PES UNIVERSITY

ERGONOMICS PORTFOLIO

UA17BD180

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01FB16ECS356

CONTENTS

CLASSWORK

Classwork 1

SHASHANK PRABHAKAR
01FB16ECS356

The designers of a new ship for use by a British crew wish to specify the minimum deck height to allow sufficient headroom for the crew. The ship will be built in 2 years' time and will be in service for 30 years. Assume a stature increase due to the secular trend of 1.5 mm/year. and recommend an appropriate height, DH.

DH = Deck height.

$DH = SH_x + CA + DA + STA(Y_t - Y_b) + PA$

SH_x = x Percentile stature = 95th percentile = 1870 mm
CA = clothing allowance = 70 mm
DA = Dynamic allowance = 100 mm
STA = secular trend allowance = 1.5 mm/year
Y_t = Target year = 2050
Y_b = Base year = 1986
PA = Psychological allowance = 50 mm

$\therefore DH = 1870 + 70 + 100 + 1.5 * (2050 - 1986) + 50$

$DH = 2186$ mm

∴ The Deck height is 2186 mm.

Helen

Classwork 2

SHASHANK PRABHAKAR
01FB16ECS356

		Brazil	India
Stature	Mean	1700	1645
	SD	66	74
sitting height	Mean	880	?
	SD	35	?
knee height	Mean	?	520
	SD	?	30

Seating ratio, SR Mean = $\frac{880}{1700} = 0.518$ (Brazil)

SR SD = $\frac{35}{66} = 0.53$

Estimated sitting height, mean = 1645 * 0.518 = 852 mm
SD = 74 * 0.53 = 39 mm
5th percentile = 852 − 1.64 * 39 = 788 mm
95th percentile = 852 + 1.64 * 39 = 916 mm

Knee height

SR Mean = $\frac{520}{1645} = 0.316$

SR SD = $\frac{30}{74} = 0.405$

Estimated mean = 1700 * 0.316 = 537 mm
SD = 66 * 0.405 = 27 mm

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FMEA - Fail Modes and Error Analysis

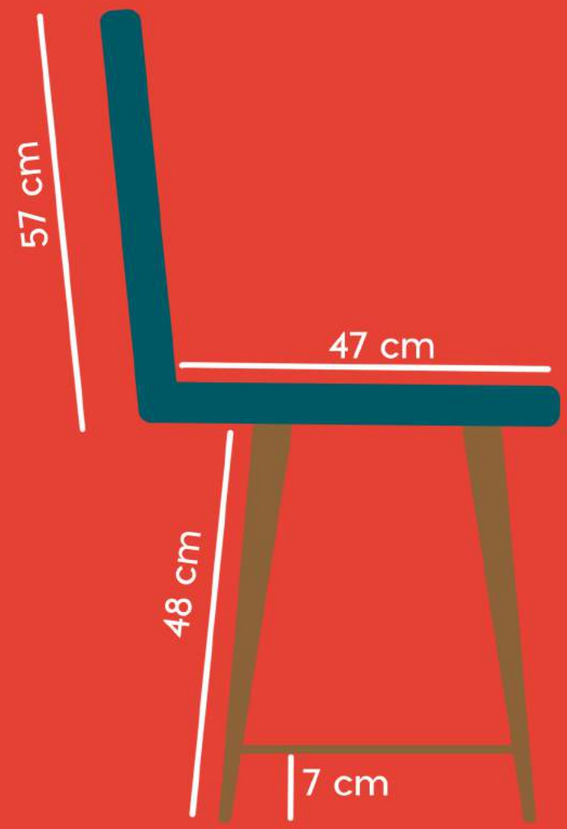
FMEA

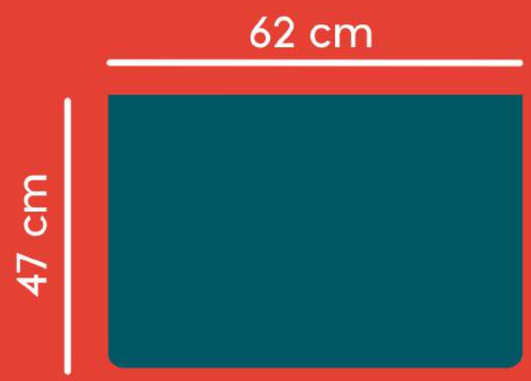
NAME	Shashank Prabhakar
SRN	01FB16ECS356

FUNCTION	FAILURE MODE	SEVERITY	S	OCCURRENCE	O	DETECTION	D	RPN	Recommended Actions
Dispence amount of cash requested by customer	Doesnot Dispense cash	Customer very dissatisfied	7	Out of cash	7	Internal low cash alert	3	147	Automatically refill after crossing threshold
		Incorrect entry to demand deposit system		Machine jams	4	Internal jam alert	8	224	Regular checks
		Discrepancy in cash balancing		Power failure during transaction	3	None	10	210	Power backup
	Dispence too much cash	Bank loses money	8	Bills stuck together	2	Loading Procedure	8	128	Checking and monitoring
		Discrepancy in cash balancing	8	Denominations in wrong trays	5	Two person visual verification	3	120	Electronic checking
	Takes too long to dispense cash	Customer somewhat annoyed	5	Heavy computer network traffic	4	None	10	200	More servers to handle load
				Power interuption during transaction	3	None	10	150	Stabilizer

MEASUREMENT OF DIMENSIONS TO DESIGN A CHAIR

Percentile	5th	50th	95th
Sitting Height	79 cm	86 cm	94 cm
Knee Height	48 cm	53.5 cm	59 cm
Popliteal Height	41 cm	45 cm	53 cm
Shoulder Breadth	38 cm	40 cm	44 cm
Shoulder Height	53 cm	57 cm	67 cm
Body Depth	45 cm	48 cm	53 cm
Buttock-Knee	51 cm	59 cm	62 cm
Hip Breadth	50 cm	55 cm	60 cm

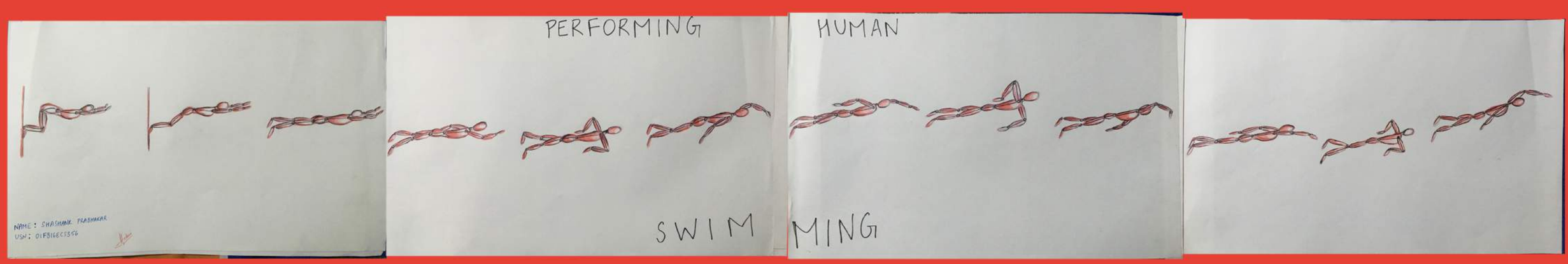




ASSIGNMENTS

ASSIGNMENT 1

PERFORMING HUMAN



SWIMMING

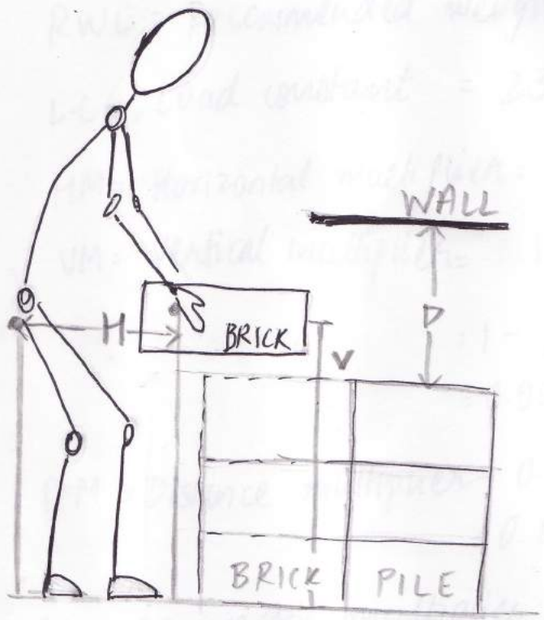
NIOSH - National Institute for Occupational Safety and Health

ASSIGNMENT - 2

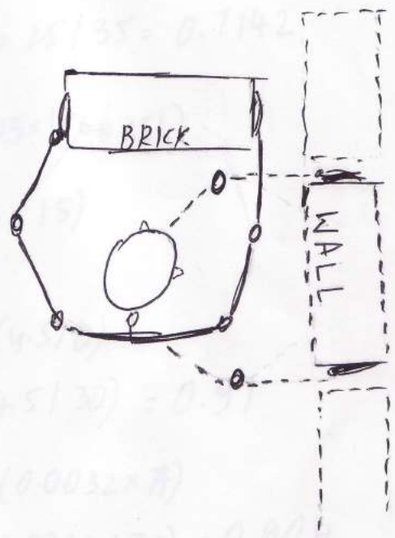
SHASHANK PRABHAKAR
01FB16ECS356

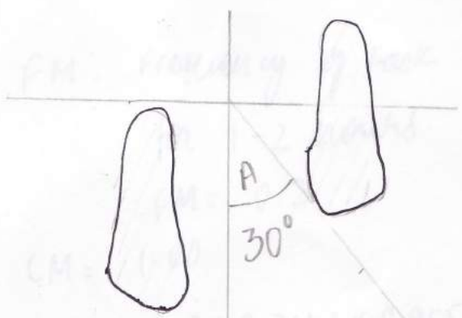
NIOSH - Approach to Lifting Task Evaluation

Task Chosen: Lifting and Laying Bricks



SIDE VIEW





H = 35 cm

V = 60 cm

D = 30 cm

A = 30°

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NIOSH Lifting Equation

RWL = LC × HM × VM × DM × AM × FM × CM

RWL = Recommended weight limit

LC = Load constant = 23 kg

HM = Horizontal multiplier = 25/H = 25/35 = 0.7142

VM = Vertical multiplier = 1 - (0.003 × |V - 75|)

= 1 - (0.003 × 15)

= 0.955

DM = Distance multiplier = 0.82 + (4.5/D)

= 0.82 + (4.5/30) = 0.97

AM = Asymmetric multiplier = 1 - (0.0032 × A)

= 1 - (0.0032 × 30) = 0.904

FM: Frequency of task measured to be 1 per minute, for 1-2 hours.

