Safety considerations

Contents

List of Figures

0.1 Title: From Design to Mass 3D printing of Medical Shields in Three Days

0.1.1 Reference:

All the info compiled here can be found in this link

0.1.2 General considerations before starting

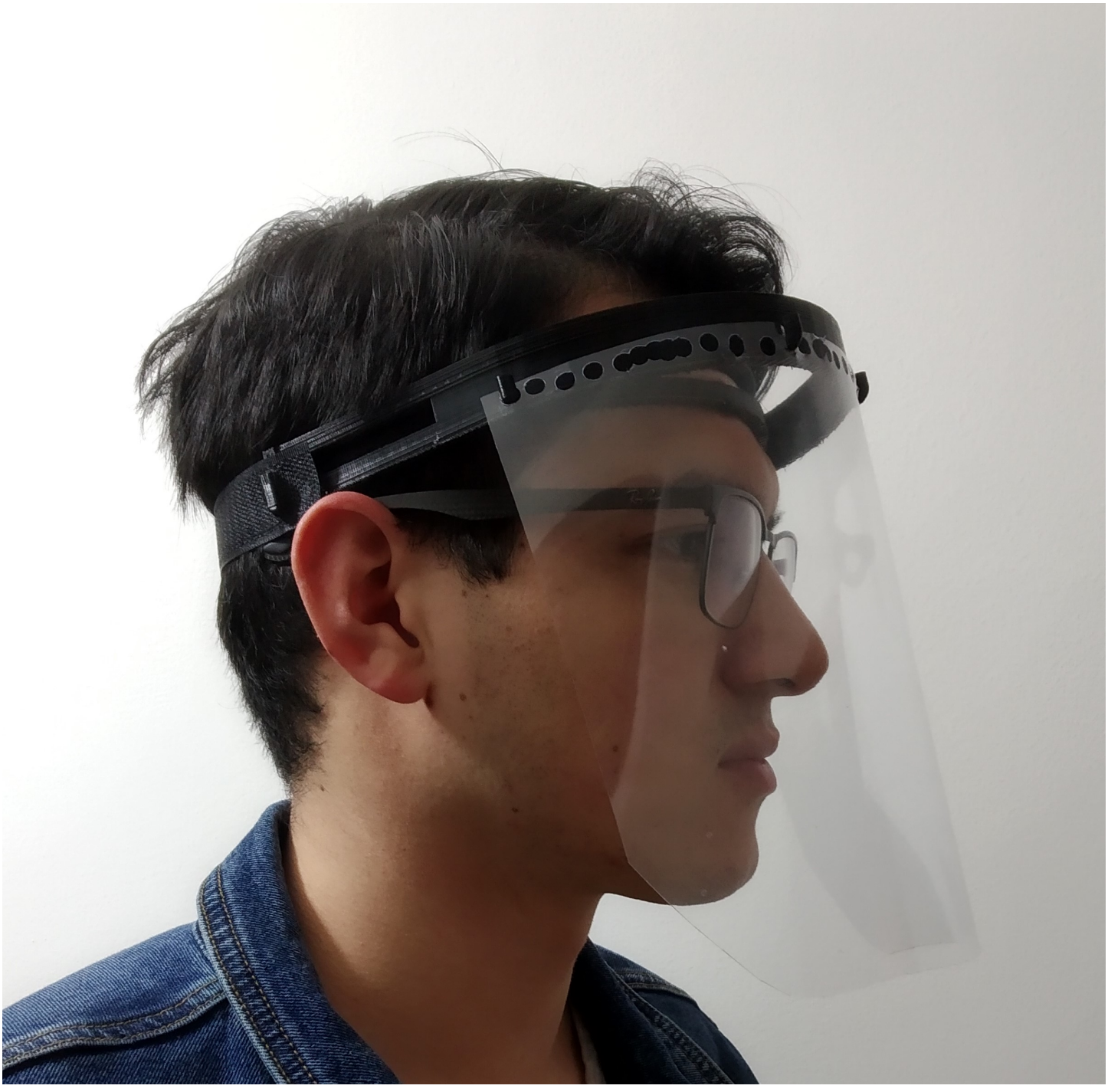
0.1.2.1 Concerns about printed respirators

