

# Personal Protective Equipment & Respiratory Protection

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## Learning Objectives

At the end of this session, participants will be able to –

- List factors that influence PPE selection
- Demonstrate how to don and doff a pair of gloves
- Demonstrate how to don and doff various PPE
- Identify various types of Respirators
- Understand how respirators function
- Demonstrate how to perform a user seal check



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# What is PPE?

“specialized clothing or equipment worn by an employee for protection against infectious materials” (OSHA)



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## Factors influencing PPE Selection

- Type of exposure anticipated
- Splash/spray versus touch
- Category of isolation precautions
- Durability and appropriateness for the task
- Fit



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## Face Protection

- **Masks** – protect nose and mouth
  - Should fully cover nose and mouth and prevent fluid penetration
- **Goggles** – protect eyes
  - Should fit snugly over and around eyes
  - Personal glasses are not a substitute for goggles
  - Anti-fog feature improves clarity
- **Face shields** – protect face, nose, mouth, and eyes
  - Should cover forehead, extend below chin and wrap around side of face



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## DO's and DON'Ts of Glove Use

- Work from “clean to dirty”
- Limit opportunities for “touch contamination”
  - protect yourself, others, and the environment
  - Don't touch your face or adjust PPE with contaminated gloves
- Change gloves
  - During use if torn and when soiled
- Discard in appropriate receptacle
  - Never wash or reuse disposable gloves



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## How to Don a Gown

- Select appropriate type and size
- 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



- A Make sure the gown covers from neck to knees to wrist.
- B Tie at the back of neck and waist.



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## Types of Respirators







- **Air-Purifying** - ambient air is passed through an air-purifying element that removes the contaminant(s) before they enter into the breathing zone.
- **Atmosphere-Supplying** - Greatest respiratory protection. Air from an outside source. They are used where oxygen levels may dip below 19.5 percent or where certain gases and vapours are highly concentrated.
- **Special-Use**


Reference: Canadian Standards Association



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## Respiratory Protection

- **Air Purifying**
  - Non-Powered (negative pressure)
    - 
  - Powered (positive pressure / PAPR)
    - 
  - Gas Mask
    - 
- **Atmosphere-Supplying**
  - Air-line Respirator
    - 
    - 
  - Self-Contained Breathing Apparatus
    - 


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## Air-purifying Respirators

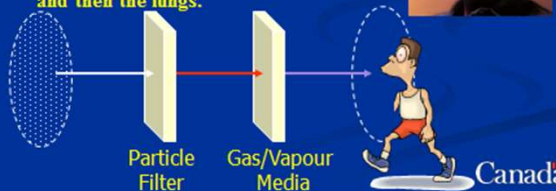
- A respirator in which ambient air is passed through an air-purifying element that removes the contaminant(s) before they enter into the breathing zone.
- Non-powered ( Negative Pressure )
- Powered ( Positive Pressure or PAPR )
- Gas-Masks

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# How Respirators Function

## Negative Pressure Air Purifying Respirator

**HOW IT WORKS**  
By inhaling, a negative pressure is created in the respirator. Ambient air flows through a filter and/or cartridge, which removes the contaminants. The clean air continues into the respirator and then the lungs.




Particle Filter      Gas/Vapour Media




## Positive Pressure Air Purifying Respirator (A.K.A. Powered Air Purifying Respirators (PAPRs))

**HOW IT WORKS**  
The motor/blower unit pulls the ambient air through a filter and/or cartridge, which removes the contaminants, and then forces the purified air into the breathing zone.



