

Improvised Collapsible Face Shield For Midwives

April 2nd, 2020

Sen-Huy Tan + Christopher Pond, e: essinncee@gmail.com

The face shield concept presented here is a work in progress aiming to provide basic functionality and is not a replacement for "real" PPE. It is intended as a temporary item for midwives performing homebirths in Vancouver, BC who otherwise have not been able to acquire adequate supplies of official PPE during the current shortages due to COVID-19. While a small number have already been made and provided to local midwives, they have not been fully tested nor remotely certified for use by any regulatory body. The assumption here is that whoever is using this design will try it out before using it in the field to make sure they know how to put it together and to understand its limitations.*

It is, however, a simple design requiring little in terms of cost, special materials, tools, machinery, and ultimately time to make - the goal is that one should be able to quickly and easily source the materials needed to try it out and make the final judgement call as to whether it meets their needs. If you need a face shield today and have a few minutes, our hope is you can make one yourself with items you might have at home or can get from your local stationery and hardware stores.

Many creative designs have popped up on social media for providing frontline medical staff with temporary equipment they are lacking. We initially explored some of the 3D printed ideas for face shields that have been widely shared, and were able to print a few to test out. However we felt they took too much time to fabricate, and for what they were we felt they would end up too expensive. We were also uncomfortable with moving forward with a design that relied on such specialized equipment, materials, and expertise, and at the same time unable to verify the suitability of typical 3D printed materials in terms of their cleanability and durability in midwifery applications.

We have no doubt others have successfully improvised similar face shields for the same purpose; we're just sharing steps for anyone to make a low-tech version in about 5 minutes. We'd welcome any feedback and suggestions for improvements and wish everyone the best of luck.



