



Donning and Doffing Personal Protective Equipment



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Objectives

Different types of Personal Protective Equipment:

- Selection
- Use & Limitations
- Donning / Doffing
- User Seal Checks
- Common Applications



Introduction

- **Hazards exist in many forms**
 - **Particulates**
 - **Gas/Vapour**



Forms Of Contaminants

PARTICULATES

GAS / VAPOUR



Dust



Mist



Fume



Fibre



Gas



Vapour



Controlling of Hazards

- Engineering controls
- Work practice controls
- Elimination or substitution
- Personal protective equipment

*Personal protective equipment last resort
(PPE)*



Personal Protective Equipment

- Hazard Assessment
- Requirement for PPE
- Selecting the PPE
- Training Employees in Proper Use of PPE



Personal Protective Equipment

Hands	Respiratory System	Skin	Eyes	Engineering Controls
<p>Gloves</p> <ul style="list-style-type: none"> <input type="checkbox"/> Nitrile <input type="checkbox"/> Vinyl <input type="checkbox"/> Neoprene <input type="checkbox"/> Cut Resistant <input type="checkbox"/> Other _____ 	<ul style="list-style-type: none"> <input type="checkbox"/> N100 Respirator <input type="checkbox"/> Half Face Respirator <input type="checkbox"/> -Particulate Filters <input type="checkbox"/> -Chemical Cartridges <input type="checkbox"/> -List Type _____ <input type="checkbox"/> Full Face Respirator <input type="checkbox"/> -Particulate Filters <input type="checkbox"/> -Chemical Cartridges <input type="checkbox"/> -List Type _____ <input type="checkbox"/> PAPR <input type="checkbox"/> -Particulate Filters <input type="checkbox"/> -Chemical Cartridges <input type="checkbox"/> -List Type _____ <input type="checkbox"/> Self Contained Breathing Apparatus (SCBA) <input type="checkbox"/> Other _____ 	<ul style="list-style-type: none"> <input type="checkbox"/> Lab Coat <input type="checkbox"/> Surgical Gown <input type="checkbox"/> Shoe Covers <input type="checkbox"/> Hair Caps <input type="checkbox"/> Coveralls <input type="checkbox"/> Scrubs <input type="checkbox"/> Tyvek Suit <input type="checkbox"/> Other _____ 	<ul style="list-style-type: none"> <input type="checkbox"/> Chemical Safety Glasses <input type="checkbox"/> Chemical Goggles <input type="checkbox"/> Face Shield <input type="checkbox"/> Other _____ 	<p>Biosafety Cabinet Used:</p> <ul style="list-style-type: none"> <input type="checkbox"/> At All Times <input type="checkbox"/> Only Sometimes <input type="checkbox"/> Explain _____ <p>Type of Biosafety Cabinet Used:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Class II B2(total exhaust) <input type="checkbox"/> Class IIA/B3(thimble connection) <input type="checkbox"/> Class IIA/B3(recirculated air) <input type="checkbox"/> Glove Box



Potential For Exposure to Biologicals

Name of Biohazard or Group of Biohazards	Type of Biohazard	Form of Biohazard	[]	Known Routes of Exposure	Known Infective Dose of Biohazard	How is the Biohazard Handled in the Lab	How frequently is the Biohazard Handled	Quantity of Biohazard Handled at One Time
	<input type="checkbox"/> Bacteria <input type="checkbox"/> Virus <input type="checkbox"/> Prion <input type="checkbox"/> Human Pathogen <input type="checkbox"/> Animal Pathogen- Non-Zoonotic <input type="checkbox"/> Animal Pathogen-Zoonotic <input type="checkbox"/> Other	<input type="checkbox"/> Culture, live <input type="checkbox"/> Frozen <input type="checkbox"/> Lyophilized <input type="checkbox"/> Fixed <input type="checkbox"/> DNA <input type="checkbox"/> RNA <input type="checkbox"/> Recombinant DNA <input type="checkbox"/> Recombinant RNA <input type="checkbox"/> Diagnostic Samples <input type="checkbox"/> Blood <input type="checkbox"/> Serum <input type="checkbox"/> Sputum <input type="checkbox"/> Feces <input type="checkbox"/> CFS <input type="checkbox"/> Tissue(type) <input type="checkbox"/> Environmental Source <input type="checkbox"/> Other		<input type="checkbox"/> Contact with Mucous Members/Eyes <input type="checkbox"/> Inhalation of Aerosols <input type="checkbox"/> Ingestion <input type="checkbox"/> Contact with non- intact skin <input type="checkbox"/> Parenteral Inoculation <input type="checkbox"/> Other		<input type="checkbox"/> Pipetted <input type="checkbox"/> Handled with Sharps <input type="checkbox"/> Centrifuged <input type="checkbox"/> Poured <input type="checkbox"/> Inoculated with Loop <input type="checkbox"/> Used to prepare slides <input type="checkbox"/> Cultures Grown <input type="checkbox"/> Infected Animal <input type="checkbox"/> Other	>5 times/day 2-4 times/day once daily up to 4 times/week 1 time/week 2-3 times/month monthly 2-4 times/year 5-11 times/year less than once a year other	ul/g quantities >1ml/g 1ml/g-100ml/g 100ml/g-1000ml/g <1 litre/kilogram unknown



