



RESPIRATORY PROTECTION - 1910.134

OSHA standards require employers to establish and maintain a respiratory protective program whenever respirators are necessary to protect the health of employees. Before discussing the requirements of OSHA's respirator standard, it will be useful to review the various types of available respirators.



Respiratory protective devices fall into three classes: air-purifying; atmosphere- or air-supplying; and combination air-purifying and air-supplying devices. A brief discussion of each follows.

Class 1. Air-Purifying Devices

The air-purifying device cleanses the contaminated atmosphere. Chemicals can be used to remove specific gases and vapors and mechanical filters can remove particulate matter. This type of respirator is limited in its use to those environments where the air contaminant level is within the specified concentration limitation of the device. These devices do not protect against oxygen deficiency.

"Oxygen deficiency" means that concentration of oxygen by volume below which atmosphere supplying respiratory protection must be provided. It exists in atmospheres where the percentage of oxygen by volume is less than 19.5 percent oxygen.

The various types of air-purifying devices include mechanical-filter cartridge; chemical-cartridge, combination mechanical-filter/chemical-cartridge; gas masks; and powered air-purifying respirators.



Mechanical-filter respirators offer respiratory protection against airborne particulate matter, including dusts, mists, metal fumes, and smokes, but do not provide protection against gases or vapors.

Chemical-cartridge respirators afford protection against low concentrations of certain gases and vapors by using various chemical filters to purify the inhaled air. They differ from mechanical-filter respirators in that they use cartridges containing chemicals to remove harmful gases and vapors.

Combination mechanical-filter/chemical-cartridge respirators use dust, mist, or fume filters with a chemical cartridge for dual or multiple exposures.

Gas masks afford respiratory protection against certain gases, vapors, and particulate matter. Gas masks are designed solely to remove specific contaminants from the air; therefore, it is essential that their use be restricted to atmospheres which contain sufficient oxygen to support life. Gas masks may be used for escape only from atmospheres that are immediately dangerous to life or health (IDLH), but never for entry into such environments.

"IDLH" means an atmospheric concentration of any toxic, corrosive or asphyxiant substance that poses an immediate threat to life or would cause irreversible or delayed adverse health effects or would interfere with an individual's ability to escape from a dangerous atmosphere.



Canisters for gas masks are color-coded according to the contaminant against which they provide protection. This information is included in the standard.

Powered air-purifying respirators protect against particulates, gases and vapors, or particulates and gases and vapors. The air-purifying element may be a filter, chemical cartridge, combination filter and chemical cartridge, or canister. The powered air-purifying respirator uses a power source (usually a battery pack) to operate a blower that passes air across the air-cleaning element to supply purified air to the respirator. The great advantage of the powered air-purifying respirator is that it usually supplies air at positive pressure (relative to atmospheric) so that any leakage is outward from the facepiece. However, it is possible at high work rates to create a negative pressure in the facepiece, thereby increasing facepiece leakage.

Class 2. Atmosphere- or Air-Supplying Devices

Atmosphere- or air-supplying devices are the class of respirators that provide a respirable atmosphere to the wearer, independent of the ambient air. Atmosphere-supplying respirators fall into three groups: supplied-air respirators, self-contained breathing apparatus (SCBA), and combination-SCBA and supplied-air respirators. A brief discussion of each follows.

Supplied-air respirators deliver breathing air through a supply hose connected to the wearer's facepiece or enclosure. The air delivered must be free of contaminants and must be from a source located in clean air. The OSHA requirements for compressed air used for breathing, including monitoring for carbon monoxide, are listed in 1910.134(d). Supplied-air



respirators should only be used in non-IDLH atmospheres.

There are three types of supplied-air respirators: Type A, Type B and Type C. Type A supplied-air respirators are also known as hose masks with blower. Air is supplied by a motor-driven or hand-operated blower through a strong, large diameter hose. Type B supplied-air respirators are hose masks as described above without a blower. The wearer draws air through the hose by breathing. Type C supplied-air respirators are commonly referred to as air-line respirators. An air-line respirator must be supplied with respirable air conforming to Grade D Compressed Gas Association's Standard CGA G-7.1-73, *Commodity Specification for Air*, 1973. This standard requires air to have the oxygen content normally present in the atmosphere, no more than 5 mg/M³ of condensed hydrocarbon contamination, no more than 20 ppm carbon monoxide, no pronounced odor, and a maximum of 1,000 ppm of carbon dioxide.