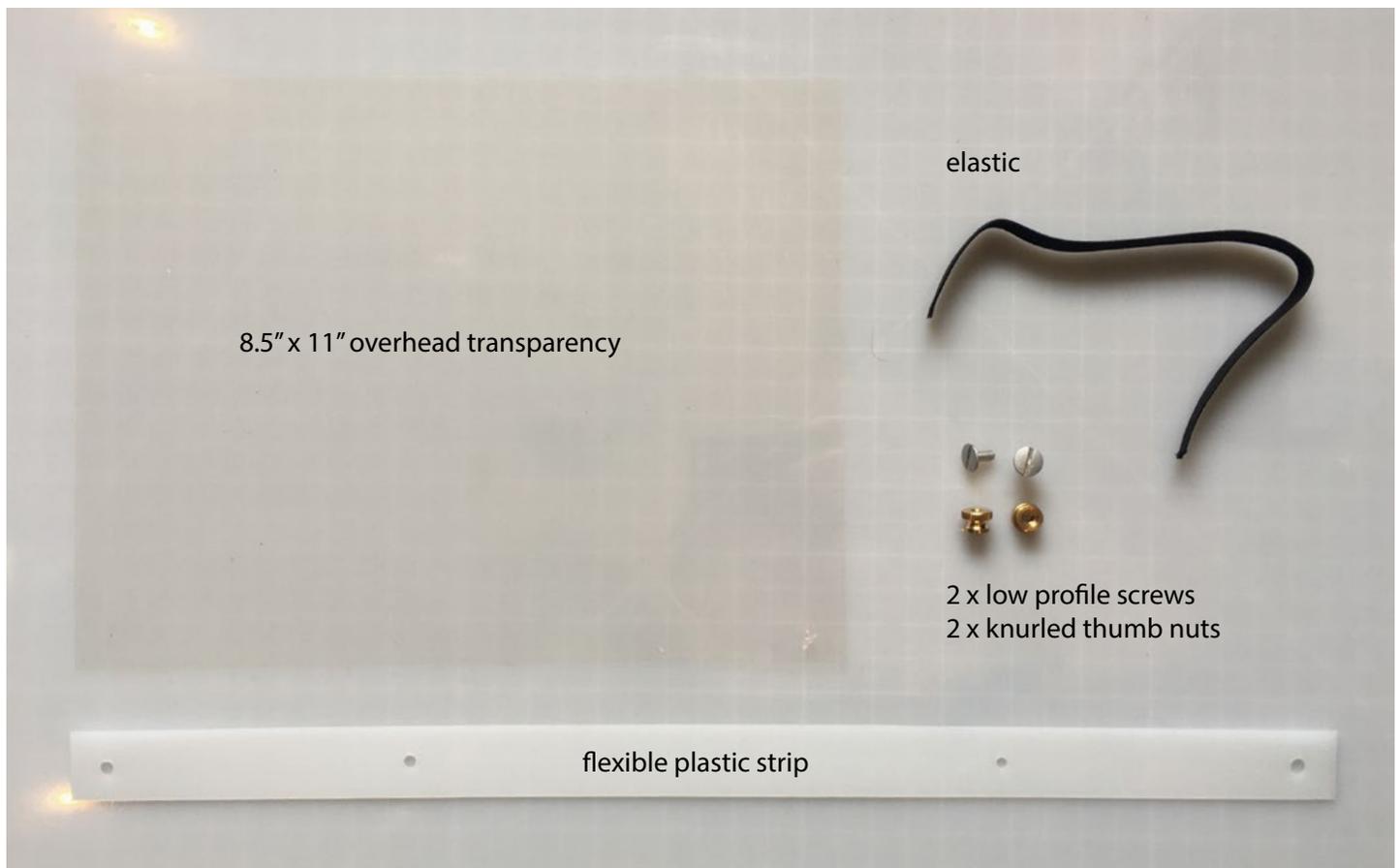
What you need

Below is a list of things and tools we used. You can likely substitute other materials and tools that perform the same function as thin flexible plastic sheets for the headband, depending on what's available in the area, eg. just use a milk jug. For the screws, we used low profile screws from what Home Depot calls "Chicago Screws", McMaster-Carr calls "Binding Barrels and Screws" so they would be comfortable but substitute with whatever is available - part numbers are provided and searchable on the respective store websites.

Components	Materials Used In Our Concept	Where to buy if needed (CAN/US)
transparent sheet for shield	8.5" x 11" overhead projectory transparency	office / stationery stores
more durable but still flexible plastic strip for headband	0.055" / 1.4mm thick HDPE sheet or 4L plastic milk jug	plastic supply / hardware stores
fasteners to attach shield to headband	8-32 aluminum low profile screws 8-32 brass flanged knurled-head thumb nuts (or equivalent screws & nuts)	Home Depot #'s: 135118, 129085 McMaster-Carr #'s: 93121A342, 92741A120
elastic tie	sewing elastic or equivalent stretch cord	sewing / hardware stores

Suggested Tools

utility knife, scissors	for cutting headband, visor, elastic
swiss army knife - reamer tool	hand reaming smooth holes in headband
paper hole puncher, soldering iron, or steel punches	optional - alternate hole making tools
straight edge	metal ruler works well to make straight cuts



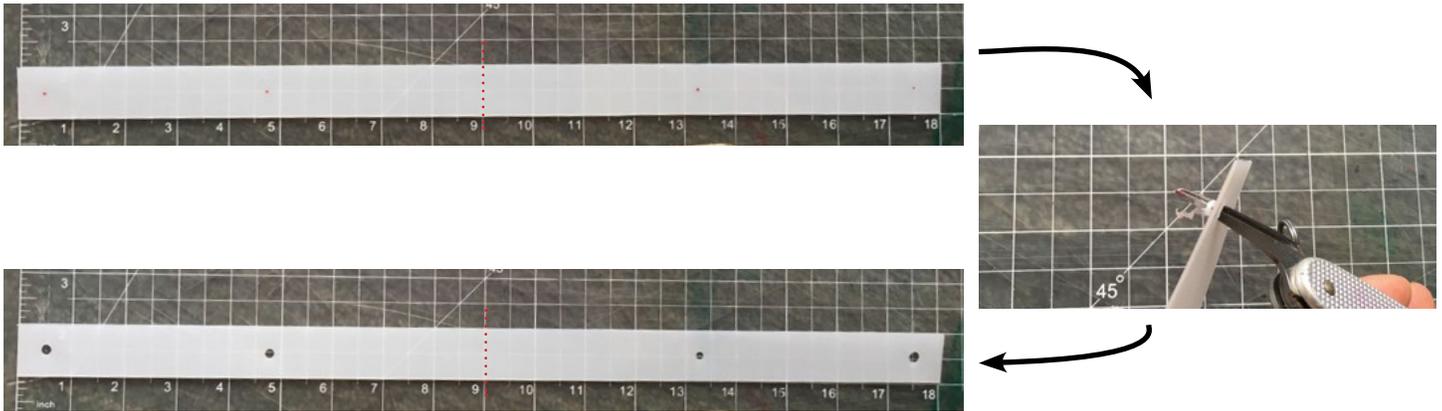
Instructions

Once you've gathered your materials, it should take you about 5 minutes or less to make your face shield.

