



**GUIDELINES FOR
PERSONAL PROTECTIVE
EQUIPMENT (PPE)
AIIMS KALYANI
[Standard Operating Procedure]**



Prepared by HICC - AIIMS Kalyani



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TABLE OF CONTENTS

I	INTRODUCTION
II	OBJECTIVE
III	SELECTION OF PPE 3.1. Appropriate use of PPE 3.2. Training 3.3. Disposal and reuse
IV	TYPES AND FUNCTION OF PPE
V	GLOVES AND HAND PROTECTION 5.1. Indication for Glove use 5.2. Indication for Gloves removal 5.3. Clinical situation where use of gloves is not recommended 5.4. Method of gloves use 5.5. Purpose of Double gloves
VI	GOWNS /APRONS 6.1. Objective 6.2. When to use 6.3. Aprons 6.4. Gowns
VII	RESPIRATORY PROTECTION 7.1. Facemask 7.2. Respirator
VIII	CAPS AND BOOTS/SHOE COVER 8.1 Objective 8.2. Do's and Don'ts
IX	PROTECTIVE EYE WEAR AND FACE SHIELD 9.1. Objective 9.2. Types 9.3. Do's and Don'ts 9.4. Removing 9.5. Cleaning
X	SEQUENCE FOR DONNING AND DOFFING OF PPE 10.1. Sequences of Donning 10.2. Sequences of Doffing
XI	ANNEXURE
XII	REFERENCES



I. INTRODUCTION

Personal protective equipment, or PPE, refers to a specialized clothing or equipment; worn by an employee for protection against infectious materials.

II. OBJECTIVE

1. Protect the skin and mucous membrane of Healthcare workers (HCWs) from exposure to blood and/or body fluids and from the HCWs hands to the patients during sterile and invasive procedures.
2. Protect the patients from contracting infections from the HCWs or visitors.

III. SELECTION OF PPE

The selection of appropriate PPE must be based on the following parameters.

1. **Type of anticipated exposure:** such as touch, splashes or sprays, or large volumes of blood or body fluids that might penetrate the clothing.
2. **Type of isolation precaution applied:** the selection of PPE is determined by the route of transmission of organisms and category of isolation precautions applied to the patient such as standard, contact, droplet and airborne.
3. **Durability of the PPE:** whether it needs to be fluid resistant, fluid proof, or neither.
4. **Fit:** PPE must fit the individual user accurately, and it is up to the employer to ensure that PPE are available in all sizes appropriate for the workforce.

3.1. APPROPRIATE USE OF PPE:

PPE should be used appropriately only when a particular indication exists in a protected environment, should not be worn outside that area and must be removed before leaving that area. There are different levels of PPE depending on the circumstance, pathogen/hazard and duration or level of exposure with some or all of the types of PPE above being used.



TABLE 1 : LEVELS OF PERSONAL PROTECTIVE EQUIPMENTS (PPE)

AREAS	ROUTINE SITUATION	OUTBREAK SITUATION
OPD	Surgical Mask	N95, Respirators
WARDS	Surgical Mask	Gloves, N95
IPD (Isolation)	Gloves, Surgical Mask	Gloves, N95
ICU	Shoe Cover, Head Cover, Surgical Mask, Gloves	Full PPE/Coverall
Operation Theatres (Ots)	Gloves, Mask, Scrub, OT Gown	Full PPE/Coverall, Double gloves- Blood Borne Virus (BBV)
Sample collection area	Gloves, Surgical Masks	N95, Gloves
Reception area, and canteen	Maintain 6ft Distance	Mask, Maintain 6ft Distance

3.2. TRAINING

Knowledge dissemination and practical training on PPE use are the foremost interventions; leading not only to best practices, but also to resource saving. Education and practical training must be given to all cadre of HCWs (and patients if necessary) on the following area of PPE use:

1. Indications of PPE use.
2. Procedure for donning and removal of PPE safely
3. Sequencing of donning and doffing.

3.3. DISPOSAL OR REUSE

It should be ensured that all single use PPEs must be disposed appropriately and reusable PPEs should be cleaned, disinfected, laundered, and stored appropriately after use.



