# RWANDA STANDARD

# RS 433-2

First edition

2020-04-24

# Face masks — Specification —

# Part 2: Barrier masks



**ICS 11.140**

Reference number

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In order to match with technological development and to keep continuous progress in industries, standards are subject to periodic review. Users shall ascertain that they are in possession of the latest edition





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**Contents** Page

## Foreword

Rwanda Standards are prepared by Technical Committees and approved by Rwanda Standards Board (RSB) Board of Directors in accordance with the procedures of RSB, in compliance with Annex 3 of the WTO/TBT agreement on the preparation, adoption and application of standards.

The main task of technical committees is to prepare national standards. Final Draft Rwanda Standards adopted by Technical committees are ratified by members of RSB Board of Directors for publication and gazettment as Rwanda Standards.

RS 433-2 was prepared jointly by Technical Committee RSB/TC 034*, Medical equipment and accessories* and *RS*B/TC 029, *Textile and Leather Technology*

In the preparation of this standard, reference was made to the following standards

1) AFNOR –SPEC S76-001, *Barrier — Guide to minimum requirements, methods of testing, making and use Serial manufacture and artisanal making (or DIY)*

2) NC 2970: 2020, *Masques barrieres: guide d'exigences minimales, de methode d'essais, de confection et d'usage ,fabrication en serie et confection artisanale.*

The assistance derived from the above sources is hereby acknowledged with thanks.

RS 433 consists of the following parts, under the general title *Face masks — Specification*:

— *Part 1: Medical masks*

— *Part 2: Barrier masks*



## Committee membership

The following organizations were represented on the Technical Committee on *Textile and leather technology*(RSB/TC 029) in the preparation of this standard.

Centre Hospitalier Universitaire de Kigali (CHUK)

Dokmai Rwanda Ltd

GBF Leather and Art promoters Ltd

GLO CREATIONS

LIXIL/SATO

Ministry of Trade and Industry (MINICOM)

RMH

Rwanda clothing Ltd

UTEXRWA Ltd

Rwanda Standards Board (RSB) – Secretariat

# Introduction

Barrier masks have been around for years and are used to block fumes, dust, and allergens. They are not particulate filtering like N95 face masks or considered Personal Protective Equipment (PPE). These are devices designed to enhance protection measures especially whenever there is a requirement that people wear a mask or covering when going out in public because of mounting evidence that infected people without symptoms can spread diseases through respiratory droplets, touching nose, eyes or mount with contaminated hands.

Barrier masks are low cost since they are reusable and produced using fabrics available on local market and without unusual technology. They are designed in accordance with accepted best practices and production quality control remains the manufacturer's sole responsibility.The manufacturer is permitted to conduct verification and validation tests within the enterprise or in collaboration with a test laboratory that has the appropriate means of testing.

Wearing of a barrier mask does not guarantee total protection but constitutes a protective mechanism against possible penetration of the contaminants in the user’s mouth and or nose area from his or her own hand or a nearby person.The barrier mask will have maximum effectiveness if it is worn in direct contact with bareskin.



# Face masks — Specification — Part 2: Barrier masks

## 1 Scope

This Rwanda Standard specifies the requirements for the material, design, performance, methods of sampling and test; and use recommendations of the barrier face masks made from woven, non-woven or knitted textile fabrics.

This standard does not apply to filtering half masks used as respiratory protective devices against particles nor to medical face masks covered by RS 433-1.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies

ASTM F2299, *Standard Test Method for Determining the Initial Efficiency of Materials Used in Medical Face Masks to Penetration by Particulates Using Latex Spheres1*

RS ISO 3758, *Textiles — Care labelling code using symbols*

ISO 4915,*Textiles — Stitch types — Classification and terminology*

ISO 9073-1, *Textiles — Test methods for nonwovens — Part 1: Determination of mass per unit area*

ISO 11737-1, *Sterilization of health care products — Microbiological methods — Part 1:Determination of a population of microorganisms on products*

ISO/TS 16976-2, *Respiratory protective devices — Human factors — Part 2: Anthropometrics*

ISO 22609, *Clothing for protection against infectious agents — Medical face masks — Test method for resistance against penetration by synthetic blood (fixed volume, horizontally projected)*

RS ISO 105-C10, *Textiles — Tests for colour fastness — Part C10: Colour fastness to washing with soap or soap and soda*