- None of the designs available right now have been tested to ensure they provide the protections needed, at least none of the ones I am aware of. To help with this, we have collected as many designs as we could find, and are working with experts to see if we can verify which ones really work. What are the key focus points? First, it's the sealing, then the filter itself, the filter to the mask, and how the mask attaches to the face, it all must be perfect. Most of us print rigid materials that are hard to make compliant for seals. (by Prusa)
- Another question we need to take into account is the porosity of the printed parts and the safety concerns that come from that. The wearer will have the mask on their face, a humid and warm place,

a perfect breeding ground for germs. We won't be able to sterilize these masks effectively so we might be causing even more problems. And the virus reportedly survives for over 48 hours on the plastics (or even 90 hours, according to some other studies). We all want to help our friends and families which means we should be all the more precautious to keep from hurting them. If you absolutely insist on printing a mask now, treat it like it is a basic surgical mask and not as a true respirator with all the protections they provide. A false sense of security can be very dangerous. I understand you're trying to help, but PLEASE spread this info into your 3D printing groups.

1 How to make protective face shield for medical professionals?

1.1 Starting point for the face shield design



All components are available in this link of Thingiverse

1.2 Pricing

The materials required to manufacture one unit are less than $1 and that is without any quantity discounts when buying. We literally got materials around Prague during one afternoon.

1.3 Which tools do you need?

A 3D printer, a laser cutter, and scissors

1.4 Which are the model files for 3d printing?

All the model files can be found online here

This repo has all the needed files on the src folder

Figure 1: Medical shield design

2 Safety and sterilization and verification

The big question is the sterility of the production environment and the finished parts. You really don't want to make things worse by producing things meant to fight the disease, while accidentally spreading it. ALWAYS check with a professional to ensure your setup or production is up to their standards and don't be offended if they are cautious to accept your help.

