



A DIVISION OF WESCO DISTRIBUTION, INC.

Air Purifying Respirators (APR) Ready Reference

Updated 10/2018

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1. The Law

A. OSHA 1910.134 Respiratory Protection

- This regulation governs the use of respirators for any airborne contaminants that engineering controls cannot keep within acceptable limits.

B. Voluntary Use Program for APR's

- When you have documentation to show you are under the OSHA PEL for a given dust, fume, mist, vapor, or gas, you are allowed to “voluntarily” let your employees use any NIOSH approved air purifying respirator without a formal respiratory program and no requirement for fit testing. However, employees are required to complete a medical evaluation and read Paragraph D found in OSHA 1910.134.
- Be sure to document that employees were given a copy of Appendix D and a brief understanding of the Voluntary Use Program.
- Please note that this program is available for disposable respirators, but does not require the medical evaluation—although it's a good idea to have a medical evaluation documented (see Disposable Respirators Ready Reference for more details).

2. The Essentials

A. What Are the Basics of APR's?

- Offer more versatility and longer life than disposable respirators
- Can use many different filters/chemical cartridges in a variety of combinations
- Replacement parts available for most models
- Easy to clean for reuse
- Half mask and full facepiece air purifying respirators are negative pressure respirators (creates negative pressure in the mask when you inhale) and PAPR's are positive pressure respirators, as they have a blower motor which forces air through the cartridge/filter to your breathing area.
- Any product listed as a “Respirator” is NIOSH approved and meets OSHA compliance
- When properly fit tested and used for the correct application, respirators provide protection to 10X the permissible exposure limit (PEL) for a given chemical dust, fume, or mist (50X the PEL for a full face APR).

B. What Are the Differences Between a Half Mask and Full Facepiece Respirator?

- **Half Mask:**
 - Lower cost to purchase and maintain
 - Must be used with safety glasses, goggles, and/or a faceshield
 - Better face seal, compared to a disposable
- **Full Facepiece:**
 - Additional eye/face protection from splashes and vapors/gasses penetrating through the eyes
 - Better overall sealing surface to provide better protection
 - While more expensive than half mask respirators, prices have been coming down considerably as vendors are realizing that these products do not need to be airline compatible
 - Lenses are fully ANSI compliant for impact protection

C. What is the Facepiece Made of?

- **PVC**
 - Cheapest
 - Less flexible
 - Can develop a memory and lose its' shape if stored improperly
- **Rubber**
 - Latex allergy concern
 - Can develop a memory and lose its' shape if stored improperly
 - Only available on MSA half mask
- **Silicone**
 - Most expensive and comfortable material
 - Very stretchy and conforming
 - Does not build a memory
 - Used on nicer models of respirators
 - Easier to clean

D. What Are the Basics of Chemical Cartridges?

- Cartridges are filled with a specially treated activated carbon with a very high adsorption capacity
- Gases and vapors passing through cartridges are attached and held to the surface of the carbon by adsorption
- With acid gas cartridges, the activated carbon is chemically treated and adsorbs through a chemical reaction
- Chemical cartridges do not become more efficient with use, unlike particulate filters
- Adsorption capacity is limited, so you must change the cartridge when any taste, odor, or irritation is detected. If this occurs, the user has already waited too long.
- OSHA requires a change out schedule to replace these cartridges before they expire (see letter E)
- In general, organic vapor cartridges are negatively affected by humidity (shortens life)
- In general, acid gas cartridges are positively affected by humidity (longer life)

E. What Are The Rules of Changing Cartridges?

- According to the revised standard, APR's can be used against harmful gases and vapors only if the chemical cartridge is equipped with the End-Of-Service-Life Indicator (ESLI) or the employer provides a change-out schedule based on objective data. Ideally, this would involve conducting air monitoring to know your exposure level in the workplace. This data can then be put into a computer program to further analyze how long a cartridge will last before needing to be replaced.

You can no longer tell employees that they need to change cartridges when they start smelling odors, although prefilters used on cartridges do get changed when the employee feels difficulty in breathing through the assembly. OSHA requires employers to review past history on when employees change cartridges, document this information, and then change cartridges on a scheduled basis before odors start leaking through the respirator. All employees would then keep track of the hours they are using the chemical cartridge, and then toss it once they get to a predetermined number of hours used.

This may sound simple enough; however, I can assure you that the majority of employers are not doing this as of yet. Unused cartridges can be stored in a climate controlled environment for greater than 5 years without a significant loss of performance.

The best way to store a respirator is to use a respirator cleaning wipe, clean the respirator, and store it in a respirator storage bag (or sealed zip-lock type bag). Storing a respirator in open air will both reduce the life of the cartridges and affect attempts to create an accurate change out schedule.

