

GENTL Mask

A Rapid Response to Support the Urgent Needs of Healthcare Professionals

An Open Source Design from

EPAM CONTINUUM



The GENTL Mask is an **Open Source face mask** design that utilizes readily available materials and incredibly simple manufacturing processes to enable localized manufacturing to help close the PPE supply gap.

The 3L GENTL mask consists of a flat-cut, three-layer design that utilizes industrial grade filter material, sealed between two layers of non-woven polypropylene. This mask is not intended to provide equivalent protection to an N95 mask; but integrates a MERV 13 filter to provide protection beyond a surgical mask. The 2L GENTL Mask is a two-layer construction of non-woven polypropylene that provides a moderate physical and liquid barrier to the wearer.

The GENTL mask conforms to the face, providing a comfortable and safe fit. Heat sealed edges force air through the filter and non-woven sheets, while a simple, single loop strap secures it in place.

GET INVOLVED We're looking to connect supply with need. Please reach out if you're a manufacturer who would like to learn more about the design and manufacturing details. If you're a healthcare organization interested in evaluating GENTL Mask or looking to place orders, please reach out so we can try to connect you with a local manufacturing source.

CONTACT US IF YOU'RE INTERESTED IN EVALUATING THE MASK OR MANUFACTURING IT:

GENTL_Mask@epam.com

DRAWINGS & BILL OF MATERIALS:

<https://drive.google.com/drive/folders/1KuoJeEBToZh5dw8I54lp9GklcJ5swzzV>

MASK PRODUCTION OVERVIEW VIDEO:

<https://youtu.be/c9aMin8DRBQ>

TOOLS REQUIRED

CUTTING SOFT MATERIALS	Laser cutter, die cutter, rotary handheld cutter
CUTTING ALUMINUM NOSE CLIPS	Sheet metal shear, metal punch, waterjet cutter, fiber laser cutter
CUTTING ELASTIC STRAP	Knives or shears including rotary handheld cutter (OLFA or similar)
HEAT-SEALING (ASSEMBLY)	ULINE Impulse Heat Sealer or similar (16" or larger), Thermal die press
STRAP TAB ATTACHMENT	Hot glue gun, ultrasonic welder, thermal press

DISCLAIMER EPAM Continuum is not looking for financial gains from this design. We are putting this into the public domain as an Open Source design with the desire to connect local manufacturers with local hospitals in need around the world in an effort to reduce the negative impact of Covid-19 and help to protect our healthcare professionals.

EPAM Continuum is offering the GENTL Mask design idea as an Open Source offering to the community during this public health emergency. These statements and the GENTL Mask are not intended to diagnose, treat, cure or prevent any specific diseases. The statements made with respect to the GENTL Mask have not been evaluated by the U.S. Food and Drug Administration or any other regulatory authority. The GENTL Mask has not been tested, nor has it been put through any necessary regulatory design review as may typically associated with medical design and development. Individuals or organizations that manufacture masks utilizing the design and specifications are responsible for any federal or state regulatory requirements that apply to the manufacture or distribution of masks intended for medical use. Individuals and organizations are free to use, copy, modify and share this design and specifications, including for commercial manufacture, without payment of any fees or charges, but may not assert ownership in the design and specifications or "GENTL Mask" mark, ownership of which belongs to EPAM Continuum. EXCEPT WHERE SPECIFICALLY PROHIBITED BY LAW, NO WARRANTIES OF ANY KIND ARE OFFERED FOR THE MASK DESIGN AND SPECIFICATIONS, INCLUDING WARRANTIES OF NON-INFRINGEMENT AND FITNESS FOR A PARTICULAR PURPOSE.