There are three basic classes of air-line respirators - continuous-flow, demand-flow, and pressure-demand-flow.

Continuous flow. A continuous-flow unit has a regulated amount of air fed to the facepiece and is normally used where there is an ample air supply such as that provided by an air compressor.

Demand flow. These air-line respirators deliver air flow only during inhalation. Such respirators are normally used when the air supply is restricted to high-pressure compressed air cylinders. A suitable pressure regulator is required to make sure that the air is reduced to the proper pressure for breathing.



Pressure-demand flow. For those conditions where the possible inward leakage (caused by the negative pressure during inhalation that is always present in demand systems) is unacceptable and where there cannot be the relatively high air consumption of the continuous-flow units, a pressure-demand air-line respirator may be the best choice. It provides a positive pressure during both inhalation and exhalation.

Types A, B, and C that are approved for abrasive blasting are designated AE, BE, and CE respectively. These respirators are equipped with additional devices designed to protect the wearer's head and neck against impact and abrasion from rebounding abrasive material and with shielding to protect the windows of facepieces, hoods, and helmets.

Self-contained breathing apparatus provide complete respiratory protection against toxic gases and an oxygen deficiency. The wearer is independent of the surrounding atmosphere because he or she is breathing with a system that is portable and admits no outside air. The oxygen or air supply of the apparatus itself takes care of respiratory requirements.

There are two basic types of self-contained breathing apparatus: closed-circuit and open-circuit. In the closed-circuit apparatus, the exhalation is rebreathed by the wearer after the carbon dioxide has been effectively removed and a suitable oxygen concentration restored from sources composed of: compressed oxygen; or chemical oxygen; or liquid-oxygen. In the open-circuit apparatus, exhalation is vented to the atmosphere and is not rebreathed. There are two types of open-circuit SCBAs: demand and pressure-demand.



Combination-SCBA and supplied-air respirators are air-line respirators with and auxiliary self-contained air supply. An auxiliary SCBA is an independent air supply that allows a person to evacuate an area or enter such an area for a very short period of time where a connection to an outside air supply can be made. These devices are approved for use in IDLH atmospheres. The auxiliary air supply can be switched to in the event the primary air supply fails to operate. This allows the wearer to escape from the IDLH atmosphere. Combination air-line respirators with auxiliary SCBA are designed to operate in three modes: continuous-flow, demand-flow, and pressure-demand flow.

Class 3. Combination Air-Purifying and Atmosphere-Supplying Devices

Lately, another type of respirator is gaining in popularity. It is a device that is a combination of an air-line respirator with an auxiliary air-purifying attachment, which provides protection in the event the air supply fails. These respirators are available in either continuous-flow or pressure-demand flow and are most often used with a high-efficiency filter as the air purifying element. Use in the filtering mode is allowed for escape only. Because of the positive-pressure and escape provisions, these respirators have been recommended for asbestos work.

A summary of the classification of respiratory protective devices follows.



I. Air-Purifying Devices

- A. Mechanical-filter cartridge
- B. Chemical-cartridge
- C. Combination mechanical-filter/chemical cartridge
- D. Gas masks
- E. Powered air-purifying

II. Atmosphere- or Air-Supplying Devices

A. Supplied-air

- 1. Type A and AE
- 2. Type B and BE
- 3. Type C and CE (Airline)
 - a. Continuous-flow
 - b. Demand-flow
 - c. Pressure-demand flow

B. Self-contained breathing apparatus (SCBA)

- 1. Closed-circuit
- 2. Open-circuit
 - a. Demand
 - b. Pressure-demand

C. Combination-SCBA and supplied-air

- 1. Continuous-flow
- 2. Demand-flow
- 3. Pressure-demand flow

III. Combination Air-Purifying and Atmosphere Supplying Devices

- A. Continuous-flow
- B. Pressure-demand flow



Requirements for a minimal acceptable respirator program are specified in 1910.134 (b)(1) through (b)(11). Other sections of the standard also refer to these requirements as shown in the table below.

