Affordable PPE of Head Region for Low-Income People (for COVID-19 Response)

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Distribution : Open Source

Project Assets: https://github.com/Iftikhar-Omar/Low-Cost-PPE-of-Head-Region

Background of the Project:
The world is facing a global crisis posed by coronavirus.The COVID-19 pandemic has swept over the world in a geometric progression. And third world countries like Bangladesh are absolutely not prepared for it. They don't even have enough personal protective equipment to save the health care staff and doctors. So the doctors and medical staff are unwilling to give service to covid-19 patients and other patients. Lack of PPE for the marginal mass living below poverty line is making them exposed to life threat by eliminating their food supply in this lockdown affected jobless situation.

Rationale of the Project:
The pandemic is highly contagious in nature. Stopping it early may make it possible to restrain its widespread contamination. As there are no known working vaccines against this virus, to prevent it from spreading would be the best strategy.

But to control it's spreading we need to ensure enough supply of preventive equipment among the general mass. But Bangladesh being a third world country couldn't ensure enough supply within its current financial state. So external support is highly demanded.

The world is implementing a lockdown strategy to restrain COVID-19 spreading which poses a great threat to the financially crippled mass of Bangladesh. Daily earning is their only means of ensuring food safety. In this situation they may starve let alone enjoy proper treatment if affected by the virus.

So the necessity of a properly working low cost PPE solution can be summarized as below:

1. General mass & marginal health care units can't afford the current high cost PPE solutions.
2. If the marginal general mass can't be protected, they will be unable to earn daily living and would starve.
3. Distant health care units will come to a halt and normal patients will be deprived of health services.
4. Our country can't afford to supply PPE to her entire population.

Context:
We are seeking help and organizing a fully capable community consisting of individuals and startups to produce this "Affordable PPE of Head Region for Low-Income People" by using local resources to protect local emergency support workers, laborers, volunteers and individuals for an emergency response to the pandemic.

We are capable of satisfying very short-term emergency needs through volunteering community contribution and securing long term supply through industrial production backed by government or non - government funding structure.

Materials Used

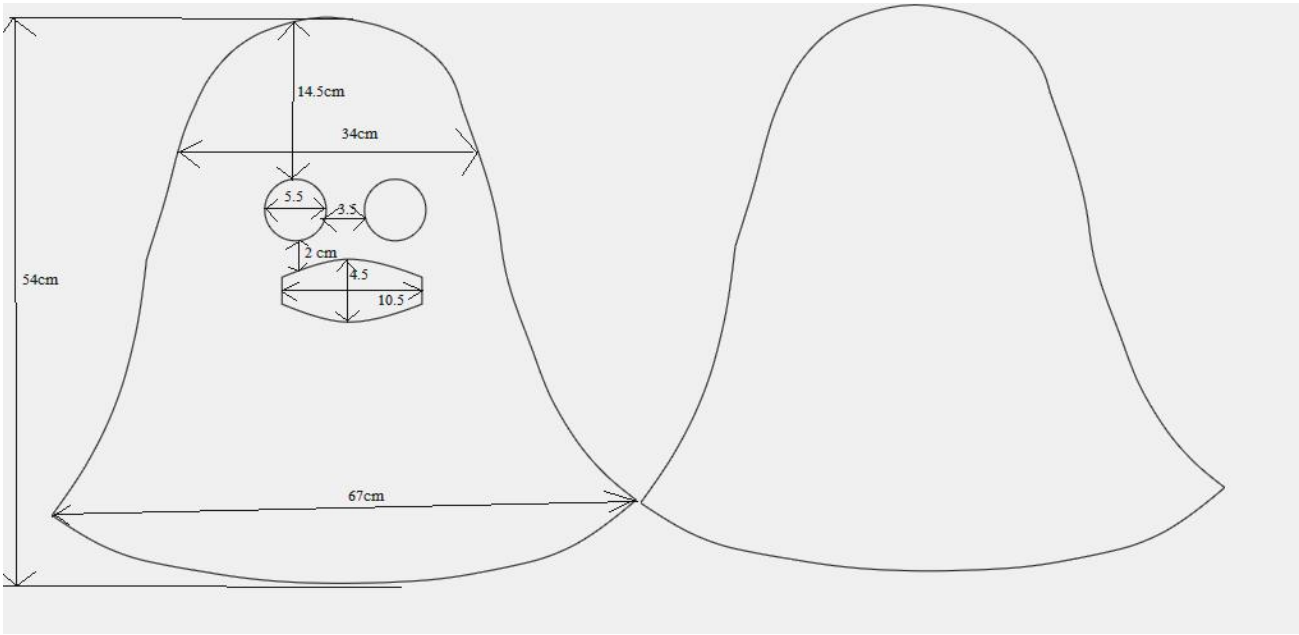
Layer 01	 Non-Woven Fabrics	Non-woven fabrics are engineered fabrics that may be a limited life, single-use fabric or a very durable fabric. Non woven fabrics provide specific functions such as - absorbency, Liquid repellency, resilience, stretch, softness, strength, flame retardancy, wash ability, cushioning, filtering bacterial barrier and sterility. Ref: https://www.inda.org/about-nonwovens/
Layer 02	Non-Permeable Polymer	Local Polyethylene
Layer 03	Non-Woven Fabrics	Description above