Materials

***DIMENSIONAL DEPICTIONS NOT TO SCALE**
See manufacturing drawings for detailed specifications

GENTL 2L MASK

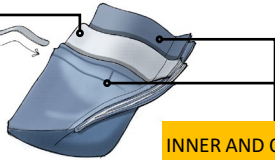
ALUMINUM
NOSE CLIP

INNER AND OUTER LINER



FILTER ELEMENT

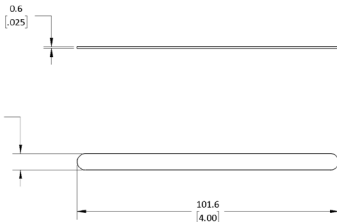
ALUMINUM
NOSE CLIP



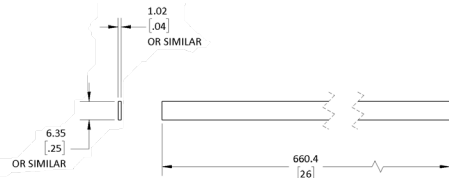
GENTL 3L MASK

INNER AND OUTER LINER

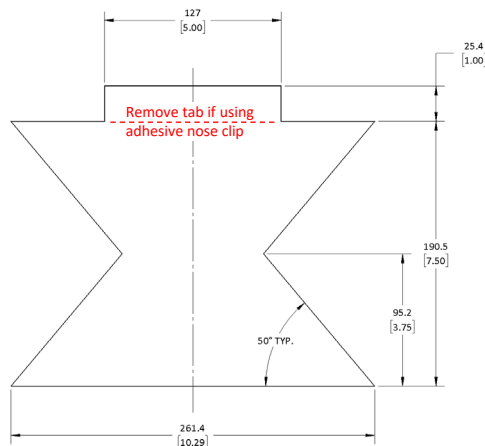
ELASTIC BAND



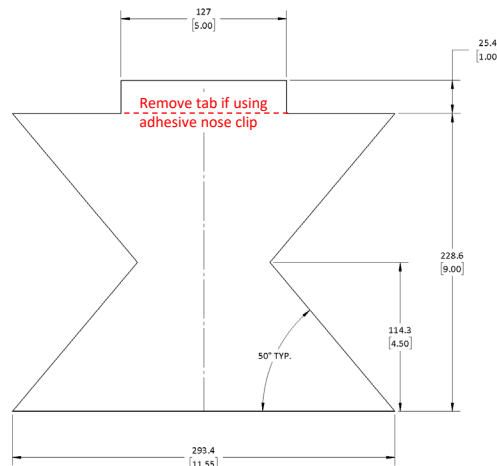
NOSE CLIP



ELASTIC STRAP



SIZE REGULAR



SIZE LARGE

INNER AND OUTER LINER

Polypropylene surgical drape or similar non-woven sheet ~ 0.007" Thick
MEDLINE part number: DYNJP2413
MEDLINE link:

https://www.medline.com/sku/item/MDPDYNJP2413;ecomsessionid=1hORuci70j7NebypcsD-5McYpilA7kpsCDMHcyjP_OC4-b2b?skuIndex=S1&question=&flowType=&indexCount=

40" x 70", 20 sheets per Case - ~\$1.90/sheet
1 sheet yields 16 liners, **\$0.24/mask (2 liners needed per mask)**

FILTER ELEMENT

Honeywell Elite Allergen MERV-13 Air filter (Pleated filter media extracted from cardboard frame intended for HVAC applications)
Home Depot part number: 203641970 (Internet), 591207 (Store SKU)
Home Depot link: <https://www.homedepot.com/p/Honeywell-30-in-x-30-in-x-1-in-Elite-Allergen-Pleated-FPR-10-Air-Filter-91001-013030/203641970>

30" x 30" filter cartridge (flattened filter media larger) – \$20 per filter
1 sheet yields 8 filters, **\$2.50/mask**

ALUMINUM NOSE CLIP

Aluminum 3003 H14 (lower temper such as H12 preferred if H14 not available)

McMaster part number: 8973K298

McMaster link: <https://www.mcmaster.com/8973k298-8973K284>

6" x 24" sheet - \$7.35 per sheet
1 sheet yields ~140 Nose Clips, **\$0.05/mask**

ELASTIC BAND

Braided elastic (MAY INCLUDE LATEX)

Example McMaster part number: 88225K61

McMaster link: <https://www.mcmaster.com/88225k61>

¼" width x 36 ft./roll. – \$6.71/roll
26 inches/mask = 16 straps/roll, **\$0.42/mask**

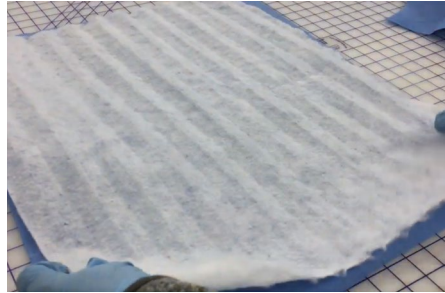


Material Preparation

SOFT GOODS



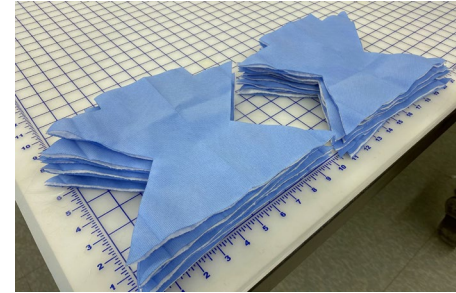
EXTRACT FILTER FROM FRAME
(3L MASK ONLY, 2L MASK DOES
NOT INCLUDE FILTER)



