

UNM Respiratory Protection



What is a Respirator?

- ***Air-purifying respirator*** means a respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.
- ***Supplied-air respirator (SAR) or airline respirator*** means an atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user.



Key Definitions

- ***High efficiency particulate air (HEPA) filter*** means a filter that is at least 99.97% efficient in removing monodisperse particles of 0.3 micrometers in diameter. The equivalent NIOSH 42 CFR 84 particulate filters are the N100, R100, and P100 filters. Magenta in color
- ***Immediately dangerous to life or health (IDLH)*** means an atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.



Key Definitions

- ***Oxygen deficient atmosphere*** means an atmosphere with an oxygen content below 19.5% by volume.
- ***Filtering face piece (dust mask)*** means a negative pressure particulate respirator with a filter as an integral part of the face piece or with the entire face piece composed of the filtering medium.



Before you Wear a Respirator

- Must receive training annually (every 12 months) or changes in the workplace render previous training obsolete.
- Medical evaluation.
- Fit testing.
- Know how to properly select a respirator & cartridges.



Medical Evaluation

- The employer shall provide a medical evaluation to determine the employee's ability to use a respirator, before the employee is fit tested or required to use the respirator in the workplace.
- Obtain a written recommendation regarding the employee's ability to use the respirator from the physician or other licensed health care professional (PLHCP).



Fit Testing

- Before an employee may be required to use any respirator with a negative or positive pressure tight-fitting face piece, the employee must be fit tested with the same make, model, style, and size of respirator that will be used.
- At least annually (every 12 months) thereafter.



Fit Testing Procedure, 1 Minute Each Exercise

- Normal breathing
- Deep breathing
- Turning head side to side
- Moving head up and down
- Talking – Rainbow Passage
- Bending over
- Normal breathing



Qualitative Fit Testing

- Isoamyl Acetate (banana oil)
- Saccharin Solution
- Bitrex™
- Irritant Smoke (Stannic Chloride)
 - No form of test enclosure or hood for the test subject shall be used



Quantitative Fit Testing



Selecting a Respirator

- What is the contaminant?
- What is the concentration of the contaminant?
- What is the IDLH of the contaminant?



Types of Respirators

- Filtering face piece
- ½ mask
- Full-face mask
- Powered air purifying respirator
- Self contained breathing apparatus



Filtering face piece (dust mask)

- Entire mask made from filtering media
- N – non oil proof
- R – oil resistant
- P – oil proof
- 95 – 95% effective for particulates
- 99 – 99% effective for particulates
- 100 – 99.97% effective for particulates
- **Not allowed for Asbestos, lead, arsenic, or cadmium**



Half mask/Dust mask
APF=10
Needs to be fit tested

Half Mask

- Made from elastomeric media such as silicone
- Has working parts
- Requires cartridges
- Required a seal check upon donning
- Do not use alcohol or petroleum products on the mask
- Do not leave in direct sunlight or extreme hot or cold environments.



Half mask (Elastomeric)
APF=10
Needs to be fit tested



Full-Face Mask

- Made from elastomeric media such as silicone
- Has working parts
- Requires cartridges
- Required a seal check upon donning
- Do not use alcohol or petroleum products on the mask
- Do not leave in direct sunlight or extreme hot or cold environments.



Full facepiece (Elastomeric)
APF=50
Needs to be fit tested



PAPR

- Comes in tight or loose fitting
- Battery powered
- Requires cartridges



**Loose-Fitting Powered
Air-Purifying Respirator (PAPR)**
APF= 25



SCBA

- Air tank
- Air usually last for approximately 30 minutes
- Whistle or bell signifies low air
- Escape mask/air



Full Facepiece Self-Contained Breathing Apparatus (SCBA)

Pressure demand mode is APF=10,000
Needs to be fit tested



Respirator Limitations

- If the concentration of the contaminant exceeds the IDLH, supplied air respirators must be used.
- Respirators must not be used over the Maximum Use Concentration, based on the assigned protection factor.
- Some situations require eye & face protection.
- Use of prescription eye-glasses may prohibit a good seal, inserts must be used.
- Qualitative fit testing limits the assigned protection factor to $10 \times$ permissible exposure limit.