∴ FM = 0.3

CM = 1.00

∴ RWL = 23 × 0.7142 × 0.955 × 0.97 × 0.904 × 0.3 × 1.00

RWL = 4.126 kg

weight of cinder block = 12.7 kilogram

∴ Lifting index = 12.7/4.126 = 3.078

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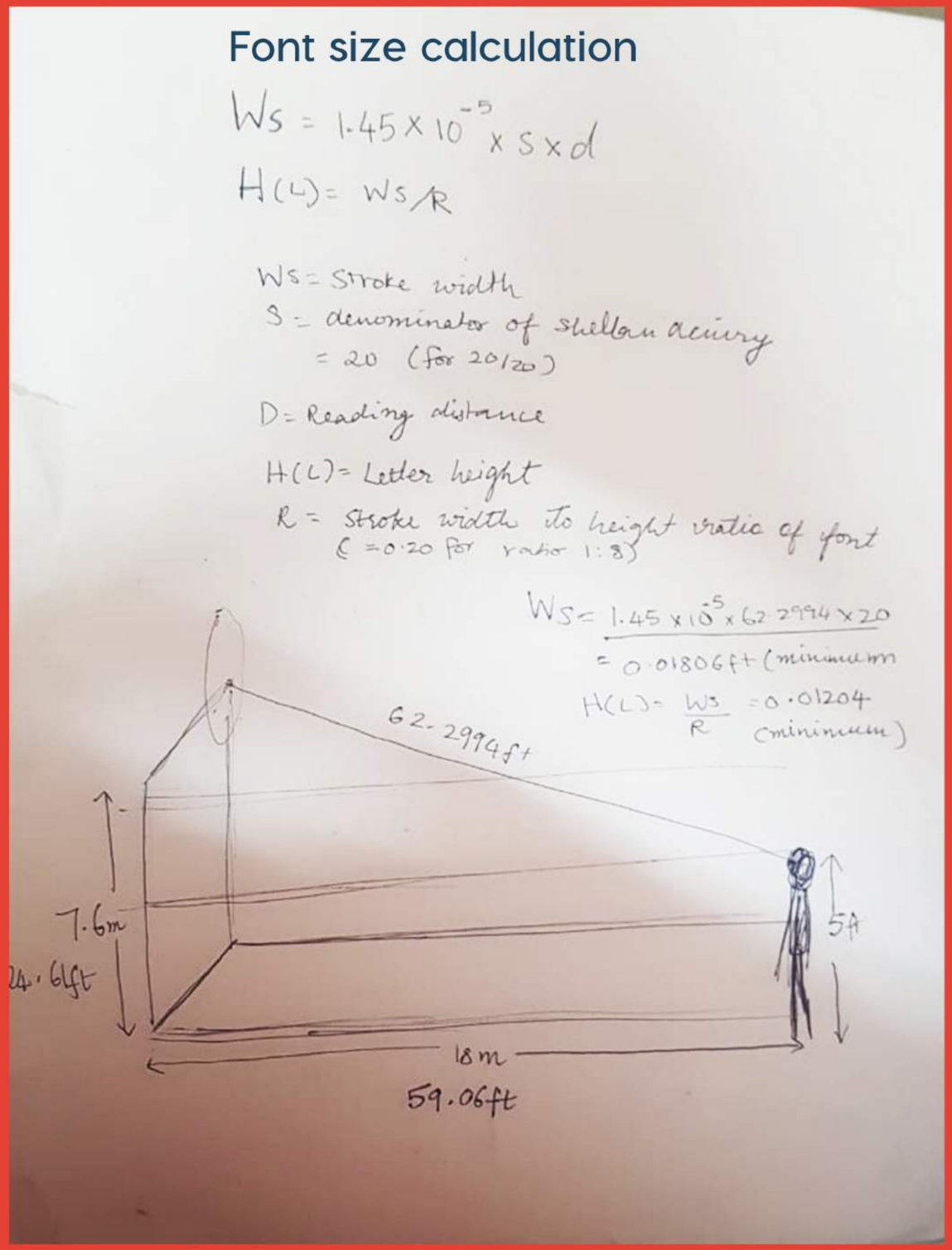
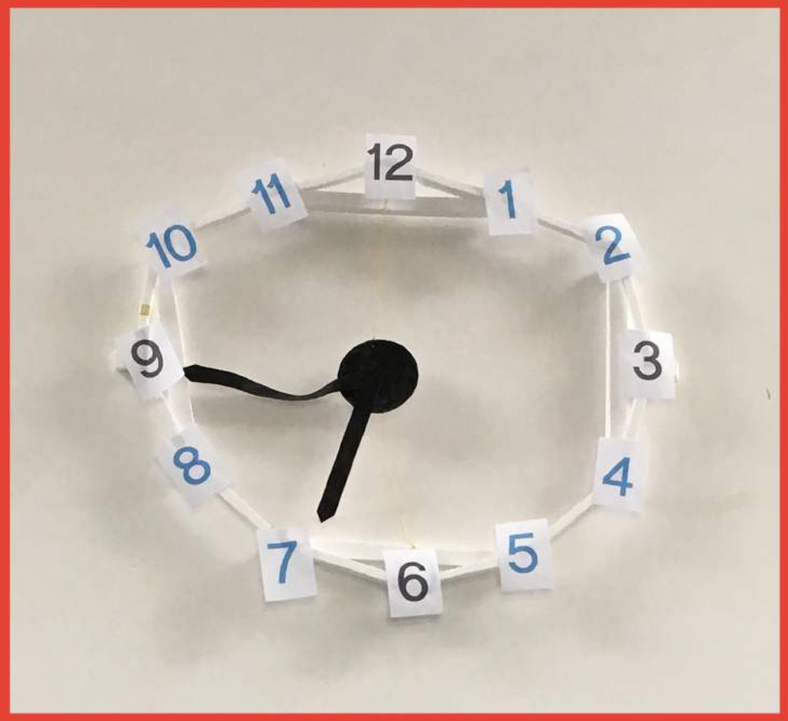
ASSIGNMENT 3 - CLOCK DESIGN





6 feet

PROJECT

SPECTACLES

NooD

ANALYSIS

Falls off easily

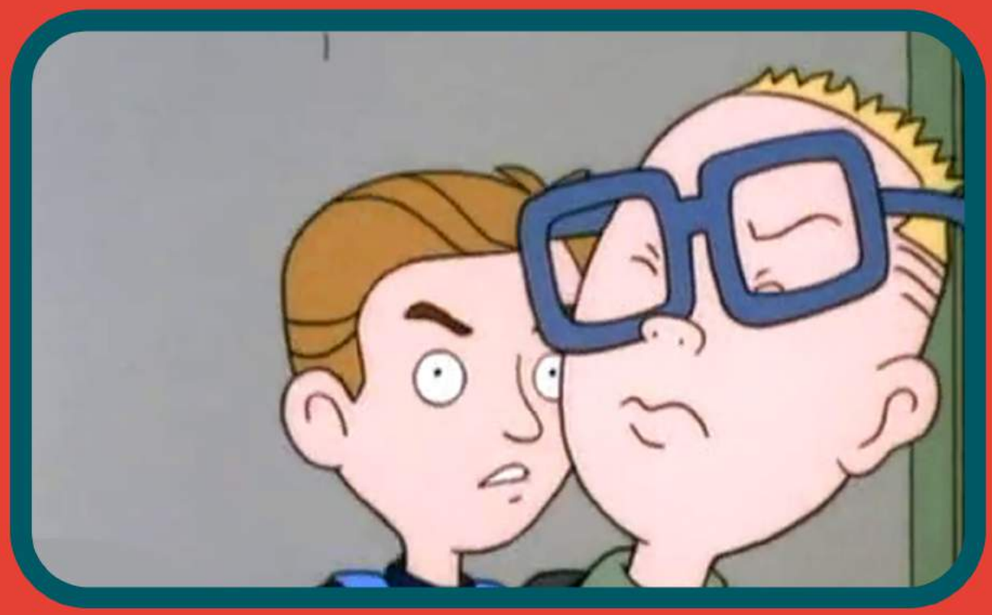
Need a bulky case to carry it around when it is not in use