Personal Protective Equipment

- **Gloves**
- **Gowns, Tyvek Suits, Coveralls**
- **Shoe and Head Covers**
- **Masks and Respirators**
- **Other Face and Eye Protection**



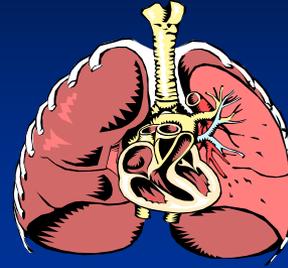
How to select your PPE

- Means of transmission
- Type of exposure

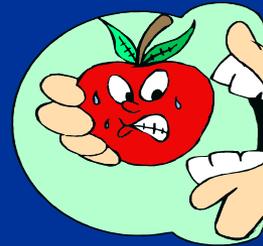


Major Routes Of Entry

Inhalation



Ingestion



Absorption

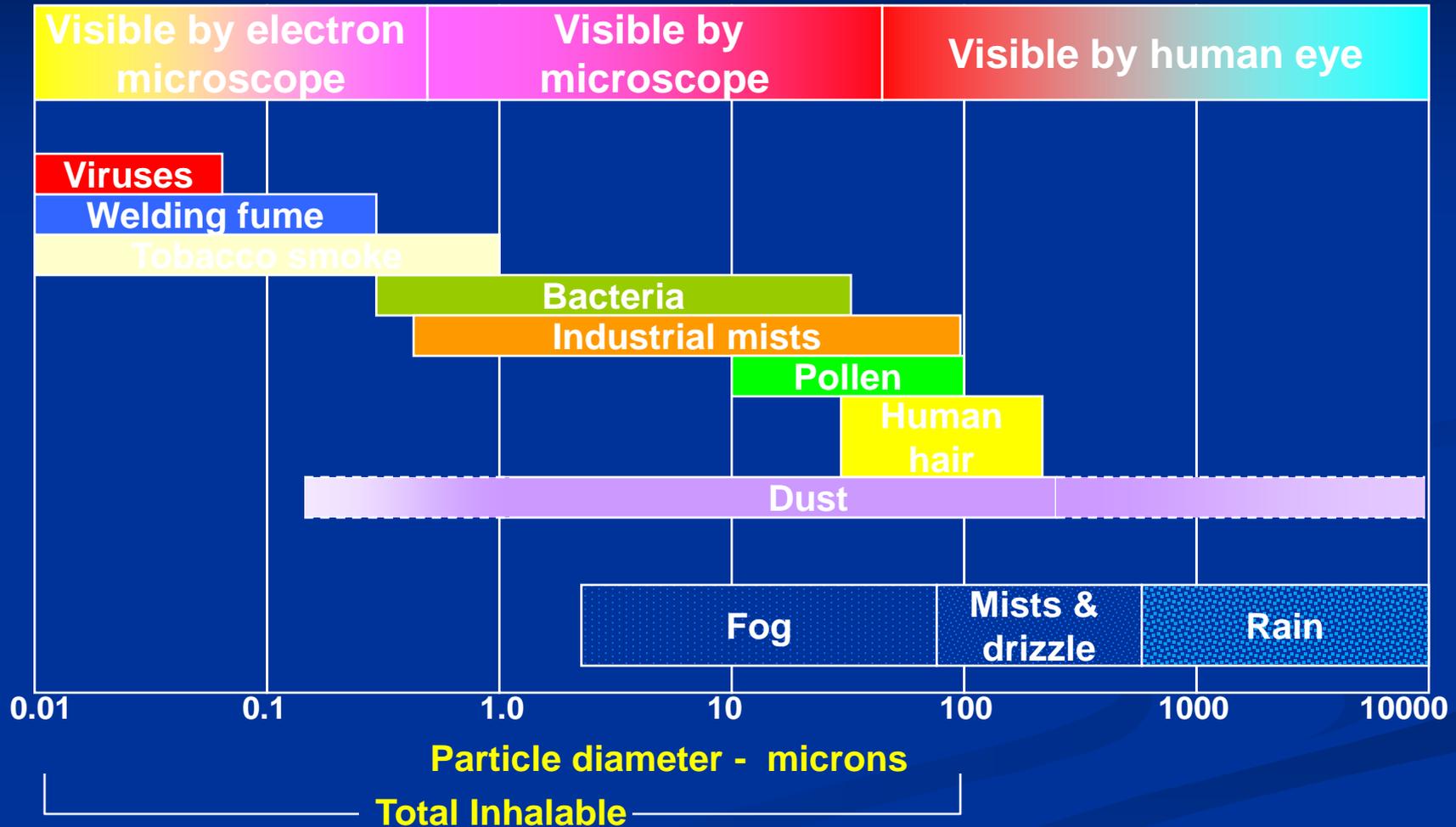


Puncture



