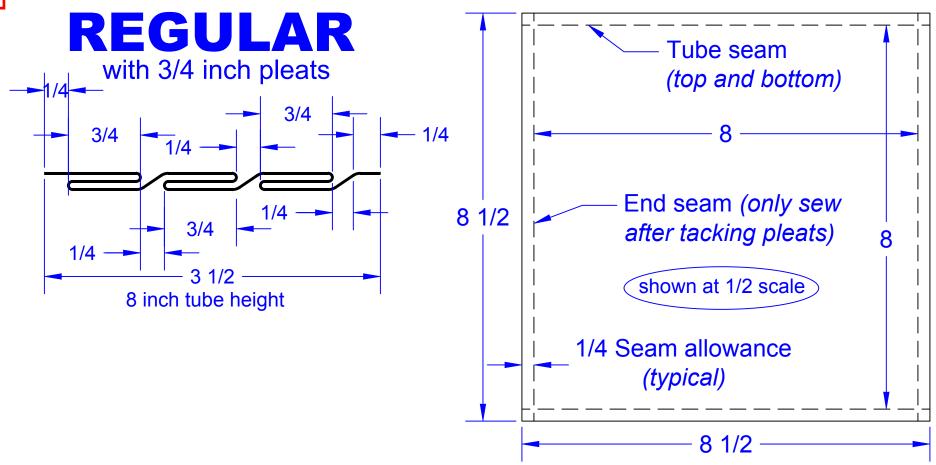


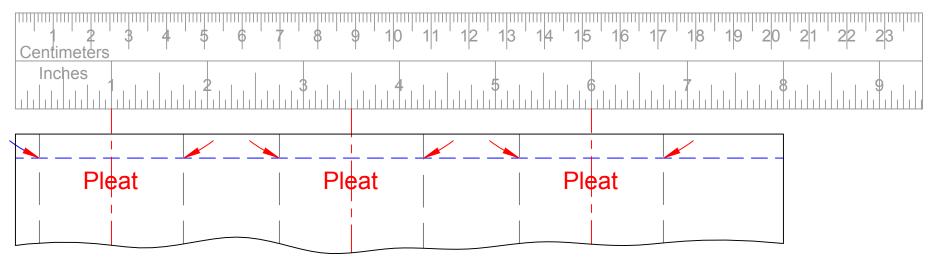




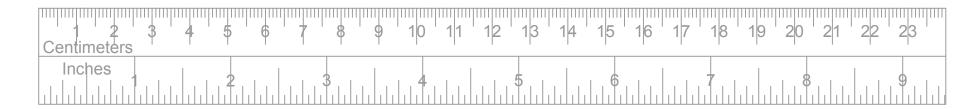


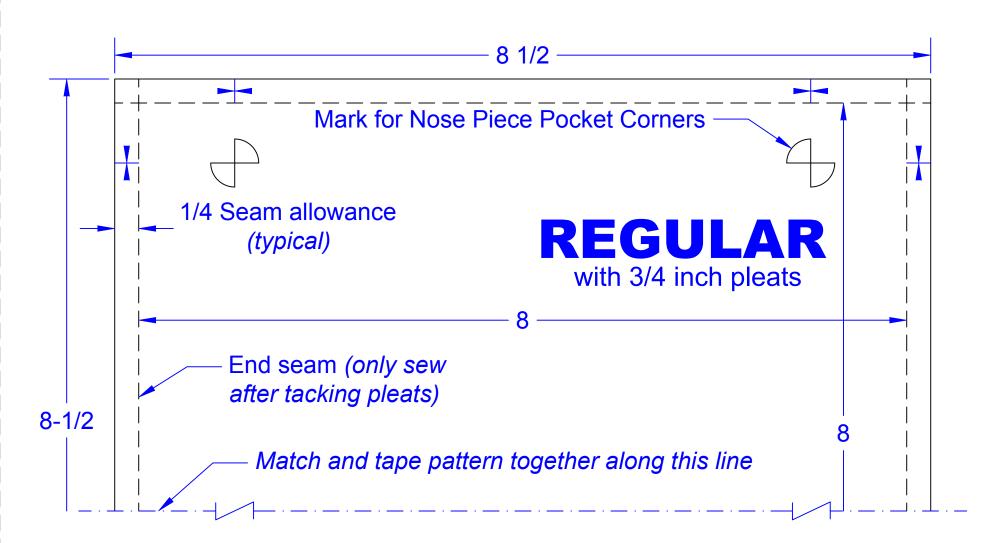




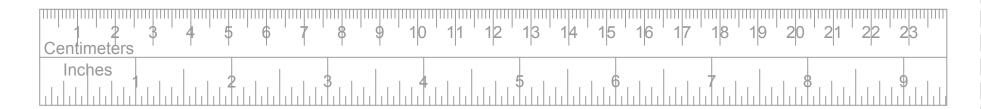