RS ISO 105-E04, *Textiles — Tests for colour fastness — Part E04: Colour fastness to perspiration*

RS ISO 105-X11, *Textiles — Tests for colour fastness — Part X11: Colour fastness to hot pressing*

RS ISO 105-B02, *Textiles — Tests for colour fastness — Part B02: Colour fastness to artificial light: Xenon arc fading lamp test*

RS ISO 3801, *Textiles — Woven fabrics — Determination of mass per unit length and mass per unit area*

RS ISO 5636-5, *Paper and board — Determination of air permeance (medium range) — Part 5: Gurley method*

## 3 Terms and definitions

For the purposes of this standard, the following terms and definitions apply:

**3.1**

**exhaled air**

air breathed out by the wearer

**3.2**

**inhaled air**

air breathed in by the wearer

**3.3**

**head harness**

holding a barrier mask in place on the head

**3.4**

**barrier mask**

facepiece covering the mouth, nose and chin fitted with a head harness

**3.5**

**breathing resistance**

resistance of a barrier mask to the flow of air inhaled (inhalation resistance) or exhaled (exhalation resistance)

**3.6**

**infective agent**

micro-organism that has been shown to cause surgical wound infections or that might cause infection in the patient, members of staff or other



**3.7**

**exhalation valve**

non-return valve which allows the escape of exhaled air from the facepiece

**3.8**

**inhalation valve**

non-return valve which allows breathable gas to enter the facepiece and prevents exhaled air from leaving via the inlet path

# 4 Requirements

## 4.1 General requirements

### 4.1.1 Materials and design

#### 4.1.1.1 Materials

**4.1.1.1.1** The barrier mask shall be made of nonwoven, woven or knitted tightly structured fabrics with or without film.

**4.1.1.1.2** The materials used shall be able to withstand handling and wear throughout the life time of the barrier mask, indicated by themanufacturer.

**4.1.1.1.3** The parts of the barrier mask likely to be in contact with the user shall be free from sharp edges and burrs.

**4.1.1.1.4** Materials that come into contact with the user's skin shall not present known risks of irritation or any other adverse effect tohealth.

**4.1.1.1.5** The barrier mask shall not disintegrate, split or tear during intended use.

**4.1.1.1.6** The barrier mask shall be able to wistand a full wash cycle (wetting, washing, rinsing) at least 30 minutes with a wash temperature of 60 °C.

**4.1.1.1.7** Head harness shall be designed such that the barrier mask can be easily put on and removed and be sufficiently robust to hold the barrier mask in place in such a way as to avoid excessive tightness and discomfort when worn.

**4.1.1.1.8** The elastic shall be a synthetic elastomeric material of approximate width of 5 mm. The length shall be suchthat the elastic fits comfortably around the head of the wearer.

### 4.1.2 Design

Barrier face mask shall:

a) bear head harness that can be made using an elastic strip or textile fabric strip for its adjustment on the user's head;

b) be designed to allow inhaled air penetrate directly in the region of the nose and mouth and the exhaled air discharge via the same route directly into the ambient atmosphere; and

c) cover the nose, mouth and chin as per Figure 1 and does not incorporate any exhalation and/or inhalation valve(s).

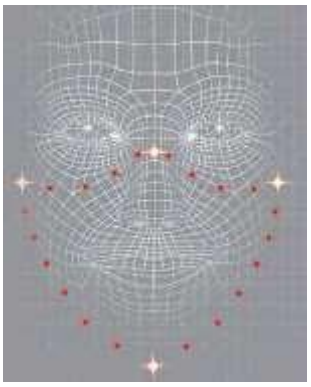


**Figure 1 — The barrier mask's protection area**

d) have different shapes and constructions. Typical shapes of barrier face mask are duckbill shape as per Figure A.3 or flat-fold shape as per Figure A.7 (See Annex A).

#### 4.1.3 Handling

#### 4.1.4 Cleaning and drying

**4.1.3.1** The barrier face mask is designed to be reusable; the materials used shall withstand the cleaning products and methods specified by the manufacturer.

**4.1.3.2** It shall be subjected to the full wash cycle (wetting, washing, rinsing,drying) at least 30 minutes with a wash temperature of 60 °C and pressed before packing or any other equivalent sterilization method.