Water settles on it (during rain) and obstructs vision

Hurts nose bridge and the part behind the ear

One size does not fit all

Hard to put on a helmet while wearing glasses



PROBLEM STATEMENT

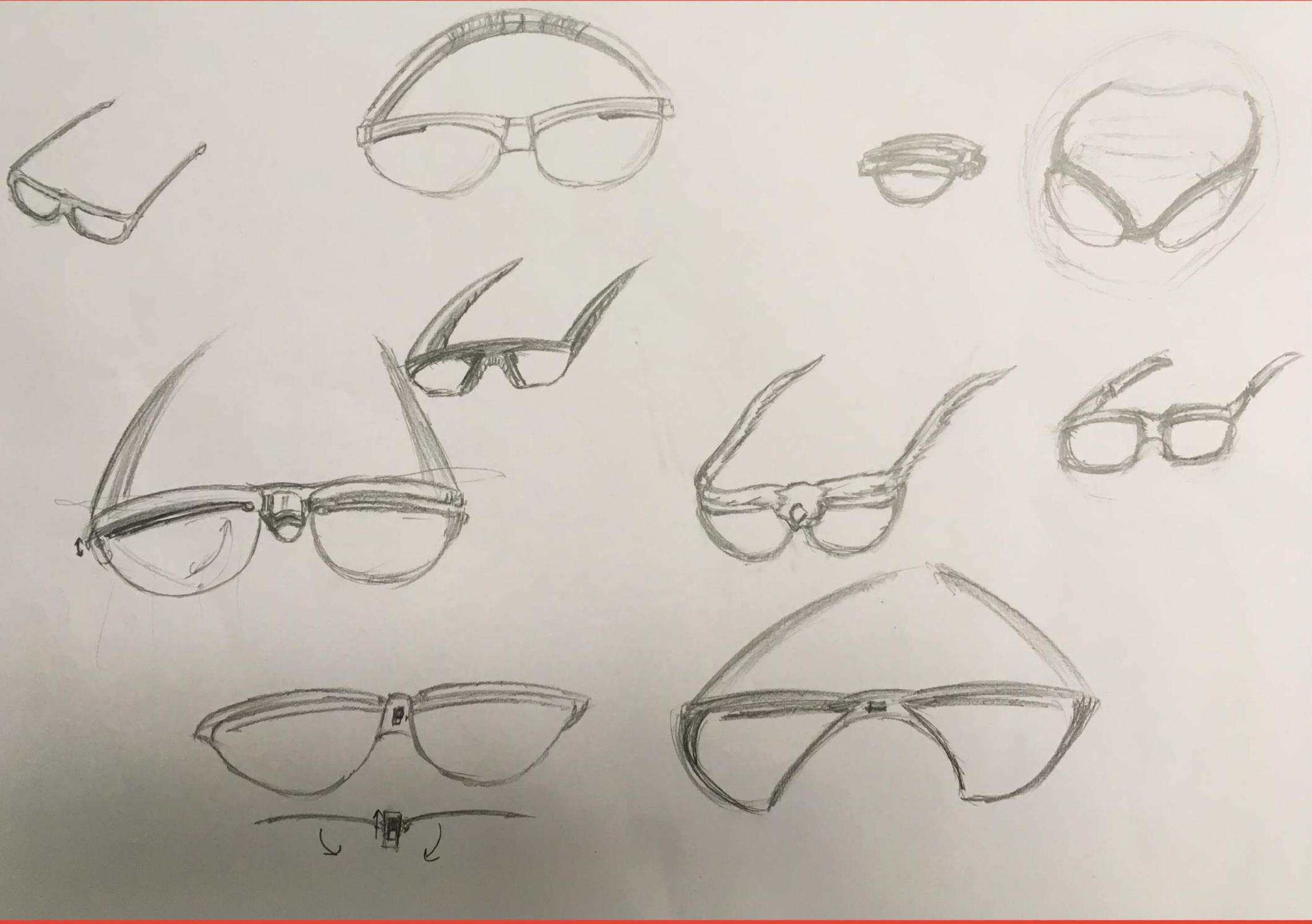
To design a pair of spectacles which solves issues faced by a general user and can suit all face sizes.

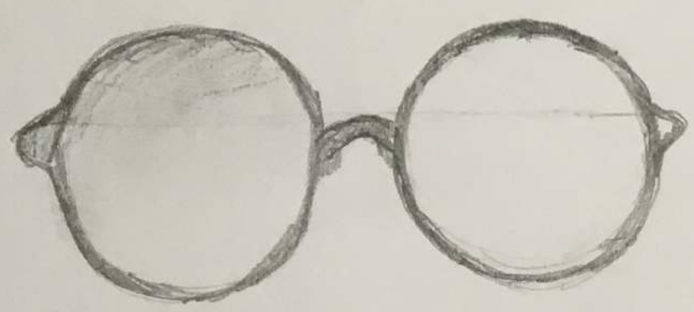
TARGET AUDIENCE

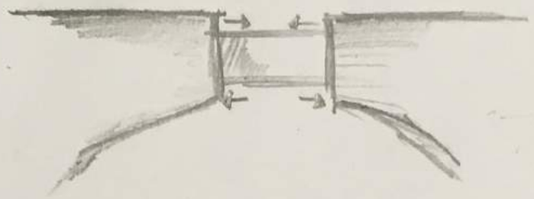
15-60

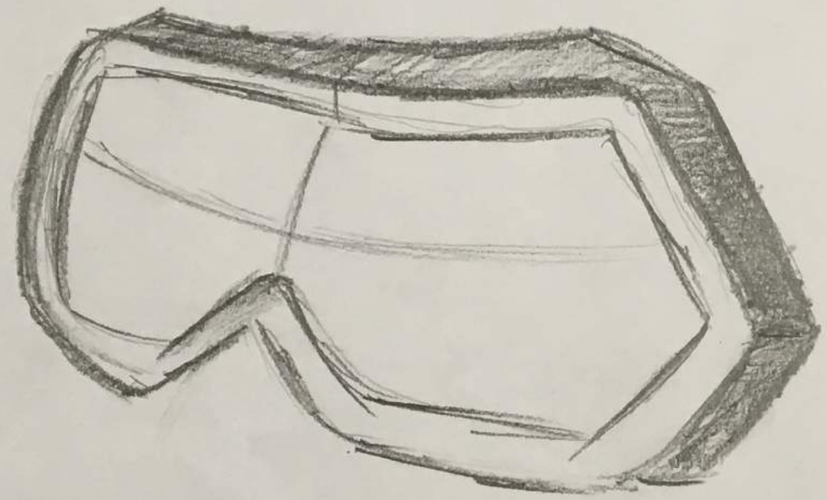
year-old people who use spectacles

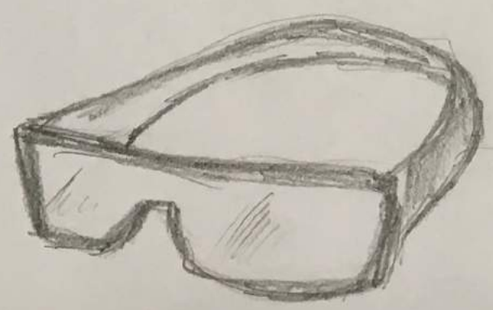
FORM EXPLORATION

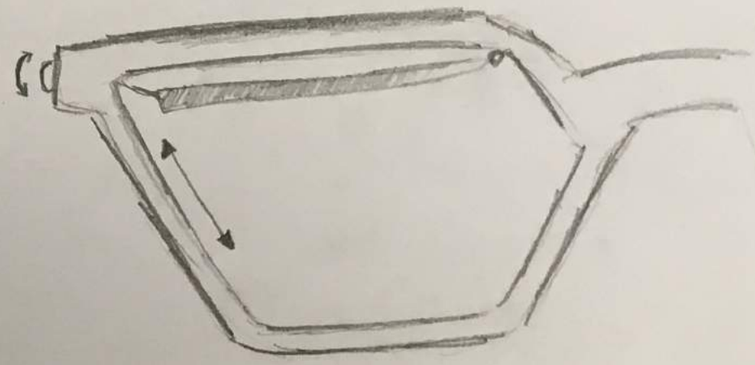


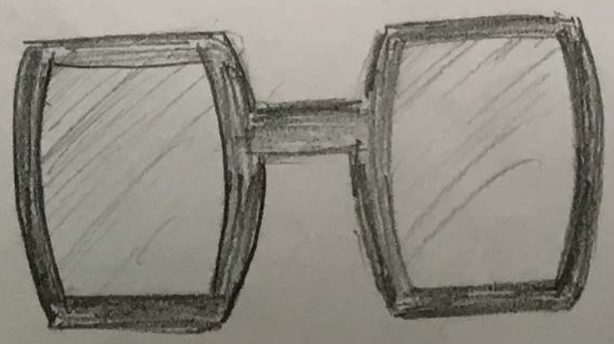












PRODUCT DESCRIPTION

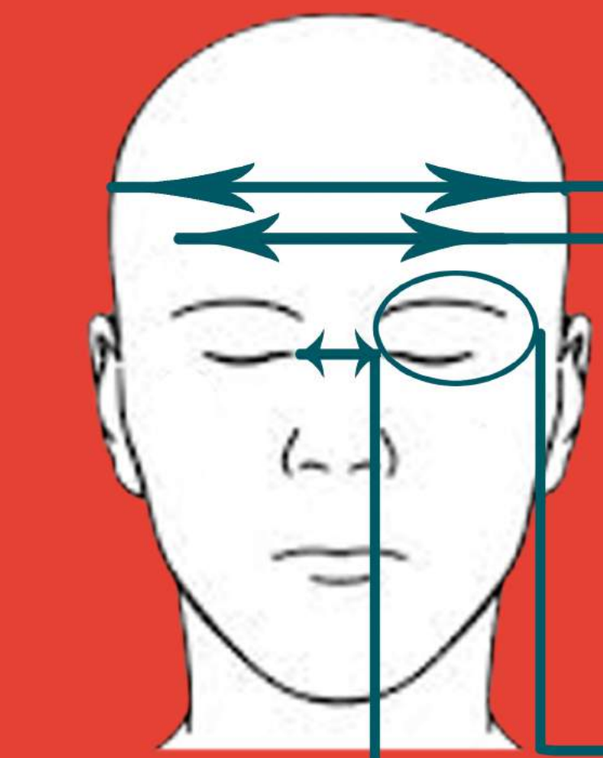
Has a strap/retaining cord to reduce the chances of it falling off