Make the headband

You can make this with just one knife if that's all you have. It's just easier and potentially safer cutting with the tools suggested. We used HDPE sheeting (0.055" / 1.4mm thick) from our local plastics supplier, which is flexible but durable, easy to cut, ream holes in, and easy to clean,

1. Cut a thin strip 18" long and 1" wide.
2. Mark the centre.
3. Mark the strip at 4.25" and again at 8.5" on either side of the centre point.
4. Use the reamer to hand drill holes large enough to fit the screws you are using at the 4.25" marks
5. Use the reamer to hand drill 0.25" holes at the 8.5" marks



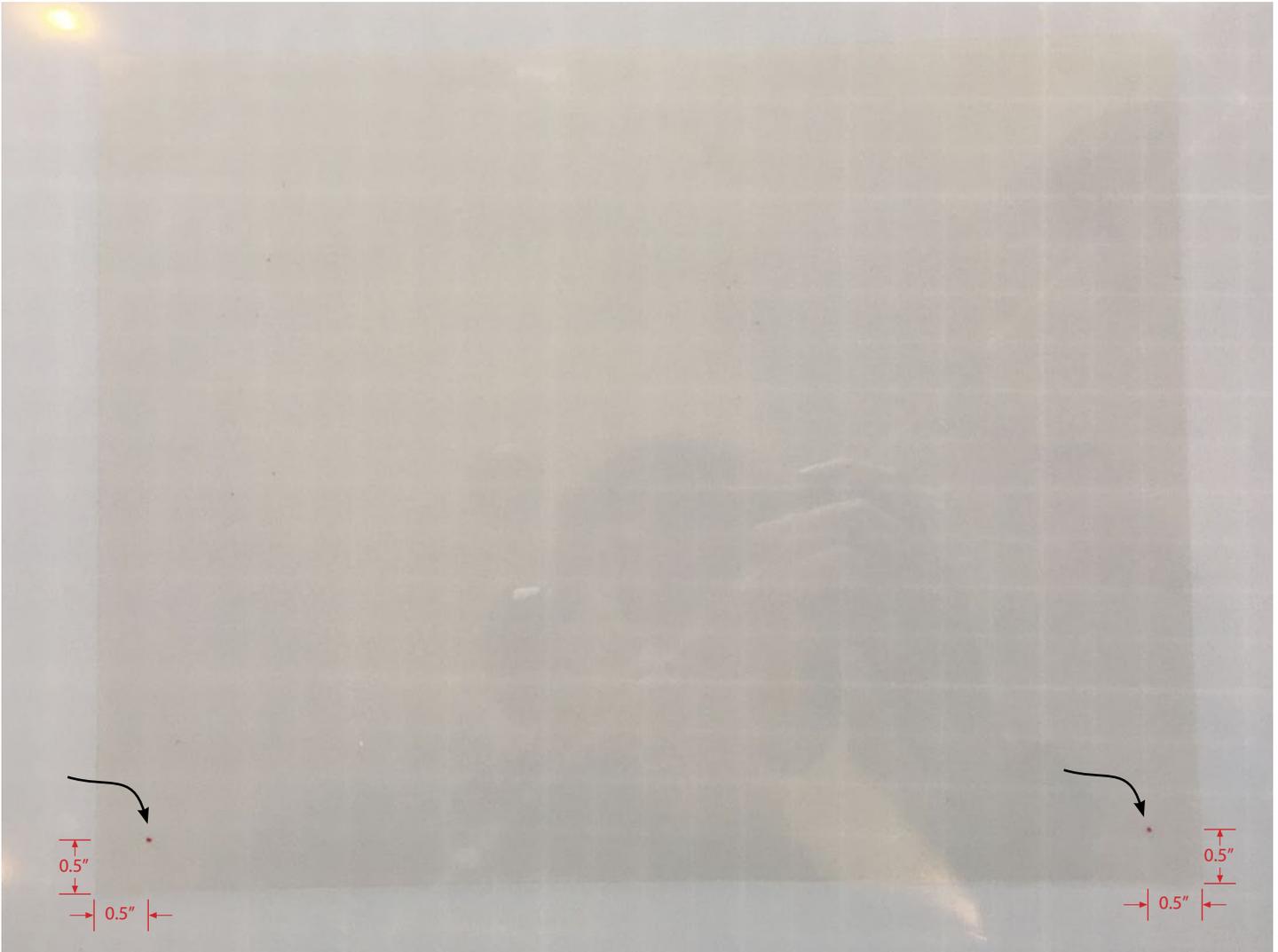
If you have access to a 24" x 24" sheet of HDPE plastic, you can easily make 24 headbands in about 30 minutes. Pictured below are longer versions of the headbands with more adjustment holes for more adjustability (not always needed).