### 4.2 Specific requirements

#### 4.2.1 Sizes and designation

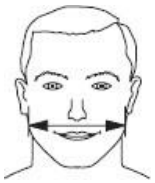
**4.2.1.1** The proposed dimensions are based on certain anthropomorphic data taken from ISO/TS 16976-2. Annex A gives recommendations on how to make a barrier face mask that meets specified dimensions for Medium size.

**4.2.1.2** The determination of the dimensions of barrier face masks shall consider the following:

a) Bigonial breadth:

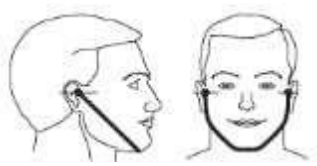




b) Menton-sellion:

c) Bitragion chin arc:





**4.2.1.**3 Barrier face masks shall be designated as extra- small, Small, Medium, Large and Extra large in accordance with the dimensions given into Table 1.

**Table 1 – Dimensions to be taken into account**

| **Designation** | **Bigonial breadth** | **Menton-sellion** | **Bitragion chin arc** |
|---|---|---|---|
| **Extra-Small,** mm | 88 – 90 | 91 – 100 | 248 – 271 |
| **Small,** mm | 98 – 105 | 104 – 111 | 280 – 306 |
| **Medium,** mm | 110 – 120 | 113 – 123 | 305 – 330 |
| **Large,** mm | 125 – 140 | 124 – 135 | 328 – 355 |
| **Extra – Large,** mm | 145 – 175 | 135 – 156 | 375 – 293 |

### 4.2.2 Performance requirements

Barrier face mask material shall comply with the performance requirements given in Table 2 when tested in accordance with test methods specified therein.

**Table 2 —Performance requirements**

| S/N | Parameter | | Requirement | Test method |
|---|---|---|---|---|
| i. | Resistance to penetration,%, min at a limit of 3 µm | Solid particles (Sodium chloride test 95 l/min) | 70 | ASTM F2299 |
| | | liquid particles or droplets (Paraffin oil test 95 l/min) | 70 | |
| ii. | Splash resistance pressure, mbar, min. | | 80 | ISO 22609 |
| iii. | Microbial cleanliness (Bioburden), CFU/g, max. | | 30 | ISO 11737-1 |
| iv. | Tensile strength of the attaching of the tape to the mask, N, min. | | 20 | ISO 9073-3 |
| v. | Total mass per unit area, g/m$^2$ | woven | 120 - 250 | RS ISO 3801 |
| | | non- woven | | ISO 9073-1 |
| vi. | Air permeance, µm/Pa.s | | 315 - 1265 | RS ISO 5636-5 |



### 4.2.3 Colour fastness

The colour fastness of the barrier face mask shall meet the requirements given in Table 3, when tested in accordance with the test methods specified therein.

**Table 3 — Colour fastness requirement**

| S/N | Colour fastness to | Numerical rating min | Testmethod |
|---|---|---|---|
| i. | Washing | 4 | RS ISO 105-C10 |
| ii. | Perspiration | 4 | RS ISO 105-E04 |
| iii. | Hot pressing | 4 | RS ISO 105-X11 |
| iv. | Light | 5 | RS ISO 105-B02 |

# 5 Packing and marking

## 5.1 Packing

Each Barrier mask shall be packed in suitable and environmental friendly packaging material. Barrier masks may be packed into groups in suitable bulk containers to protect them from any mechanical damage and any contamination during transportation, distribution and storage.

## 5.2 Labelling

### 5.2.1 Barrier mask

Each barrier face mask shall be neatly, legibly, and indelibly marked with the following information:

a) trade mark or Manufacturer’s Name

b) description of the material used;

c) recommended period of use for the barrier face mask; and

d) handling instructionsincluding washing, bleaching, drying and ironing as per RS ISO 3758.

### 5.2.2 Bulk containers

The following information shall appear in neat, legible, and indelible marking on the outside of each bulk container:

a) manufacturer's name and address;

b) name of the product as “Barrier face mask”;

c) trade mark;

d) country of origin;

e) quantity;

f) illustration of the face mask and how to use it and dispose it; and

g) level of protection.

# 6 Sampling and Inspection for compliance

**6.1** Compliance to the requirements of this standard shall be done through inspection for freedom from physical damage, dimensions, packaging and labelling as per the requirements of Clause 5, availability of data

on biocompatibility as per relevant part of ISO 10993-1 and or testing for performance requirements in clause 4.2.2 and 4.2.3.