MINIMAL ACCEPTABLE RESPIRATOR PROGRAM	
Requirement	Standard
Written Operating Procedures	.134(b)(1), (e)(1), and (e)(3)
Proper Selection	.134(b)(2), (c), and (e)(2)
Training and Fitting	.134(b)(3), (e)(5), and (e)(5)(i-iii)
Cleaning and Disinfecting	.134(b)(5) and (f)(3)
Storage	.134(b)(6), and (f)(5)(i-iii)
Inspection and Maintenance	.134(b)(7), (e)(4), (f)(2)(i-iv), and (f)(4)
Work Area Surveillance	.134(b)(8) only
Inspection/Evaluation of Program	.134(b)(9) only
Medical Examinations	.134(b)(10) only
Approved Respirators	.134(b)(11) only



Written Operating Procedures

OSHA standards state that the employer is responsible not only for providing appropriate respirators, but also for developing written standard operating procedures for their selection, use and care. The procedures must include a discussion or explanation of all items specified in 29 CFR 1910.134(b).

Proper Selection

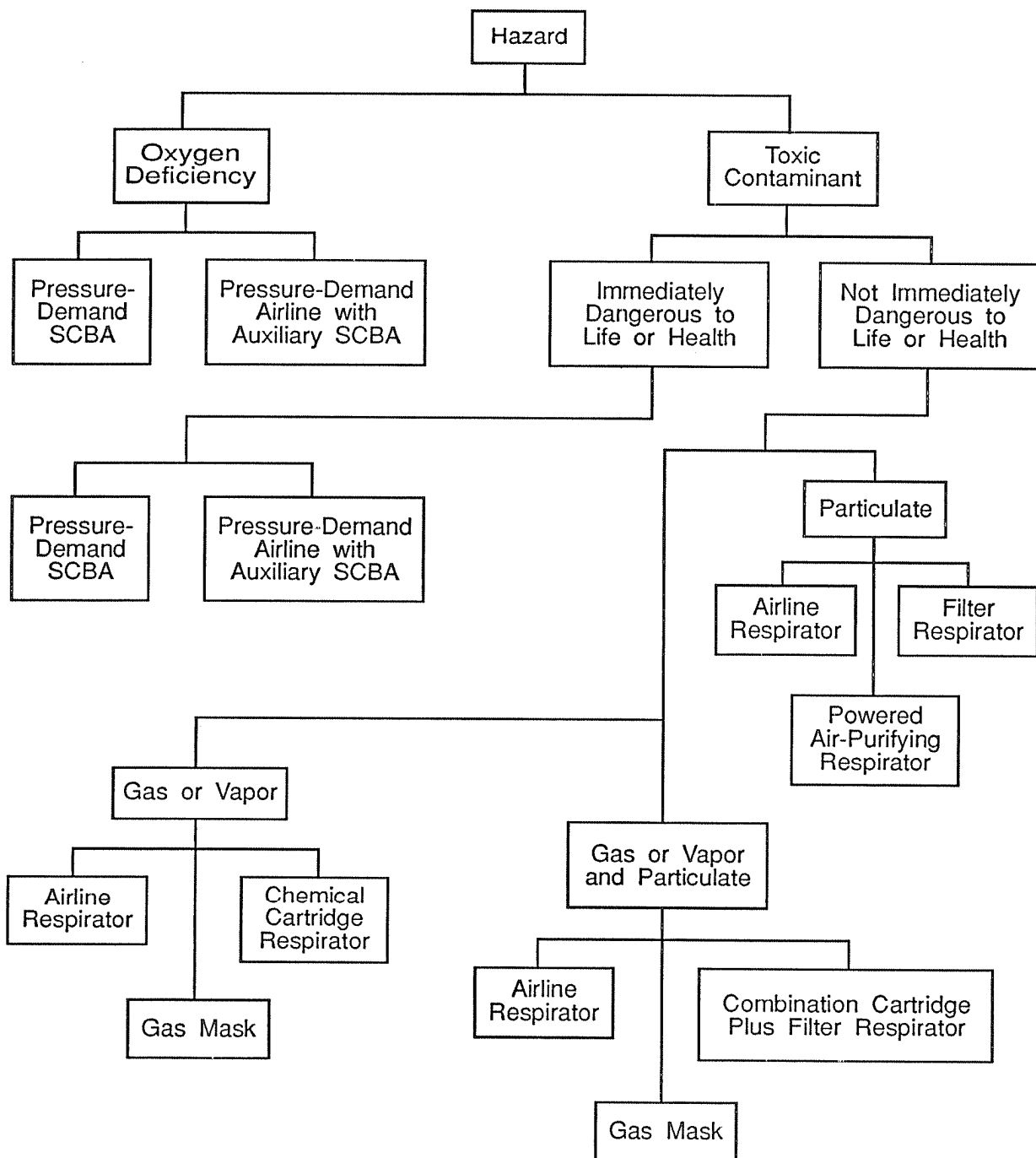
Respirators shall be selected on the basis of hazards to which the worker is exposed. The respirator type is usually specified in the work procedures by a qualified individual supervising the respiratory protective program. The individual issuing them shall be adequately instructed to insure that the correct respirator is issued.