Make the transparent shield

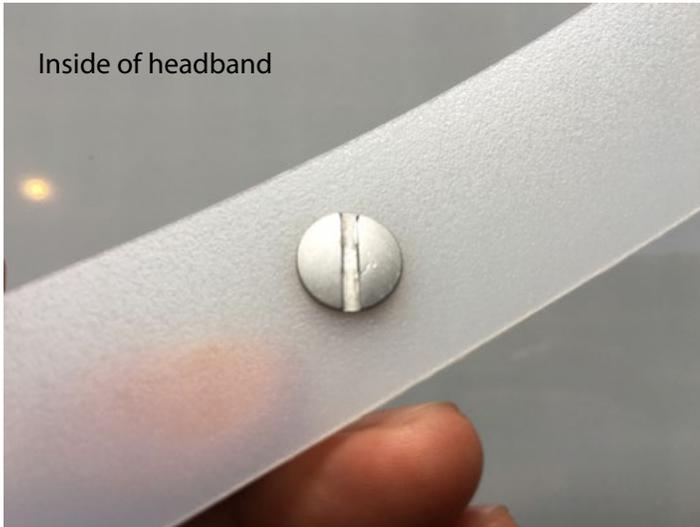
We used 8.5" x 11" overhead projector transparency sheets.

1. Mark a dot 0.5" in from the sides on two corners along the long edge of the sheet
 2. Use the reamer to carefully make holes at your markings large enough to fit the screws you are using
- Optional - use a paper hole puncher to make the holes, carpentry steel punches, or melt holes using a soldering iron*



Putting it together and wearing

1. Put screws into the middle holes and attach the transparent shield with the thumb nuts.
2. Tie elastic to rear holes
3. Test fit and adjust elastic length and angle of shield to allow for some space from wearer's face to reduce fogging
4. Headband should sit above brow line - note the shield is open at the top, also to reduce fogging
5. To adjust or take off - grasp the bottom corners of the visor and move head downwards and back out of the headband without touching face



Cleaning

1. Disassemble all parts and clean with alcohol or wash
2. Discard transparency and elastic if necessary and replace with new

Storage

1. The 8.5" x 11" transparencies fit exactly in a Large sized Ziploc Freezer Bag - you can store several extras in your charting binder
2. Keep headband in separate Ziploc bag with screws and elastics attached to simplify assembly when needed
3. Spare fasteners and elastics are also easy to bring along



Optional - A longer strip allows for more holes for elastic attachment points to fit bigger and smaller head sizes. Use scissors to round off outer corners if you want, and include an extra screw and thumb nut in case one gets lost in use



Overhead Projector Transparency vs PETG

While projector transparency sheets are not very durable, they are inexpensive and easy to replace as needed, and really lightweight making the entire unit feel secure even in motion. Alternatively the design allows for use of flexible PETG sheet (0.030" / 0.8mm thick) for the shield instead of overhead projector transparencies - still hand cuttable and provides better clarity, cleanability, allows for different shield shapes, bigger gap between face and shield to reduce fogging, no modifications to headband necessary. PETG will be more expensive, harder to find in some places, and feel much heavier when worn for long periods.