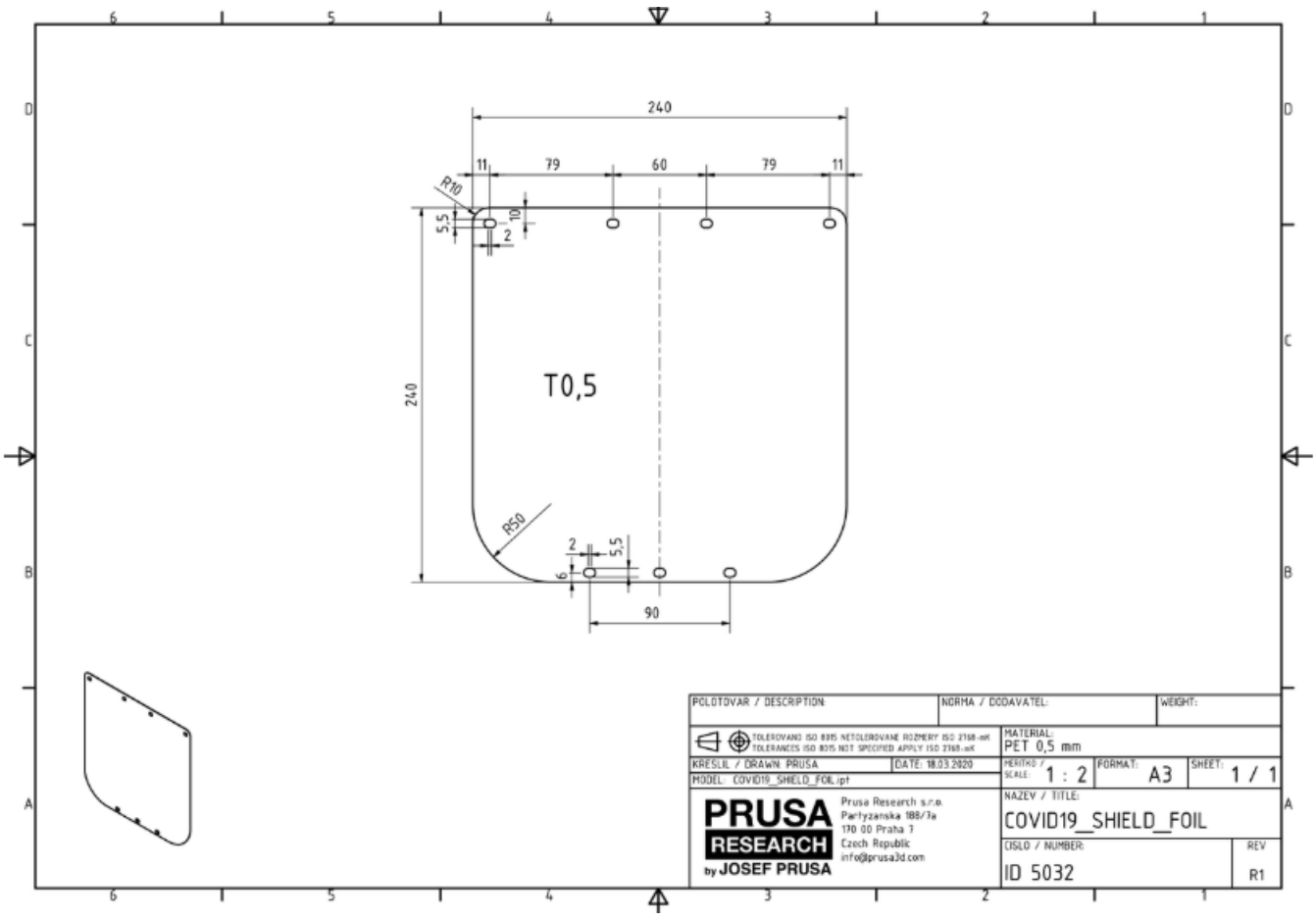


Figure 2: Medical shield design specs

Figure 3: Medical shield example of use

Keep in mind that the virus can live on the plastic for 48-90 hours and plastics cannot be easily sterilized after use. So they are one-use only, at least until we find a way to reliably sterilize the printed parts!

Here are the precautions we are taking (these also apply to other 3D printed designs out there) and they are still pending validation – always check for updates of this article.

- The plastic is heated up to a high temperature during printing pretty much sterilizing the printed part, don't let the part sit on the bed for hours where it can be contaminated again. Wear a fresh pair of gloves and surgical mask before removing the prints and put it directly into a fresh sealable bag. In our farm, we have the air completely exchanged every 2 minutes and it is filtered, this greatly helps reduce anything harmful in the air.
- When lasering the clear shields, leave the protective foils on so it can be removed before assembly and use. This greatly reduces any possible contamination. Also, pack it as an entire batch your laser can make at a time. Our laser can make 40pcs in one go, so when we open the laser, we collect all of them at once – again in fresh gloves while wearing a surgical mask. We put them into a sealable bag immediately. If your laser can only produce one at a time, make sure you are wearing fresh gloves for each part you produce.
- When cutting the elastic, we also wear gloves and surgical masks. Do not unpack more than you need to work on, reducing exposure to the air will reduce contamination.

2.1 If you want to manufacture shields for others

PLEASE READ THIS CAREFULLY

Figure 4: Medical shield example of use

1. Act as if you were infected by the COVID-19 virus. Wear a face mask and a fresh pair of gloves when collecting each batch of printed parts. Store the parts immediately in a sealable bag.
2. Talk with whoever you're making the shields for, let them know about your manufacturing environment
3. There is still debate about how long the virus survives on plastic, but most sources mention 2-3 days. That means that by letting the packed face shields sit for 2-3 days before distributing them, you'll greatly reduce risk of transmission
4. Do not store the entire stock in one place, minimize the risk of cross-contamination