Figure

	• Non-woven fabrics for face and head safety. • Eye protection goggles using Transparent acrylic sheet.
	It protects the nose, eyes and sensitive areas of the face. We used local foam sheets to lock the air and it makes a tight fit on the face.

Assembling Steps (Head Cover) :

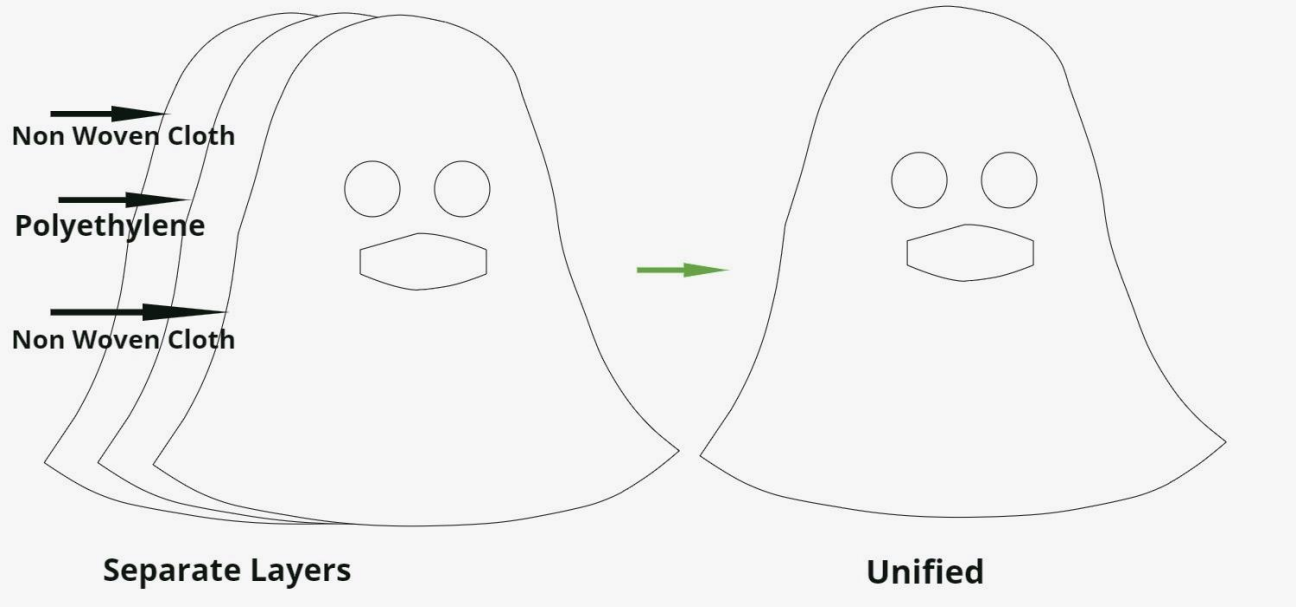
Step 1: **Cutting Polyethylene and Non-Woven Cloth**
The cloth and polyethylene layer should be cut according to the design. The adjustment may be necessary for children and people having a special size of the head. The product requires four non woven cloth layers and two polyethylene layer to be cut following the same dimension. The frontal piece has holes for eyes and mouth.



