



DIY COVID-19 Mask with Eyeshield

March 30, 2020

Overview - March 30, 2020

This guide will demonstrate how to create an N95 mask that is intended to be capable of preventing ultra fine particles from entering the respiratory system of medical staff and associated support personnel during the anticipated Personal Protection Equipment (PPE) shortage.

This guide has been developed to be able to instruct someone with the most basic construction skills to construct a high quality N95 mask. If you are a more experienced seamstress or tailor, and understand the principle of this mask, please feel free to replace our simple guidance for more advanced techniques.

This design attempts to duplicate, as much as possible, the quality of masks that are used in the medical setting. In the face of rising demand for PPE, educated best guesses in ways to supplement the manufacturing gap may become a necessity. Further, the engagement with the community, as a source of strength, can allow for us to fill that gap while capacity is increased. This mask design was constructed with components that are medically necessary – synthetic materials, actual viral filter material, eyeshield – but are available from consumer suppliers and should outperform a mask made of only cotton.

The mask design and this associated guide represents a collaboration of OB/GYNs, Virologists, Microbiologists, and Polymer Scientists, industrial and graphic designers, several who are also seamstresses.

Using these instructions, community members can supplement our collective supplies which can be made available for use in non-COVID but PPE-required contexts. A supply of community-sourced masks can help relieve the expected shortcomings in the upcoming weeks.

Every mask matters because they help to protect the healthcare workers who are working tirelessly to protect the lives of families and friends in our community. By working together, you are helping the people you know, and people you do not know. Please utilize Governor DeWine's together@governor.ohio.gov to ask where you can drop off finished masks.

For much more information, please see our YouTube Video, entitled:
"Covid 19 Masks: Scientist Meets Seamstress" at https://youtu.be/w_9R_WRKZg4

This effort was a joint collaboration between:

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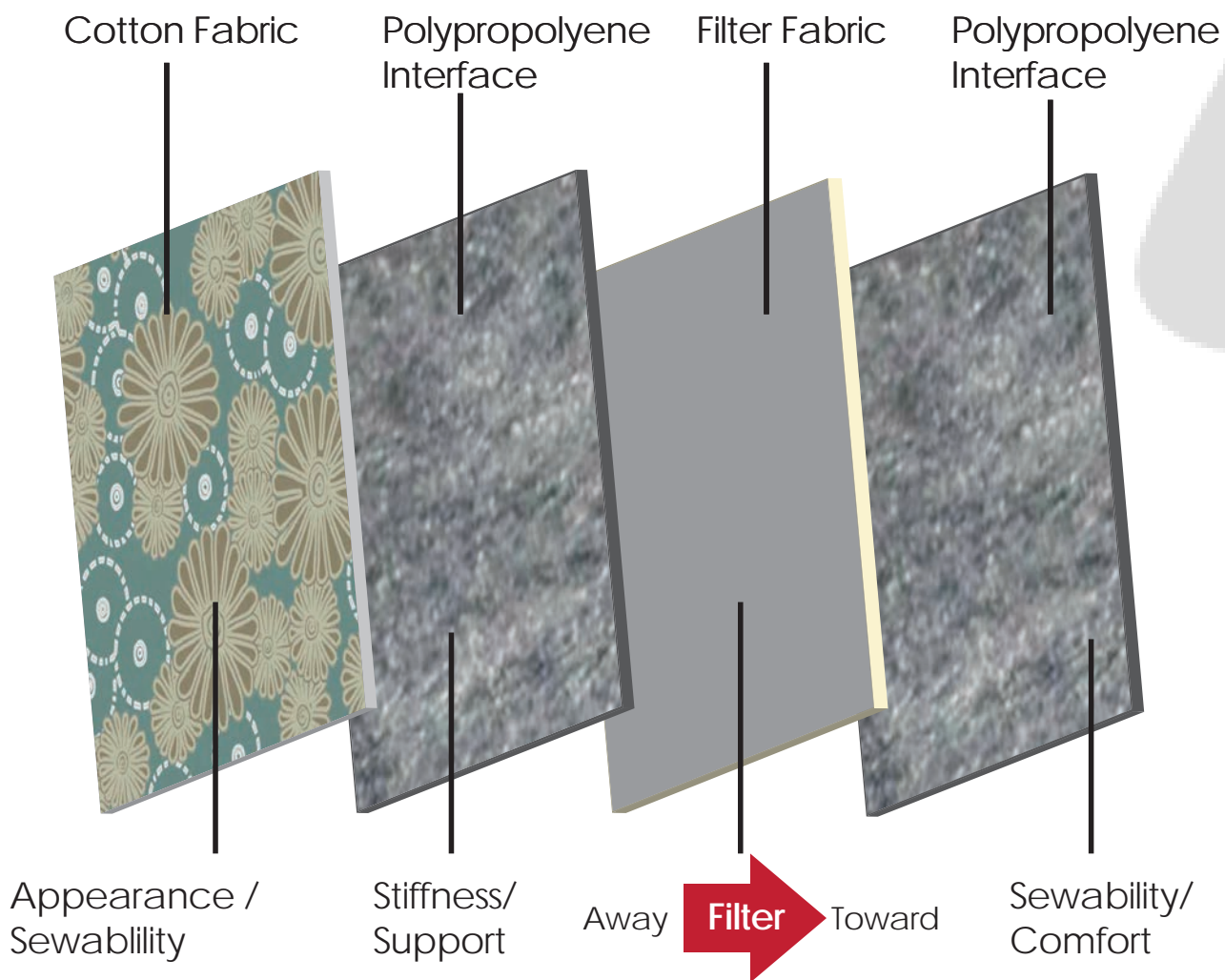
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Among many others that were happy to help