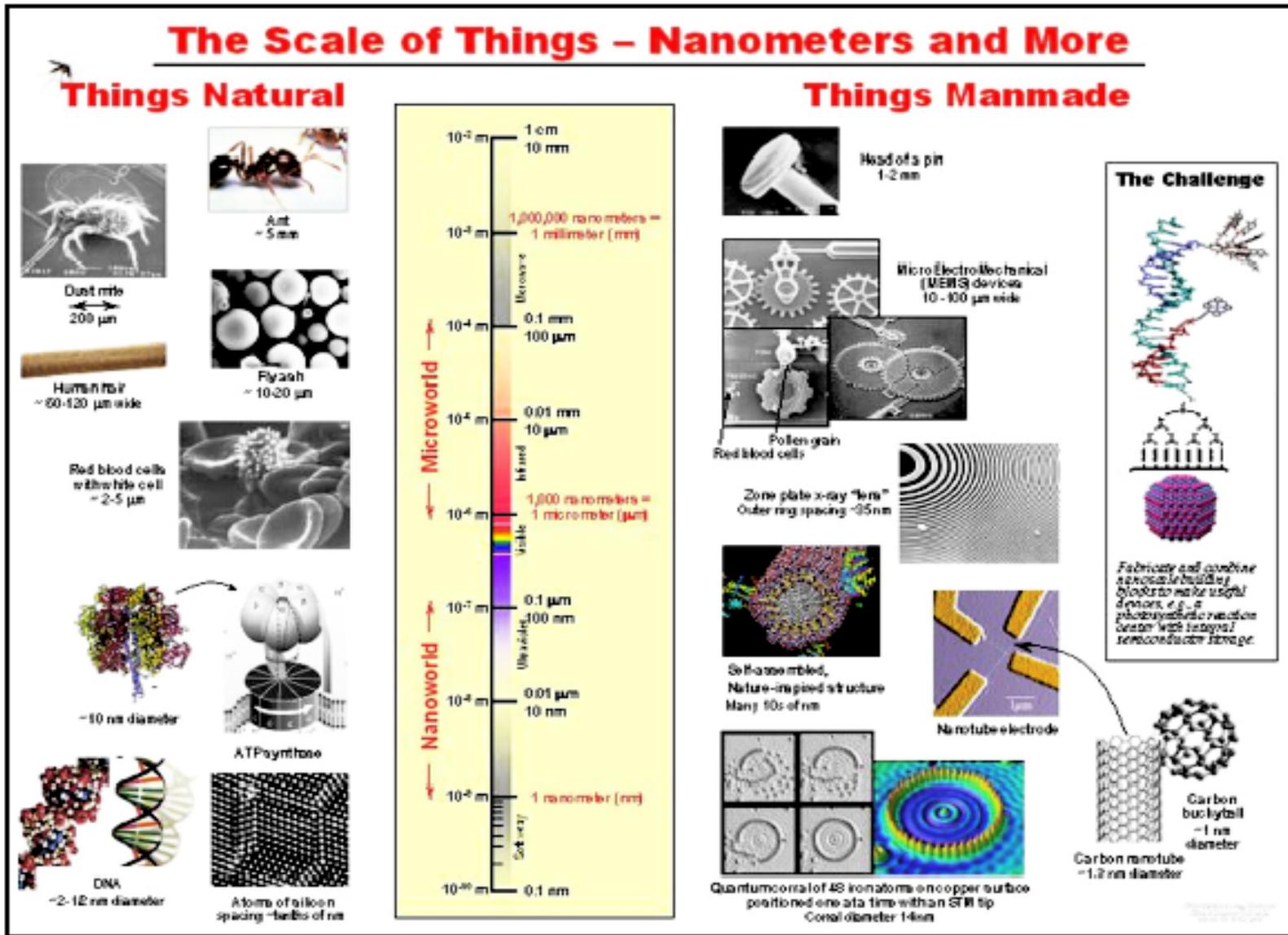


Sizes of Selected Particles



(1mm = 1,000 microns)

Figure 1 — Particles of various size ranges from www.nano.gov.





Selecting PPE

- **Safe design and construction**
- **Maintained in a clean and reliable fashion**
- **Fit and comfort should be considered**
- **Several different type of PPE worn together, make sure they are compatible**

Some PPE have standards that need to be followed.