**Measurements can be modified as needed for perfect fit.*

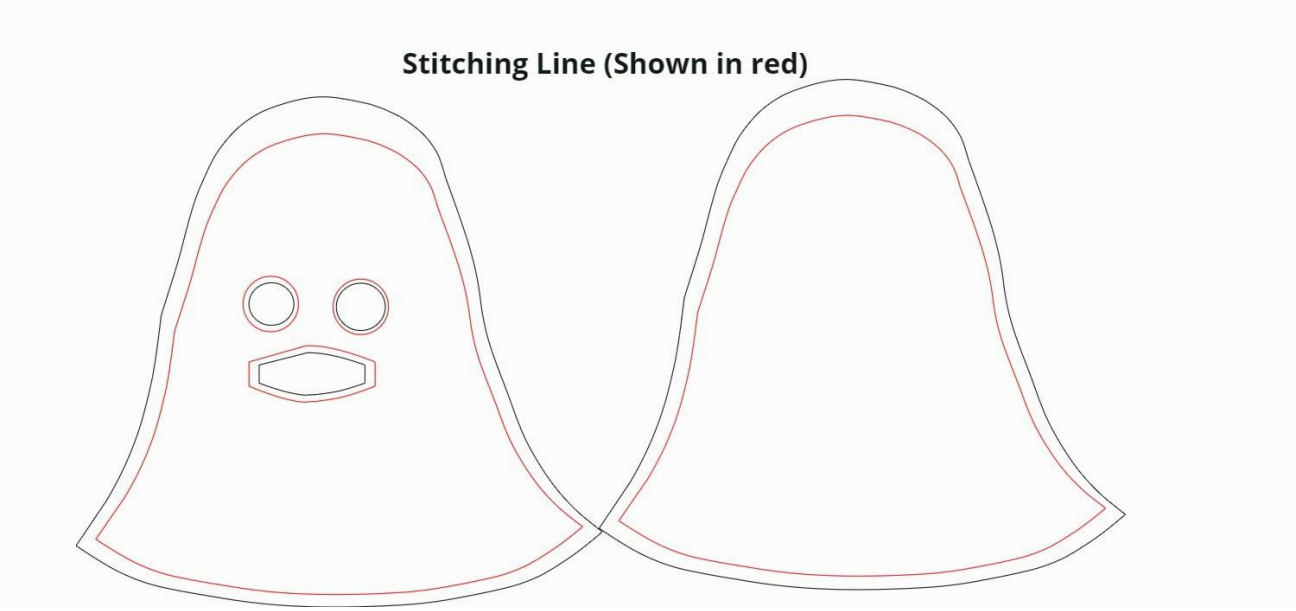
Step 2: Arranging the Pieces

It needs to be aligned in a manner so that non woven cloths are on the outer parts and polyethylene in the middle. There would be parts of prepared layers one for the frontal part and one for the back.