What Makes a Mask Good?

A good mask is durable, fits your face, wearable for long periods of time, and most importantly, filters contaminants and is made from materials that viruses hate. **Our mask has four layers that are designed to achieve these characteristics.**



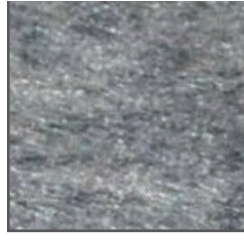
The filter fabric is directional. Make sure the arrow on the side of the filter box aligns with the arrow shown in this diagram. It will be helpful to mark the Filter Fabric by hand to ensure that the "Toward" and "Away" sides remain clear.

You will need:

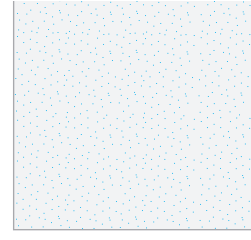
Materials:



One (1) 10" x 10"
Cotton Fabric

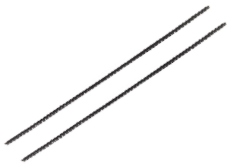


Two (2) 10" x 10"
Polypropylene
or Polyethylene
Interface* (Fabric)

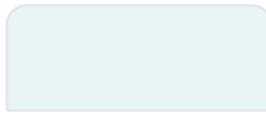


One (1) 10" x 10"
Home Furnace
Filter Fabric -
rated for VIRUS

****Do Not Use
Cotton or Muslin***



Two 10"
Pipe Cleaners
or
Bendable Wire



4" x 10"
Transparency
Film
Staples, 200 pk



Two (2) 7"
Elastic Straps
OR alternate

Tools:



Iron



Sewing Machine



Hot Glue Gun

Processes:



Fold



Sew



Glue

Where to find materials:

Fabric, elastic straps, pipe cleaners or bendable wires and Interface material can be bought at Jo-Ann Fabrics or other craft supply store. At the time this tutorial is being written, Jo-Ann is giving away decorative cotton fabric and elastic straps for free. In general, cotton is fine to be used on the outer layer, but the inner layers should be made from synthetic materials as they do not hold onto moisture in the same manner as natural fibers.