**6.2** Random sampling shall be done by drawing the number of face masks relative to the appropriate lot size as specified in Table 4.

**Table 4 — Sample sizes and compliance criteria**

| Lot size | Sample for inspection | | Sample for testing | |
|---|---|---|---|---|
| **Lot size** | **Sample size** | **maximum number of failure** | **Sample size** | **maximum number of failure** |
| 10 - 100 | 10 | None | 2 | None shall fail |
| 101 - 500 | 20 | 1 | 5 | |
| 501 - 1000 | 30 | 2 | 8 | |
| 1001 - 1500 | 40 | 3 | 10 | |
| 15001 - 2500 | 55 | 4 | 12 | |
| 2501 and above | 80 | 5 | 14 | |



# Annex A
(informative)

# Procedure for designing and making of Large Size “ Duckbill” and Large Size “Flat-fold” barrier face masks

## A.1 General

**A.1.1** The dimensions and shape of the pieces of the textile fabric shall be designed such that on completion of assembly with the head harness (and if applicable the nose bridge), the barrier mask can be adjusted to the user’s morphology.

**A.1.2** Assembly of the pieces can be done by ultrasonic by stitching.

**A.1.3** At the time of making, the hygiene conditions shall be controlled to reduce risks of contamination and making shall be followed by cleaning of the barrier masks before packaging and before use.

**A.1.4** The shapes of barrier masks can be “duckbill”type given in A3, “flat-fold”barrier face mask is given in A.7or any other shape that serves its purpose.

## A.2 Medium Size “Duckbill” type barrier face mask

### A.2.1 Dimensioning

#### A.2.1.1 Textile fabric

It is recommended to use the following sizing for the textile fabric of the “duckbill” type barrier mask:

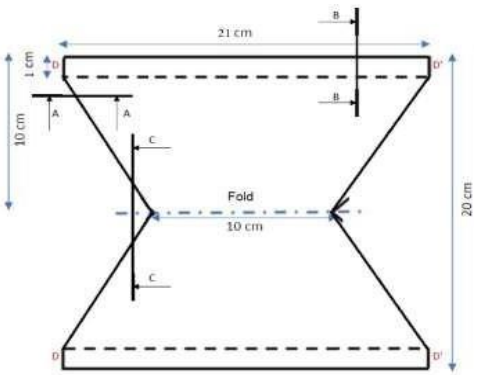



**Figure A.1 — Duckbill - Sizing for the textile fabric**

#### A.2.1.2 Head harness

It is recommended to use the following sizing for the head harness of the “duckbill” type barrier face mask

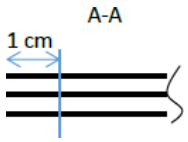
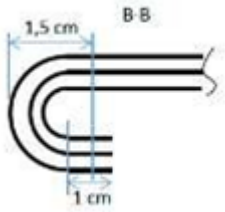

**Figure A.2 — Duckbill - Sizing of head harness**

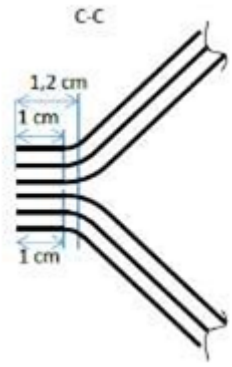
### A.2.2 Procedure

To make a “duckbill” type barrier mask, it is recommended to follow the steps listed in Table 2.The stitch types used may be 301 or 401 0r 504 in accordance with the descriptions provided in ISO 4915.



**Table A.1 — Procedure for making duckbill type barrier face mask**

| Steps | Diagram | Necessary equipment |
|---|---|---|
| a) Prepare the textile fabric pieces asshown in A.2.1.1; | - | Industrial: Cutting table<br><br>Artisanal (or DIY): Scissors |
| b) Edge stitch (pre-stitch) all around the piece 1 cm from theedges |  | Industrial: stitch 301 or 401 or 504<br><br>Artisanal: flatbed sewing machine, straight or zigzag stitch |
| c) Hem the 2 long edges, sothat the hem is on theinside; |  | Industrial: stitch 301 or 401<br>Artisanal: flatbed sewing machine, straight stitch |