Step 3:Stitching or Heat Press

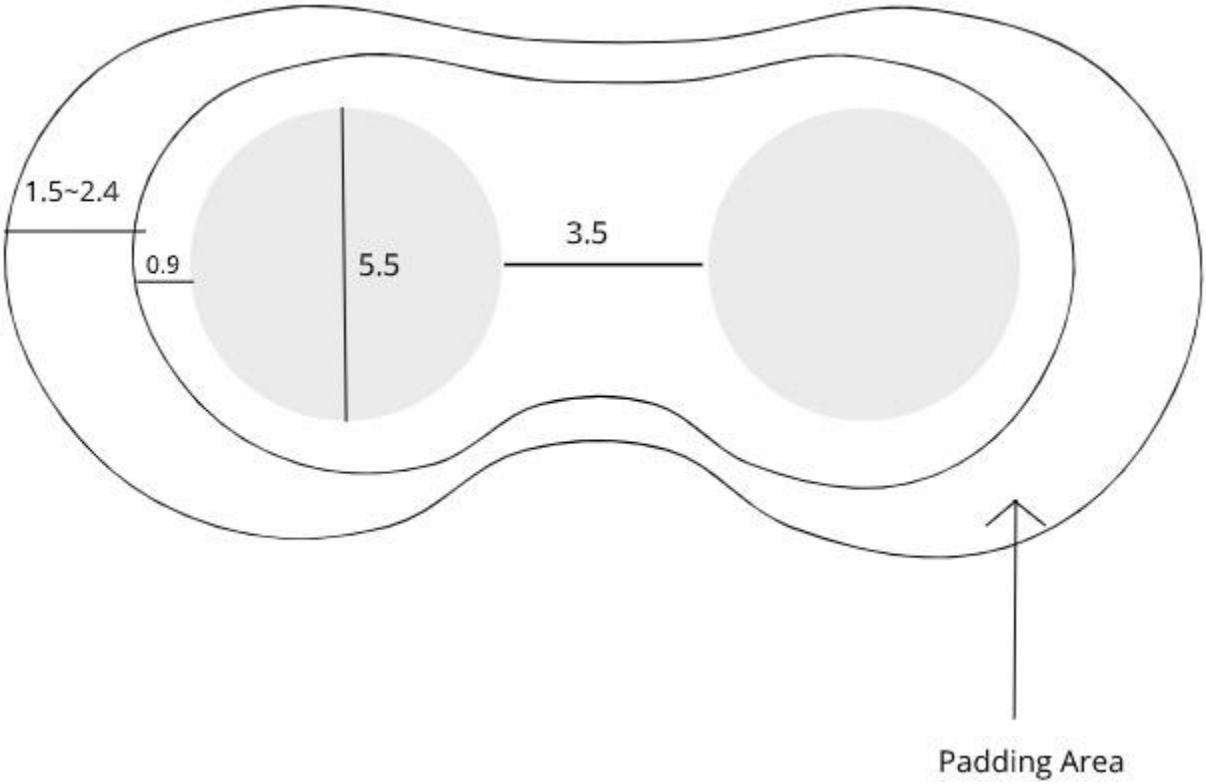
Stitching lines are shown which could be utilized either for stitching or heat press. The heat pressing option offers more safety.



Step 4: Adding Foam Padding

The foam padding ensures airtight fittage of the goggles. The padding is placed around eye holes where the goggle will press against the face. This foam padding alleviates the need of silicon fitting structure on the goggle to fit perfectly.