Hardware stores sell Home Furnace Filters in a variety of sizes and filtration rating. The size does not matter. The filtration rating does. You are looking for something that is rated "Virus".

Transparency Film is also known as Transparency Film for color copiers. You do not need the Laser Printer version (is more than twice the price). Office supply stores such as Staples have these items listed as "C-Line Transparency Film for Plain Paper Copiers, 50/Box (CLI60727)". The purpose of this material is to be transparent enough to see through while being stiff enough to stop a water droplet from landing on the skin or eyes of the wearer.



Pictures of
"Virus" Rated Home Furnace Filters



Pictures of
Polypropylene Interface

A picture of
Transparency Film

Step 1: Mark Your Filter Fabric!

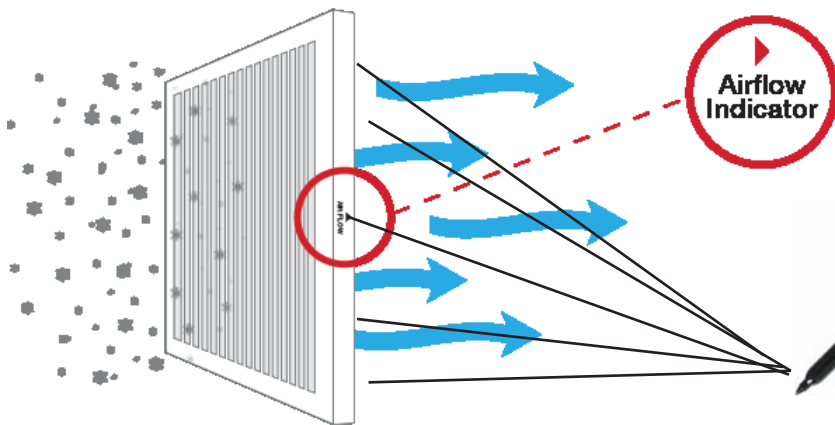
The fabric in furnace filters is directional, meaning that it filters the air in one direction. Before you remove the filter fabric from the package it came in,

MARK YOUR FILTER FABRIC!

Look at the filter package. On one side, you should see an arrow like this:



The arrow points toward the side of the filter fabric that we want to have face the person wearing the mask.



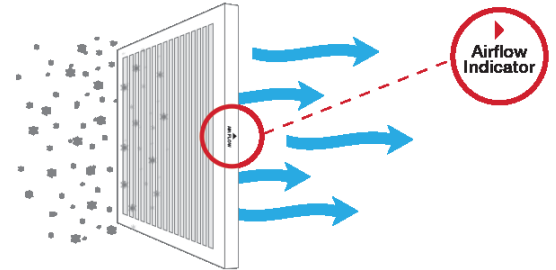
Write several small "T"s or other marks on the side of the filter that the arrow is points to.

Step 2: Prepare the Filter Fabric



- Home Furnace Filters can be purchased at any hardware store.
- They come in a variety of sizes and filtration ratings.
- Size does not matter.
- Look for one labeled with "Virus"

Carefully remove the cardboard and metal wire mesh if present. The wire mesh can be very sharp, use caution.



▶ Gently remove Home Furnace Filter Fabric from cardboard case and wire mesh (not all filters have a wire mesh).

- These filters are secured with adhesive. Gentle pressure and steady pressure will preserve the integrity of the filter fabric.

▶ Cut the Filter Fabric into 10" x 10" squares. Mark the side that filters the air.

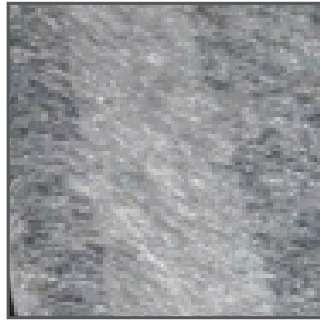
- The "Airflow" arrow on the side of the filter denotes which side of the filter produces filtered air. When placing the filter fabric in the mask, please ensure that the "airflow" direction is oriented toward the face of the user.