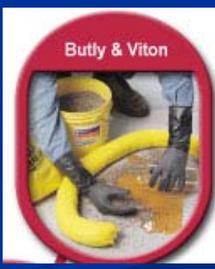


Training Employees

- **In proper use of PPE**
 - **When PPE is necessary.**
 - **What PPE is necessary.**
 - **How to properly put on, take off, adjust and wear the PPE.**
 - **The limitations of the PPE.**
 - **Proper care, maintenance, useful life and disposal of PPE.**



Gloves



- **Gloves help protect you when directly handling potentially infectious materials or contaminated surfaces.**
- **Wear gloves when directly handling potentially infectious materials or in contact with contaminated surfaces.**
- **Vinyl, latex, or nitrile gloves may be worn. (there are many other types of gloves other than the ones listed here)**
- **Change gloves when visibly soiled, torn or punctured.**
- **Wash hands upon removing gloves. Gloves do not replace the need for excellent hand washing!**

■ <http://www.bestglove.com>



Gloves



- **Purpose is to protect from infectious agents/chemicals being transmitted/absorbed via hands**
 - **Body fluids, mucous membranes non-intact skin**
 - **Contaminated equipment and surfaces**
 - **Considerations**
 - **Fit (tight fitting or loose fitting)**
 - **Material**
 - **Sterile, non sterile**
 - **Use and reuse, disposable versus reusable**



Types of Protective Gloves

- Type of chemicals handled.
- Nature of contact (total immersion, splash, etc.).
- Duration of contact.
- Area requiring protection (hand only, forearm, arm).
- Grip requirements (dry, wet, oily).
- Thermal protection.
- Size and comfort.
- Abrasion/resistance requirements.
- Gloves made from a wide variety of materials are designed for many types of workplace hazards. In general, gloves fall into four groups:
 - Insulating rubber gloves (See 29 CFR 1910.137 and the following section on electrical protective equipment for detailed requirements on the selection, use and care of insulating rubber gloves).
 - Gloves made of leather, canvas or metal mesh;
 - Fabric and coated fabric gloves;
 - Chemical- and liquid-resistant gloves;





Limitations of PPE(gloves)

■ Gloves:

- Prone to holes and tears even before their use
- Glove materials can degrade over time/extended wear
- Protects against visible/gross contamination but doesn't provide a perfect seal against all contamination



Gowns

- Gowns help protect you from the contamination of clothing with potentially infectious material.
- Wear a gown when contamination of clothing with potentially infectious material is possible.
- Your gown should fully cover the torso, fit close to the body and cover the arms to the wrists.
- Choose a gown appropriate to the situation:
 - Disposable vs re-useable (requires laundering).
 - Fluid-resistant vs non fluid-resistant.
 - Sterile vs clean.



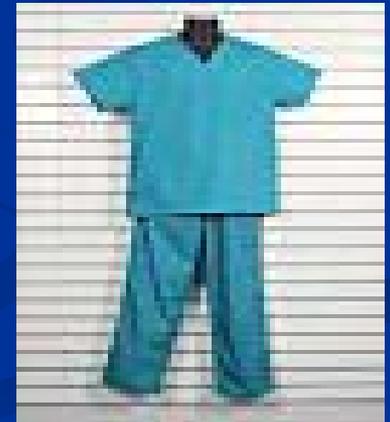


O.R. Gown Full Barrier Front



- raised neckband, colour coded to identify size
- GORE® LP Surgical Fabric protection on gown front and on sleeves from 4" above elbow to knitted cuff and yolk to hem
- three sets of inside centre back tape ties
- overlap back for better coverage
- outside tie closure at waist
- seam sealed sleeves

■ Scrubs





Tyvek Suits, Coveralls



- **Protect your skin and clothing when working with dirt, paint, solvents, chemicals, oil, grease. These multipurpose suits are durable and can be worn over and over.**

Head and body protection in a disposable coverall with elasticized cuffs to protect arms and legs.

The durable Tyvek® fabric is hard to tear or puncture, yet it functions as a breathable membrane that allows body heat and sweat to escape while preventing chemicals, paints and particles from getting in.

- (There are many other types of coveralls made of cloth, heavy PVC/Poly, etc.....)



Limitations of PPE (gowns and tyvek suits)

■ Gowns

- Gowns that are fluid-permeable can become saturated/ wet over time

■ Tyvek suits

- The garment is not suitable for use in all situations and environments with all chemicals and hazardous materials.

(you must consider when choosing protective clothing the permeation, degradation and penetration of the material with respect to the chemical you are trying to protect against)

The decision regarding the choice of chemical protective clothing must be made by trained and qualified safety professionals.



Shoe and Head Covers

■ Shoe covers

- Wear shoe covers to provide a barrier against possible exposure to airborne organisms or contact with a contaminated environment.



■ Head covers

- Wear head covers to protect the hair and scalp from possible contamination when sprays or airborne exposure is anticipated.





