



Best Practices for Respiratory Protection

Scope

Respiratory protection procedures are regulated by OSHA under 29 CFR 1910.134. The reader must be thoroughly familiar with this regulation and the specific risks at their facility. Although this best practice provides commentary on certain aspects of respirator use and the regulation, it is not intended to be used in lieu of the regulation.

Key Points

- Respiratory protection is a “last resort” form of protection. The best respiratory protection is to eliminate the hazard completely or by implementing administrative or engineering controls, when practical.
- Selection of the respirator to be used shall be made by a safety professional familiar with the regulation and potential hazards at the facility.
- Understand the types of respiratory protection options available, their limitations, and symptoms of failure.
- Best practice is for the facility to have a simple chart indicating the hazard or activity and the corresponding respirator type/cartridge to be used for that circumstance.
- Voluntary use of respirators, including dust masks, require involvement of the safety professional as described in this document.

Respiratory Protection Program

The regulation requires that the facility have a documented Respiratory Protection Program. This program shall include the following elements, as applicable. This Best Practice provides commentary on some of these elements.

- Procedures for selecting respirators for use in the workplace;
 - Determine list of chemicals or activities that require respirator use
 - Identify appropriate type of respiratory protection equipment
 - Identify permissible exposure levels for each chemical or activity and the action level for protection (typically half of the PEL)
- Medical evaluations of employees required to use respirators;
- Fit testing procedures for tight-fitting respirators;
 - Must be fit tested for each type, manufacturer, and size
 - Retested when noticeable changes occur such as weight gain, weight loss, new dentures, etc.
- Procedures for proper use of respirators in routine and reasonably foreseeable emergency situations;
- Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, and otherwise maintaining respirators;
- Procedures to ensure adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators;



- Training of employees in the respiratory hazards to which they are potentially exposed during routine and emergency situations;
- Training of employees in the proper use of respirators, including putting on and removing them, any limitations on their use, and their maintenance; and
- Procedures for regularly evaluating the effectiveness of the program.
- Roles and responsibilities. A safety professional shall be designated as Program Administrator and oversee the respiratory protection program.

Best practice is to review and update the Respiratory Protection Program annually and when significant changes in respiratory hazards occur.

Before You Require a Respirator

Consider alternatives to respirator use when possible. For example,

- Can the work be moved to another area where respiratory quality is improved?
- Are there alternatives to the work, such as brushing on a coating versus spraying?
- Can local ventilation be used?
- Can engineering controls be installed, such as a hood or vent, closed system solids conveyor, etc.?
- Are there substitute chemicals that can be used that are less harmful to employees?

Types of Respirators

Air-Purifying Respirators

These respirators remove air contaminants by filtering, absorbing, adsorbing, or chemical reaction with the contaminants as they pass through the respirator cartridge. This respirator is to be used only where adequate oxygen (19.5 to 23.5 percent by volume) is available.

Air-purifying respirators can be classified as follows:

- Particulate removing respirators, which filter out dusts, fibers, and mists. These respirators may be single-use disposable respirators or respirators with replaceable filters. A “dust mask” is one example of this type. Remember that a dust mask is a type of respirator and shall be part of your respiratory protection program.
- Gas- and vapor-removing respirators, which remove specific individual contaminants or a combination of contaminants by absorption, adsorption or by chemical reaction. Chemical-cartridge respirators are examples of gas- and vapor-removing respirators.
- Combination particulate/gas- and vapor-removing respirators, which combine the respirator characteristics of both kinds of air-purifying respirators.
- Continuous Flow / Powered Air Purifying Respirator (PAPR). This respirator maintains a continuous flow of air through the face-piece and prevents leakage into the face-piece.

Supplied-Air Respirators

These respirators provide breathing air independent of the environment. Such respirators are to be used when the contaminant has insufficient odor, taste or irritating warning properties, or when the contaminant is of such high concentration or toxicity that an air-purifying respirator is inadequate. Supplied-air respirators, also called airline respirators, are classified as follows:

- Positive Pressure/Pressure-Demand. This respirator maintains a continuous positive pressure within the face-piece, thus preventing leakage into the face-piece.
- Self-Contained Breathing Apparatus (SCBA). This type of respirator allows the user complete independence from a fixed source of air and offers the greatest degree of protection but is also the most complex. Training and practice in its use and maintenance is essential.
- Airline Respirator. Used in emergency situations, and where an SCBA cannot feasibly be used. An airline respirator uses a long airline to supply breathing air to the user, instead of an SCBA. Airline respirators should have a self-contained escape bottle of sufficient size that is employee or self-activated to supply air in the event of air supply interruption or equipment failure that will allow the employee to escape the hazardous environment without needing to remove their respirator. The airline that supplies the respirator mask shall not be any longer than 300 ft. in length and be free of any damage.