IV. TYPES AND FUNCTION OF PPE

- **Gloves**— Protect hand and prevent contamination from infectious agents or skin damage from harmful materials.



- **Gowns/aprons**—protect body and clothing from contamination or damage.



- **Masks**—protect against inhalation of droplets, particles, and chemical fumes





- **Respirators**—protect respiratory tract from airborne infectious agents

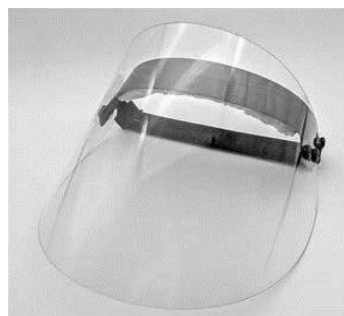


N95 MASKS

- **Goggles**—protect eyes or reduce/prevent the risk of the person's eyes being exposed to infectious agents or harmful materials



- **Face shields**—protect face, mouth, nose, and eyes being exposed to infectious agents or harmful materials



- **Cap/hair cover**—to protect hairs from contamination or damage.



- **Boots/shoe cover**—to protect feet from contamination or damage.



When PPE is used correctly, it creates barrier between the person and the infectious agents or, harmful materials.

V. GLOVES: HAND PROTECTION

Gloves can protect both the HCWs from exposure to microorganisms that may be carried on hands. It is used as part of standard, contact and droplet precautions. Gloves should be worn only there is an appropriate indication.

5.1. Indications for glove use

- Before a sterile procedure
- Anticipation of a contact with blood or body fluid, regardless of the existence of sterile conditions and including contact with non-intact skin and mucous membrane.
- Contact with a patient (and his or her immediate surroundings) during contact Precautions.



STERILE GLOVES INDICATED	EXAMINATION GLOVES INDICATED (CLINICAL SITUATIONS)	GLOVES NOT INDICATED (except for CONTACT precautions)
<p>Any surgical procedure; vaginal delivery; invasive radiological procedures; performing vascular access and procedures (central lines); preparing total parental nutrition and chemotherapeutic agents.</p>	<p>Potential for touching blood, body fluids, items visibly soiled by body fluids.</p> <p>DIRECT PATIENT EXPOSURE: contact with blood; contact with mucous membrane and with non-intact skin; potential presence of highly infectious and dangerous organism; epidemic or emergency situations; IV insertion and removal; drawing blood; discontinuation of venous line; pelvic and vaginal examination; suctioning non-closed systems of endotracheal tubes.</p> <p>INDIRECT PATIENT EXPOSURE: emptying emesis basins; handling/cleaning instruments; handling waste; cleaning up spills of body fluids.</p>	<p>No potential for exposure to blood or body fluids, or contaminated environment</p> <p>DIRECT PATIENT EXPOSURE: taking blood pressure; temperature and pulse; performing SC and IM injections; bathing and dressing the patient; transporting patient; caring for eyes and ears (without secretions); any vascular line manipulation in absence of blood leakage.</p> <p>INDIRECT PATIENT EXPOSURE: using the telephone, writing in the patient chart; giving oral medications; distributing or collecting patient dietary trays; removing and replacing linen for patient bed; placing non-invasive ventilation equipment and oxygen cannula; moving patient furniture.</p>



5.2. Indications for glove removal

- As soon as gloves are damaged (or non-integrity suspected)
- After contact with blood, or body fluid, non-intact skin, and mucous membrane
- After contact with a patient and their surrounding or a contaminated body site