Assigned Protection Factors

Table 1. -- Assigned Protection Factors⁵

Type of respirator ^{1, 2}	Quarter mask	Half mask	Full facepiece	Helmet/hood	Loose-fitting facepiece
1. Air-Purifying Respirator	5	³ 10	50	.....	.....
2. Powered Air-Purifying Respirator (PAPR).....		50	1,000	⁴ 25/1,000	25
3. Supplied-Air Respirator (SAR) or Airline Respirator					
• Demand mode	.....	10	50	.....	.....
• Continuous flow mode	.....	50	1,000	⁴ 25/1,000	25
• Pressure-demand or other positive-pressure mode	.....	50	1,000	.....	.....
4. Self-Contained Breathing Apparatus (SCBA)					
• Demand mode	.....	10	50	50	.....
• Pressure-demand or other positive-pressure mode (e.g., open/closed circuit)	.....	.....	10,000	10,000	.....

Maximum Use Concentration (MUC)

- MUC is calculated by taking the assigned protection factor of the respirator and multiplying it by the contaminates permissible exposure limit (PEL).
- This will give the user the respirators MUC unless the IDLH has been reached then the user goes to supplied air.
- Example: Acetone PEL = 1,000 ppm
 - Half mask 10x PEL
 - $10 \times 1,000\text{ppm} = 10,000\text{ppm}$ is the MUC, however if the IDLH is reached the user must use a supplied air respirator.



Selecting Appropriate Cartridges

- The manufacturer has cartridge selection chart based on the contaminant.
- For the example below using a 3M half mask in an atmosphere of acetone below the IDLH, 3M recommend an (OV) Organic Vapor cartridge.

Chemical Name CAS #	Synonym	IDLH (ppm)	OEL (ppm)	Threshold (ppm)	Respirator (to 10x OEL)	Comments
Acetaldehyde 75-07-0	Acetic aldehyde, Ethanal	10000	TWA=200 (OSHA) C=25	0.186	(F)OV (F)Form	Formaldehyde cartridge not specifically approved, but 3M recommended for longer service life
Acetic acid 64-19-7	Ethanoic acid, Glacial acetic acid, Methane carboxylic acid, Vinegar acid	1000	TWA=10 STEL=15	0.016	(F)OV	
Acetic anhydride 108-24-7	Acetic acid anhydride, Acetyl oxide, Ethanoic anhydride	1000	TWA=1 STEL=3	0.029	(F)OV	
Acetone 67-64-1	2-Propanone, Dimethyl ketone, Ketone propane	20000	TWA=500 STEL=750	4.58	OV	3M 3530 Monitor



Inspecting a Respirator

- Ensure silicone has no rips or tears.
- Diaphragms not wilted or creased, both inner and outer.
- Straps in working order.
- No visual defects/damage.



Donning a Respirator

- No facial hair where the mask will be placed on the users face.
- Don the respirator on the chin then up to nose or forehead.
- Place the mask in a comfortable position.
- Negative pressure check.
- Tighten and re-arrange as necessary.



User Seal Check

- Negative pressure check
 - Don the respirator.
 - Place your hand over the cartridges.
 - Inhale, the mask should collapse against the users face.
- Positive pressure check
 - Don the respirator.
 - Place your hand over the exhalation valve.
 - Exhale, the mask should move outward off the users face.



Wearing a Respirator

- Wear the respirator following all of the manufacturers guidelines.
- If you believe the respirator has breeched, leave the contaminated atmosphere immediately.
- If you feel dizzy, if it is hard to breathe, or you recognize a medical symptom leave the contaminated atmosphere immediately.
- Some full-face respirators may fog up.



Recognizing Medical Symptoms

- Dizziness
- Fatigue
- Coughing
- Bodily impairment
- Tunnel vision
- Hearing going in and out
- Loss of consciousness or memory



Doffing a Respirator

- Once in a non contaminated environment:
 - Ensure all gross matter is wiped from the mask.
 - Using a clean hand grasp the mask by the front.
 - Pull the mask forward and upward off the users face.
 - Do not handle contaminated mask, clean appropriately.
 - Disinfect, and store per your written program's procedure.



Cleaning a Respirator

- Wash components in warm (43 deg. C [110 deg. F] maximum) water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.
- When the cleaner used does not contain a disinfecting agent, respirator components should be immersed for two minutes in one of the following:
 - Hypochlorite solution (50 ppm of chlorine) made by adding approximately one milliliter of laundry bleach to one liter of water at 43 deg. C (110 deg. F); or,
 - Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 milliliters of tincture of iodine (6-8 grams ammonium and/or potassium iodide/100 cc of 45% alcohol) to one liter of water at 43 deg. C (110 deg. F); or,
 - Other commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer.



Storing the Respirator

- All respirators shall be stored to protect them from damage, contamination, dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals, and they shall be packed or stored to prevent deformation of the face piece and exhalation valve.





Be Safe



TONIGHT



Acknowledgement

I _____, have completed the PPE Respiratory Protection training.
(Print Name)

Date: _____