Warning Signs of Respirator Failure

Air-Purifying Respirators for Particulates – Warning Signs

When breathing difficulty is encountered with a filter respirator (due to partial clogging with increased resistance), the filter(s) must be replaced. Disposable filter respirators must be discarded.

Air-Purifying Respirators for Gas or Vapor – Warning Signs

If any of the warning properties (e.g., odor, taste, eye irritation, or respiratory irritation) occur when using a gas or vapor respirator (chemical cartridge), promptly leave the area and check the following:

- Proper face seal
- Damaged or missing respirator parts
- Saturated or inappropriate cartridge

If no discrepancies are observed, replace the cartridge or filter. If any of the warning properties appear again, the concentration of the contaminants may have exceeded the cartridge design specification. If this is the case, an SCBA or airline respirator may be required for the work.



Service Life of Air-Purifying Respirator Cartridges and Filters

Since warning properties are not always detectable and ESLI's (end of service life indicators) are not available for most chemical contaminants, change-out schedules will be based upon anticipated exposure levels, degree of exertion and duration of use. PAPR's are generally used for relatively short durations when there is a potential for incidental chemical exposure as opposed to during a known exposure and also during known particulate exposures such as when feeding material back into a process. Documenting the amount of time the cartridge was used helps track service life of cartridges. This can be accomplished by writing the information on the used cartridge with a permanent marker pen after each use.

Chemical cartridges capture vapors and gases, but do not filter out particulates such as fumes, dust and mist.

- Cartridges work by adsorption, and **MUST** be changed out at predetermined intervals based upon conditions or any time odor, taste or irritation is detected in the face-piece (this is an indication that break through may be occurring).
- In general, chemical cartridges should be changed after 8 to 12 hours of continuous use, and/or 7 to 10 days of periodic use depending on the duration of use and concentration of exposure. Utilizing the protective caps on the inlet and outlet of the chemical cartridges when stored will extend shelf life.

Particulate cartridges, such as High Efficiency Particulate Air (HEPA) filters filter out dust, mist and fumes, but do not capture chemical vapors and gases.

- HEPA filters actually become more effective at trapping particulates as material builds up on the surface of the filter.
- As filter loading increases, breathing resistance increases.

Filters must be replaced when increased breathing resistance is noted. When in doubt about the previous use of the respirator, or if there are any indications of breakthrough, loading or other condition that potentially compromises the cartridge, obtain a replacement cartridge.

Service Life of Supplied Air Respirator Hoods and Helmets

When using an airline respirator, leave the area immediately if an air pressure drop is sensed. The Program Administrator will set the flow rates for air-fed systems. The flow will typically be between 6 and 15 cfm. The pressure to obtain this flow will be set by the Program Administrator and marked on the pump or the regulator for cylinders systems. All cylinder supplied-air must be Grade D or better and clearly labeled. The supplier will furnish certificate of analysis.