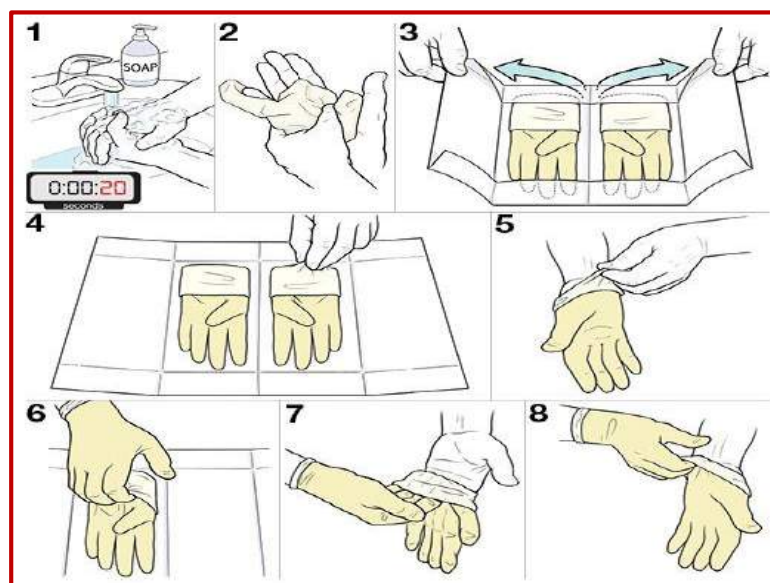
5.3. Clinical situations where use of gloves is not recommended

- For routine patient care activities, e.g. measuring blood pressure, temperature, and pulse and while giving injections and during maintenance of intravenous (IV) cannula, provided there is no blood leakage
- Giving oral medications and serving food
- During bathing, giving care to the patients and while transporting patient
- For routine entry into isolation rooms, if contact with the patient and/or environment is not anticipated
- Using computer keyboard, telephone, writing in the patient's chart, collecting patient's dietary trays, and removing and replacing linen for patient's bed.

The use of gloves in a situation when their use is not indicated represents a waste of resources without reduction in the cross-transmission. Therefore, gloves should not be used when not clinically indicated.

5.4. METHODS OF GLOVES USE:

I. HOW TO DON GLOVES





Step-1-2: Hand Hygiene – Turn on the water. Wet your hands and wrists. Use liquid soap from a pump dispenser. Work up a lather. Scrub your hands well for at least 20 seconds. This is about the time it takes to sing the Happy Birthday song twice. Rinse your hands with your fingers pointing down toward the drain. Dry your hands with a paper towel. Use this towel to turn off the faucet.

(NOTE: Once you have washed your hands, don't touch anything but your supplies.

You must wash your hands again if you touch anything else, such as furniture or your clothes)

Step-3: Open the inner packaging of the gloves with the fingers pointed towards you and the thumb clearly visible. This is to ensure that the gloves are in the correct position for application.

Step-4-5: Put on the first glove: Take the hand you write with and grasp the glove for your other hand at the folded edge of the cuff. Pick up the glove by the folded edge. Put your hand inside the glove. Keep your hand flat and your thumb tucked in. Pull the glove on. Be careful not to touch the outside of the glove. Touch only the part of the glove that will be next to your skin. Leave the cuff on the glove folded.

Step-6: Put on the second glove: Now, slip the fingers of your gloved hand into the folded cuff of the other glove.