Step 3: Fuse Interface to Outer Layer

Place Cotton Fabric



On top of
Polypropylene Fabric



Iron long enough to
fuse



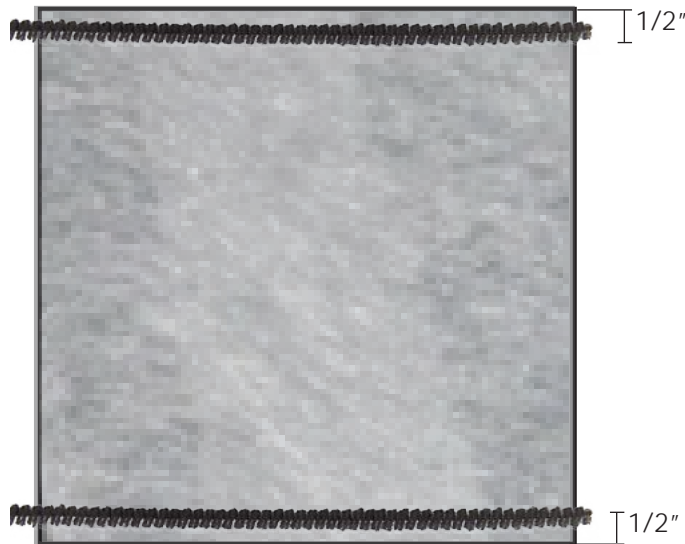
Be Careful!

It is easy to melt the Polypropylene Sheet with the Iron

You can use a hand towel to help slow the heat transfer if you run into problems

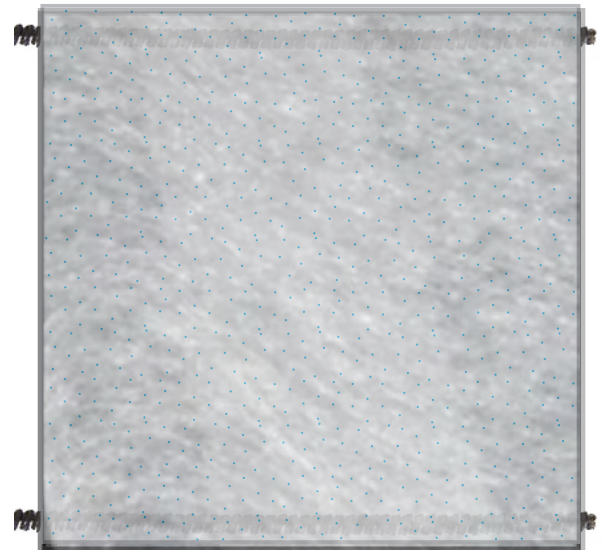
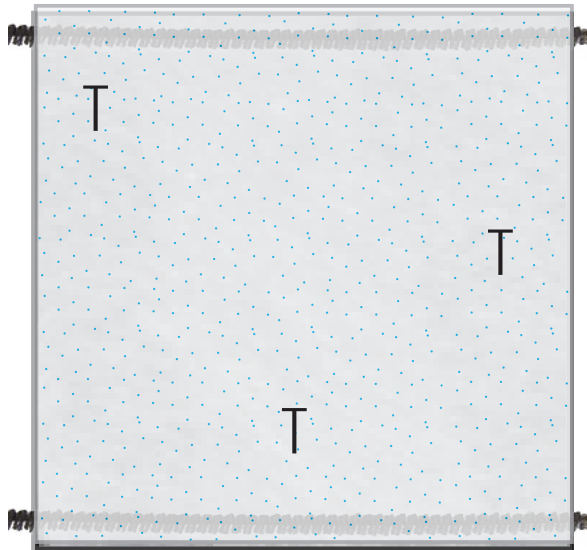
- ▶ Lay **Cotton Fabric** on top of polypropylene fabric (fusible interface).
- ▶ Iron the **Cotton Fabric** side and fuse the **Polypropylene Fabric** (interface) onto the backside of the **Cotton Fabric** 