Other Material Suggestions

COVID-19 related restrictions on travel, business closures and shipping delays may complicate people's ability to get even the few items needed for this face shield. Here are some ideas for material substitutions.

Headband	<i>Use a plastic 4L milk or juice jug, which are often also made out of HDPE (you can check the recycling plastic code on the bottom). Cut a strip of plastic out of the middle (see pics). It's not pretty but it works. Cardboard also works, but is not going to be reusable or waterproof.</i>
----------	--

Transparent shield	<i>You can substitute A4 sized sheets, clear binder covers, scavenged polycarbonate from juice containers, retail packaging, etc. - just keep in mind you may need to adjust the locations of the attachment holes on the headband with different materials.</i>
Shield fasteners	<i>Different shaped screws and nuts than what we've used will also work to attach the transparent shield to your headband. Permanent fasteners can also work for single use variations - depending on the thickness of the headband materials you are able to find, try grommets, rivets, staples etc. - make sure the sharp ends of any of your fasteners are facing outwards, and the smooth sides are on the inside of the headband.</i>
Elastic	<i>Anything that can stretch a bit without breaking should work. String together some produce elastic bands (the thicker ones for broccoli & asparagus), cut a strip off a cotton t-shirt, exercise band (eg. Theraband), balloon, etc.</i>

Some of these suggestions are clearly less than ideal, but an appetite for tinkering will go a long way. Some material substitutions will not be reusable if they can't be properly cleaned, but if readily available and there are no alternatives, consider if it may be simpler to make multiple sets of face shields to treat as single use supplies.

RELEASE, WAIVER OF LIABILITY, DEFENSE, INDEMNIFICATION AND HOLD HARMLESS AGREEMENT

You acknowledge that you understand that Sen-Huy Tan and Christopher Pond ("S&C") are acting as good samaritans and independent volunteers providing dissemination of a design for the manufacture of face shields. We do not certify the design or components operate properly or satisfy any regulatory requirements. This Release, Waiver of Liability, Defense, Indemnification and Hold Harmless Agreement ("Agreement") is meant to reflect the fact that S&C offer the design as an experimental device, without warranty of any kind.

You agree that the design provided to You by S&C or by any individual associated with S&C is provided "AS IS" and without representations or warranties of any kind, express or implied, and is intended to be a gift. By accepting the design, you further acknowledge that such design has not been evaluated or approved by any regulatory authority.

You understand that the design furnished by S&C is meant to benefit society, and is not intended, and shall not be used, for commercial use. If You are an adult under the laws of the relevant jurisdiction and are the individual recipient, you acknowledge that You understand the potential risks of the use of the design and expressly assume such risks. If the individual recipient is a child under the laws of the relevant jurisdiction, You represent that You are the parent or legal guardian of the child and that You understand the potential risks of the use of the design and expressly assume such risks on behalf of the individual recipient.

Furthermore, You (either for yourself or your child) release and forever discharge S&C from any and all liability for acts or omissions— including negligent acts or omissions—causing damage, loss, injury, or death to the individual recipient or others from the use of the design. You agree to defend, indemnify and hold S&C harmless from any and all liability or loss—including liability for negligence—arising in conjunction with or resulting from the individual recipient's use of the design (including all attorney's fees and expenses incurred by S&C).

You further understand and agree that S&C and any individual associated with S&C shall not be liable for any injuries or damages, including any consequential, incidental, indirect, punitive or special damages, resulting from or arising out of the use of the design provided by S&C or any individual associated with S&C.

Any information provided by S&C and any individual associated with S&C is not intended to be relied upon to protect from, diagnose or treat a health problem or disease, and S&C make no claims regarding the design or the components. You should consider consultation with a qualified health care provider prior to providing face shields manufactured pursuant to the design. Any statements made by S&C are for informational purposes only and are not meant to replace the services or recommendations of a physician or other qualified health care practitioner.

You acknowledge that this Agreement is governed by the laws of the Province of British Columbia (without reference to its conflict of law provisions) and the parties intend that this Agreement be interpreted as broadly and inclusively as permitted by law. If any portion of this Agreement is found to be invalid for any reason, the remainder of the Agreement shall continue to remain in full force and effect and shall continue to be binding.

By accessing the design, You acknowledge that You have carefully read the foregoing provisions, understand their contents, and agree with and to each and every provision herein.