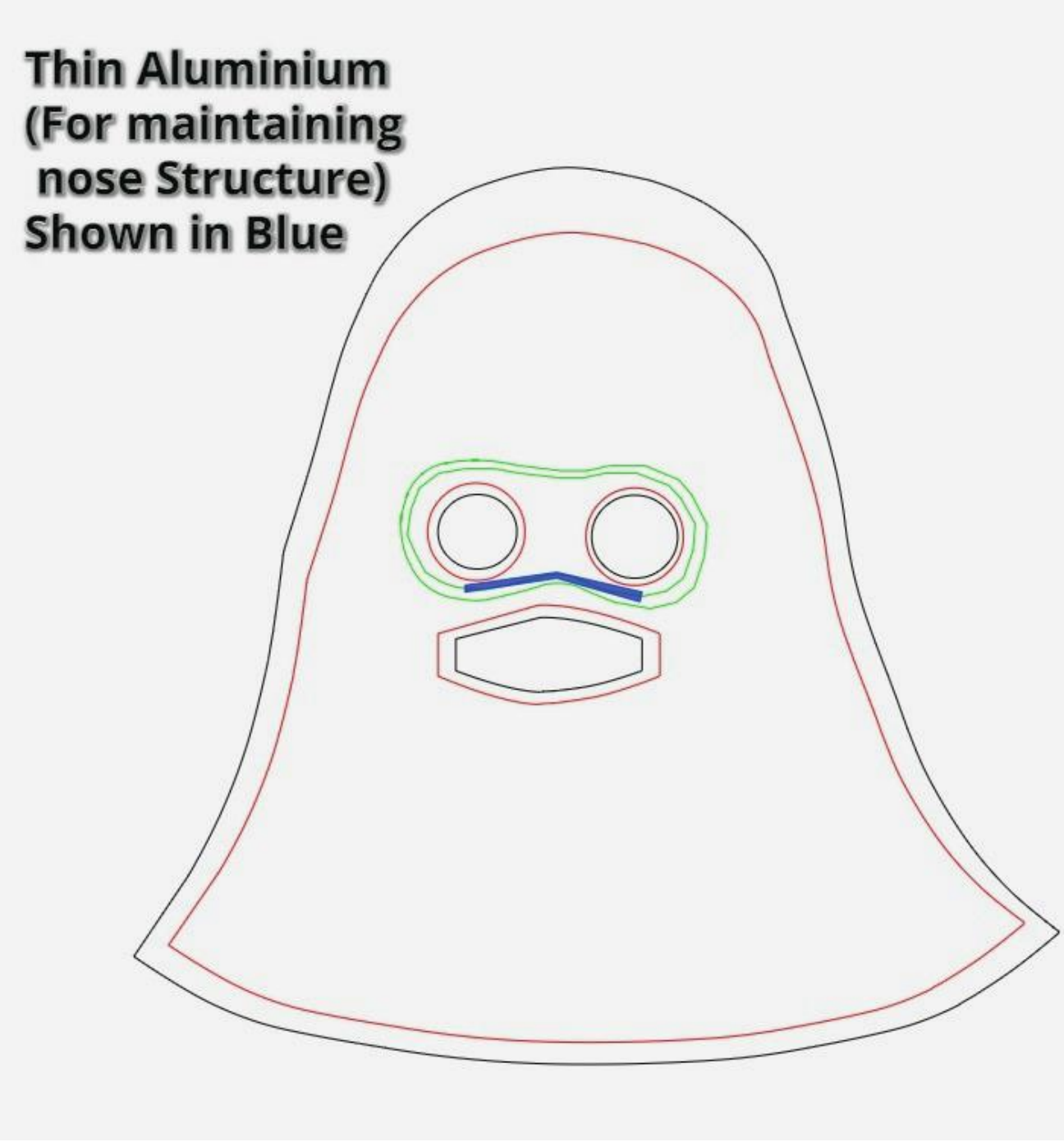
Foam File Cutting Design:



For cutting the foam sheet:
https://drive.google.com/open?id=1yVMcu56kwsMV_goK5I_BOR4XqhE6wXMm

Step 5: Adding Aluminium Support

For this step, a thin aluminium sheet is cut and folded multiple times. For thick aluminium sheets, folding may not be necessary. This is supposed to give rigidity to the nasal support structure.



Step 6: Adding an elastic in Throat region

Adding an elastic in the throat - neck region Would make the product more secure as it would restrict airflow, even more, making the person more isolated from the environment. However, even without the elastic, the product is secure enough.