FLATTENED FILTER IS HALF THE SIZE OF DRAPE.
FOLD THE DRAPE IN HALF WITH FILTER INSIDE (3L).
THE 2L MASK ONLY REQUIRES YOU TO FOLD THE
DRAPE IN HALF BEFORE CUTTING (NO FILTER)



ARRANGE PATTERNS AND LASER CUT
STACK. YOU SHOULD BE ABLE TO FIT 8
MASK PATTERNS PER MATERIAL STACK

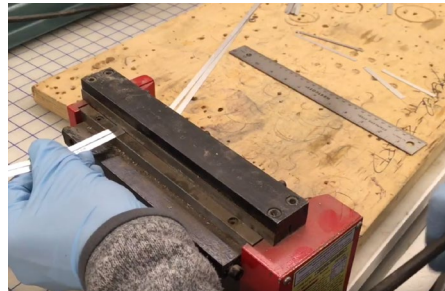


EXTRACT BLANKS AND SET
ASIDE FOR ASSEMBLY

ALUMINUM CLIPS



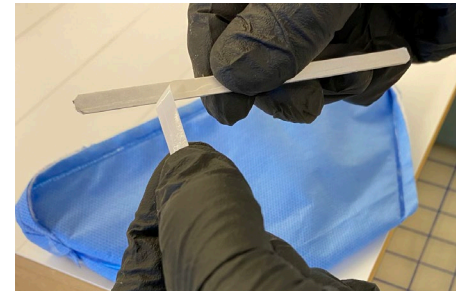
CONVERT SHEET TO LONG
STRIPS OF SPECIFIED WIDTH



TRIM TO SPECIFIED LENGTH



DEBURR STRIPS



OPTIONAL APPLY PO-2 OR
SIMILAR DOUBLE STICK ADHESIVE

ELASTIC STRAPS



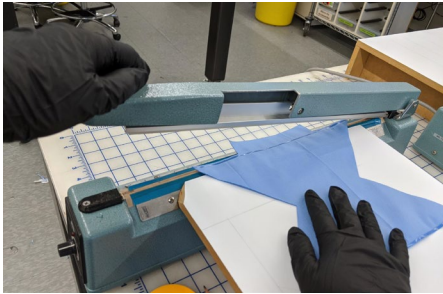
CUT TO LENGTH



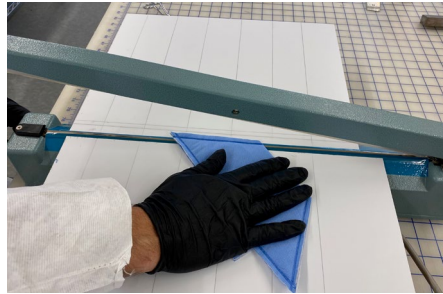
SET ASIDE FOR ASSEMBLY



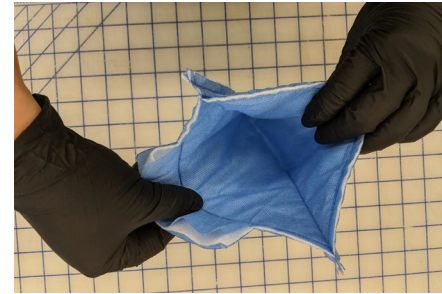
Assembly Process



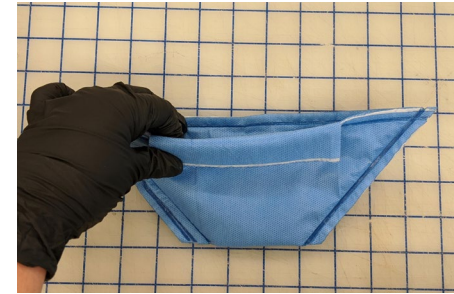
*HEAT SEAL LONG SEAMS



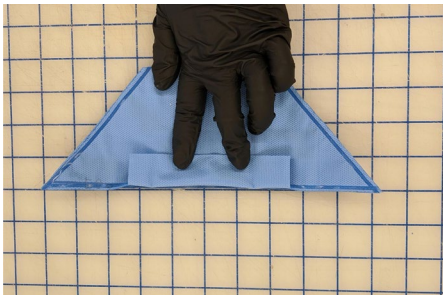
*HEAT SEAL SIDE SEAMS



TEST SEAM STRENGTH



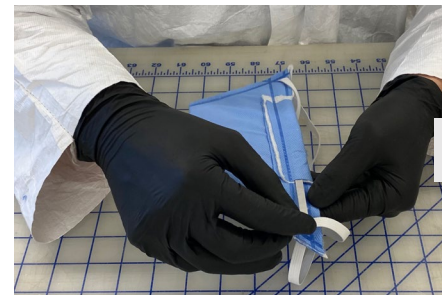
FOLD NOSE TABS OUTWARD
(3L SHOWN HERE)



FOLD NOSE TABS OUTWARD
