DIY Protective Shield & Mask

A PPE Playbook For Makers

VOLUME 1B

03 / 31 / 2020

EMERGENCY DESIGN COLLECTIVE

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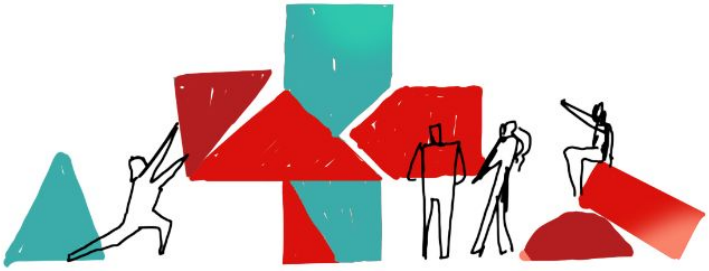
01. Overview



What is this?

This is the **Personal Protective Equipment (PPE) Playbook** created by designers and doctors from the **Emergency Design Collective** to guide makers' contributions to the healthcare system more efficiently.

Part 1 of this playbook is meant to help the amazingly generous makers, hackers, 3D printers, sewers and crafters **create Do It Yourself (DIY) PPE and deliver it** to our front line health workers. We have built and tested many of the different DIY cloth face masks, 3D printed face masks, laser cut face shields and 3D printed face shields circulating on the internet and social media.

Who are we?

We are a team of designers˜ and healthcare professionals who have come together to help streamline the DIY (Do It Yourself) Personal Protective Equipment (PPE) effort. We are incredibly grateful to this community for donating your supplies and time to **keep frontline workers safe**. You are selfless heroes. Thank you!

Important Disclaimer

These recommendations are intended for use in health care settings facing extreme shortages of traditional, FDA approved PPE, where hospitals are asking for community produced PPE to protect health care workers who would otherwise not have access to any approved PPE supplies. These recommendations are not backed by any official government organization or the organizations we work for. To the best of our ability, these designs have been vetted by healthcare professionals, material science experts and designers for efficacy, comfort, ease of use, scalability, ease of manufacturing and quality. All of the recommended designs have been tested in the health care setting by front line workers. These recommendations are to be used at your own discretion and the discretion of the hospitals and health care systems that accept the products. **We accept no responsibility or liability for the creation and use of these designs. A legal disclaimer can be found on the last page of this Playbook.**

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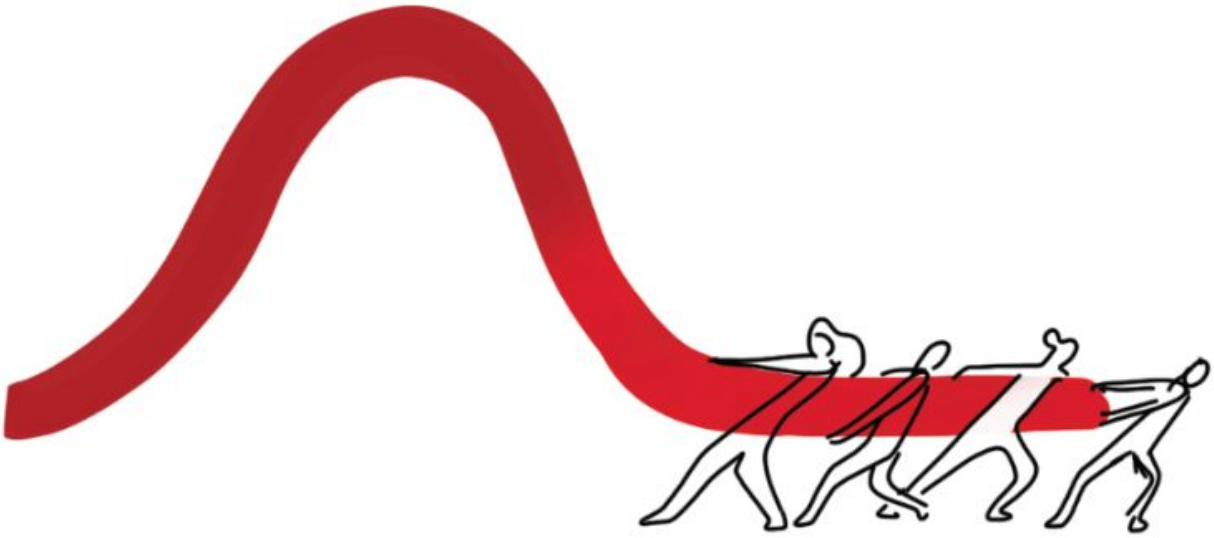