F. What Factors Can Reduce Cartridge Service Life?

- **Worker Exertion Level** – A worker breathing twice as fast as another will draw twice the amount of contaminants through the respirator cartridge
- **Temperature** – The hotter it is, the shorter the service life
- **Relative Humidity** – Water vapor will compete with the organic vapors for active sites on the adsorbent. This can be somewhat the opposite for chemicals used for an acid gas cartridge.
- **Respirator Cartridge Variability** – Some cartridges contain more activated charcoal than others. For liability reasons, we must use specific manufacturers' service life information from their web sites.
- **Multiple Contaminants** – Predictions should be derived from the least well adsorbed compound
- **Storage Conditions** – After cartridges have been opened and used, ideal conditions would be in a sealed bag in a low-humidity, room-temperature environment

G. Why Are No Cartridges Approved for Certain Chemicals?

- If you are working with a chemical that is not yet regulated by OSHA, it might mean that no research has been conducted yet to verify if a chemical cartridge will properly block out that contaminant (although other organizations have documented exposure limits that can be investigated: REL, TLV, OEL, etc.). The American Conference of Governmental Hygienists (ACGIH) has more up-to-date chemical exposure data and may have set a Threshold Limit Value (TLV) that you may reference. However, when you find that supplied air is being recommended for a particular chemical, then there might be several reasons why no cartridge is approved:
 - The chemical may have poor warning properties, meaning it can't be smelt very well. Keep in mind, poor warning properties does automatically require you to use supplied air
 - Sorbent material may be ineffective at blocking out the chemical
 - Sorbent material may work, but the life of the cartridge may be very short

H. What Are the Categories of Filters?

- **N-Series Filters** – No Oil – Use and reuse of the N-series filters is subject only to considerations of hygiene, damage, and increased breathing resistance
 - **R-Series Filters** – Oil Resistant – The R-series should only be used for one 8-hour working shift when oil is present
 - **P-Series Filters** – Oil Proof – Use and reuse of the P-series filters is subject only to considerations of hygiene, damage, and increased breathing resistance
 - **Filter Efficiencies** – 100 (99.97%), 99%, and 95% – These are efficiencies of filters for particulates down to a 0.3 micron particle size
- To summarize, there are the 9 categories of filters:

N95	R95	P95
N99	R99	P99
N100	R100	P100

I. What Are The Basics of Powered Air Purifying Respirators (PAPR's)?

- PAPR's have a motor which draws air through a specific chemical cartridge or filter to a hood, helmet, or facepiece
- PAPR's with hoods can be worn without conducting fit testing (medical evaluations still required)
- Employees can have beards and wear their own prescription glasses without compromising the seal
- PAPR's are cooler and more comfortable since the user does not need to strain to force air through the filtering media
- Worker has a higher level of protection, compared to negative pressure air purifying respirators such as disposable, half-mask, or full facepiece respirators
- 4 cubic feet per minute (CFM) air flow required for half mask or full facepiece styles
- 6 CFM air flow required for hoods or helmets, no fit testing required
- The term HEPA (high efficiency particulate air) filter is used in place of P100 for this category of respiratory protection
- Extra hose can be coiled through ice water to make uncomfortable environments more tolerable

J. Which Brand of APR Do You Recommend?

- It would be very difficult to insist that one brand is better than all the rest because it truly is a matter of personal preference
- Generally speaking, the fewer the employees, the lower amount of time needed to use the respirator, and the more seasonal the workforce might be indicators for a customer wishing to use more disposable or limited use type respirators (those that simply cost less)
- Respirator facepieces are normally made of silicone, rubber, or PVC. Most employees feel silicone is more comfortable than rubber or PVC; however, it generally costs more. The only disadvantage of silicone is that it can tend to slip around on your face if you are sweating. With that said, PVC quality has improved dramatically over the last 20 years and is now close in comfort to that of silicone.
- Another factor regarding price involves the number of cartridges an employee may go through. If it is a very short term project, then they may prefer to only order one pair of cartridges/filters or to use the 3M 5000 Maintenance-Free Disposable Respirator.
- Manufacturers typically cannot make claims that one brand of respirator cartridges/filters lasts longer than another. This would be difficult to predict since they are all NIOSH approved on an equal level.

K. Which Size of Half Mask Respirator Should I Choose?

- 70% of men and 65% of women will fit into a size medium.
- The remaining 30% of men use a size large and the remaining 35% of women use a size small.
- You must factor in whether or not they must wear prescription or safety glasses, as the respirator can interfere with how the glasses sit on the nose.
- It is quite common for workers to be able to pass fit tests in 2 or even all 3 different sizes. Bigger sizes tend to interfere with safety glasses, so in borderline situations, choose the smaller size.

3. Product Reference

- A. Fit Test Kits – Any tight fitting respirator must be fit tested unless it is for a voluntary use program (just remember, you need to know concentration of chemicals in the air before considering a voluntary program or even to select a respirator that is appropriate for levels of contaminants found).
- B. Additional Cartridges/Filters – Cartridges have a limited life and it is important to have spare cartridges/filters to complete any given project.
- C. Respirator Cleaning Pads
- D. Respirator Storage Bags
- E. 3M Monitor Badges – If working with specific chemicals that the 3M reference guide indicates can be used for air monitoring
- F. Peel-Away Lens Covers – Specifically for full face respirators, helmets, and hoods
- G. Prescription Lens Inserts – Available for all full face respirators
- H. Safety Glasses and Goggles

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