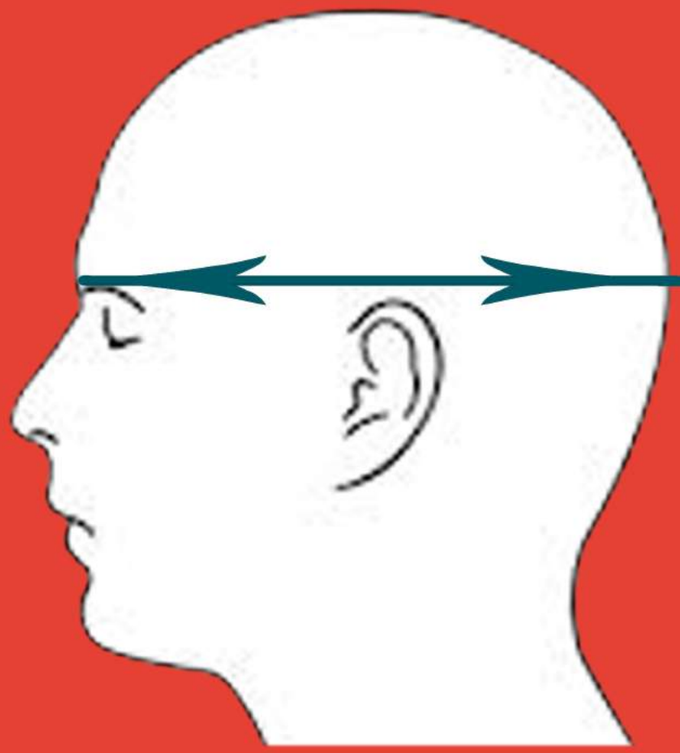
Has a mechanism to adjust size to suit all face sizes

Wipers to keep the glass clear

Soft air chamber nose pads that do not hurt and sit snugly

ERGONOMIC MEASUREMENT

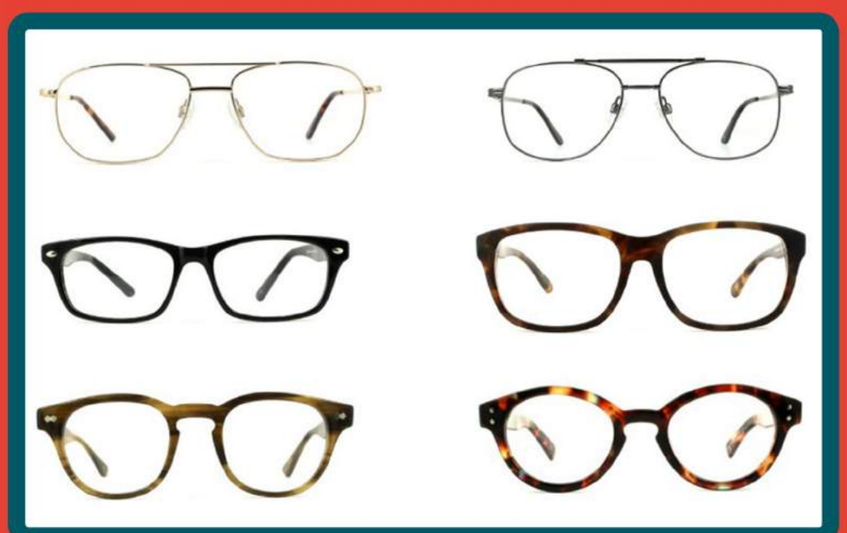




Percentile:	5th	50th	95th
Head Breadth:	133 mm	146 mm	157 mm
Outer eye dist:	85 mm	100 mm	115 mm
Lens size:	45 mm	50 mm	52 mm
Inner eye dist:	23 mm	30 mm	39 mm
Head length:	170 mm	185 mm	199 mm
Circumference:	509 mm	540 mm	569 mm

MARKET STUDY

Nose pads come in different shapes. Bean-shaped, shaped along the bridge, oval and rectangular



Frames are made of different materials.
Metal: Titanium, Monel, Steel and Aluminium
Non-Metals: Zylonite, Cellulose acetate propionate, Nylon
Titanium is the most expensive.
Cellulose acetate propionate is hypoallergic, lightweight and cost effective.
Aluminium frames are light, but options are limited in colour.

Lenses are made of High-index plastics, Polycarbonate, Tribrid, Trivex or Crown Glass.
Trivex is light, Anti-UV and impact-resistant.
Crown Glass is heavy and breaks easily.
Tribrid is thin and lightweight

MATERIAL

FRAME

Cellulose acetate propionate

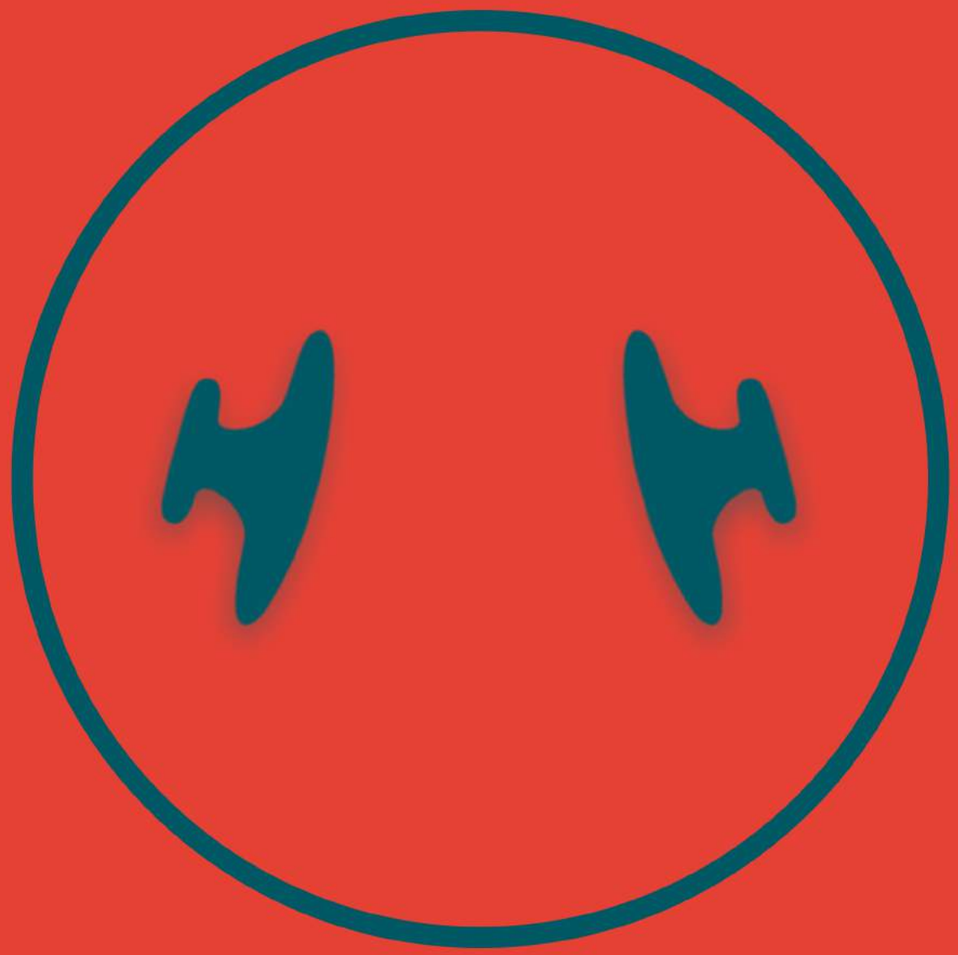
- Nylon based plastic
- Hypoallergic (causes no allergy)
- Lightweight
- Cost effective
- Glossy or matte
- Any colour

LENSES

Trivex

- Urethane-based pre-polymer
- Excellent optics, crisp and sharp
- Lightweight (lightest lens material)
- 100% UV resistant
- Superior impact resistance
- Chemically resistant

NOSE PADS



Silicone

- Soft
- Non-slip
- Lightweight
- Skin-friendly
- Removable
- Water/sweat has no effect

STRAP

Neoprene

- Spectacles can be secured around neck when not in use
- No temple tip, so does not hurt behind ears
- Lightweight
- Skin-friendly
- Water/sweat has no effect