Creation & Delivery

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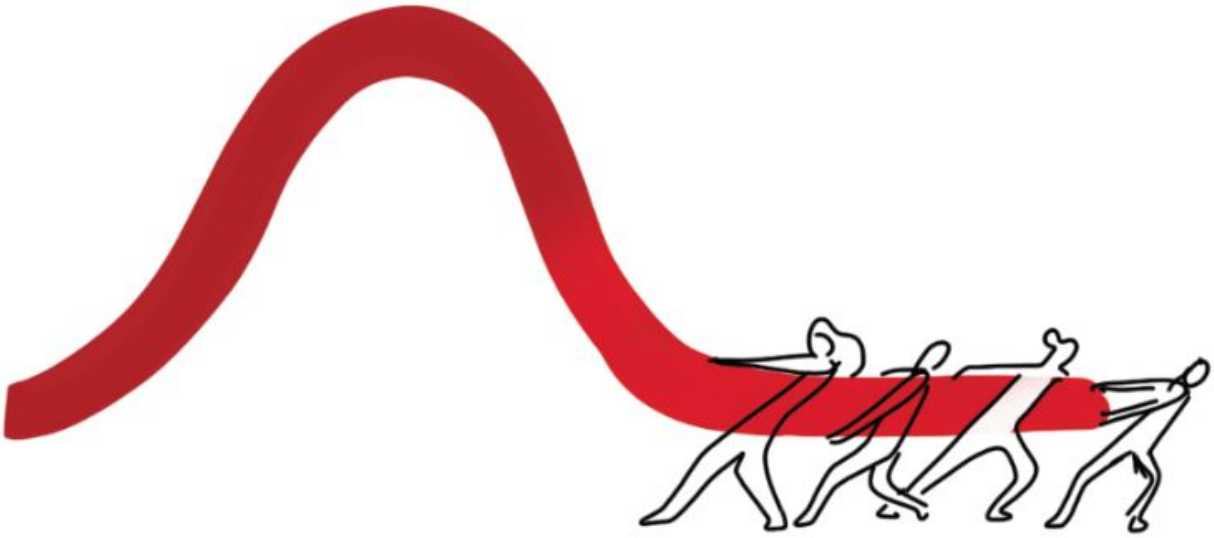

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02.
Matching your skills and supplies to the right design

Use this table to help guide your efforts depending on the supplies you have at your disposal!

I have a...

	3D Printer	Laser Cutter	Cricut or Silhouette	Scissors	Hole Punch & X-Acto	Sewing Machine	Hand sewing
Face Shield designs							
Fully Assembled (visor + plastic shield) 3D Printed **Budmen Face Shield**	X	X	X	X	X		
3D Printed Visor for **Budmen face shield**	X						
Wolf Disposable Face Shield			X				
Badger Shield		X	X	X			
Mask designs							
Wolf Mask						X	X

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03.
Best practices

To maintain a minimum of cleanliness and help reduce the risk of spreading COVID-19, it is important to have some basic processes in place, adapted from Make4COVID's order of operations:

Before making:

1. **If you are feeling unwell or running a fever, please do not make parts.** Please take your temperature. Remember we are trying to help and we are not helping if we spread this disease further. Coronavirus remains viable on plastics for over 3 days. The hospitals will be disinfecting these upon arrival and the following procedures are in place to limit viral loads during printing and packaging. This is an effort that requires many people and we need to be conscientious of the responsibility this carries.

2. **Before embarking on your making journey**, be sure you have access to the following:
    - **Personal safety needs:**
        - Disinfectants - household cleaners OR 60%+ alcohol
        - Soap & water
        - Gloves
        - Facemask/face covering (homemade is encouraged)
    - **Packaging needs:**
        - Plastic bags
        - Sharpies/permanent marker
        - Duct tape
        - Boxes
        - Fabrication Form

3. **Before starting** any making:
    - Wash your hands for 20 seconds
    - Did you wash your hands? Thank you :)
    - Put on gloves and a facemask
    - Wipe all work surfaces along with all tools with household cleaner or 60%+ alcohol

03.
Best practices (cont.)

While making:

4) **Try to work alone** when making any products for the COVID relief efforts. This minimizes risk of transmission of the disease.

After making:

5) Once you have finished making your product:
   - Package your products in sealed plastic bags and a cardboard box
   - ****VERY IMPORTANT**:** Include a printed out and filled in fabrication form, which states the number of units of product, the type of material used, date and time of sealing. This is very important to help hospitals determine what decontamination procedure they need to follow.