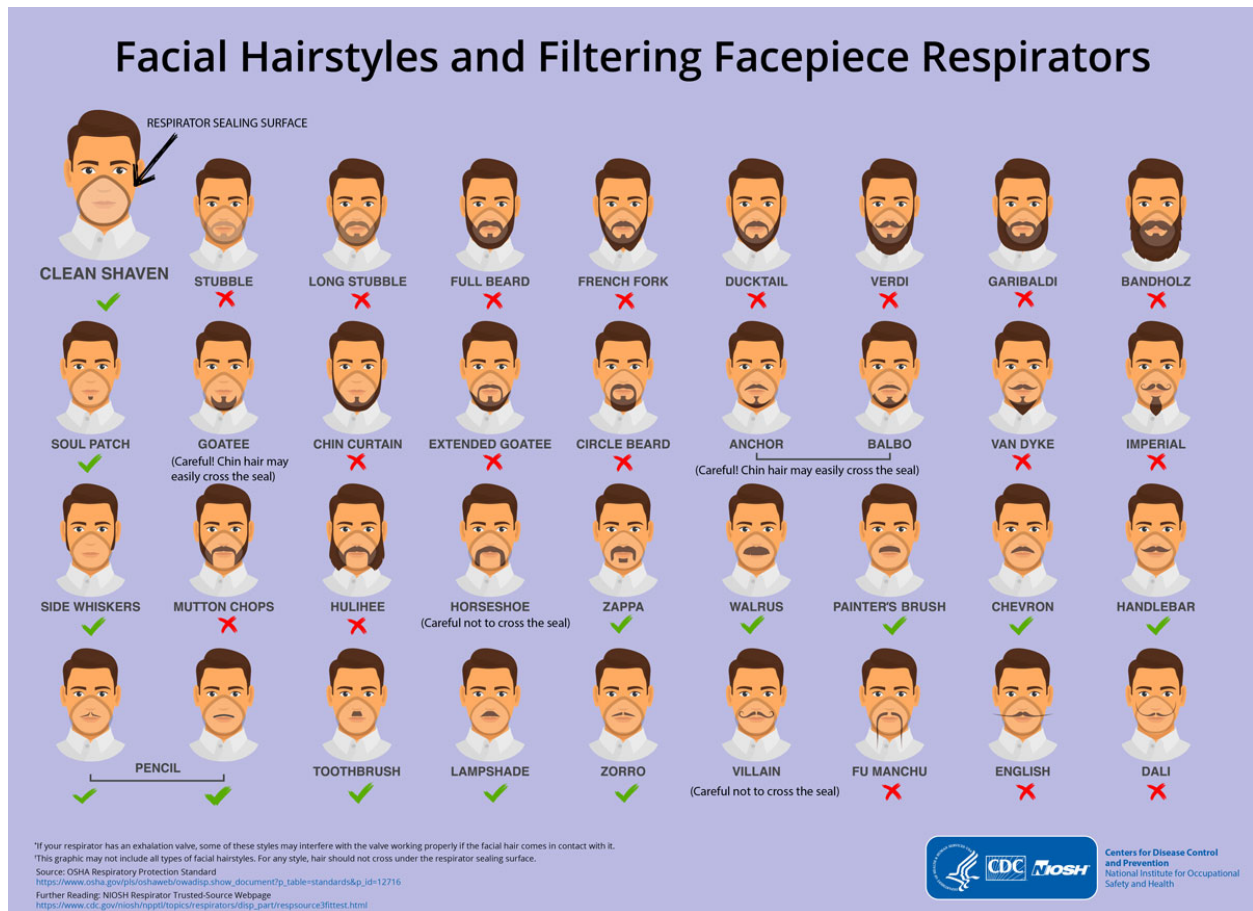
Voluntary Use of Respirators



The voluntary use of respirators can be confusing, but the requirements are fairly simple. Voluntary use, including use of a dust mask, must be approved by the respiratory program administrator. Voluntary use involves use of a respirator when there is no known hazard that is mitigated by the respirator, but the employee desires to use one anyway. The use will be approved after an assessment has been made to determine that no exposure limits will be exceeded and the respirator use will not create a hazard to the employee. Employees who use respirators on a voluntary basis must be given a copy of Appendix D of the Respiratory Protection Standard. Best practice is to return a signed copy to the employer to document training on the respirator use.

Facial Hair

Respirators that require a tight fit to the face shall not be worn when facial hair comes between the sealing surface of the face-piece and the face or that interferes with its function. Facial hair is allowed as long as it does not protrude under the respirator seal, or extend far enough to interfere with the device's function. Short mustaches, sideburns, and small goatees that are neatly trimmed so that no hair compromises (is under) the seal of the respirator usually do not present a hazard. See the figure below from NIOSH (National Institute for Occupational Safety and Health). Note that the respirator sealing surface is superimposed on each facial hair style to indicate whether the facial hair crossed the sealing surface.



Training

Training for each person using a respirator shall be conducted initially and annually thereafter. Training on this subject is most effective when done hands-on or at least having samples of respirators and cartridges used at the site as part of the training. Best practice is for training must include an explanation of the following:

- Why respirator use is necessary;
- Tasks or hazards at your site that require respiratory protection
- Nature of the respiratory hazard and consequences of not fitting, using, and maintaining the respirator properly;
- Reason(s) for selecting a particular type of respirator;
- Capabilities and limitations of the selected respirator;
- How to inspect, put on and remove, and check the seals of the respirator;
- Respirator maintenance and storage requirements;
- How to use the respirator effectively in emergency situations, including when the respirator malfunctions; and



- How to recognize medical signs and symptoms that may limit or prevent the effective use of the respirator.
- Voluntary use requirements.

The person assigned the site safety responsibility for respirators, shall be sufficiently trained or experienced so he or she can:

- Implement all regulatory and site requirements.
- Identify hazards that require respiratory protection
- Select appropriate respirators to provide protection from hazards
- Maintain the list of jobs that require respiratory protection
- Write operating procedures, that include information about respiratory protection
- Perform simple respirator repairs and determine when a respirator should be replaced or sent out for repairs
- Provide effective training.
- Understand and apply the requirements in other applicable regulatory standards.

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