Assembling Steps (Goggles) :

Step 1: Choosing Material

We have two possible candidates for the frame material. Which are -

a. Acrylic Sheet
b. PVC Board

The front window also has three possible candidates. Which are -

a. Transparent Acrylic Sheet
b. Glass
c. Stretched, Non - Rigid & Transparent Polymer (Eg Polyethylene)

Step 2: Preparing the Frame

a. For Transparent Acrylic: The material should be laser cut and put together airtightly by either of silicon glue,glue gun, super glue or scotch tape.

b. For PVC Board: The material should either be laser cut, lathe cut or hand cut with anticutter. It may be put together airtightly by either of silicon glue,glue gun, super glue or scotch tape.

File: https://drive.google.com/open?id=1Mw6y2D0K8dRKrT3eS9OCi0B52uu7jypU

For Hand Cutting:

a. Print the pdf containing goggles scheme
b. Paste the paper on PVC, plyboard or any suitable material using glue
c. Cut according to the lines.

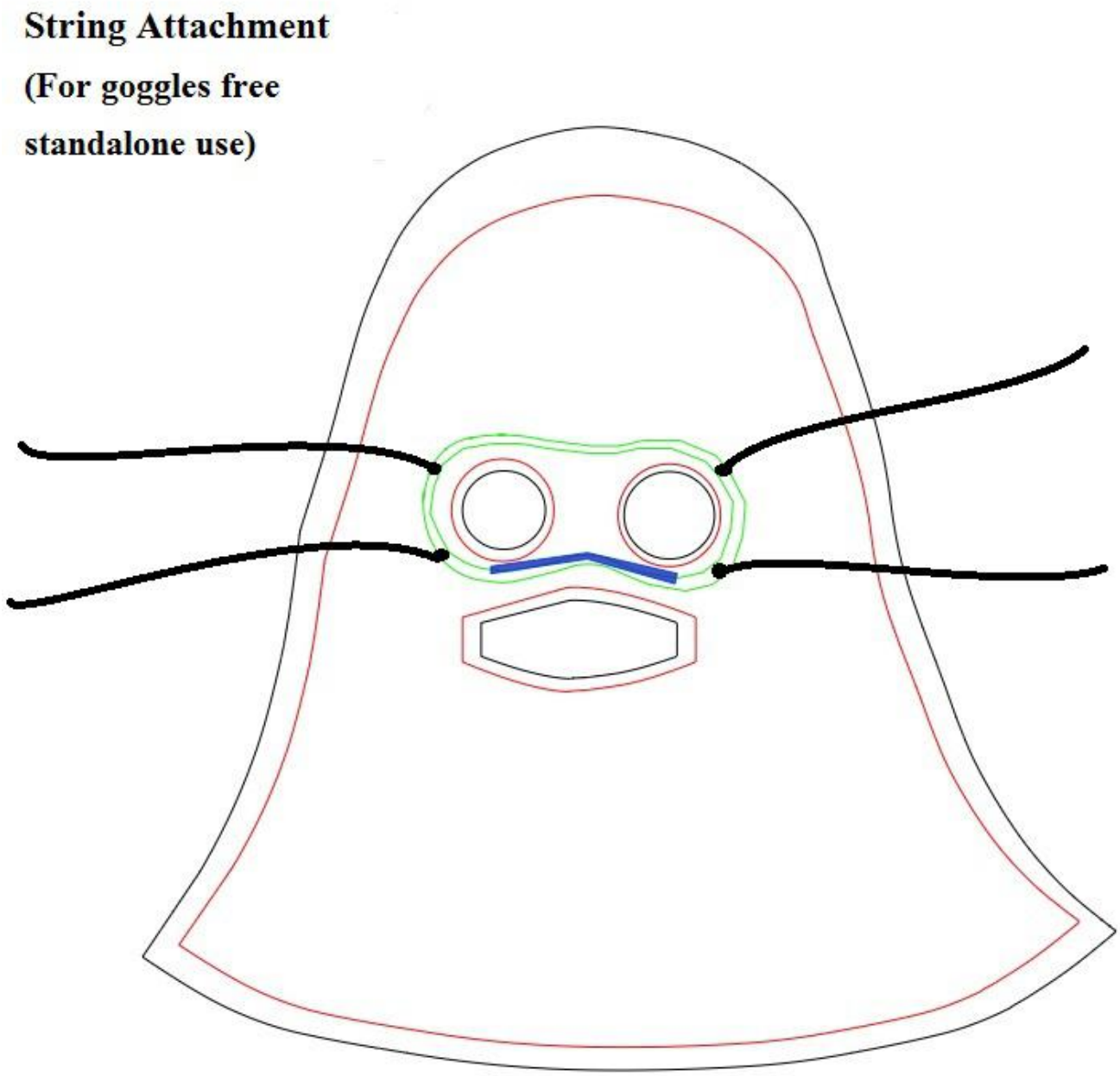
File: https://drive.google.com/open?id=1OzMwBtcfpBgELYDIT7I_o1X-AQIMfWk4