04.
Getting products to the frontline

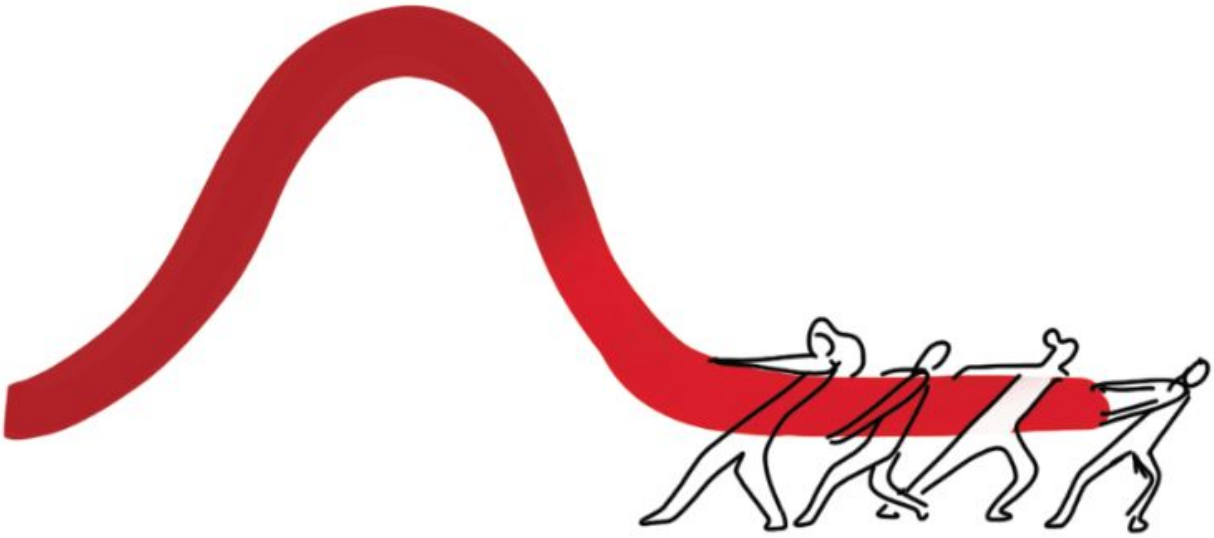
Many makers wonder whether hospitals will actually take these products? **The short answer is yes!** If your local hospital is not accepting PPE there hospitals across the united states (and the world) in dire need of the products you are creating.

Here is how we recommend getting your products to the frontline:

1. **Connect with your local hospital at findthemasks**, a database of hospitals nationwide, asking for donations and listing their institutional needs. While most hospitals on this list are not accepting DIY PPE, we encourage makers to use this list as a launching point to quickly determine local needs.

2. **Post your product on your social media networks** - facebook, NextDoor, Instagram, Twitter, etc. Chances are someone you know (or someone they know!) needs your product.

3. We know there isn't a central distribution system for DIY PPE yet, but we're working this out. **Leave your name, email, address, and product in this form** to stay updated on the Emergency Design Collective's PPE efforts to connect products from the local maker community to hospitals in need.



Design

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05.
Design A: 4-Layer Cloth Mask

Source: Wolf Design Group, Portland, OR (comprised of team of clinicians and crafters)

finished Wolf Cloth Masks

Why we chose this design:

- Simple design
- Supported by filtration testing
- Better fit than other homemade masks
- Washable
- Supported by literature
- Follows CDC guidelines of using masks with shields

Making time:
1 hour without a sewing machine, 10 minutes with sewing machine

Filtration:
69.94% at highest fit factor

Ease of assembly:
novice to intermediate.

Estimated Cost:
$2.00 per unit

Instructions: one-pager, complete Product Spec

Materials you'll need, where to get them and reasonable substitutes

Wolf Cloth Mask material	Where to get supplies	Substitutes
100% Cotton Fabrics	- Home - Craft supply stores including Joanne Fabrics, Michaels, The Craft Warehouse - Amazon	- Bedsheets - Pillow Cases - T-Shirts - Non-woven propylene (e.g. reusable shopping bag material)
Elastic	- Amazon/Craft supply stores	- Yarn, shock cord, cut fabric strips, elastic waist bands,
Metallic Strip	- Home: Paperclip - Amazon - Metallurgy/Craft Store	- 14 gauge bare copper electrical wire, pipe cleaners, metallic wire tape,
Ribbon	- Home - Amazon/Craft Store	- Small fabric strips, small pieces of yarn

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05.
Design A: 4-Layer Cloth Mask

Source: Wolf Design Group, Portland, OR (comprised of team of clinicians and crafters)

finished Wolf Cloth Masks

Why we chose this design:

- Simple design
- Supported by filtration testing
- Better fit than other homemade masks
- Washable
- Supported by literature
- Follows CDC guidelines of using masks with shields

Making time:
1 hour without a sewing machine, 10 minutes with sewing machine

Filtration:
69.94% at highest fit factor

Ease of assembly:
novice to intermediate.