Limitations of PPE (shoe covers and head cover)

■ Shoe covers

- Must be slip resistant or made of anti-slip materials and still may not be adequate for certain tasks

■ Head Covers

- Can become wet/ saturated over time



Masks and Respirators

- 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.



Respirators



- Respirators filter the air you breathe to help protect you from microorganisms including bacteria and many viruses.



- Types of respirators include:
 - Disposable Respirators (includes N95, N100)
 - Air Purifying Respirators
 - Powered Air Purifying Respirator (PAPR)
 - Self-Contained Breathing Apparatus (SCBA) Respirators





Air Purifying Respirators



■ Non-powered (Negative Pressure)



■ Powered (Positive Pressure or PAPR)



**Air-Mate™ HEPA
PAPR System**



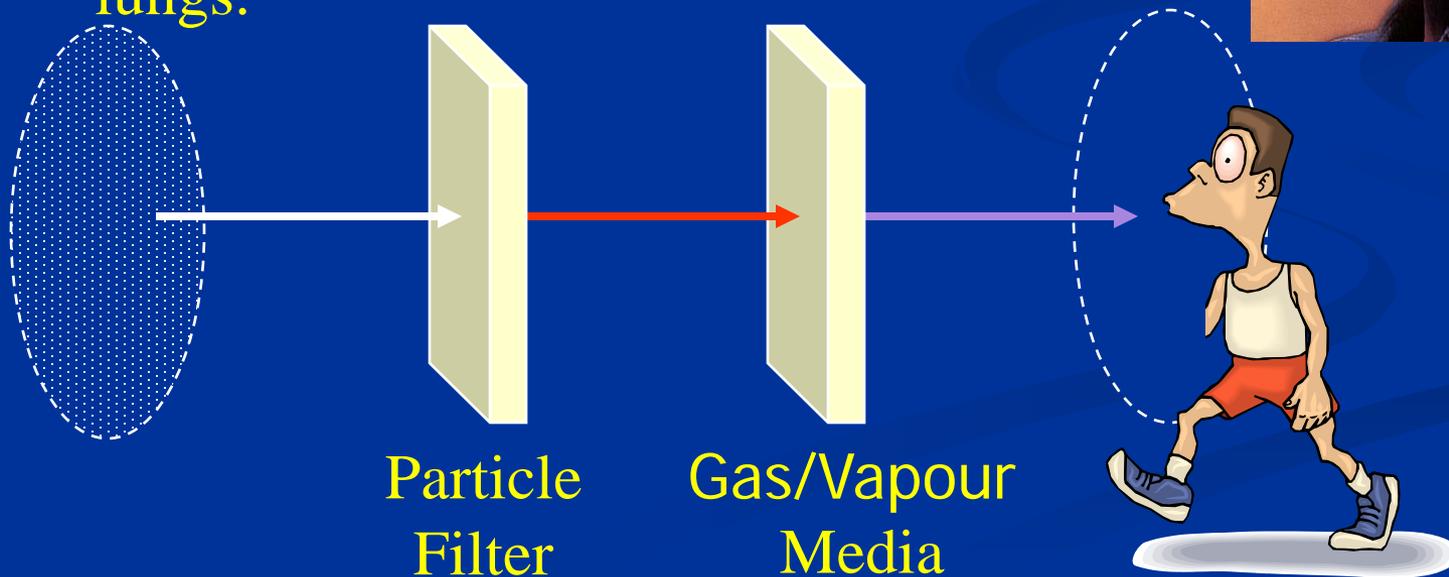
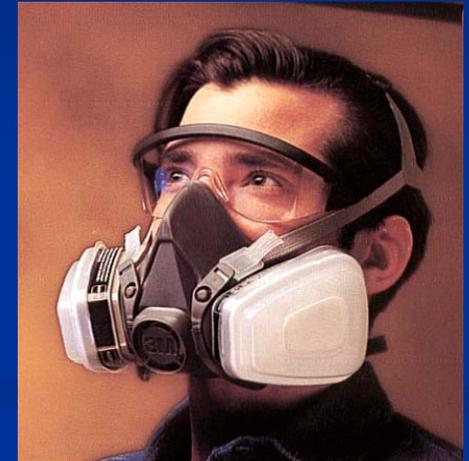
**R-Series™
PAPR System**