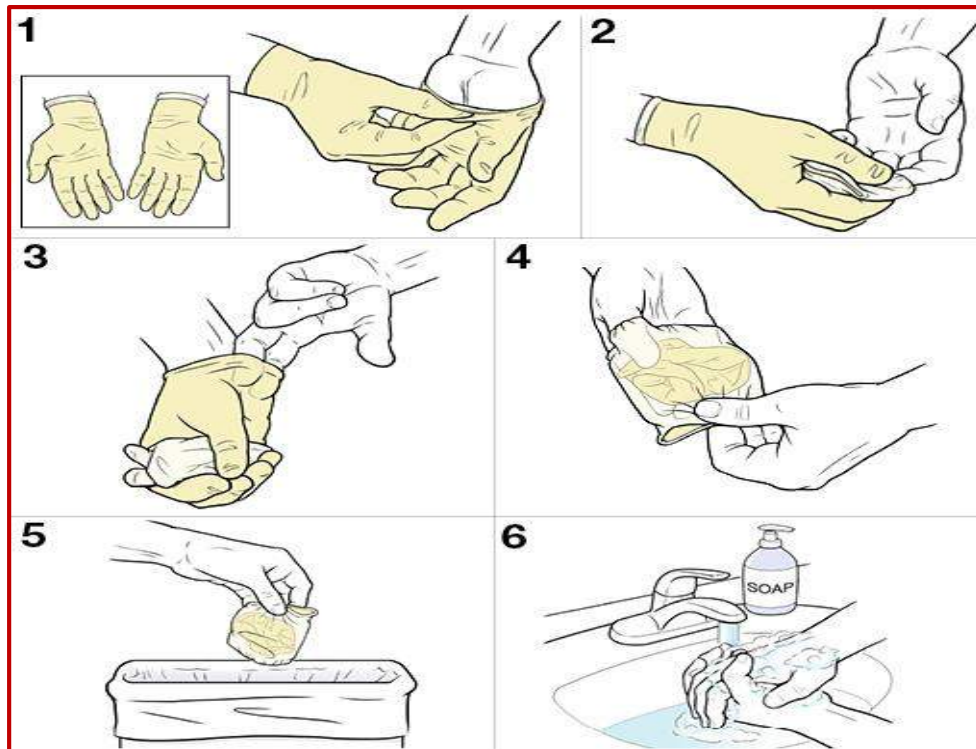
Step-7: Lift up the second glove. Put the glove over your fingers. The hand that you are putting the glove on should stay flat. Keep the gloved thumb up and back to keep from touching your bare palm or wrist.

Step-8: Pull the glove over your hand. Adjust each glove to get a snug fit. Adjust the fingers after both hands are gloved. Reach under the cuffed part to pull up or adjust.

Step-9: Once both gloves are donned, position your hands in a manner that would Ensure they are not inadvertently touched. This should ideally be in front of you, and very close to your chest



II. HOW TO DOFF GLOVES



Step-1-2: When removing gloves, touch only the outside of the glove. Do not touch your wrist or skin with contaminated gloves. Grasp the outer surface of the glove below your thumb. Be careful not to touch the skin under your glove. Grasp the glove and peel the glove off, so that it is inside out. Keep the discarded glove in the remaining gloved hand.

Step-3-4: With your ungloved hand, put two fingers underneath the cuff of the remaining glove, taking care not to touch the outside of the dirty glove. Peel glove off your hand in the direction towards your fingers, away from your body. As you remove the glove, turn it inside out into the other discarded glove. This keeps the soiled gloves together with their dirty surfaces folded inside, rather than on the outside. This prevents risking contaminating your hands with the soiled gloves.

Step-5-6: Discard gloves and wash your hands as outlined in the hand washing procedure.



5.5. PURPOSE OF DOUBLE GLOVES

- To prevent sharp injuries though evidence for this is lacking
- To prevent contact with blood or body fluid when microtears are present on gloves. Studies have shown that double gloving can be used in countries with a high prevalence of hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV).
- For prolonged surgical procedures (>30minutes)
- For procedure at risk of contact with large amounts of blood or body fluids
- In high-risk orthopedics procedures.

TABLE-1: Types of gloves according to their use with clinical situations: -

Types of gloves	Indication of use	Example
Non sterile gloves	Used for procedures where there is a risk of transmission of infections from patient to HCWs; <ul style="list-style-type: none"> • Potential for exposure to blood, body fluid, secretions, or excretions. • Contact with non-intact skin or mucous membranes. 	<ul style="list-style-type: none"> • Venipuncture • Vaginal examination • Dental examination • Emptying a urinary catheter bag • Nasogastric aspiration • Managements of micro cuts and abrasions
Sterile gloves	It is used for procedures where sterile environment is required (i.e. for all surgical and aseptic procedures) and prevents the transmission of organisms from patient to HCW and vice versa.	<ul style="list-style-type: none"> • Surgical aseptic technique procedures, e.g., • Urinary catheter site dressings • Central venous line insertion site dressing • Lumbar puncture • Clinical care of surgical wounds or drainage sites • Dental procedures requiring a sterile field



Reusable utility gloves	Indicated for non-patient-care activities	<ul style="list-style-type: none">• Handling or cleaning contaminated equipments or surface• Housekeeping duties• Instrument cleaning in CSSD unit
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VI. GOWNS OR APRONS

6.1. OBJECTIVE

- To protect the healthcare workers' arms and exposed body areas and prevent contamination of clothing with blood, body fluids and other potentially infectious material.
- Protective clothing (apron or gown) is routinely used upon entering the room of a patient requiring contact precaution and during sterile aseptic procedures.