(2L SHOWN HERE)



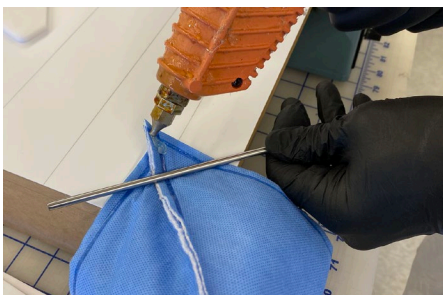
**HEAT SEAL NOSE TAB



SLIDE IN NOSE CLIP



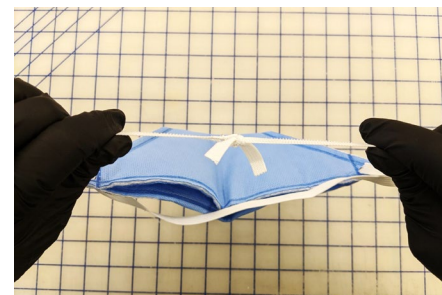
ADHERE NOSE STRIP (SELF
ADHESIVE NOSE STRIP STYLE)



PLACE HOT GLUE AND FOLD THE
CORNERS OF THE MASK OVER A
DOWEL ABOUT 1/4" IN DIAMETER.
THIS FORMS THE LOOPS FOR
ATTACHING THE ELASTIC BAND.



PRESS UNTIL HOT GLUE SETS,
REMOVE DOWEL



ADD STRAP AND TIE USING A SQUARE
KNOT, TEST THE KNOT INTEGRITY

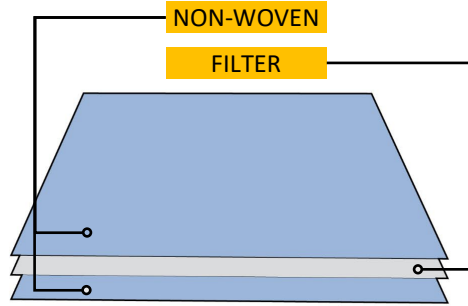


FORM THE NOSE CLIP OVER A DOWEL
ABOUT 5/8" IN DIAMETER

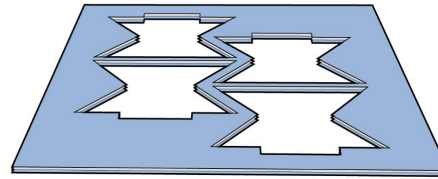
- * All heat seals should be applied on both sides. Seal one side, flip, then seal again. This ensures an even material melt and secure seal. Dwell time is ~4 seconds per side for the ULINE impulse heat sealer, results may vary.
- ** Nose tab heat seal should only be performed from the nose tab side. Adhesive nose clips may not require nose tabs (Trim All)
- *** REFER TO MANUFACTURING DRAWINGS FOR HEAT SEAL SEAM ALLOWANCES, ELASTIC TAB FOLD DIMENSIONS, ETC