Step 4: Place Nose / Chin Pinch Wires



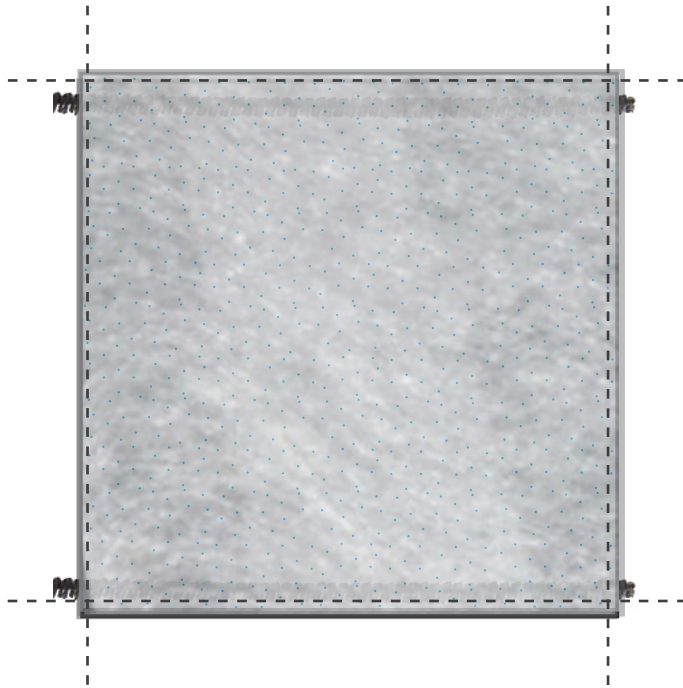
- ▶ Lay the fused pieces of fabric face down on a workspace.
- ▶ Place the **Pipe Cleaners** (or bendable wire) on top of the **Polypropylene Fabric** 1/2" from the top and bottom edges.


Step 5: Layer Filter and Backing



- ▶ Lay the **Filter Fabric** on top of the pipe cleaners (or bendable wires) with the marked "T" side facing up.
- ▶ Lay the second **Polypropylene Sheet*** over the **Home Furnace Filter Fabric**
 - Polyethylene Drape Sheets used in surgical procedures can be used here if you have access to them