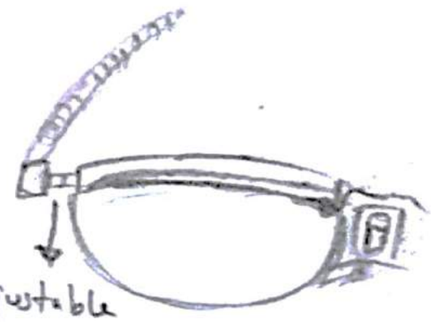
WIPERS

Polyethylene with microfiber edge line

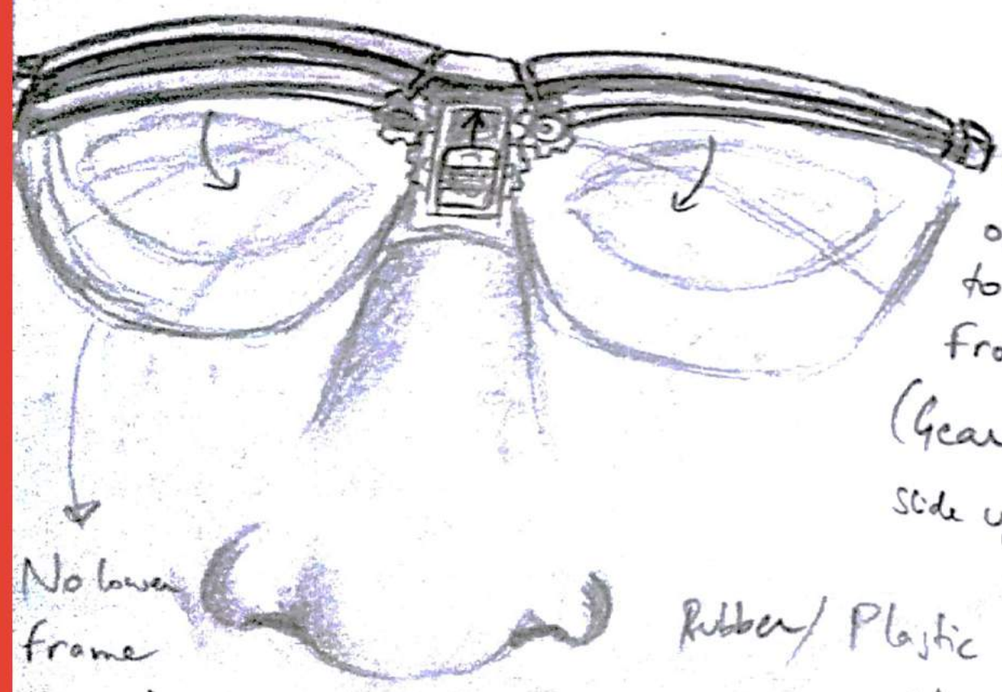
- Microfiber end wipes off water and dust

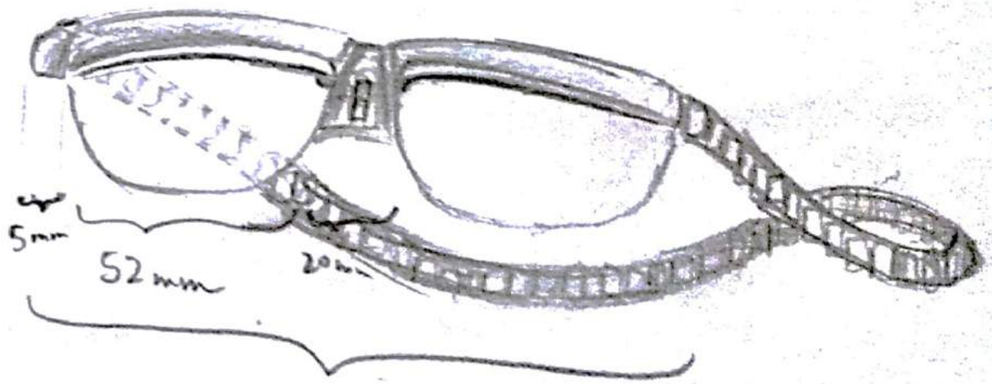
Magnified view

CONCEPTS

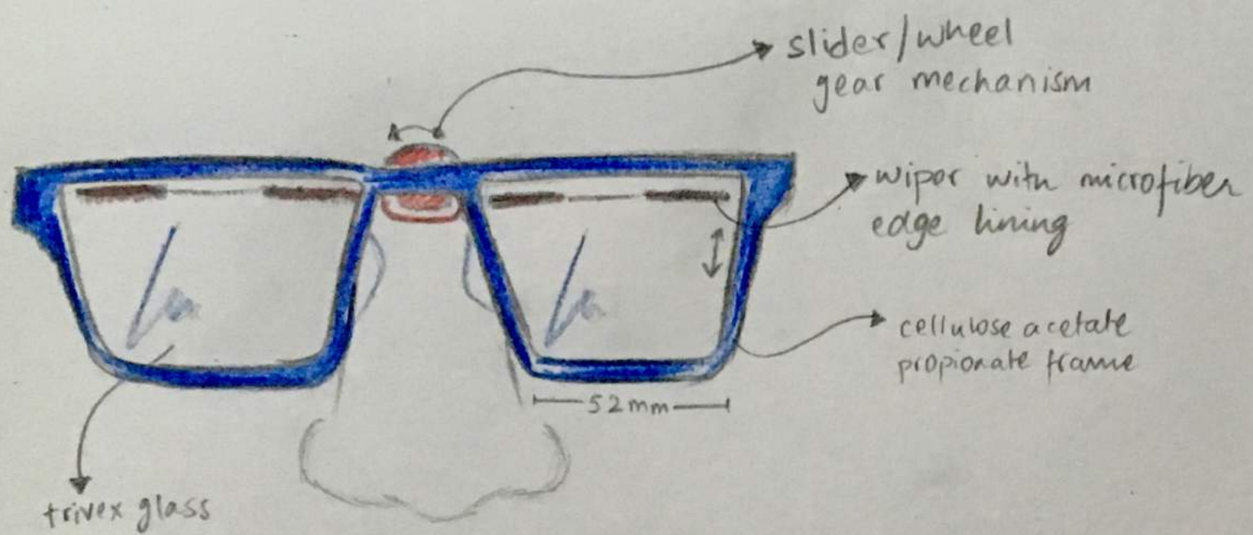

Adjustable
width

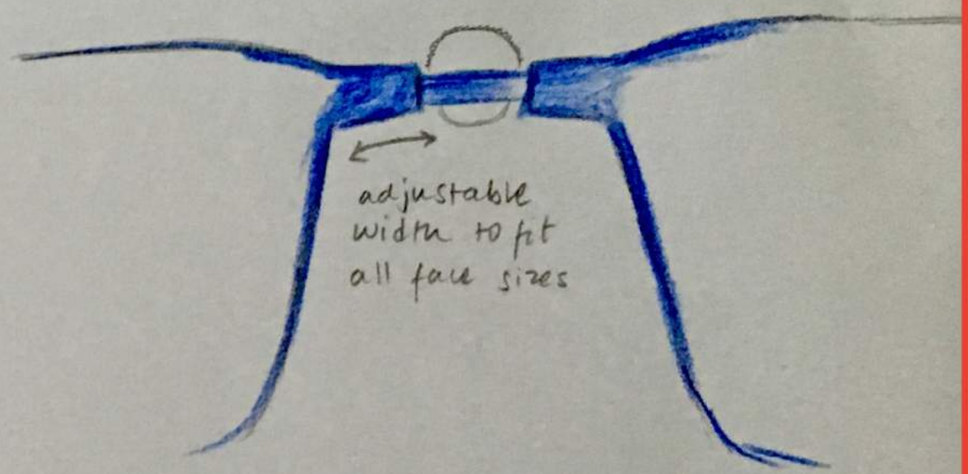

Expandable adjustable strap
Press down to release
510 - 580mm

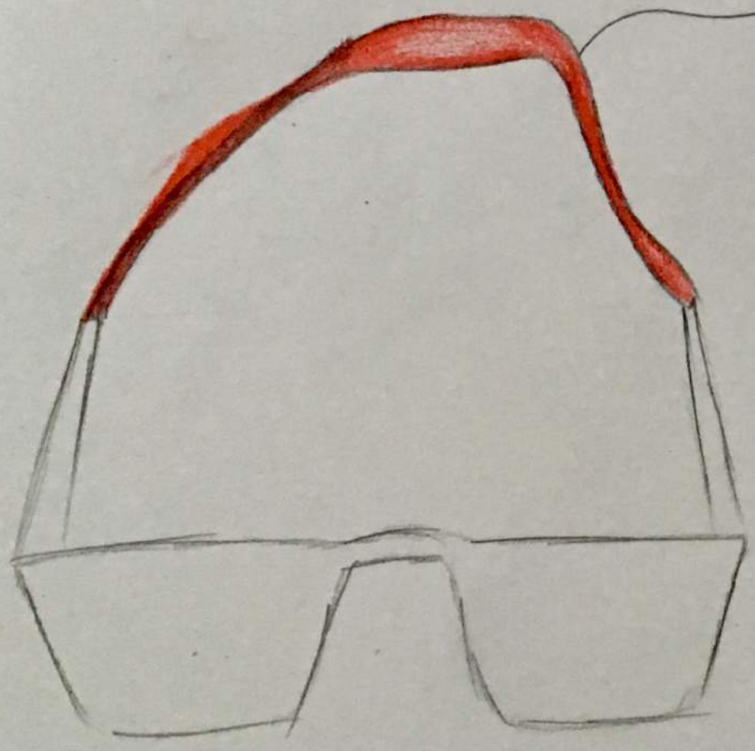

Wipers can be operated manually to remove water from the lens
(Gear operated, slide up to use)
No lower frame so water droplets can fall down
Rubber/ Plastic parts to reduce weight and increase comfort