Estimated Cost:
$2.00 per unit

Instructions: one-pager, complete Product Spec

Materials you'll need, where to get them and reasonable substitutes

Wolf Cloth Mask material	Where to get supplies	Substitutes
100% Cotton Fabrics	- Home - Craft supply stores including Joanne Fabrics, Michaels, The Craft Warehouse - Amazon	- Bedsheets - Pillow Cases - T-Shirts - Non-woven propylene (e.g. reusable shopping bag material)
Elastic	- Amazon/Craft supply stores	- Yarn, shock cord, cut fabric strips, elastic waist bands,
Metallic Strip	- Home: Paperclip - Amazon - Metallurgy/Craft Store	- 14 gauge bare copper electrical wire, pipe cleaners, metallic wire tape,
Ribbon	- Home - Amazon/Craft Store	- Small fabric strips, small pieces of yarn

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06.
Design B: Disposable Face Shield

Source: Wolf Design Group, Portland, OR (comprised of team of clinicians and crafters)

finished Wolf Disposable Face Shield

Why we chose this design:

- Simple design
- Structurally and functionally similar to commercially available options
- Functionally solid unit with Wolf Cloth Mask
- Comfortable
- Accommodates glasses, although with significant fogging.
- Disposable (can be cleaned if supplies short)
- Follows CDC guidelines of using masks with shields
- Can be more enclosed by bouffant cap

Making time:
<15 seconds to print,
1 minute to assemble

Ease of assembly:
novice

Estimated Cost:
~ $0.14 per unit

Instructions: one-pager, complete Product Spec

Materials you'll need, where to get them and reasonable substitutes:

Wolf Disposable Face Shield material	Where to get supplies	Substitutes
Plastic Overhead Projector Sheets/Transparency Film	- Office supply stores - Your own office stock - Amazon	- Rolled 4 mil or greater overhead laminate paper (thickness limited by Cricut ability, although scissors users won't have restraints)
Paper clamps	- Your own office stock - Office supply stores - Amazon	- Paperclips
Scotch Tape	- Office supply store	- Any tape - Super glue

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07.
Design C: Budmen Face Shield

Source: Budmen (reviewed for clinical use by the NIH)

finished Budmen Face Shield

Why we chose this design:

- Can be scaled quickly
- Easy to assemble (once parts are printed)
- Field tested in numerous healthcare facilities

Making time:
2 - 3 hours to 3D print,
3 - 8 min to assemble

Ease of assembly:
novice (assembly), intermediate (printing)

Estimated Cost:
$8.00 per unit

Instructions: Budmen Product Spec

Materials you'll need, where to get them and reasonable substitutes:

Budmen Face Shield material	Where to get supplies	Substitutes
Foam tape	- Hardware Store - Amazon	Weather Stripping
Clear Shield Material: .005 thick poly sheet cut into 12" x 9" rectangles	- McMaster Carr Moisture Resistant Polyurethane Film 0.01 - McMaster Carr Moisture Resistant Polyurethane Film 0.005 - PaperGala - 12X12 sheets on Ebay - UW Database Suppliers	Dura-Lar 0.01 ideal but 0.005 could work . Overhead transparency sheets. Laminator sheets (laminated together)
Elastic Band - 1/2in wide - cut to 31 in. long	- UW Database Suppliers	N/A
Printer Filament (PLA, ABS, PETG, Nylon)	- Amazon	Other clear impermeable material
Super glue	- Office supply store - Amazon	N/A
Rubbing alcohol and other disinfectants	- Retail store - Amazon	N/A

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08.
Design D: Badger Shield

Source: UW Makerspace via OSCMS

finished Badger Shield

Why we chose this design:

- Modeled after current hospital face shields
- Made from economic materials
- Can be produced quickly without much machinery

