

Memo to College of Engineering COVID response Team

From: David Brookstein, Senior Associate Dean, College of Engineering

April 1, 2020

All,

I have made respirators for myself and my wife that are comprised of the fabric that is used in 3M FILTRETE 2800 MPR HVAC filters. (readily available) This is the highest rated MOR product that is made by 3M. It also includes rubber bands to secure it around my nose and mouth.

Below is what it looks like on me.



Below are the configurations of the rubber bands that secure my respirator is very comfortable. In fact, I have worn it for about an hour with no problem exhaling or inhaling.



I also plan to regularly disinfect it using the device (So Clean™) I use for daily cleaning my CPAP mask which uses activated oxygen (ozone) to clean it without degrading any of the plastic elements comprising the mask.

Below is information on the 3M FILTRETTE 2800 product.



(Microparticulate Particle Rating) has a rating of MERV 14. The higher the MPR, the more microparticles - such as pollen, pet dander, smoke, bacteria and viruses - your filter will capture from the air passing through it. (from the 3M website)

With regard to the viricides incorporated in the fabric I found the following in the 3M patent which covers this product (US Patent US 9,539,532 “AIR FILTER WITH SORBENT PARTICLES”
“*The particular sorbent particles are not critical to the invention hereof, so long as they possess the desired sorbent properties for the intended end use application for the filter. Desirably the sorbent particles will be capable of absorbing or adsorbing gases, aerosols or liquids expected to be present under the intended use conditions. The sorbent particles may be provided in any usable form including beads, flakes, granules or agglomerates. Suitable sorbent particles include activated carbon; alumina and other metal oxides; sodium bicarbonate; metal particles (e.g., silver particles) that can remove a component from a fluid by adsorption, chemical reaction, or amalgamation; particulate catalytic agents such as hopcalite (which can catalyze the oxidation of carbon monoxide); clay and other minerals treated with acidic solutions such as acetic acid or alkaline solutions such as aqueous sodium hydroxide; ion exchange resins; molecular sieves and other zeolites; silica; biocides; fungicides and viricides.*” (emphasis added)

While of course this respirator I made for myself and my wife is not FDA approved and I am not suggesting we make these for TUH at this time I am open to sharing the design with any of you who might like to make one for yourself. **Again, with the proviso that it is not FDA approved.** Notwithstanding that I have a substantial amount of experience in textile engineering and I have complete confidence that both my and my wife can use this for personal protection. Previous to joining Temple I was the Dean of Engineering and Textiles at Philadelphia University. Threw I was the Principal Investigator on a US ARMY Research project titled “Laboratory for Engineered Human Protection”. I was also a recipient of the ASTM Committee D13 Textile Harold De Witt Smith Award for outstanding achievement in textile fiber utilization.

I look forward to your comments or questions.
Dave

Instructions for making a protective mask (not FDA or NIOSH approved)

Materials and supplies needed

1. Polyester Mosquito Netting 72" wide – available from JoAnn Fabrics

<https://www.joann.com/utility-fabric-mosquito-netting-white/10173292.html>

2. 3M Filtrete Filter 20"x 25"x 1" available from <https://www.iallergy.com/collections/3m-filtrete-furnace-filters/products/3m-filtrete-2800-ultrafine-filter?variant=1668834426889>



3. Staples Premium Rubber Bands, #117B, 1 lb. Bag, 200/Pack (28621-CC)

https://www.staples.com/Staples-Rubber-Bands-Size-117B/product_808017

Tools needed

1. Good fabric scissors https://www.staples.com/Westcott-13529-Titanium-Bonded-Scissors-Straight-Handle-8-Gray-Yellow/product_488010
2. Sewing machine with thread (any kind of thread is fine)
3. Single hole punch https://www.staples.com/Staples-Premium-10577-1-Hole-Punch-5-Sheet-Capacity/product_395197

Instructions to make 5" x 9" mask

1. Deconstruct the Filtrete Filter

- a. One cut the metal grid from both sides of filter (see below). Cut along the outside periphery of the filter. Cut the grid from both sides of the filter.



- b. After you have cut away the grid you then need to use your finger to separate the grid from the fabric. (see below)



- c. You should now have the pleated fabric removed from the filter. Don't worry about the pleats and do not try to use an iron to flatten the pleats. That would melt the fibers.

2. Now its time to cut the fabrics into 5" by 9" rectangles with the pleats flattened. Note: A 20" x 25" filter should yield approximately enough fabric rectangles for about 10 masks.
3. Note that the Filtrete filter shows which direction the air flow should be. Make sure that the fabric you harvest from the filter is used to make a mask where the airflow direction of the fabric should be AWAY from your mouth and nose.