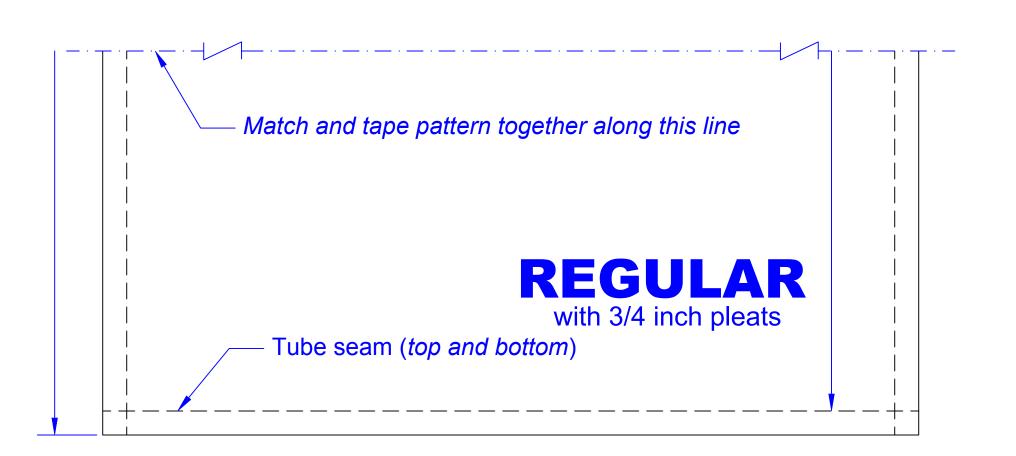


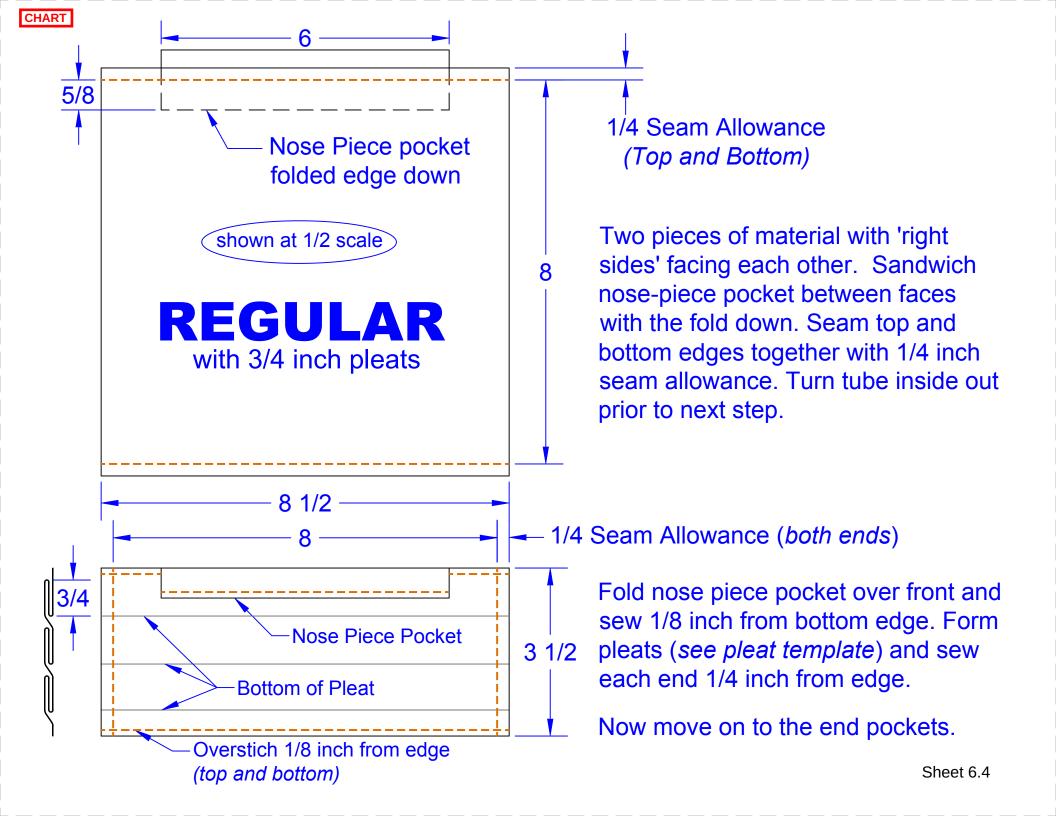


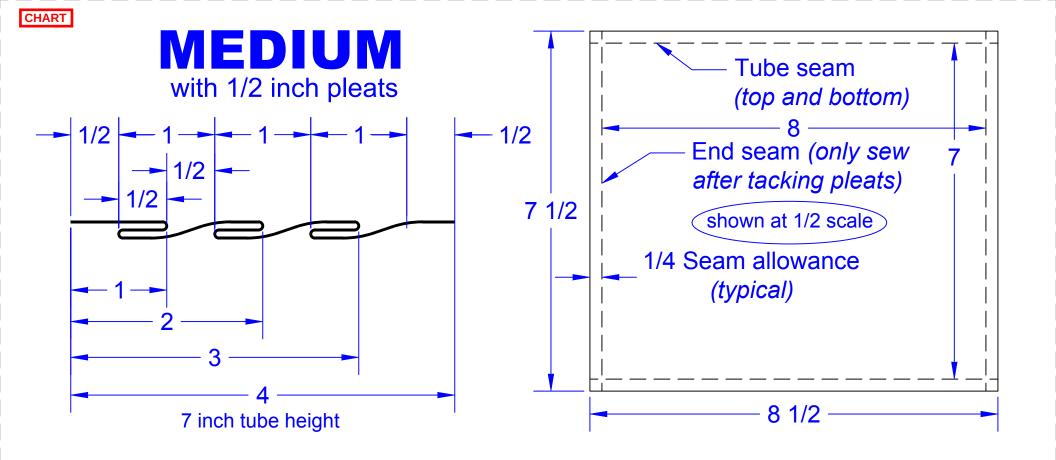


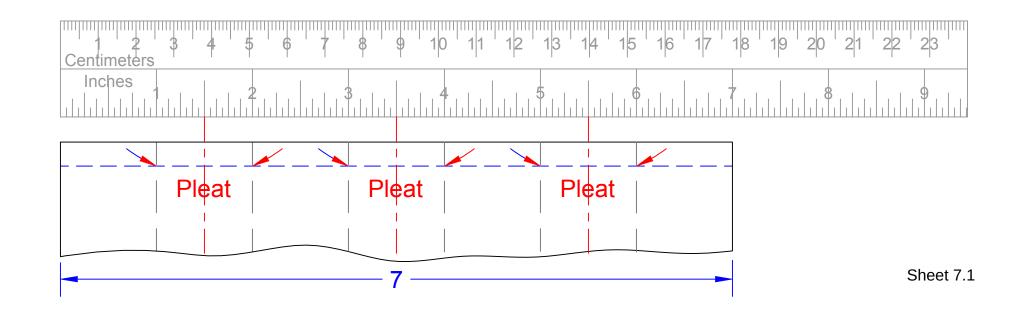


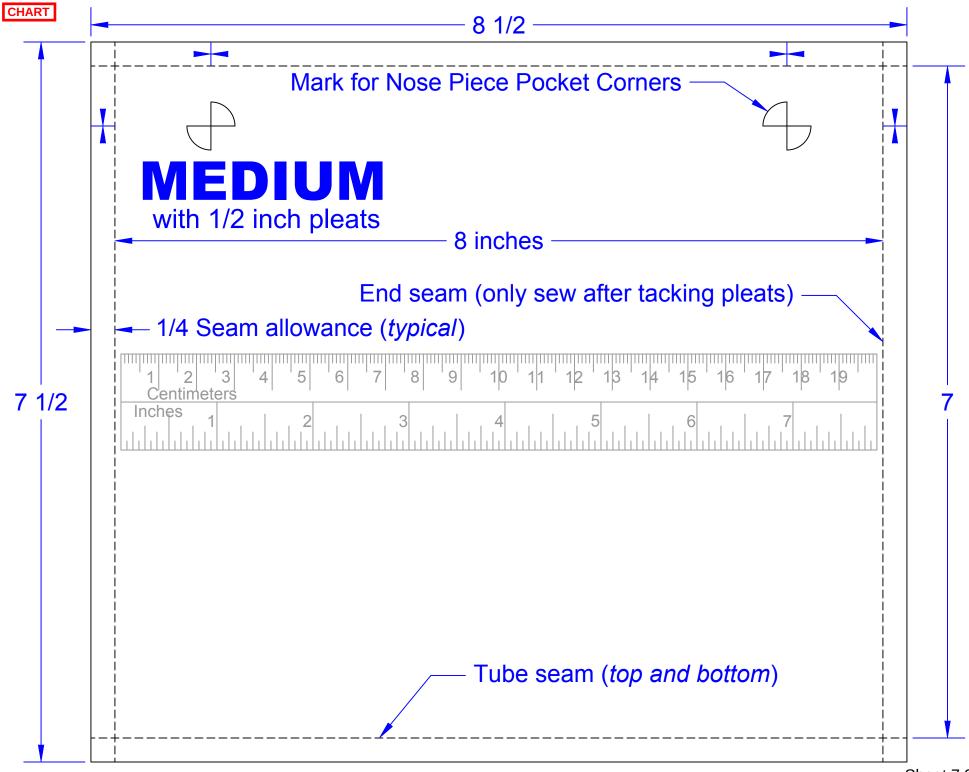


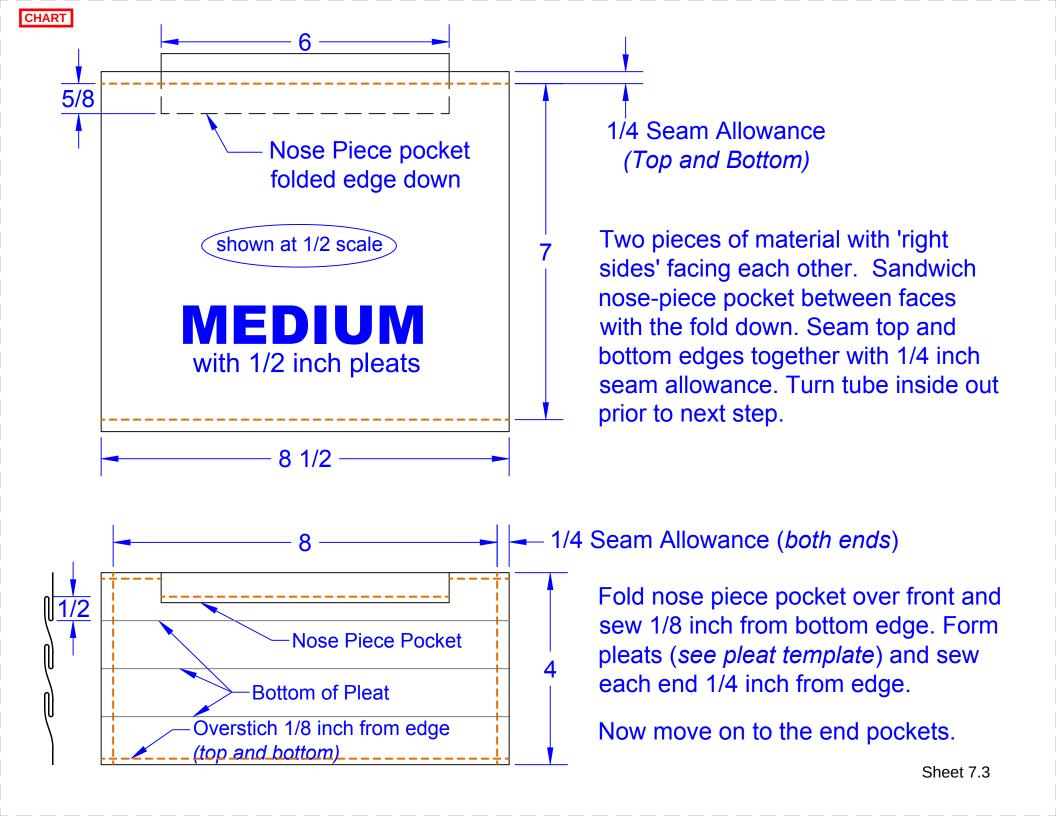