Negative Pressure Air Purifying Respirator

HOW IT WORKS

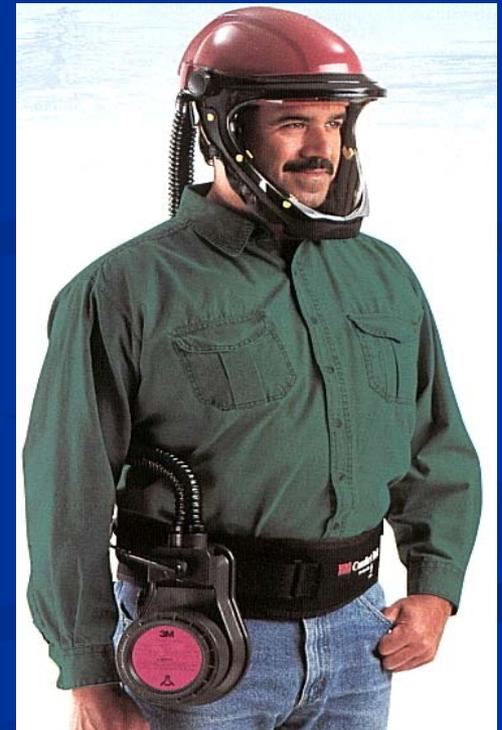
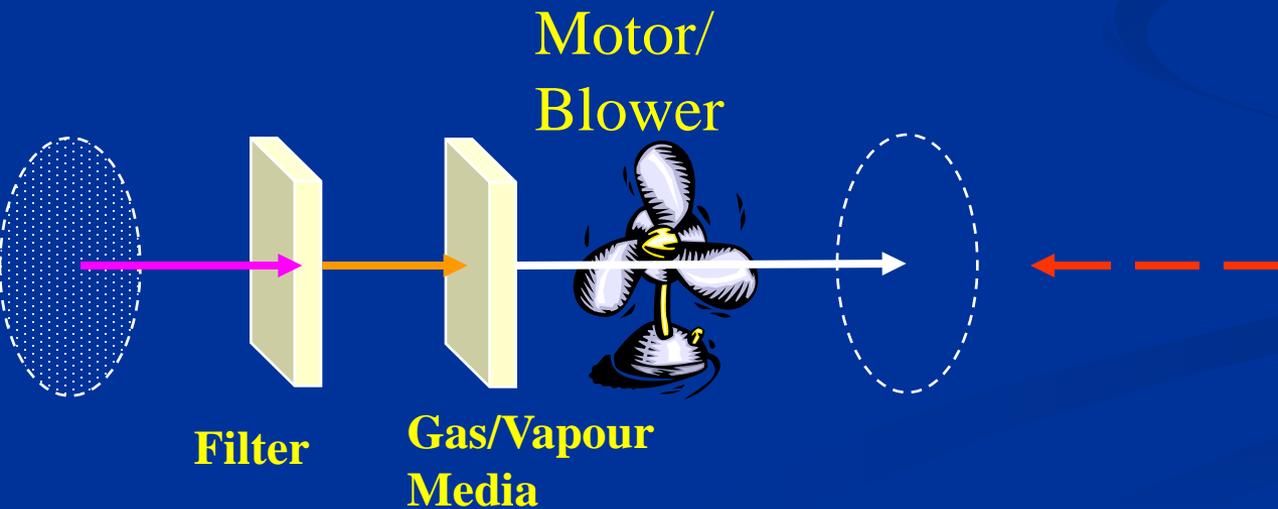
By inhaling, a negative pressure is created in the respirator. Ambient air flows through a filter or cartridge, which removes the contaminants. The clean air continues into the respirator and then the lungs.





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

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





Fit Testing Methods

QUALITATIVE:

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



QUANTITATIVE:

Objective test.
Number generated.





Factors Affecting Face Seal

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





NIOSH Particulate Filter Classifications



- **N-Series: Not for oil**
 - Approved for non-oil particulate contaminants
 - Use until increased breathing resistance or damaged (In Health Care settings, the infection control practices take precedence)

- **R-Series: Resistant to oil**
 - Approved for all particulate contaminants
 - Time restriction of 8 hours when oils are present

- **P-Series: Oil Proof**
 - Approved for all particulate contaminants
 - Manufacturer's time use restrictions apply



NIOSH Particulate Filter Classifications



42 CFR 84 Filter Classifications

Minimum Efficiency	N Class No Oil	R Class Oil Resistant	P Class Oil Proof
95%	N95	R95	P95
99%	N99	R99	P99
100%	N100	R100	P100



Limitations of Air Purifying Respirators

- **Not for use in atmospheres containing less than 19.5% oxygen**
- **Not for use in Immediately Dangerous to Life and Health (IDLH) atmospheres**
- **Not for use when concentration exceeds Assigned Protection Factor (APF) X Exposure Limit**
- **Do not use with facial hair, or other conditions that interfere with the seal between the face and the respirator (N100, 1/2 or full face tight fitting respirator)**
- **Do not alter, abuse, or misuse the respirator**



Limitations of PPE (respirators)

■ Respirators:

- Difficult to wear over long periods of time
- Materials can degrade and lose their protective properties over time
- The effectiveness of the respirator is highly dependent on the user fit



Respiratory Protective Equipment Spectrum

Surgical
Mask

Half
Facepiece,
Filtering
Facepiece
or
Maintenance-
Free

Full-face
Respirator

Powered-
Air
Purifying
Respirator

Air-
Line

Self-
Contained
Breathing
Apparatus

Protection



Canada 



Eye and Face Protection

- Safety spectacles
- Goggles
- Welding shields
- Laser safety goggles
- Face shields





Eye and Face Protection

- Goggles help protect only your eyes from splatters.