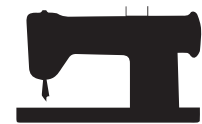
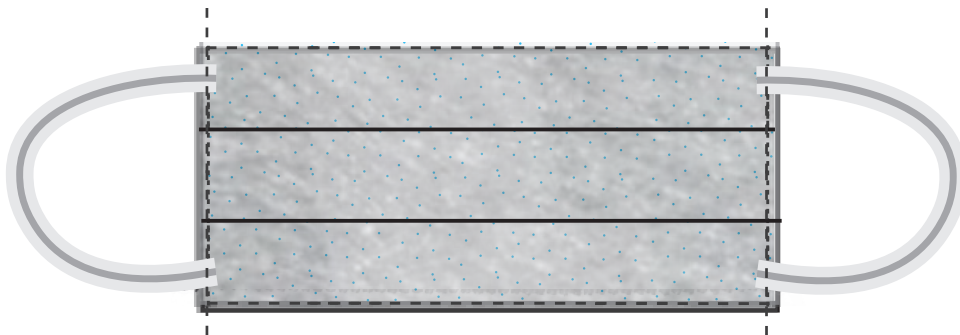
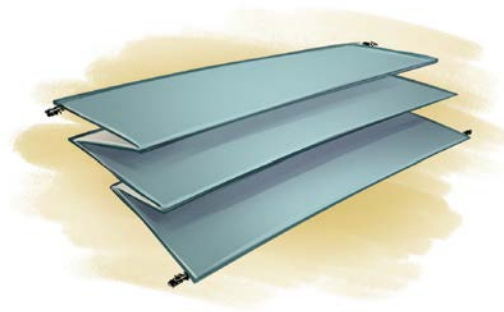
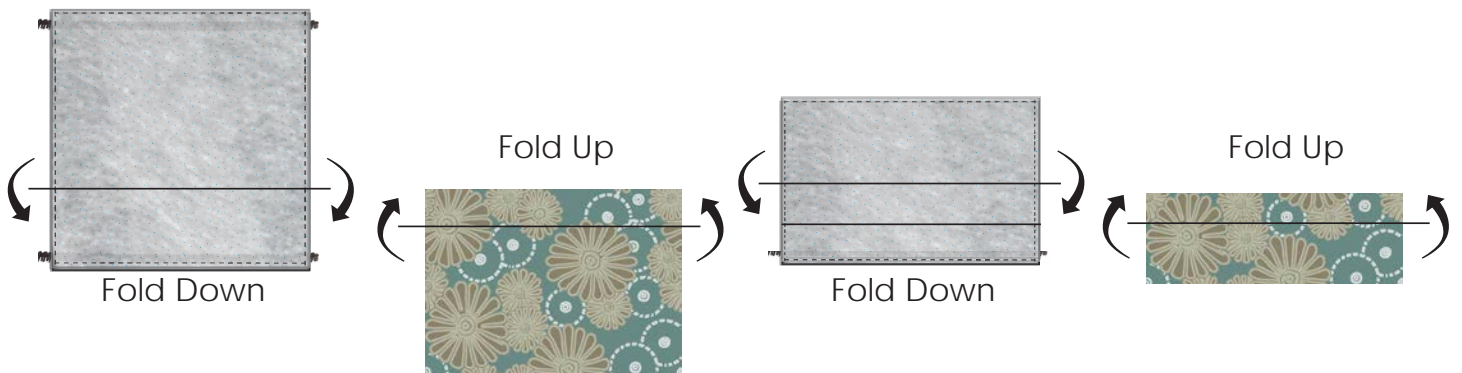
Step 6: Sew Assembly Together




► Sew all layers together around the perimeter of the mask. 

- There are more advanced ways to assemble this mask. We have deliberately chosen the easiest to relay, thereby reaching the widest possible group of makers.
- If you are a more experienced seamstress or tailor, and you wish to use more advanced assembly techniques, we invite you to use all of your skill set, just please remember to keep the filter fabric facing in the correct direction.

Step 7: Fold Mask, Attach Ear Straps



- ▶ Fold Mask assembly in an accordion pattern
- ▶ Sew the edges to hold accordion shape.
- ▶ Place the **Elastic Straps** on either side.
- ▶ Sew the **Elastic Straps** in place. 

Step 7a: Alternate Ear Straps



For everyone who is sewing masks and can't find elastic. Bungee cords are full of elastic 😊




7" length for both straps

- In researching how others are making these masks, there appears to be a shortage of elastic straps for ear straps.
- Alternate strap material include strips made from T-shirts, sections of panty hose, or even carefully deconstructed bungee cords.
- This is an opportunity to get creative. The requirements of this component should be securely sewn to the mask first and comfort to the wearer second.

Step 8: Attach Face Shield



- ▶ Flip the Mask over.
- ▶ Using the hot glue gun, place a continuous bead of hot glue along the upper edge of the outside of the mask. 
- ▶ Wait 30 - 60 seconds
- ▶ Place the bottom edge of the **Transparency Film** onto the bead of hot glue, press evenly and wait to cool

Step 9: Label and All Done!



- ▶ Label your mask with a marker "VIRUS FILTER" and perhaps the name and type of home furnace filter used

The authors of this guide Thank You.

Your effort will help people you do not know.

They Thank You.

If you live in Ohio, Please utilize Governor DeWine's together@governor.ohio.gov to ask where you can drop off finished masks.

If you live elsewhere, please contact your local government to find where these are needed most.