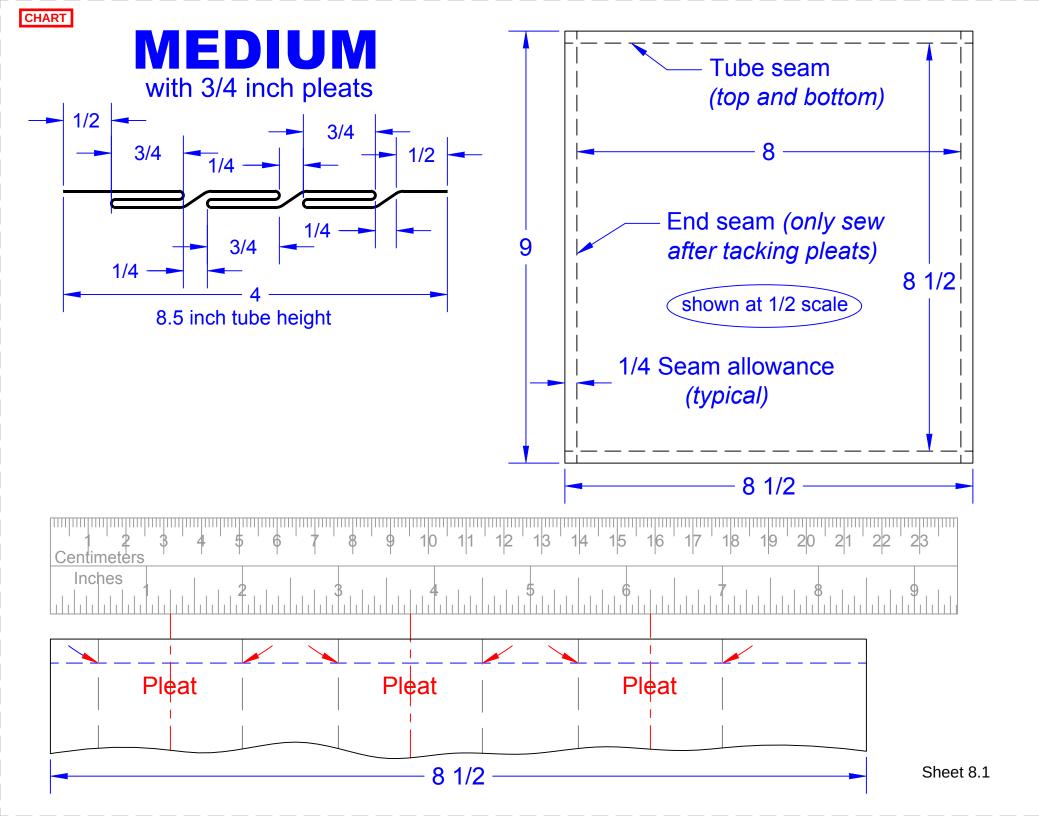




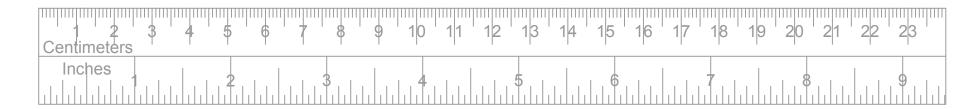


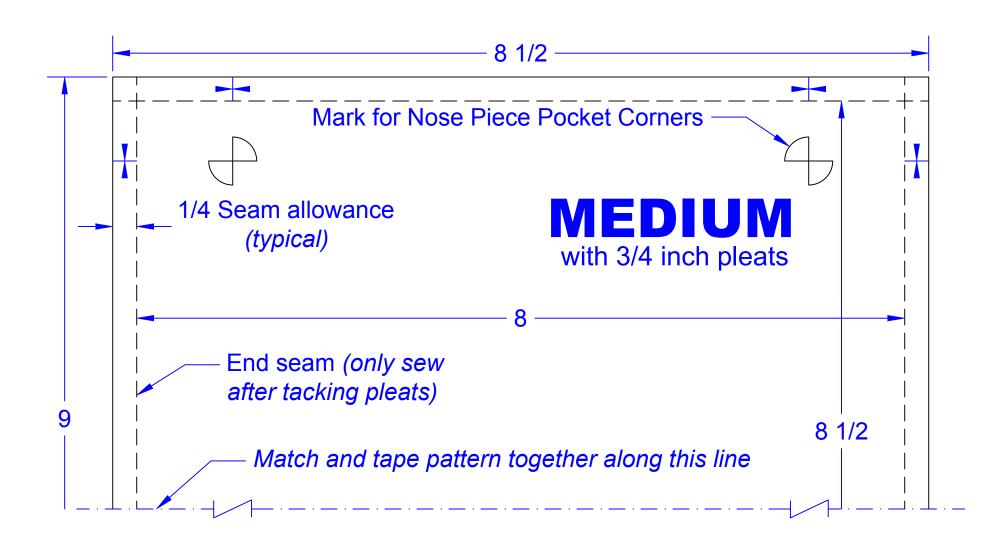




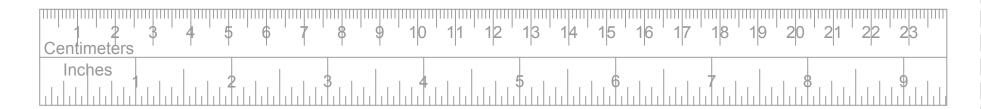


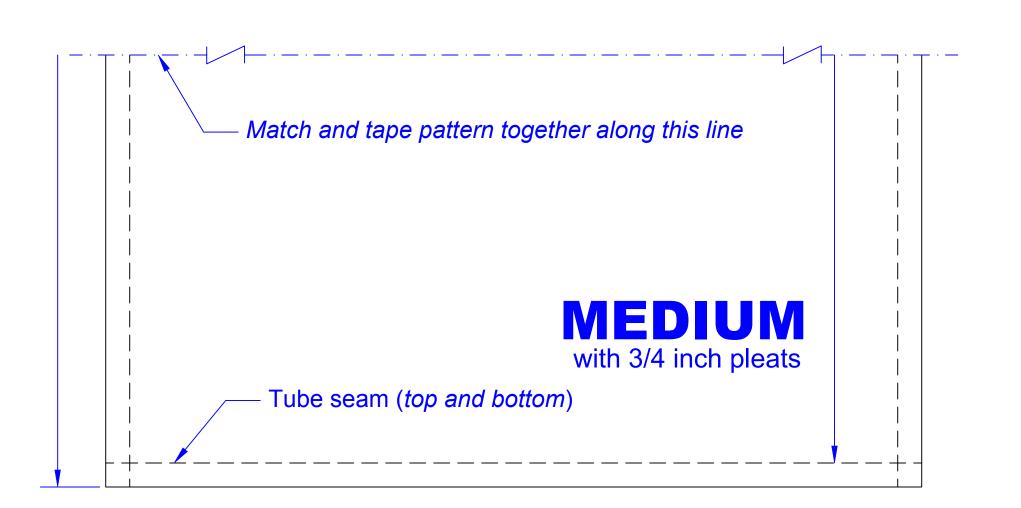