| | | |
|---|---|---|
| d) Fold along the fold line, right sides together (outer fabric surface against outer fabric surface) and stitch theedges. Turn;<br><br>e) Prepare a head harness (two soft elastic strips or two fabric strips) as indicated in A.2.1.2 |  | Industrial: stitch 301 or 401 or 504<br><br>Artisanal: flatbed sewing machine, straight stitch |
| f) Assemble the head harness on themasks; | On the mask, turn down the point formed at point D (see pattern) to the inside of the mask. Thread the elastic strip under the point. Fixthe point in position by sewing it down (parallel to the elastic strip) or by welding it. Repeat this operation with the other point formed at point D'(seepattern).Assemble(orknot)the2ends of the elastic strip. Fixed in this way, theelastic strip can slide. | Industrial: ultrasonic(continuous system of electrode wheel type) stitch 301<br><br>Artisanal: flatbed sewing machine, straight stitch |

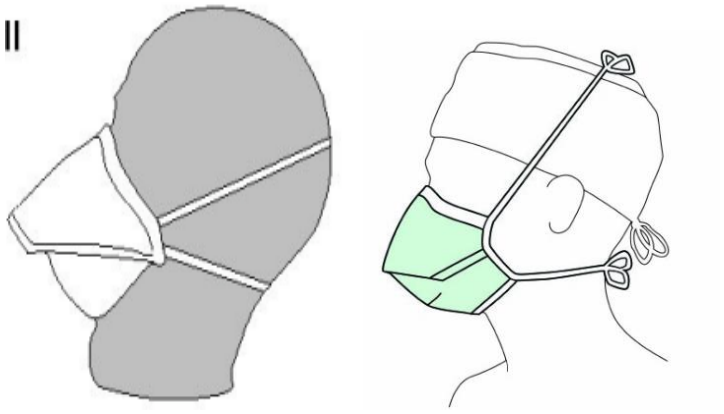


**Figure A.3 —Examples of "duckbill" type barrier mask**

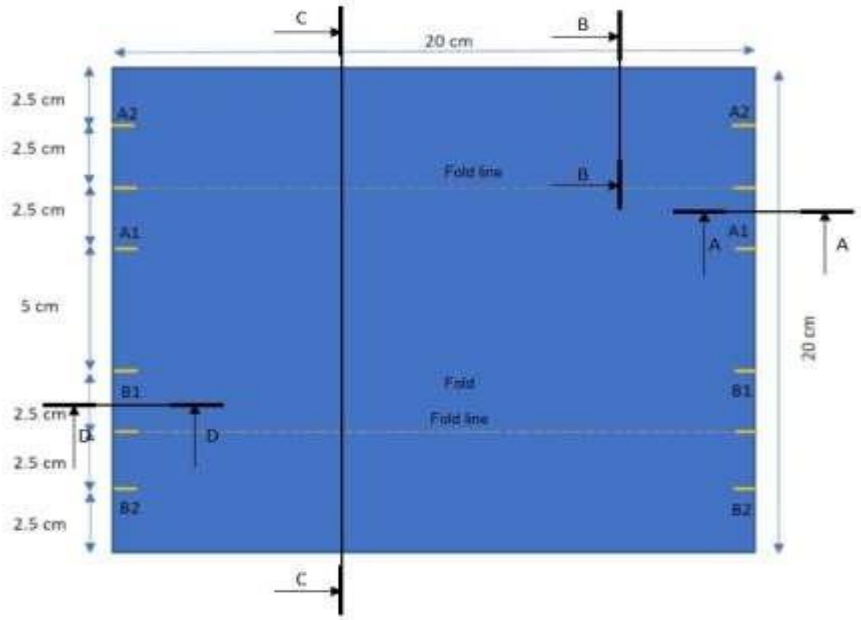
## A.3 Flat-fold" barrier mask

### A.3.1 Dimensioning

#### A.3.1.1 Textile fabric

It is recommendedtousethefollowingsizingforthetextile fabricofthe"flat- fold" barrier mask:

**Figure A.4 — Flat-fold - Dimensioning of the textile fabric**




Making of the fabric mask can also be performed using pattern-making of different pieces assembled by seaming.