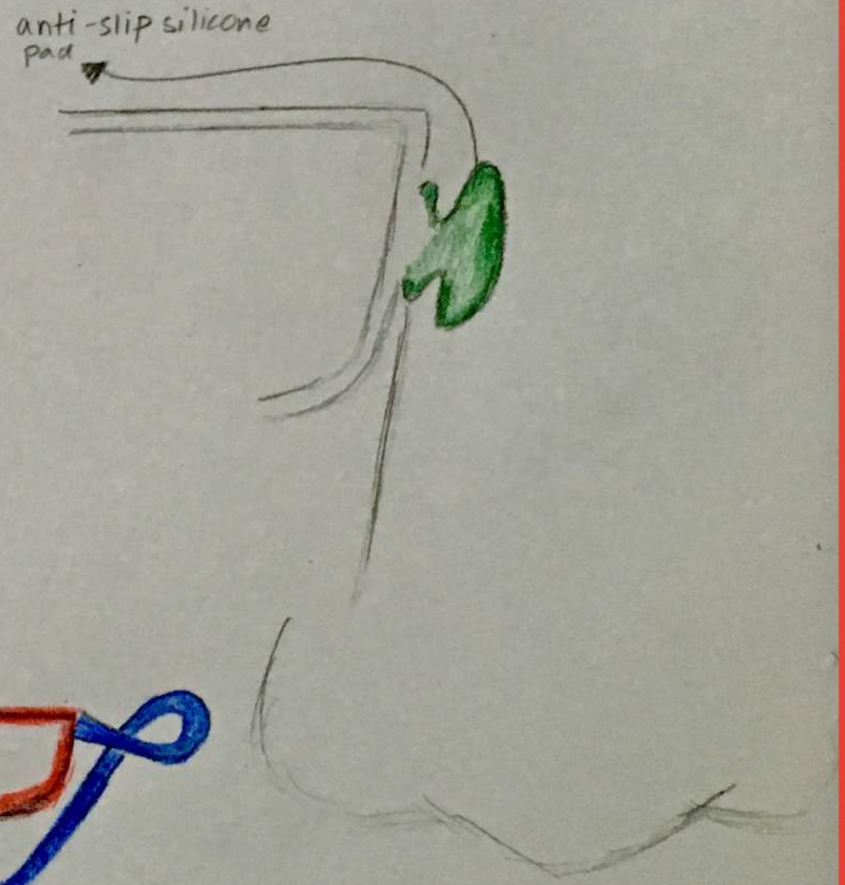

5mm
52mm
135 - 155mm adjustable

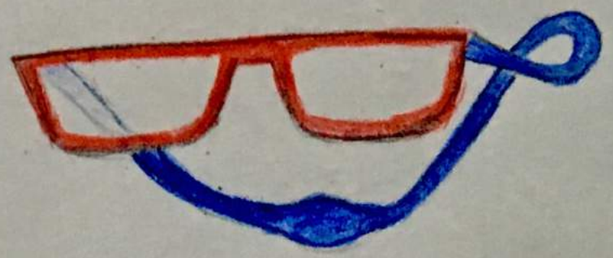
CONCEPT 1


slider/wheel
gear mechanism
wiper with microfiber
edge lining
cellulose acetate
propionate frame
52mm
trivex glass


adjustable
width to fit
all face sizes

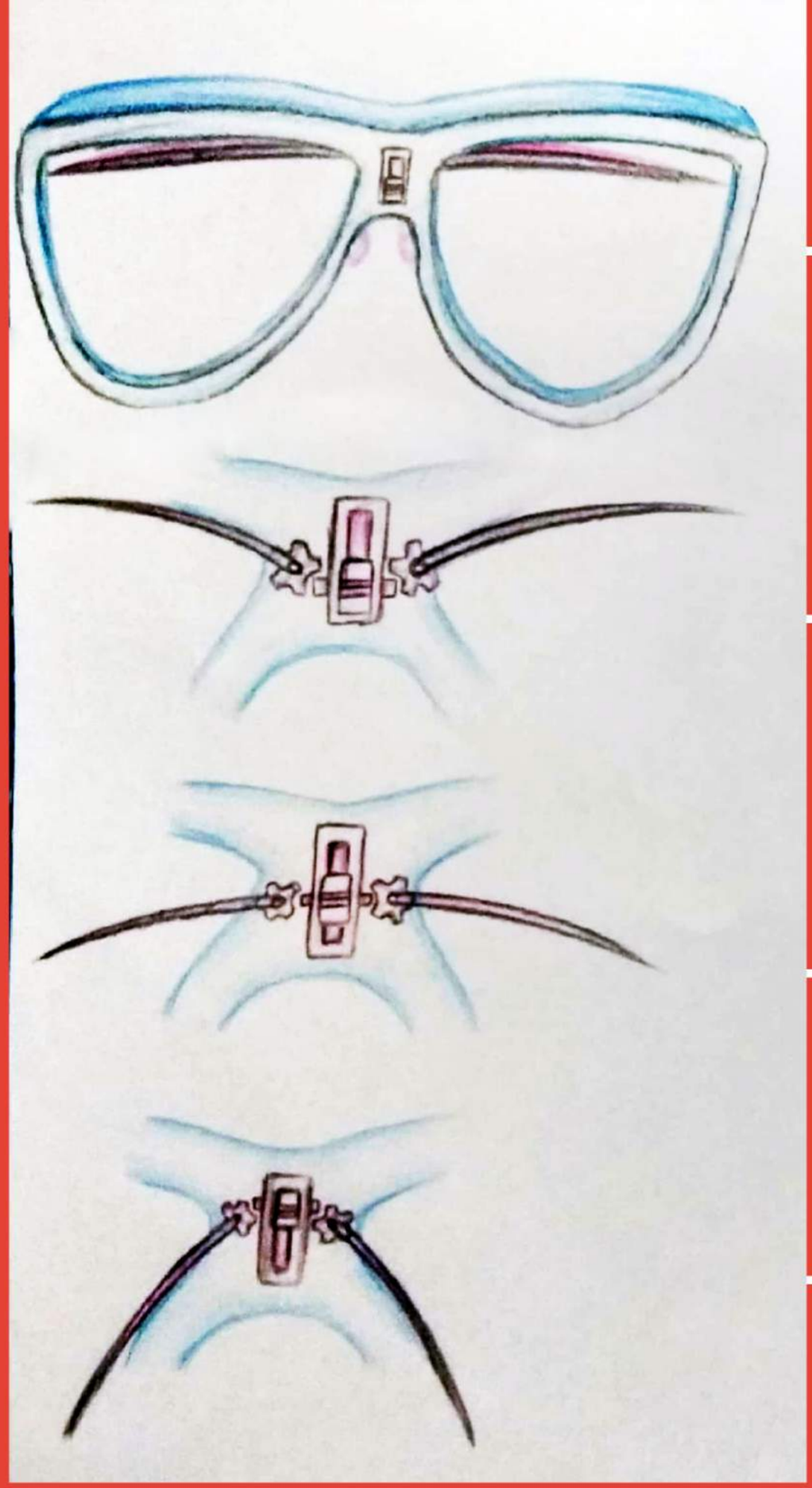

neoprene
band
- can be removed
- adjustable size by
fitting in the temple
part of frame
135-155mm
adjustable


anti-slip silicone
pad



CONCEPT 2

FINAL CONCEPT



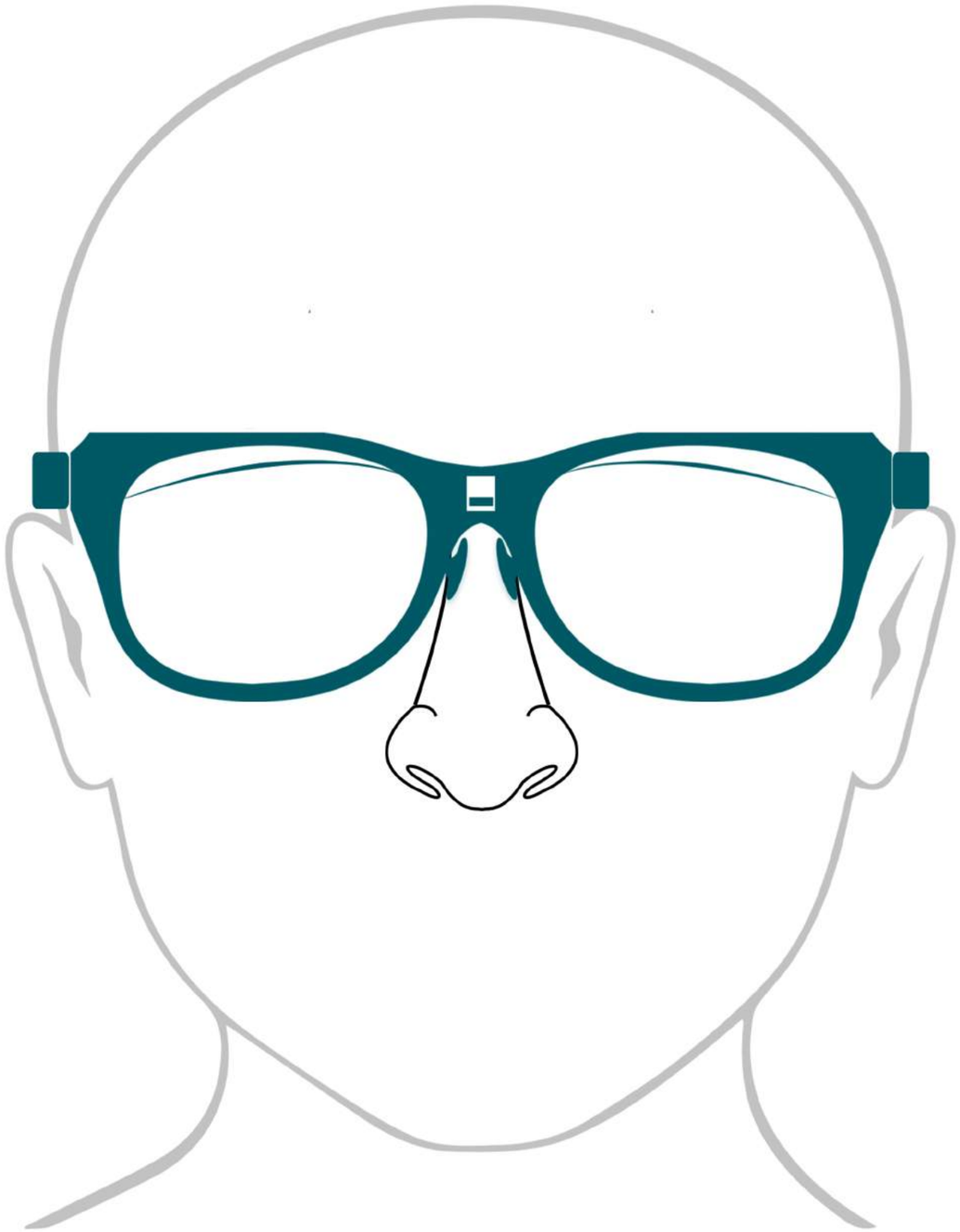
Slider is at the bottom.