6.2. WHEN TO USE

They should be worn by HCWs when:

- there is close contact with the patient, materials, or equipment, which may lead to contamination of skin, uniform or other clothing with infectious agent.
- there is a risk of contamination with blood, body substances, secretions, or excretions (except sweat)

6.3. APRONS

- Single-use plastic aprons are recommended for general use when there is the possibility of sprays or spills, to protect clothes that cannot be taken off.
- They should be worn as single-use items for one procedure or patient care activity only.
- Once the task is performed, they must be removed immediately after use by tearing the necks strap and waist tie and gently rolling it inwards to minimize contamination of microorganism during disposal.

6.4. GOWNS

- Gowns are used to protect the HCW's exposed body areas and to prevent contamination of clothing with blood, body substances, and other potentially infectious material.



- **Donning:** Gown should be fully covered, torso from neck to knees, arms to end of the wrist and then wrapped round the neck. It should be fastened in back of neck and waist.

- ❖ **Select appropriate type and size**

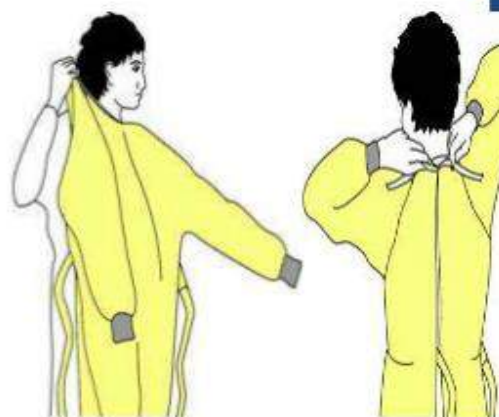
(Covers arms, body front, neck to mid-thigh) **Opening is in the back**

- ❖ **Secure at neck and waist**

- ❖ **If gown is too small, use two gowns**

Gown #1 ties in front .

Gown #2 ties in back



- **Doffing:** Once the task is performed, the gown must be removed immediately after use by unfastening the gown ties; taking care that sleeves should not contact the body while reaching for ties.
- Then the gown is pulled away from the shoulders and neck, touching inside of the gown only.

- **Unfasten ties.**
- **Peel gown away from neck and shoulder.**
- **Turn contaminated outside toward the inside.**
- **Fold or roll into a bundle and discard.**





VII. RESPIRATORY PROTECTION

Respiratory protection reduces inhalation of aerosols and therefore is essential when there is a risk transmission of droplets (larger droplets in contact precaution and smaller droplets in airborne precaution).

There are two types of PPEs available for respiratory protection –

1. Facemasks
2. Respirator

7.1. FACEMASKS:


- Facemasks include surgical masks, which are fluid resistant, and procedure or isolation masks, which are not fluid resistant.
- Surgical masks are loose fitting, single use items that cover the nose and mouth.
- They are used as a part of standard precautions to keep splashes or sprays from the person wearing them.
- They also provide protection from respiratory secretions and are worn when caring for patients on droplet precautions.
- When using a surgical mask, the following measures should be considered:
 1. Disposable masks should be discarded or changed after 4-6 hours of use or earlier if it becomes soiled or wet.
 2. Disposable masks are for single use only, should never be reapplied after removal.
 3. Masks should not be left dangling around the neck, a common practice observed among doctors.
 4. Touching the front of the mask while wearing should be avoided.
 5. Hand hygiene should be performed upon touching and discarding the used mask.