#### A.3.1.2 Head harness

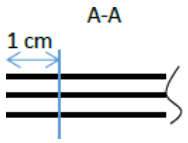
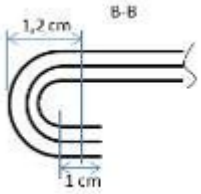
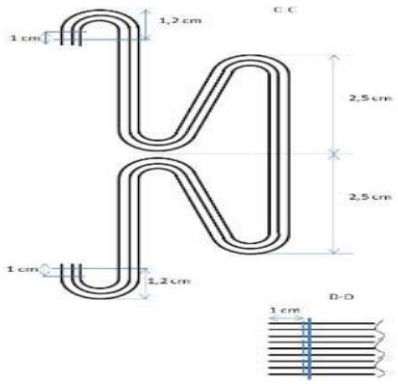
It is recommended to use the following sizing for the head harness of the "flat-fold" barrier mask:


**Figure A.5 — Flat-fold - Sizing of the head harness**

### A.3.2 Procedure

To make a“flat-fold”barrier face mask, it is recommended to follow the following steps.

**Table A.2 — Procedure for making “flat-fold”barrier face mask**

| Steps | Diagram | Necessary equipment |
|---|---|---|
| h) Prepare the textile fabric piecesas described in section A.3.1.1; | - | Industrial: Cutting table Artisanal (or DIY): Scissors |
| b) Edge stitch (pre-stitch) all around the piece 1 cm from theedges |  | Industrial: stitch 301 or 401 or 504<br>Artisanal: flatbed sewing machine, straight or zigzag stitch |
| c) Hem the top and bottom of the barrier mask turning in a 1.2 cm hem |  | Industrial: stitch 301 or 401 Artisanal: flatbed sewing machine, straight stitch |
| d) Stitch the pleats folding A1 onto A2 then B1 onto B2 for the first edge;<br>e) Stitch the pleats folding A1 onto A2 then B1 onto B2 for the second edge | | |
| |  | Industrial: stitch 301 or 401 or 504<br>Artisanal: flatbed sewing machine, straight stitch |
| f) Prepare a head harness (two soft elastic strips or two fabric strips)as indicated in section A.3.1.2. | | |
| For an elastic harness, for passing behind the ears, edge stitch one elastic strip onto the right edge at the top and bottom (elastic strip facing inward) then edge stitch the other elastic | | 5<br>Industrial: ultrasonic |

| | |
|---|---|
| strip onto the left edge at the top and bottom (elastic strip facinginward).<br>For an elastic harness, for passing behind the head, edge stitch one elastic strip onto the right edge at the top then onto the left edge at the top (elastic strip facing inward) then edge stitch the other elastic strip onto the right edge at the bottom then onto the left edge at the bottom (elastic strip facinginward).<br><br>For a fabric harness, edge stitch one fabric strip on the right edge and another onto the leftedge | (continuous system of electrode wheel type) stitch 301<br>6<br>Artisanal: flatbed sewing machine, straight stitch |

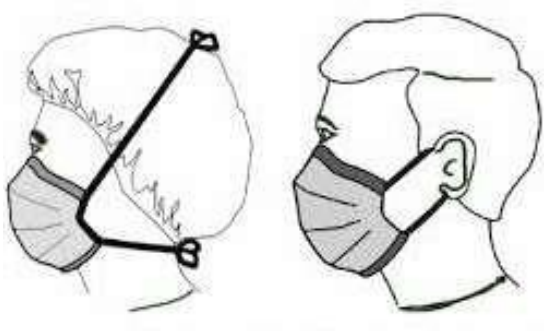


**Figure A.7 — Example of “Flat-fold” barrier mask**

# Annex B
(normative )

## Recommendation for making a barrier mask

**B.1** The following material specified in Table 4 below are recommended for use in the manufacturing of barrier masks to confirming with requirements for breathability at a vacuum pressure of 100 Pa and splash protection **(3 µm).**

**Table 4 — list of the materials for barrier masks**

| S/N | Structure(layers) | Composition |
|---|---|---|
| i. | Woven, plain weave | Cotton |
| | Nonwoven | Viscose |
| | Woven, plain weave | Cotton |
| ii. | Woven | Cotton |
| | Woven | Cotton |
| iii. | Knit (flat- knit, weft insertion) | 100 % polyamide |
| | Nonwoven | 100 % polyester |
| iv. | Nonwoven | Polypropylene |
| | Nonwoven | Polypropylene |