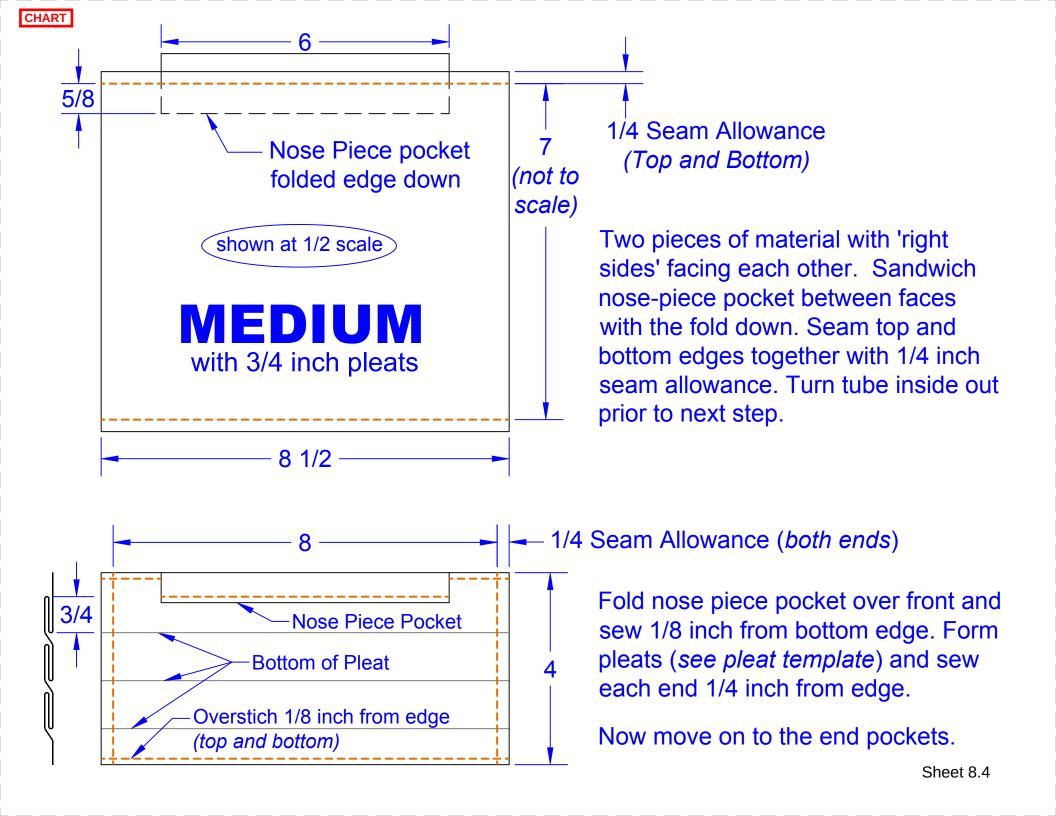


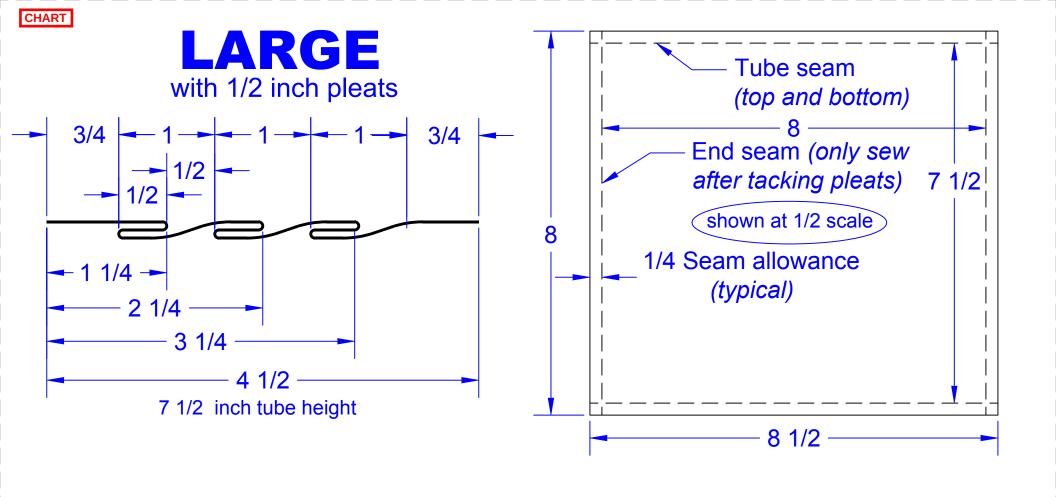


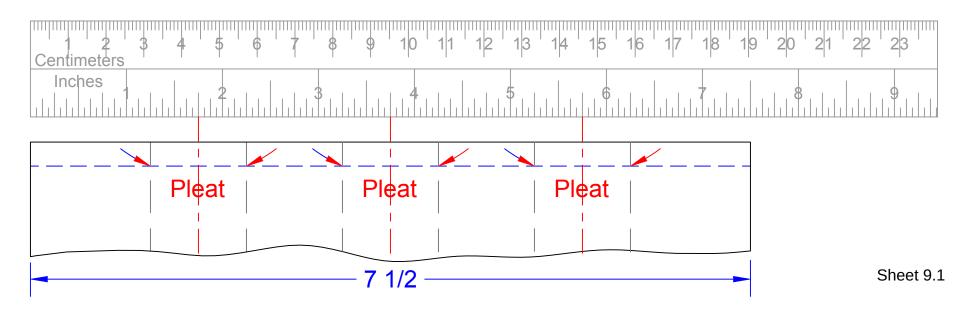


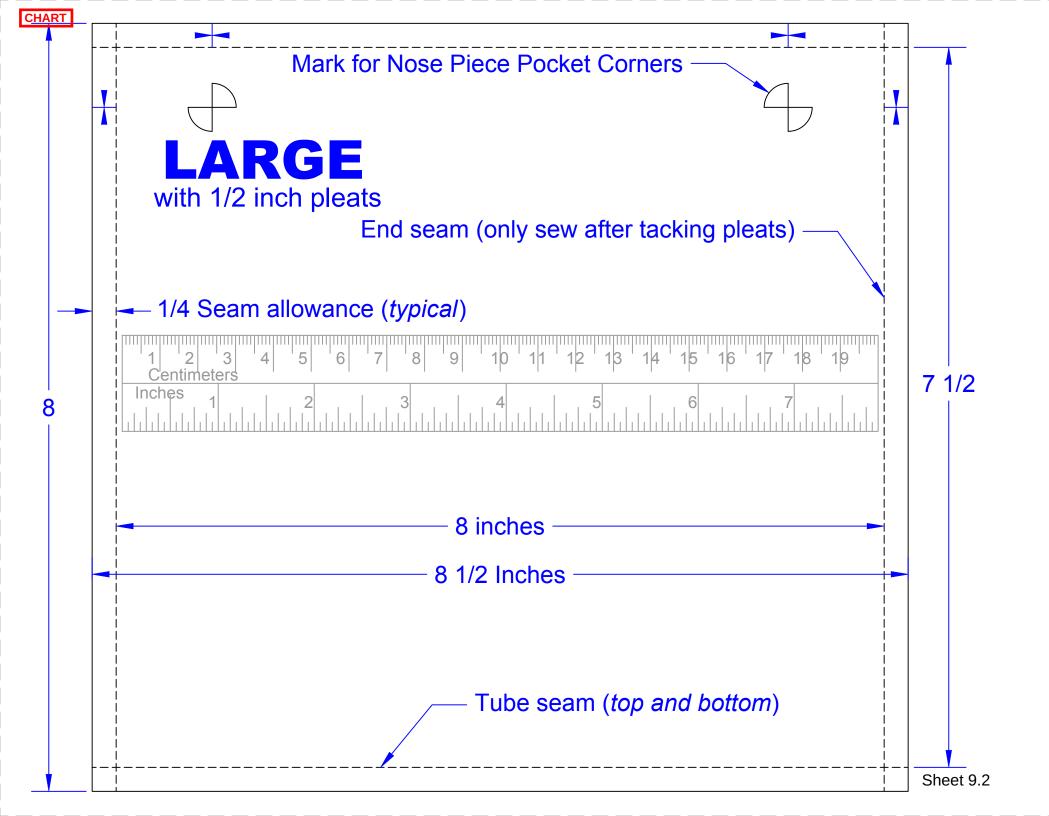


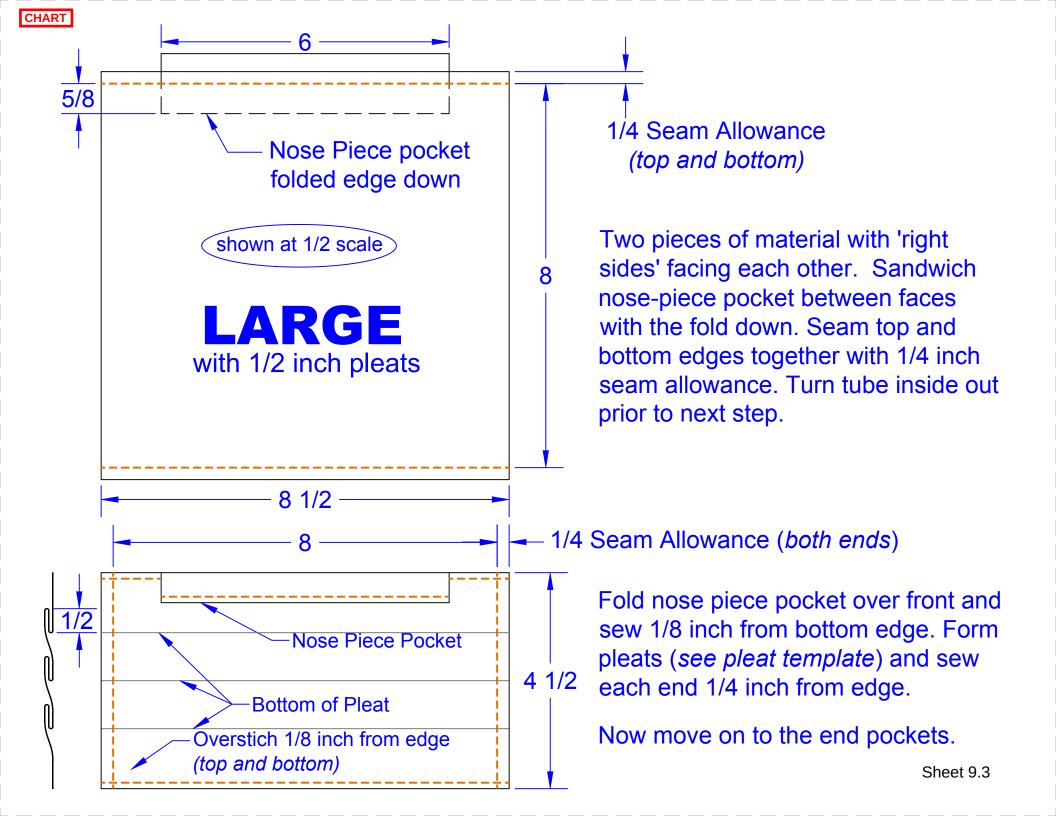