The technique of donning and doffing of surgical mask has been depicted:

How to Don a Mask

- Place over nose, mouth and chin
- Fit flexible nose piece over nose bridge
- Secure on head with ties or elastic
- Adjust to fit



PPE Use in Healthcare Settings

Removing a Mask



- Untie the bottom, then top, tie
- Remove from face
- Discard



PPE Use in Healthcare Settings

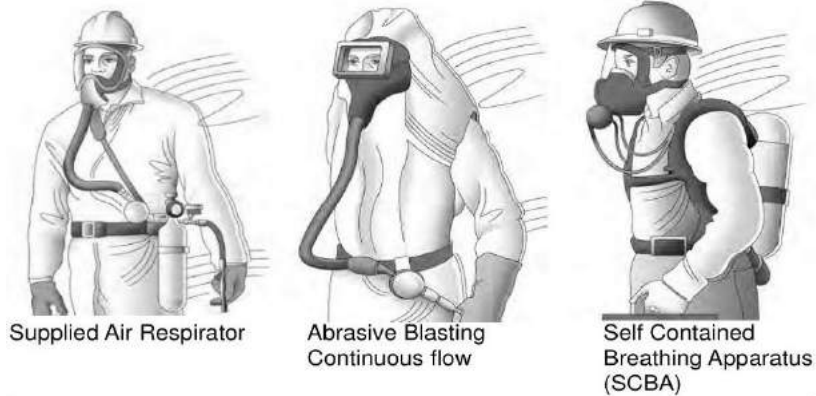
7.2. RESPIRATORS:

A respirator is a device designed to protect the wearer from inhaling particulate matter, including airborne microorganism, fumes, vapors, and gases.

TYPES OF RESPIRATORS:

There are two main types of respiratory protection—

1. **Air-purifying respirators (APRs):** Air-purifying respirators (APRs) work by removing gases, vapors, aerosols (droplets and solid particles), or a combination of contaminants from the air through the use of filters, cartridges, or canisters. E.g. N95 respirator.
2. **Atmosphere-supplying respirators (ASRs):** in which an alternate supply of fresh air is delivered



Types of Respirators according to National Institute for Occupational safety and Health (NIOSH) defines respirators based on their resistance to oil and ability to filter of airborne particles.

Filter Class	Description
N95, N99, N100	Filters at least 95%, 99%, 99.97% of airborne particles. Not resistant to oil.
HEPA (High Efficiency Particulate Air)	Filters at least 99.97% of airborne particles. For use on PAPRs only. PAPRs use only HE filters.

N95 RESPIRATORS:

- N95 respirator is the most common respirator used in healthcare facilities.
- When dealing with patients infected with highly transmissible respiratory pathogens while following droplet precautions. Filter small particles spread by the airborne route, such as tuberculosis, measles and varicella.
- **Negative-pressure:** N95 respirators are described as "negative-pressure respirator" because the pressure inside the face piece is negative during inhalation compared to the pressure outside the respirator.
- N95 mask is for single-use only, should not be reused as it cannot be cleaned disinfected.
- **Removal or change:** N95 masks should be removed or changed once in 8 hours (as per manufacturer's instruction) or earlier if it gets clogged, wet or dirty on the inside, or deformed, or torn.



- Staff required to wear N95 Respirators must undergo fitting
- The user must follow the correct technique of donning and doffing the N95 respirator, otherwise it may not provide adequate respiratory protection.

DONNING OF RESPIRATORS

- Select a fit tested respirator
- Place over nose, mouth, and chin
- Fit flexible nose piece over nose bridge
- Secure on head with elastics
- Adjust to fit



Perform a fit check

Fit check ensures that the respirator is sealed over the bridge of the nose and mouth and that there are no gaps between the respirator and the face.

Procedure:

- **Placement:** The respirator is placed on the face and tied over the head and at base of the neck.
- **Sealing:** The respirator is compressed to ensure a seal across the face, cheeks and the bridge of the nose.
- The positive pressure seal of the respirator is checked by gently exhaling. If air escapes, the respirator needs to be adjusted.
- The negative pressure seal of the respirator is checked by gently inhaling. If the respirator is not drawn in towards the face, or air leaks around the face seal; the respirator is readjusted and the process is repeated. If still not proper, then it respirator should be checked for any defect or damage.



DOFFING OF RESPIRATOR

- Always remove it just outside the patient room.
- Lift the bottom elastic over your head first
- Then lift off the top elastic
- Discard and perform hand hygiene.