In selecting the correct respirator for a given circumstance, many factors must be taken into consideration, e.g., the nature of the hazard, location of the hazardous area, employee's health, work activity, and respirator characteristics, capabilities, and limitations.

In order to make subsequent decisions, the nature of the hazard must be identified to ensure that an overexposure does not occur. One very important factor to consider is oxygen deficiency. NIOSH/MSHA approval for supplied-air and air-purifying respirators is valid only for atmospheres containing greater than 19.5 percent oxygen. If oxygen deficiency is not an issue, then the contaminant(s) and their concentration(s) must be determined. The figure below presents an outline for the selection process based on these criteria.



RESPIRATORY SELECTION FOR ROUTINE USE OF RESPIRATORS





Training and Fitting

The user must be instructed and trained in the selection, use and maintenance of respirators. Every respirator user shall receive fitting instructions including demonstrations and practice in how the respirator should be worn, how to adjust it, and how to determine if it fits properly.

Cleaning and Disinfecting

Respirators must be regularly cleaned and disinfected. Those issued for the exclusive use of one worker should be cleaned after each day's use or more often if necessary.

Storage

OSHA standards require that respirators "be stored in a convenient, clean, and sanitary location." The purpose of good respirator storage is to ensure that the respirator will function properly when used. Care must be taken to ensure that respirators are stored in such a manner as to protect against dust, harmful chemicals, sunlight, excessive heat or cold, and moisture.

Inspection and Maintenance

Respirators used routinely shall be inspected during cleaning. Worn or deteriorated parts shall be replaced. Respirators for emergency use such as self-contained devices, shall be thoroughly inspected at least once a month and after each use.



Work Area Surveillance

The OSHA standard requires that "appropriate surveillance of work area conditions and degree of employee exposure or stress be maintained." This should include identification of the contaminant, nature of the hazard, and concentration at the breathing zone.

Inspection and Evaluation of the Program

The standard requires regular inspection and evaluation to determine the continued effectiveness of the respirator program. Many factors affect the employee's acceptance of respirators, including comfort, ability to breathe without objectionable effort, adequate visibility under all conditions, provisions for wearing prescription glasses (if necessary), ability to communicate, ability to perform all tasks without undue interference, and confidence in the facepiece fit.

Failure to consider these factors is likely to reduce cooperation of the users in promoting a satisfactory program.

Medical Examinations

Persons should not be assigned to tasks requiring the use of respirators unless it has been determined that they are physically able to perform the work and use the equipment. A physician shall determine the health and physical conditions that are pertinent for an employee's ability to work while wearing a respirator. The user's medical status should be reviewed periodically.



Approved Respirators

The standard states that "approved or accepted respirators shall be used when they are available." A respirator is approved as the whole unit with specific components. OSHA recognizes a respirator as approved if it has been jointly approved by NIOSH and the Mine Safety and Health Administration (MSHA).