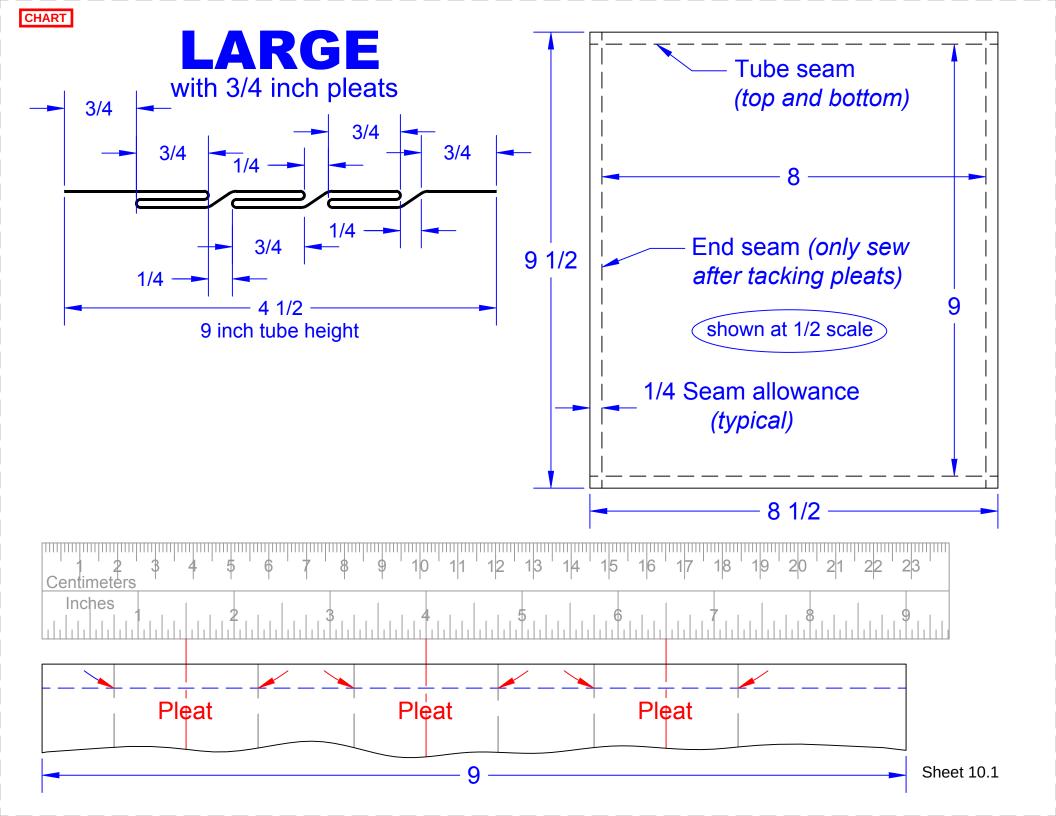




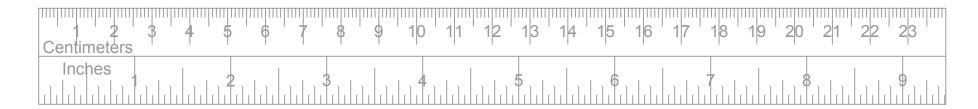


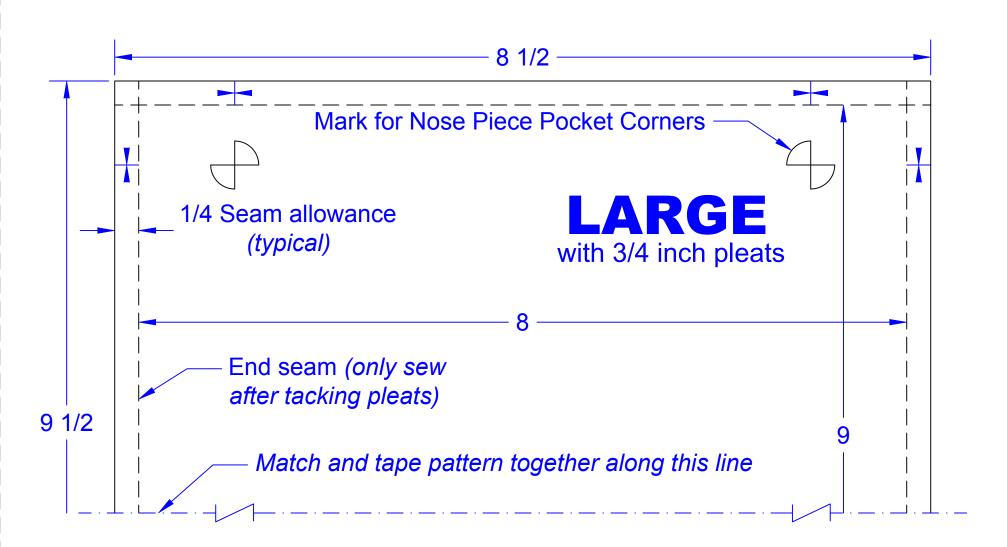




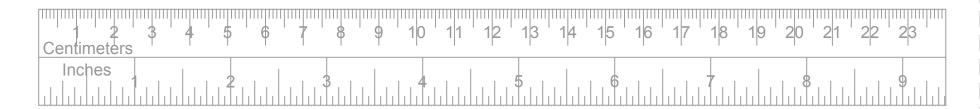


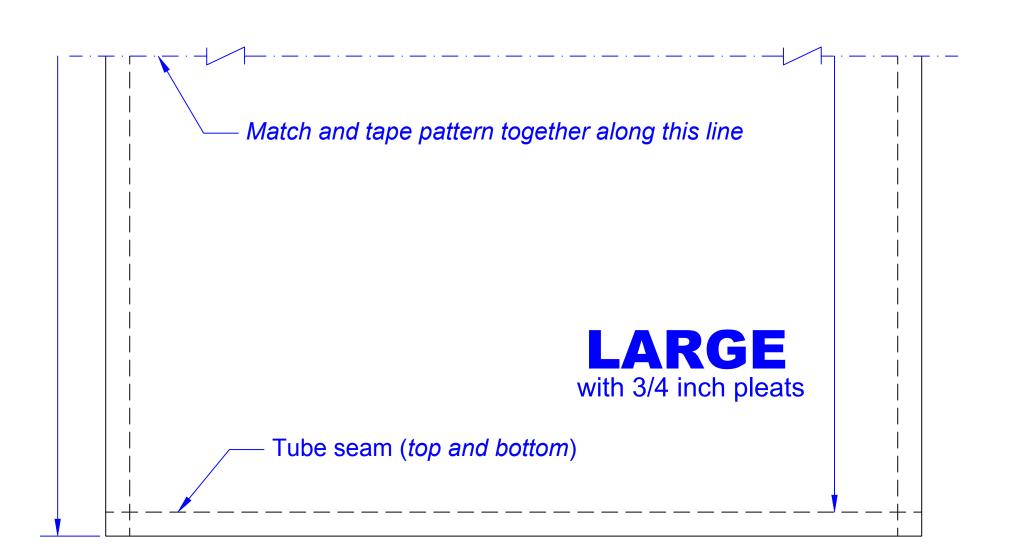


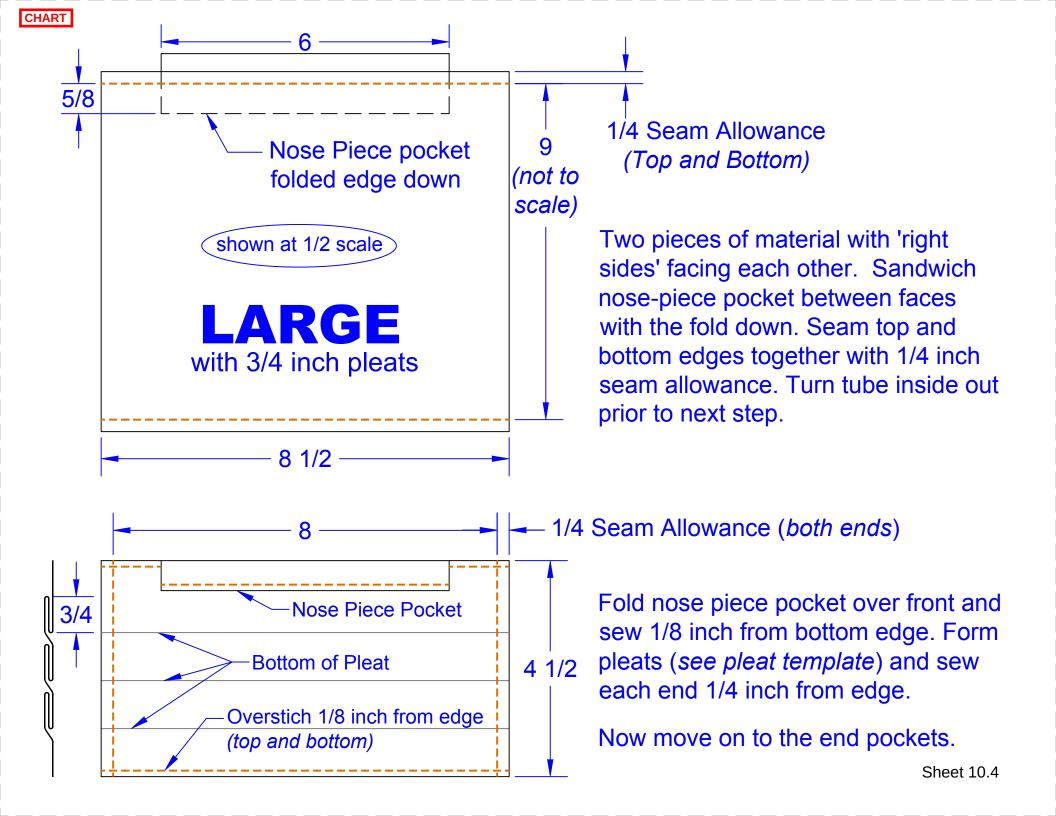