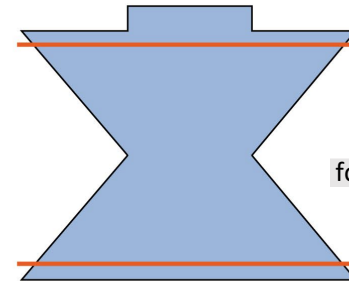
Assembly Process Diagram – 3L



CREATE STACK OF MATERIALS

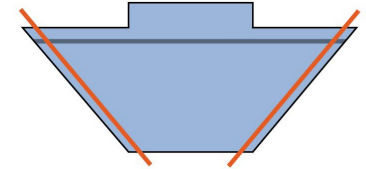


LASER CUT STACK

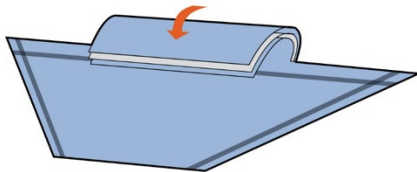


*HEAT SEAL LONG SEAMS

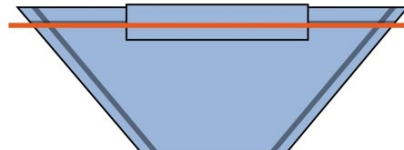
fold



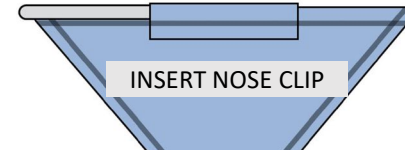
*HEAT SEAL SIDE SEAMS



FOLD NOSE TABS OUTWARD

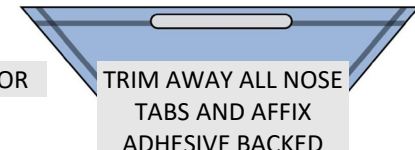


**HEAT SEAL NOSE TAB



INSERT NOSE CLIP

OR



TRIM AWAY ALL NOSE TABS AND AFFIX ADHESIVE BACKED NOSE STRIP



FOLD OVER EDGES AND BOND FOR STRAP

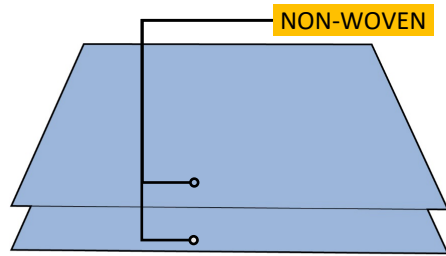


ADD STRAP AND TIE

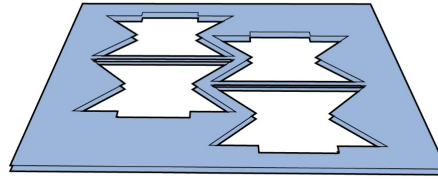
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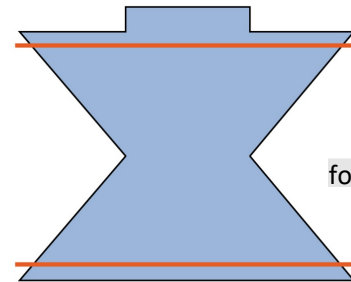
Assembly Process Diagram – 2L



CREATE STACK OF MATERIALS

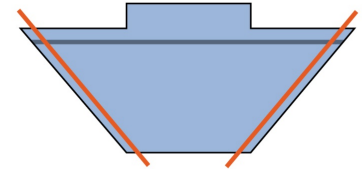


LASER CUT STACK

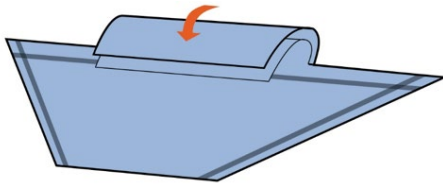


*HEAT SEAL LONG SEAMS

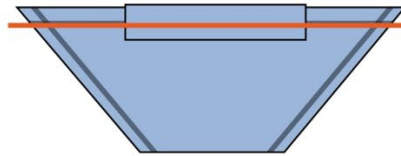
fold



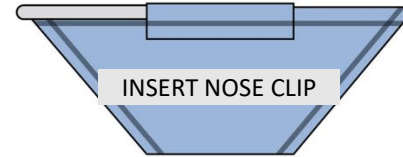
*HEAT SEAL SIDE SEAMS



FOLD NOSE TABS OUTWARD

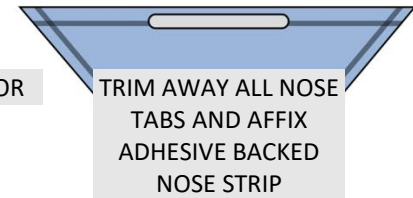


**HEAT SEAL NOSE TAB



INSERT NOSE CLIP

OR



TRIM AWAY ALL NOSE
TABS AND AFFIX
ADHESIVE BACKED
NOSE STRIP



FOLD OVER EDGES AND BOND FOR STRAP



ADD STRAP AND TIE

- * All heat seals should be applied on both sides. Seal one side, flip, then seal again. This ensures an even material melt and secure seal. Dwell time is ~4 seconds per side for the ULINE impulse heat sealer, results may vary.
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