- A face shield provides splatter protection to facial skin, eyes, nose, and mouth.



Goggles



- Goggles are a barrier style of protection for the eyes.
- Goggles should fit snugly over and around the eyes or prescriptive lenses.
- Note: prescriptive lenses and/or safety glasses do not provide adequate eye protection.





Goggles

■ 3 types of goggles

- **Direct vented goggles** -allow a direct flow of air from the work environment into the goggles. Used for cases where impact is the hazard, not for splash or vapour hazards
- **Indirect vented goggles** – provide protection from splash entry by a “hooded” or covered vent that allows the free movement of air but prevents the direct passage of liquid. Used in cases where chemical splash is the hazard. (limit or prevent the passage of liquid splash into the goggles)
- **Non-vented goggles** – will have no venting of any kind and offer protection against the passage of dust, mist, liquid and vapours. Used for cases where chemical vapour is the hazard



Face Shields



- Face shields protect the mucous membranes of the eyes, nose and mouth from splashes of body fluids (during procedures and patient care activities that are likely to generate splashes or sprays of blood, body fluids, secretions and/or excretions).
- Wear a face shield when facial skin protection is needed in addition to eye, nose and mouth protection.
- A face shield may be worn with an N95 or N100 respirator.
- The face shield should cover the forehead, extend below the chin and wrap around the side of the face.



Limitations of PPE (eye and face protection)

- **Safety glasses** - used mainly to protect the eyes from injury, flying objects such as large chips, fragments, particles, sand and dirt.
- **Goggles** — used to protect the eyes from impact, splash and vapour hazards. Available non-vented or with direct or indirect vents. The non-vented goggles may fog up during use and the indirect vented limit or prevent the passage of liquid splash into the goggles (not 100% proof).
- **Faceshield** - A supplementary protective device worn to shield the wearer's face from certain hazards. Face shields are secondary protectors only and must be worn with safety glasses or goggles, as stated in ANSI Z87.1.



Donning an N100 Respirator

- Place the respirator over your nose and mouth. Be sure the metal nose clip is on the top





Donning an N100 Respirator

- Pull the bottom strap over your head until it rests below the ears at the back of your neck. Untwist the strap





Donning an N100 Respirator

- Pull the top strap over your head until it rests on the crown of your head above your ears. Untwist the strap





Donning an N100 Respirator

- Without removing the respirator, adjust the straps until the respirator is secure. To tighten the respirator, gently pull the ends of both straps. To loosen the respirator, press on the back side of the buckle.





Donning an N100 Respirator

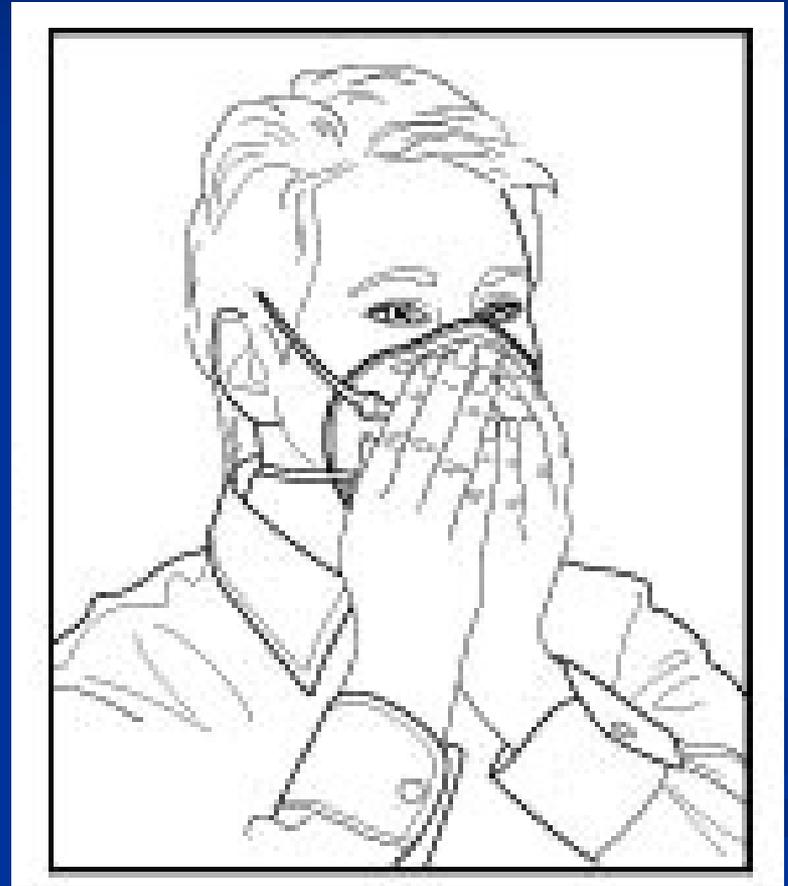
- Using both hands, starting at the top, mould the metal nose clip around your nose to achieve a secure seal. Note: Pinching the nosepiece using one hand may result in improper fit and less effective respirator performance. Use two hands.