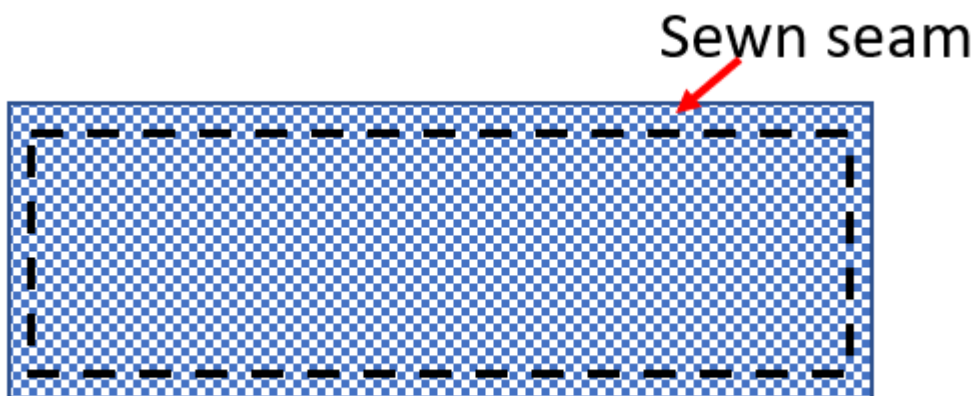


4. Now cut the polyester mosquito mesh into 5" x 9 "rectangles. Note: the purpose of the mosquito mesh against your face is to prevent you from inhaling loose fibers from the Filtrete filter material.
5. Place the 5" x 9' rectangles on top of the filter fabric that is next to your mouth and nose.

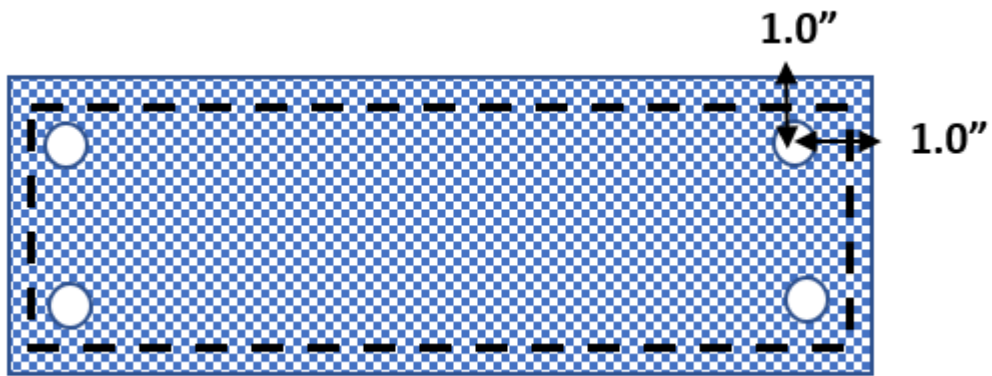


Mosquito net fabric
Filter fabric

6. Sew the filter fabric and mosquito fabric to gather along the perimeter of the assembly. If you don't have a sewing machine you can either stitch by hand. Or you can skip this step and just go to step #7. Then when you go to step #8 the rubber bands will to the job of holding the two fabrics together.



7. Use hole punch to punch 4 holes in the sewn assembly. (holes need to go through both fabrics)



8. Take 4 rubber bands and do the following.
 - a. Loop one rubber band through each hole



- b. Bring the other end of the rubber band loop through the other loop



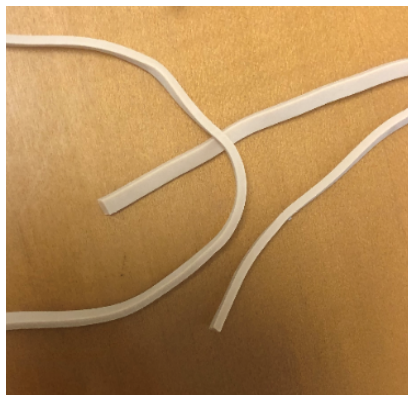
- c. Pull the looped rubber band tight (not too tight)



- d. Do the same thing with other rubber bands on the remaining three holes
- e. On the other side (the long side) cut the two rubber bands in half



- f. Now place one end of the cut rubber band through the opposite rubber band loop and tie a square knot



You have now made a mask!
Remember: This is not NIOSH or FDA approved. But it's better than nothing!