Filter      Gas/Vapour Media      Motor/Blower



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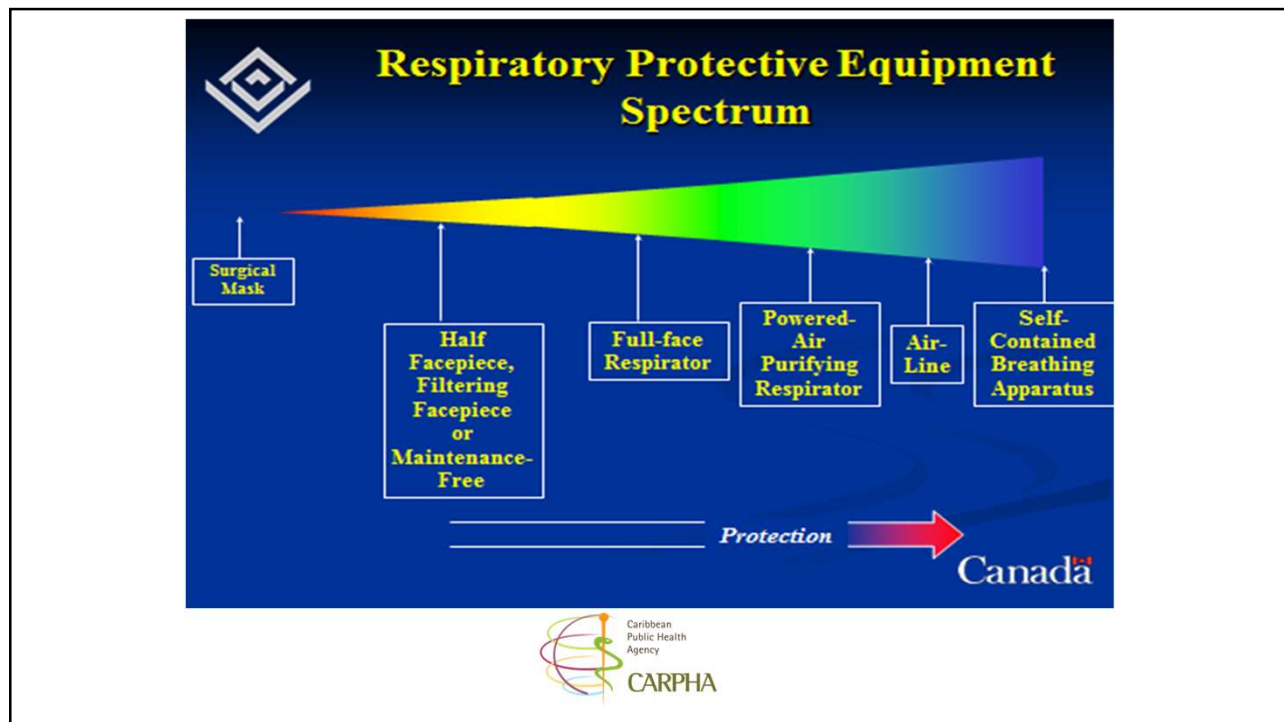
# Surgical Mask vs. Respirator



- Surgical masks help protect your nose and mouth from splattered body fluids (such as blood, respiratory secretions, vomit, urine or feces).
- **A surgical mask is not a respirator.**
- Respirators filter the air before you inhale it.



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## Selection of Respiratory protection for biological agents

- Respirators only reduce exposure. They do not eliminate exposure.
- There are no "Occupational Exposure Limits" (OEL) for biological agents.
- In general, respirators with higher assigned protection factors (APF) can reduce exposure to airborne contaminants.
- Selection of respiratory protection will be based on your Hazard Assessment and Infection Control Procedures to minimize risk.



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## Limitations of Respirators

- Difficult to wear over long periods of time
- Materials can degrade and lose their protective properties over time
- Effectiveness is highly dependent on the user fit
- Tight fitting negative pressure air purifying respirators cannot be used with facial hair, or other conditions that interfere with the seal between the face and the respirator



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## Health Surveillance

- Before fit testing and respirator use, the program administrator shall ensure that the individual is free from any condition that may preclude the user from wearing a respirator.
- This initial review is done by having the employee fill out a survey.
- Where the program administrator or respirator user is concerned with any condition, a medical opinion shall be obtained before the person is permitted to wear a respirator in their job.
- Evaluation should be done before conducting a fit test.



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## Fit Testing Methods

**QUALITATIVE:**  
Subjective pass/fail method.  
Sensory response of the test subject to a test agent.

**QUANTITATIVE:**  
Objective test.  
Number generated.











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## Factors which affect the seal

- Facial hair
- Weight loss/gain
- Wrinkles, scars, acne, make-up
- Facial structure
- Dentures



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## Before using a filtering face piece Respirator

Follow the manufacturer's inspection procedures:

- Check for cracks, tears, dirt and fatiguing
- Examine inhalation, and exhalation valves (\*where applicable)
- Examine head straps for elasticity
- Ensure filter gaskets are properly seated and in good condition\*
- Note when the filter / cartridge was last changed\*



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## Seal Check

- Place both hands over the respirator and inhale sharply
- The respirator should collapse slightly
- If air leaks between the face and face seal of the respirator, reposition it and adjust the nose clip for a more secure seal
- If you cannot achieve a proper seal, do not enter the contaminated area



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## Donning and Doffing a N95 respirator

- Video for Qualitative Fit Testing
  - <https://www.youtube.com/watch?v=xl4qx6gEYXU>
- Donning and Doffing Practical



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## Summary

- Factors which influence PPE selection - type of exposure anticipated, splash/spray versus touch, isolation precautions required, appropriateness, fit
- Face protection – mask, goggles, face shields
- Use gloves appropriately, avoid “touch contamination”, one use only



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## Summary

- Gowns should cover neck to knee to wrist
- Practice donning and doffing before conducting activity
- Use the Buddy system to ensure PPE is used properly
- Discard using appropriate containers
- Ensure ready availability of various sizes and types of PPE



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## Summary

- Types of Respirators - Air-Purifying, Atmosphere-Supplying, Special-Use
- Air-purifying respirators - Non-powered (Negative Pressure), Powered (Positive Pressure or PAPR ), Gas-Masks
- A surgical mask is not a respirator.
- Respirators filter the air before you inhale it.



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## Summary

- Respirators only reduce exposure. They do not eliminate exposure.
- Effectiveness of a respirator is highly dependent on the user fit
- Various user factors can affect the seal
- Fit testing: Qualitative and Quantitative
- Always perform a seal check when using a respirator before entering containment zone.