Check the seal of your adjustable filtering facepiece respirator each time you don the respirator

- 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. See your supervisor.





Doffing an N100 Respirator



- Cup the respirator in your hand to maintain position on your face.



Doffing an N100 Respirator



- Still holding respirator in position, pull top strap over head first, followed by the bottom strap.



Doffing an N100 Respirator



- **Remove respirator from face and store according to facility policy. Wash hands.**



DONNING PPE

- 1 Change into Scrubs
- 2 Put on Head Cover
- 3 Don respiratory protection
- 4 Put on safety glasses, goggles or face shield
- 5 Put on first pair of gloves
- 6 Put on gown or coveralls or apron if necessary
- 7 Put on second pair of gloves
- 8 Put on Shoe Cover



Change from your regular clothes to scrubs





Put on Hair Cover





Remove any eyewear or jewellery that could affect the respirator fit.





Donning Respirator

Refer to Respirator donning handout.
Prescription eyeglasses can be re-donned once respirator seal check is completed





Putting on Eye protection, Safety Glasses Goggles or Face Shield





Putting on 1st Pair of gloves





Donning Fluid Resistant Gown



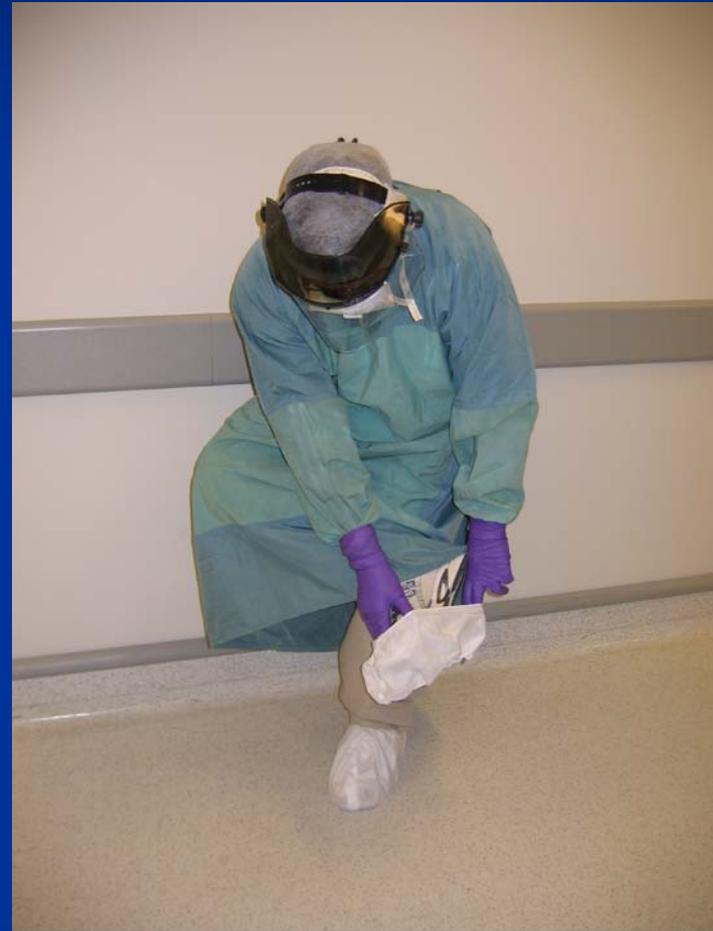


Putting on Second Pair of Gloves





Putting on Shoe Covers





PPE Doffing Procedure

Removing 1st pair of gloves





Remove gown and place in laundry hamper or dispose





Based on your Protocols and what you are working with:

- **You could remove the second pair of gloves after removing the fluid resistant gown.**
- **Or**
- **You can remove your second pair of gloves after you have removed all your PPE**



Remove 2nd pair of gloves





**Remove eye protection and clean with a
disinfectant as
required by your facility**





Remove eye glasses prior to doffing respirator





Remove Respirator





Remove Hair Cover





Remove Shoe Covers





Wash Hands





Wash Hands Often



- Cleaning your hands gets rid of germs you pick up from other people . . . from the surfaces you touch . . . and from the animals you come in contact with.



Hand Washing



1. Wet hands



2. Use liquid Soap



3. Lather, rub & count to 20



4. Rinse



5. Towel or air dry hands



6. Turn off taps with towel or your sleeve



- **Note: Any mention of trade names is for identification purposes only and is not intended as an endorsement.**



Any Questions?