As slider is pushed down, the slider tooth turns the gear.

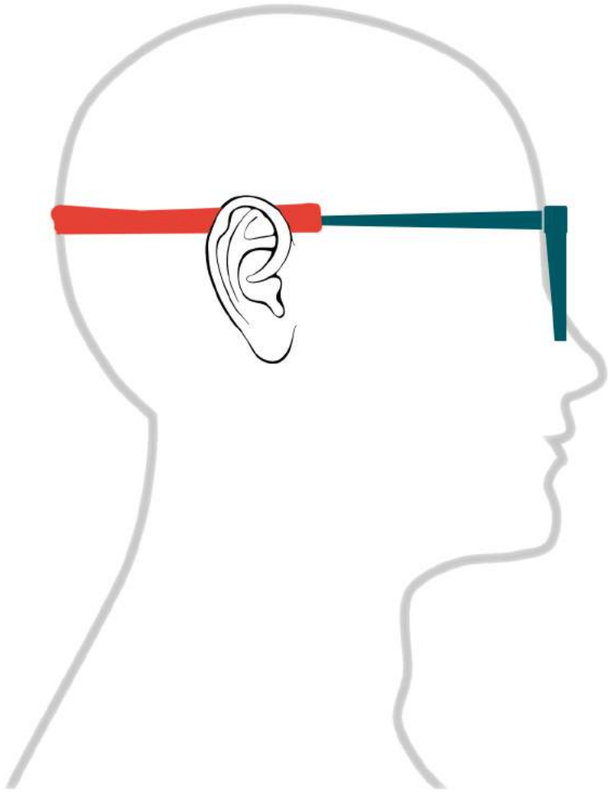
Slider is in the middle.Wiper is halfway down.

Slider at the top. Wiper has wiped the glass.

