

3D printed respirator mask

Introduction:

The original intention was to make a mask better than a scarf for last-resort scenarios, per relaxed CDC guidelines during the COVID pandemic. With many revisions, we are aiming for n95 but have not yet finalized filtration efficacy numbers and make no claim to this filtration level. This homemade mask is only recommended for community use. Medical use is at local institution or user's own risk. The mask passes fit testing on most people without modification, but user may alter for improved fit as needed. This was developed as a hobby by an anesthesiology resident in Connecticut who is not a biomedical engineer and does not have formal training in making personal protective equipment. User cannot hold creator liable, and understands the risks herein.

Proposed criteria for use:

- 1) Total shortage of n95 masks
- 2) Hospital or local agency allowing homemade/alternative masks
- 3) User understands the CDC is allowing homemade masks as a last resort and that this is a non-approved, unverified mask that must be used at your own risk

Directions: Watch YouTube videos by username *ChrisWiles*, or search YouTube for:

“COVID PANDEMIC 3D PRINTED MASK TUTORIAL” and “COVID PANDEMIC MASK Post-Production Processing”

Check fit against face. If it fits, proceed. If not, submerge rim in hot water (be careful) for 5 seconds, as seen in video, then mold to face (may repeat). Then:



Option 1: Sand the inner edges of the mask well, especially nose area for comfort

OR



Option 2: Line the edge with Armacell TAP18230 or similar weather sealing material for comfort. Warning: allergic reaction to materials is possible.



Secured around head with phlebotomy tourniquet, cut into thirds. **Tie shorter for desired tightness:**



It is recommended you use this over surgical mask, cloth mask, or a layer of surgical polypropylene (eg Halyard H600), frequently used as instrument tray wrap. One piece of this may be included in while supplies last. Consider asking OR to save from surgeries such as orthopedic, vascular, and neuro cases. These layers in series create a 4-layer barrier with electrostatic charge and Theoretic virus-filtering capability while still being breathable (see page 2).

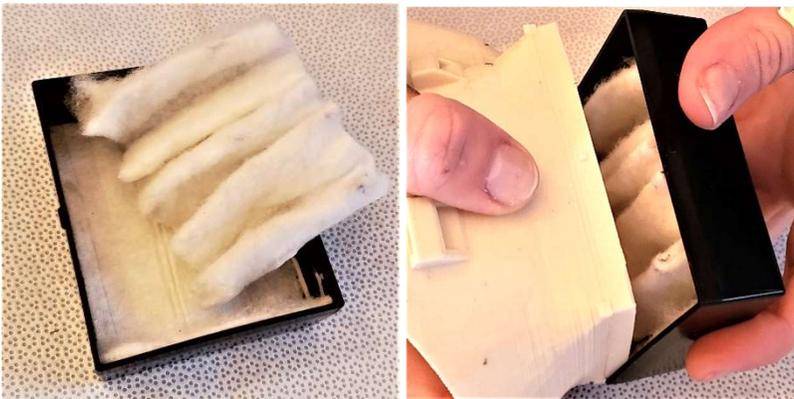


Filtration/sealing/cleaning information:

Filter is estimated to last approximately 1 week of full-time usage but may differ based on frequency of usage, user conditions, moisture, and more. Cartridges can be replaced as needed and should be sealed with silicone or other means to maintain air seal.

Mask have been sprayed with clear sealant and can be cleaned with bleach or alcohol wipes, though IV tourniquet straps may weaken with repeated exposure to certain chemicals. They can be replaced as needed (see below for instructions). UVC light may also be effective. Vaporized hydrogen peroxide is expected to be an effective modality but has not been tested. If you can verify sterilization efficacy with this technique, please provide feedback to cwiles@uchc.edu.

Additional information: Cartridge consists of 2 layers of 3M MPR 1500 (Microparticle Performance Rating) filter attached to the cartridge using hot glue gun to fill in all the cracks and ensure no air leaks



Silicone temporarily connects and seals these two components together. HOLD BY MASK, NOT FILTER BOX.

MPR – Microparticle performance rating – rating system developed by 3M, rates filters based on their ability to capture airborne particles smaller than 1 micron, usually 0.3-1.0 micron in size. Ratings are from 600-2800. Best filtration **MPR 1500-2800** – captures allergens, dust, bacteria, viruses

Next is a corrugated square of **MERV 13** for additional filtration (Minimum Efficiency Reporting Value) MERV ranges from 6-16. 13 captures viruses. Higher levels are harder to breathe through and hard to find.

User assumes all risks by using this and does not hold creator/distributor liable for damages including injury, infection with pathogens, or death related to usage. Additionally, contact dermatitis (rash/allergic reaction of the skin) may occur from foam or other materials. Stop using if any issues arise. User cannot hold creator responsible for adverse reactions and uses these homemade ppe items in agreement with this.