VIII. CAPS AND BOOTS/SHOE COVERS

8.1. Objective

To protect against exposure to patient's blood, body fluids, secretions or excretions, which may splash onto hairs or shoes.

8.2. Do's and Don'ts

- Launder caps and shoe covers appropriately if they are reusable, followed by disinfection.
- Do not reuse disposable caps/ shoe covers. They should be discarded as per the hospital guidelines.
- Discard them after each use in appropriate container.

IX. PROTECTIVE EYE WEAR AND FACE SHIELD

7.1. Objective

To protect the mucous membranes of the eyes when conducting procedures that are likely to generate splashes of blood, body fluids, secretions or excretions.

7.2. Types and Uses

Goggles—Used to protect eyes only

Face shields—Used protect face, nose, mouth, and eyes

7.3. Do's and Don't

Goggles

1. Should fit snugly over and around eyes



2. Personal glasses not a substitute for goggles
3. Antifog feature improves clarity

Face Shields

1. Should cover forehead, extend below chin and wrap around side of face.
2. Single use/reusable face shields may be used in addition to surgical masks as an
3. alternative to protective eye wear.

7.4. Removing Face and Eye Protection

- Should be removed after gloves have been removed and hand hygiene performed.
- The ties, earpieces and /or headband used to secure the equipment to the head are considered 'clean' and therefore safe to touch with bare hands. The front of a mask, protective eyewear or face shield is considered contaminated.

7.5. Cleaning Reusable Face and Eye Protection

- Reusable face shields and protective eyewear should be cleaned according to the manufacturer's instructions, generally with detergent solution, and be completely dry before being stored.
- Disinfection may be done by any low-level disinfectant solution.

X. SEQUENCE FOR DONNING AND DOFFING OF PPE

Following sequence should be followed while wearing and removing the full PPE as per the situation.

Sequence of Donning

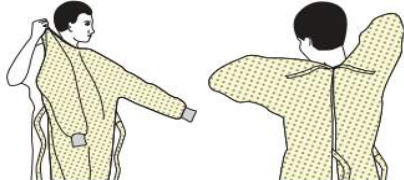
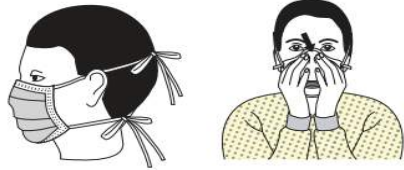
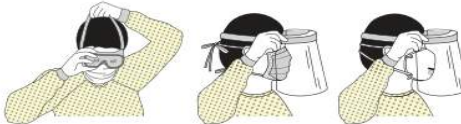

1. Gown first (wear shoe covers prior if required) → 2. Cap/ head cover →
3. Mask or respirator → 4. Goggles or face shield → 5. Gloves

Sequence of Doffing

1. Gloves → 2. Face shield or goggles → 3. Gown → 4. Mask or respirator → 5. Cap/ head cover → 6. Shoe cover



10.1. SEQUENCE FOR DONNING PPE: The type of PPE used will vary based on the level of precautions required, such as standard and contact, droplet, or airborne infection isolation precautions. The procedure for putting on and removing PPE should be tailored to the specific type of PPE (CDC).

<p>1. GOWN</p> <ul style="list-style-type: none">• Fully cover torso from neck to knees, arms to end of wrists, and wrap around the back• Fasten in back of neck and waist	
<p>2. MASK OR RESPIRATOR</p> <ul style="list-style-type: none">• Secure ties or elastic bands at middle of head and neck• Fit flexible band to nose bridge• Fit snug to face and below chin• Fit-check respirator	
<p>3. GOGGLES OR FACE SHIELD</p> <ul style="list-style-type: none">• Place over face and eyes and adjust to fit	
<p>4. GLOVES</p> <ul style="list-style-type: none">• Extend to cover wrist of isolation gown	

USE SAFE WORK PRACTICES TO PROTECT YOURSELF AND LIMIT THE SPREAD OF CONTAMINATION

- Keep hands away from face
- Limit surfaces touched
- Change gloves when torn or heavily contaminated
- Perform hand hygiene