Making time:
1 min to laser cut, 3-8 min to assemble

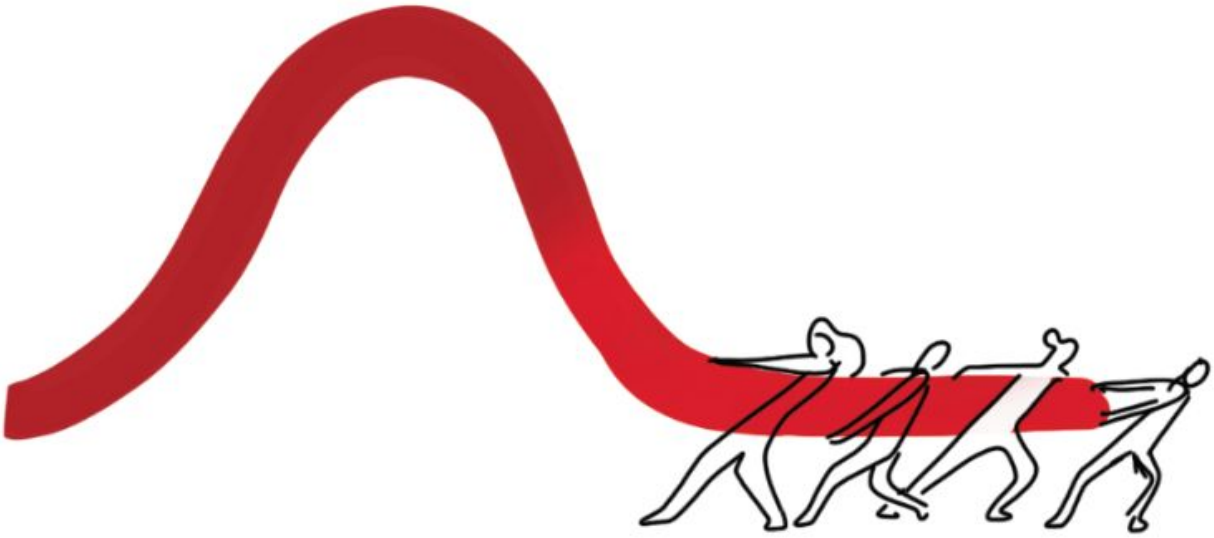
Ease of assembly:
novice

Estimated Cost:
:$1.50 - $3.00/unit

Instructions: Badger Shield Product Spec

Materials you'll need, where to get them and reasonable substitutes:

Badger Shield material	Where to get supplies	Substitutes
Clear Polyester Film (.007" thick)	- McMaster Carr Moisture Resistant Polyurethane Film 0.01 - McMaster Carr Moisture Resistant Polyurethane Film 0.005 - UW Database Suppliers - 12X12 sheets on Ebay	- Dura-Lar 0.01 is ideal but 0.005 can work - Overhead transparency sheets - Laminator sheets (laminated together)
Elastic Fabric (1" wide x 13" long)	- Fabric Stores - UW Database Suppliers	N/A
Adhesive Backed Polyurethane Foam	UW Database Suppliers	Crafting foam with double sided tape



Legal

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09.
Important Disclaimer - as of March 2020

The recommendations, plans, suggestions, guidance and requirements on this site (collectively the "Guidance") are being developed in real time. The Guidance is subject to change. When you use the Guidance to make DIY-PPE the result is a "Product". We cannot guarantee the effectiveness or safety of the Guidance or of any Product.

This is a blanket and blunt disclaimer: the Guidance and Products are presented as is and we cannot guarantee they will work to keep you safe. Any use of the Guidance and/or the Products is at your own risk. They are not guaranteed to prevent you becoming ill or dying.

Under normal circumstances, we would not recommend following the Guidance or using the Products unless and until they were rigorously tested and reviewed by our peers and relevant agencies.

These are not normal circumstances.

Unless and until the COVID19 pandemic is brought under control we are providing you with the best Guidance we can. That Guidance is not official, authorized by any government or governmental agency and it is not endorsed by our employers.

The Guidance and the Products are intended for use in health care settings facing extreme shortages of traditional, FDA approved PPE, where hospitals are asking for community produced PPE to protect health care workers who would otherwise not have access to any approved PPE supplies.

To the best of our ability as of the date of publication, these designs have been vetted by healthcare professionals, material science experts and designers for efficacy, comfort, ease of use, scalability, ease of manufacturing and quality. All of the recommended designs have been tested in the health care setting by front line workers. These recommendations are to be used at your own discretion and the discretion of the hospitals and health care systems that accept the products.

We accept no responsibility or liability for your use of the Guidance and/or the Products.
We can tell you we are following the Guidance and using the Products and we'll get through this together.