**B.2** In addition to the material selection, the following shall be observed:

a) fabrics shall be tightly constructed;

b) fabrics shall be to allow air to pass through when breathing;

c) fabrics shall be sufficiently soft and supple to apply around the face to ensure sealing;

d) use of fabrics that are not too warm;

e) use of smooth, non-irritating fabrics;

f) do not use light and loosely constructed fabrics;

g) do not use staples when designing or assembling the barrier mask;

h) avoid the use of fabrics that are too stiff that would not be appropriate for sealing;

i) avoid the use of use warm fabrics that would make masks difficult to wear;

i) avoid the use of use irritating fabrics that would make masks difficult to wear;

j) avoid to make vertical seams, along the nose, mouth and chin;



# Annex C
(informative)

# Use of a barrier face mask

## C.1 General

**C.1.1** Barrier face masks is intended to reduce the risk of general transmission of the infective agents by enhancing other measures aiming at avoiding close contact of people in a situation where peole are required to keep distance from one another while in public, to frequently disinfect the hands, avoid hand to touch their mount, nose and eyes.

**C.1.2** Masks are effective only when used in combination with frequent hand-washing with alcohol-based hand rub or hand washing with soap and water

**C.1.3** To be effective, the barrier face mask must be used correctly. For this,it is recommended to wear the mask on bareskin (in other words without air in contact with the user's skin and,for certain people, a shaven skin).

## C.2 Putting on a barrier mask

**C.2.1** The following steps are followed when putting on a barrier face mask:

a) wash your hands with soap and water or rub with hand sanitizer before any handling of the mask;

b) locate the top of the mask;

c) place the barrier mask on the face, with the nose bridge (if it exists) on the nose;

d) hold the barrier mask on the outside and pass the elastics strips or fabric ties of the head harness behind the head, at either side of the ears, without crossing them;

e) pull down the bottom of the barrier mask under the chin;

f) check that the mask covers the chin properly;

g) pinch the nose bridge (if it exists) with both hands to adjust it over the nose;

h) check that the barrier mask is correctly positioned. This should be done by checking the sealing and that there is no breathing discomfort; and

i) once adjusted, no longer touch the face mask with the hands. Each time the barrier mask is touched, the user must wash the hands with soap and water or rub with hand sanitizer.

**C.2.1** The barrier mask must be removed each time it is dirty or wet. It should not be put in a waiting position on the forehead or under the chin during and after use.

## C.3 Removing a barrier face mask

In order not be contaminated when removing a barrier face mask, it must be correctly removed and isolated, either to be disposed or to be washed. The next are the recommendations to follow:

a) if wearing protective gloves, it is necessary to first remove them;

b) remove the barrier mask by holding the back of the elastic strips of the head harness without touching the front part of the barrier mask. Individuals should be careful not to touch their eyes, nose, and mouth when removing their face covering;

c) place a barrier mask to be disposed or washed in an appropriate container;

d) wash your hands with soap and water or rub with hand sanitizer immediately after removing; and

e) clean the outside of the specific container with a cleaning product.



## C.4 Washing and drying a barrier face mask

**C.4.1** Washing and drying of the barrier mask shall be in accordance with the manufacturer's specifications (instructions for use, washing instructions ortraining).

**C.2.2** Any contact between a dirty barrier mask (to be washed) and clean items of clothing should be avoided. Those responsible for washing should protect themselves in order to handle dirty masks if they are not in a water-soluble bag.

**C.2.3** It is not recommended to use specific products other than those normally used for washing without being certain beforehand that they are non-toxic in terms of inhaled residues, and that their use does not damage the materials with a wash temperature of at least 60 °C. Other similar sterilization method can be used.

**C.2.4** Complete drying (in other words all the core layers for the barrier mask is recommended after washing is finished.

NOTE It is not recommended to clean barrier face masks with a microwave.

C.2.5 A visual inspection (with protective gloves or washed hands) shall be carried out before each wash cycle. If any damage to the barrier mask is detected (less well-fitting, deformation, wear, etc.) the barrier mask shall be thrown away.

## C.5 Disposing of a barrier face mask

The barrier face masks must be disposed of in a dustbin fitted with a plastic bag (preferably with a dustbin with a lid and non- hand operation). Double bagging is recommended to retain the contents of the first bag in the case of tearing of the outer bag during collection.

# Bibliography

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