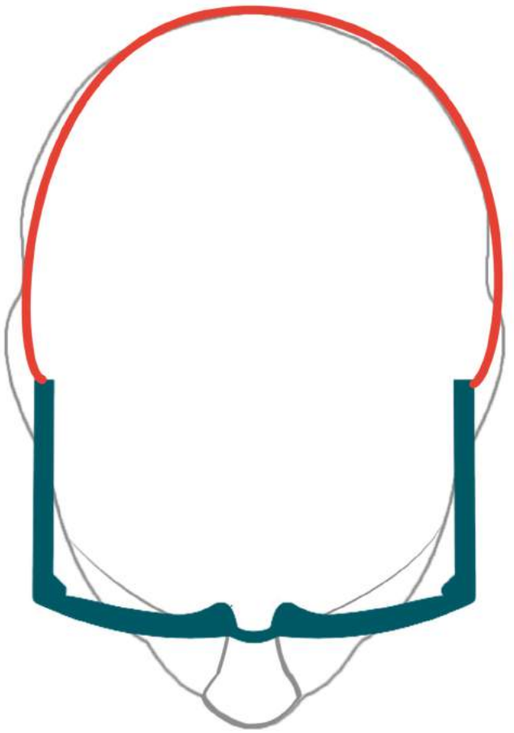
Final Concept



Front view

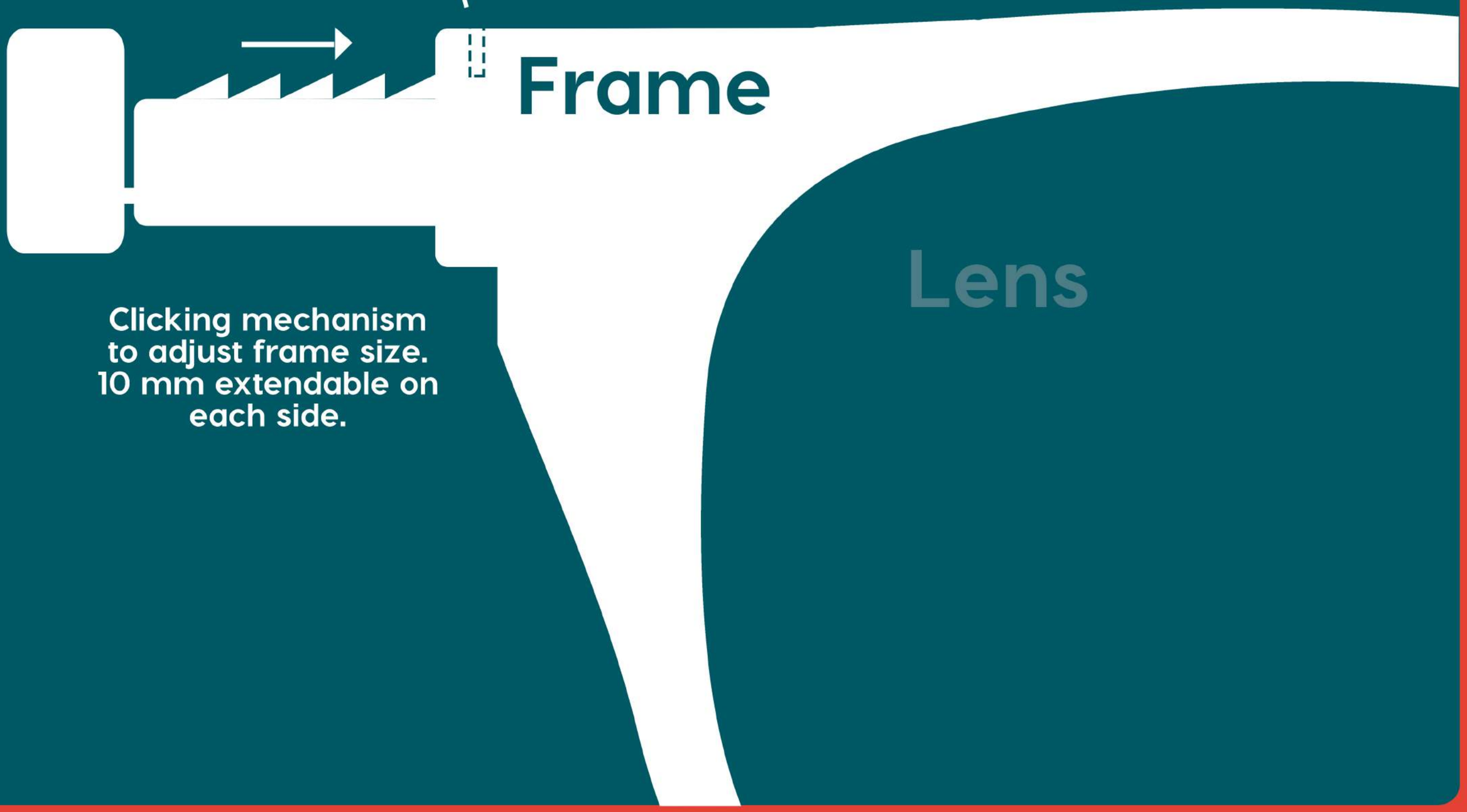


Side view



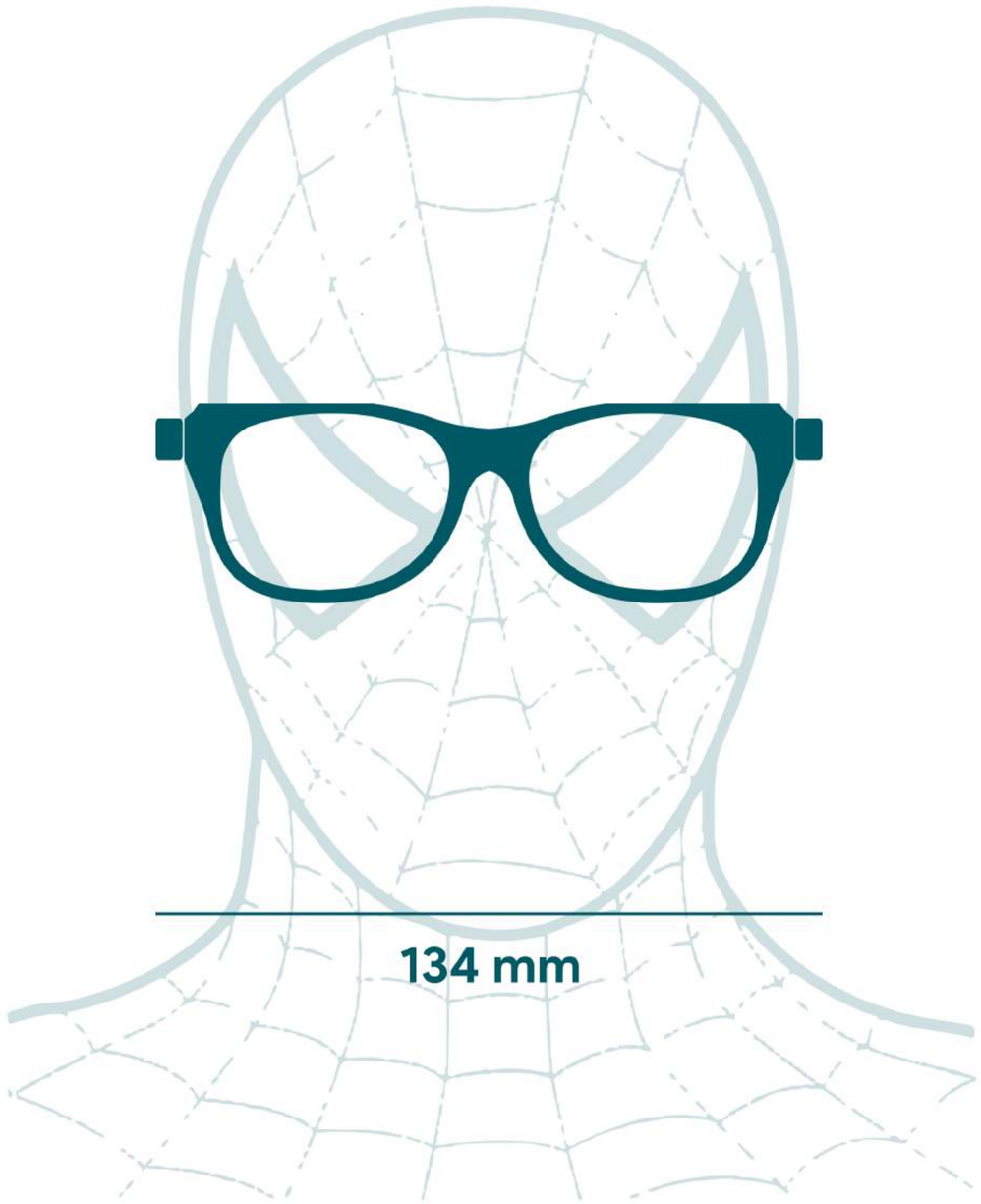
Top view

There is flexible rubber barrier to offer slight resistance while pushing the teeth back in.

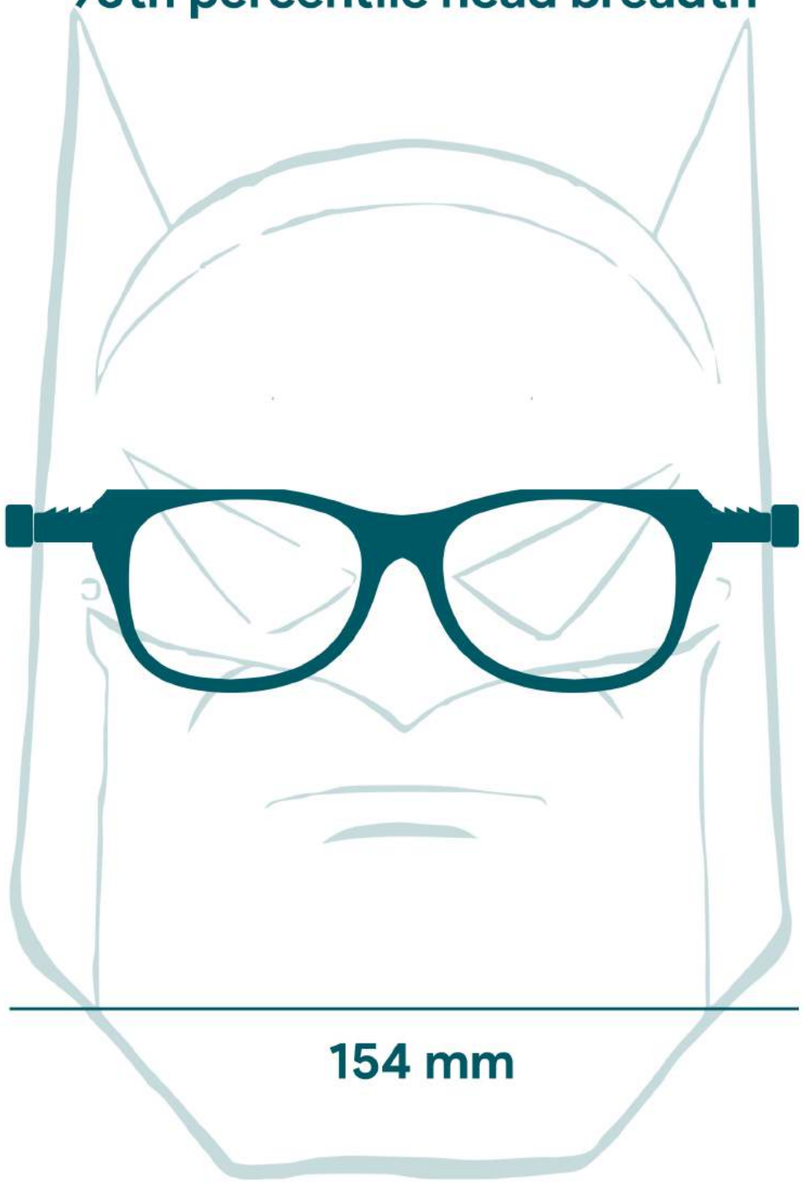


Clicking mechanism to adjust frame size. 10 mm extendable on each side.

Narrow face
5th percentile head breadth

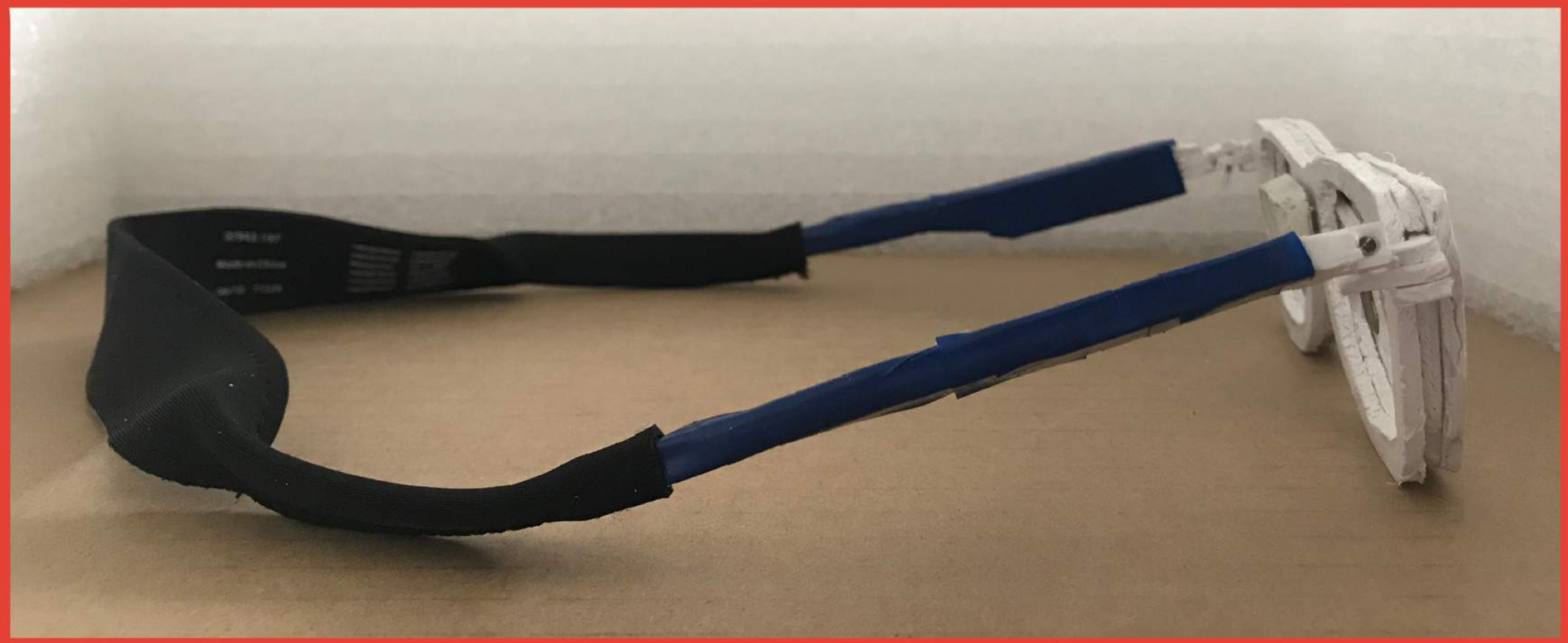


Broad face
95th percentile head breadth



PROTOTYPE

PROTOTYPE



THANK YOU