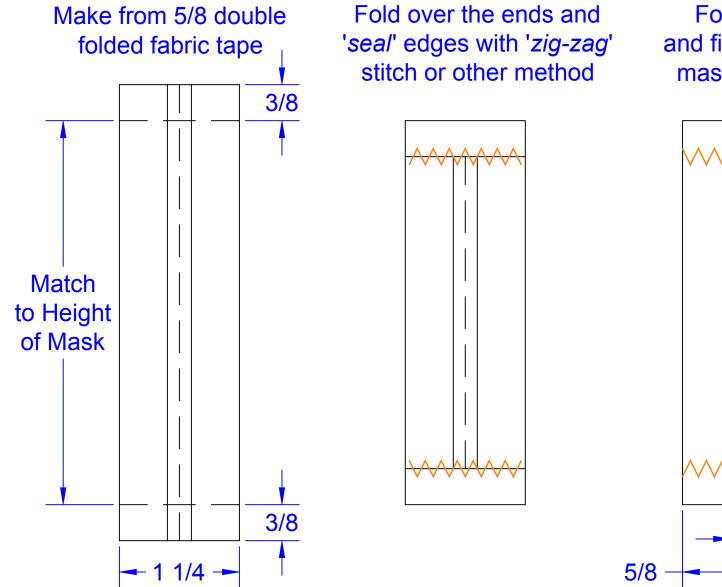




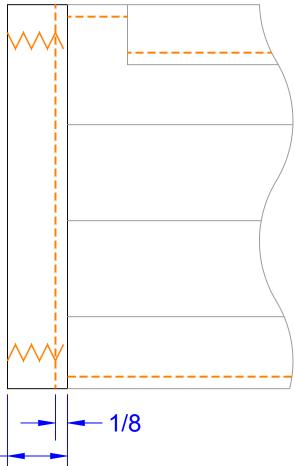




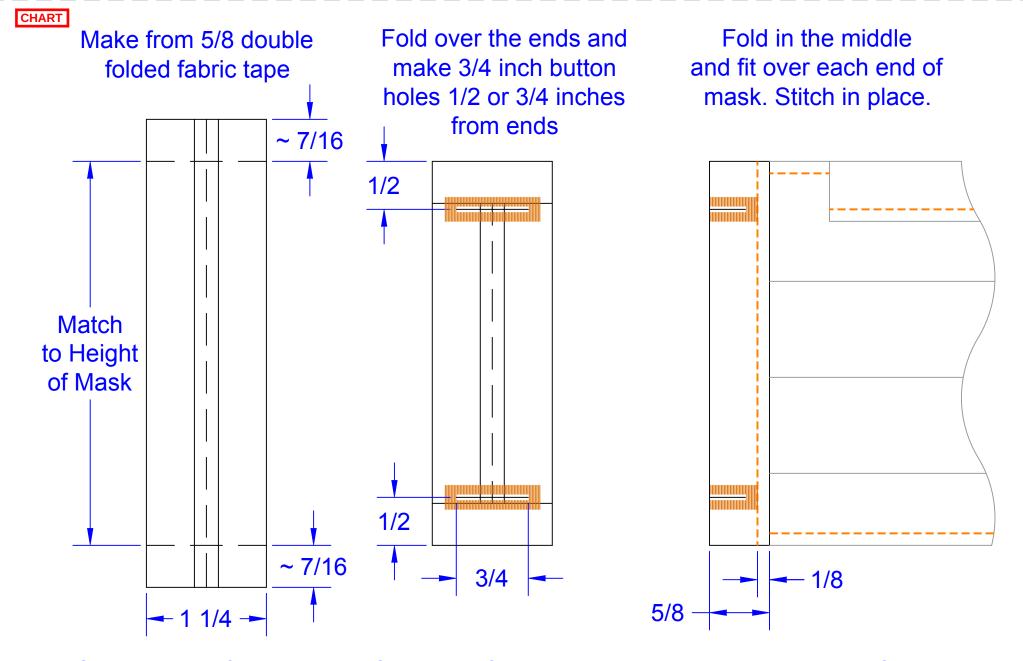




Fold in the middle and fit over each end of mask. Stitch in place.



After the **End Pockets** are completed the completed mask should be washed, dried and ironed. Then just insert the nose piece and straps of you choice.



Some people find the mask fits better if the straps are closer to the center of the mask. This is an alternate end pocket that uses button holes to provide that option. The buttonholes also fastens the end flaps down. You will need to adjust the length of the flaps to match the button hole location.

Sheet 11.2