Step 3: Preparing the Front Window

a. For Acrylic or Glass: The material should be cut and glued appropriately by following the design.

b. For Polyethylene Like Material: The material should be glued to the frame carefully while keeping it fully stretched. Some details here.

Standalone Use (Without Goggles)



In some areas, using goggles may not be appropriate. If we attach strings on the padding and tie it behind the head, it would secure the eyes from viruses in an affordable manner. But to make it airtight, the padding needs to be really good.

In this setting, The viewport may be of two types:

1. Transparent Acrylic Based:
   Acrylic would be a nice approach. This setting would ensure good quality and a neat view port. After arranging, the setting needs to be glued securely around eye holes.

   Cutting Scheme: here

2. Transparent Polymer Based:
   Using transparent polymer would greatly reduce price. And would ensure material availability. The eye holes would be of the middle layer's transparent polymer.

Manufacturing Process:

If the demand prediction and situation provided, we can manage it by following steps

Manufacturing Requirements:

To manufacture this products industrially, we need to ensure stable supply of:

1. Non Woven Cloth
2. Optimum Quality Polyethylene
3. Silicon Rubber
4. Foam Padding Material
5. Elastic
6. Thin Aluminium Sheet (foil paper)
7. Cotton Thread (For Sewing, - If heat pressing is not used)

Feasibility:

Most of the materials proposed are common household scraps. So for the mass low income people of our community we can go for rapid production with low risk of material shortage.

Scalability:

As our manufacturing plan, we'll initially produce it within our country to meet the national demand of local low-income people. The industrial version can secure any group of community with high precision.

Availability:

All material is available locally and the used most of the used materials are byproduct of other commodities. So all the materials are widely available in the local market.

Per Unit Cost :

Costing	Quantity	Price (BDT)
Acrylic & Cutting	2 square meters (3mm)	TK.100-130
PVC	2 square meters (2mm)	TK.40-60
Glue Gun **(People can use Chloroform/silicon/superglue to join acrylic parts)**	1	TK.150
Non-Oven Cloth / Bag	2-4	TK.2 per bag Cloth roll price TBA
Lace		Any Cloth
Local Foam Sheet		TBA
Total Cost/piece		TK.160 (maximum)

Affordable Version Without Goggles

Costing	Quantity	Price (BDT)
Polythene	1-2	0.5-2
Shopping Bag	1-2	2-4
Needle & Thread	1	5-10
Total		16 (maximum)

Timeline:

1. A group of 3 can produce 150 - 200 Pcs per day on DIY approach
2. Industrial production is scalable

Suppliers: *(Processing, Please Enrich it Here in Comments)*

Material	Market Area	Detailed Location
Acrylic	Dhaka	Anower Bhai (ref. Kwoshik BUET) Shop location: Section, near Police station, dhaka Mobile: 01731393553 laservision2017@gmail.com (Given location, the supplier will delivered it to specified address within Dhaka)