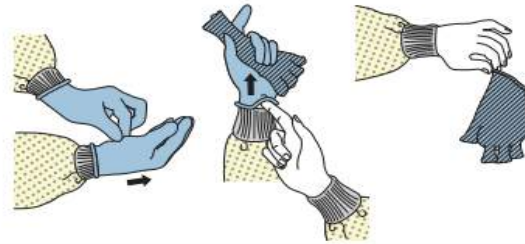
6.2. SEQUENCE FOR DOFFING PPE:

There are a variety of ways to safely remove PPE without contaminating your clothing, skin, or mucous membranes with potentially infectious materials. Here is one example. Remove all PPE before exiting the patient room except a respirator, if worn. Remove the respirator after leaving the patient room and closing the door.

Remove PPE in the following sequence:

1. GLOVES

- Outside of gloves are contaminated!
- If your hands get contaminated during glove removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Using a gloved hand, grasp the palm area of the other gloved hand and peel off first glove
- Hold removed glove in gloved hand
- Slide fingers of ungloved hand under remaining glove at wrist and peel off second glove over first glove
- Discard gloves in a waste container



2. GOGGLES OR FACE SHIELD

- Outside of goggles or face shield are contaminated!
- If your hands get contaminated during goggle or face shield removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Remove goggles or face shield from the back by lifting head band or ear pieces
- If the item is reusable, place in designated receptacle for reprocessing. Otherwise, discard in a waste container



3. GOWN

- Gown front and sleeves are contaminated!
- If your hands get contaminated during gown removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Unfasten gown ties, taking care that sleeves don't contact your body when reaching for ties
- Pull gown away from neck and shoulders, touching inside of gown only
- Turn gown inside out
- Fold or roll into a bundle and discard in a waste container

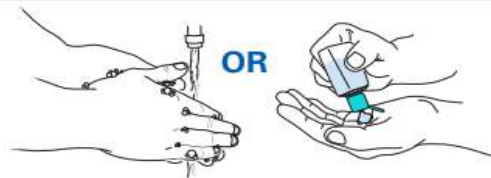


4. MASK OR RESPIRATOR

- Front of mask/respirator is contaminated — DO NOT TOUCH!
- If your hands get contaminated during mask/respirator removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Grasp bottom ties or elastics of the mask/respirator, then the ones at the top, and remove without touching the front
- Discard in a waste container



5. WASH HANDS OR USE AN ALCOHOL-BASED HAND SANITIZER IMMEDIATELY AFTER REMOVING ALL PPE



REMEMBER: Perform Hand Hygiene Between Steps If Hands Become Contaminated and Immediately After Removing All PPE



XI. ANNEXURE

N95 Respirator Specification

Key Features -

- NIOSH approved N95 rating
- Adjustable nose clip
- Nose foam
- Ultrasonically welded headbands

Approvals and Standards -

- NIOSH approved N95 particulate respirator
- Meets NIOSH 42 CFR 84 N95 requirements for a minimum 95% filtration efficiency against solid and liquid aerosols that do not contain oil.
- NIOSH approval number: TC-84A-0007
- Assigned Protection Factor (APF 10) per US OSHA and Canada CSA

Material Composition -

- Straps – Thermoplastic Elastomer
- Nose Clip – Aluminum
- Nose foam - Polyurethane
- Filter – Polypropylene
- Shell – Polyester
- Cover web - Polyester
- This respirator contains no components made from natural rubber latex
- Approximate weight of product: 0.35 oz.
- See the 3M Technical Bulletin - Cellulose
- Certification - Filtering Facepiece
- Respirators for information about which 3M respirators contain cellulose

Time Use Limitation - Replace the respirator when it becomes dirty, damaged, or difficult to breathe through.

Shelf Life and Storage -

- 5 years from the date of manufacture
- Use by date on box in MM/YYYY format
- Store respirators in the original packaging, away from contaminated areas, dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals
- Store in temperatures between -4°F (-20°C) and +86°F (+30°C) and not exceeding 80% RH



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