

Risk Control Bulletin

Respiratory Protection Program Series

Getting Started

RISK CONTROL



Respiratory protection is not always needed. Just providing respirators to employees without training or a medical examination can violate OSHA regulations. Employers need to determine if the employees might be exposed to hazardous chemicals during the course of their work.

Step 1: Review the process, products, and the chemicals used in the workplace. Drum and container labels may be the first place to look for information and a hazard warning. Labels may not fully explain or alert the reader. Read the chemical products' material safety data sheets (MSDSs). The MSDS should list the specific chemical names of the various components in that product listed in Section 2. Chemicals that have an assigned OSHA permissible exposure limit (PEL) should be listed.

Avoid being misled when no chemicals are listed in Section 2. Every chemical can be potentially dangerous based on the exposure level. An exposure could result from ingestion, skin contact, or inhalation. Manufacturers often use newly developed chemicals. Those new chemicals may not have either animal studies or industrial experience to assign an occupational health limit (OHL). Because there is no assigned OHL, the manufacturer may not have listed that chemical in its product's composition. Other times a manufacturer may not divulge the contents in their product or may have simply stated, "proprietary information." Employers should then contact the manufacturer to obtain that specific chemical information.

Step 2: Evaluate the employees' occupational exposure. How is the chemical handled? How is the chemical controlled? How long is the exposure time? Respirators are considered the least effective exposure protection method because the chemical exposure is still there and the employee may not wear their respirator properly. The best exposure-reduction approach involves implementing effective engineering controls. Respiratory protection should be provided only after all practical engineering controls have been attempted and the employees' exposures still could not be lowered below acceptable levels.

Step 3: Quantify the employees' workplace chemical exposure concentrations. This is an important step. Testing can objectively quantify the highest exposure level likely to be encountered for each chemical agent. Locations having a potential oxygen-deficient atmosphere should be identified and measured following appropriate confined space entry procedures.

Step 4: Use the objective sample test data to select the proper types of respirators. You are legally required to follow OSHA's permissible exposure limits (PEL) when determining the proper respirator. Employers have the option of using a more stringent guideline when selecting the type of respirator.

Many of the federal OSHA permissible exposure limits (PELs) were set more than 20 years ago. Unfortunately, not many of the PELs have been updated. However, some state OSHA programs may have amended their OSHA regulatory PELs. It is best to confirm which current enforceable PEL affects your facility. Many times the OSHA PELs do not address the most recent health studies. Therefore, you may decide to use a more stringent limit to provide the employees a higher level of safety protection. The ACGIH and NIOSH are two organizations that offer guidelines and recommendations for airborne chemical concentrations based on recent animal studies and industrial experience.



The National Institute for Occupational Health and Safety (NIOSH) is a research branch that submits recommendations to OSHA. That organization provides “advisory” limits called recommended exposure limits (RELs) to OSHA for their review and acceptance.

The American Conference of Governmental Industrial Hygienists is an independent organization of research scientists and educators that provides exposure guidelines. These are updated annually and are called Threshold Limit Values (TLV®). These TLV’s may address a time-weight average or a short term exposure limit concentration.

Step-5: Determine the type of respirator with the proper protection level that needs to be provided by dividing the monitored chemical’s airborne concentration by its PEL. For this example, if the airborne test sample concentration was 45 ppm and the OSHA PEL was set at 5 ppm for an allowable time-weighted average.

$$\text{Protection Factor (PF)} = \text{Concentration} / \text{PEL}$$

$$\text{PF} = 45 \text{ ppm} / 5 \text{ ppm} = 9$$

Therefore, the selected respirator should provide a minimum protection factor of 10

Respirators are available in different, sizes, styles, types, options, and accessories. For example, a supplied air hooded respirator is normally assigned a higher assigned protection factor (APF) when compared to a full facemask air-purifying respirator. Correct selection provides better protection and comfort.

Types of Respirators

Respirators need to be properly selected based upon the physical properties of the contaminant, the toxicity and the airborne chemical concentration. Other selection factors to consider are the nature and extent of the hazard, and work requirements. Airborne conditions, such as the amount of oxygen present, as well as the limitations and characteristics of the available respirators must be understood. Respirators must not impair the worker’s ability to see, hear, communicate, and move as necessary to perform the job safely.

Hazard	Respirator
Oxygen deficiency Gas, vapor contaminants and other highly toxic air contaminants	Full-face piece, pressure-demand SCBA certified for a minimum service life of 30 minutes. A combination full-face piece, pressure-demand SAR, combined with an auxiliary self-contained air supply.
Contaminated atmospheres for escape	Positive-pressure SCBA. Gas mask. Combination positive-pressure SAR with escape SCBA tank.
Gas and vapor contaminants	Chemical-cartridge or canister respirator. Gas mask. Positive-pressure supplied-air respirator.
Particulate contaminants	Positive-pressure supplied-air respirator including abrasive blasting respirator. Powered air-purifying respirator equipped with high-efficiency filters. Any air-purifying respirator with a specific particulate filter
Gaseous and particulate contaminants	Positive-pressure supplied-respirator. Gas mask. Chemical-cartridge respirator with mechanical filters.
Smoke and other fire-related contaminants	Positive-pressure self-containing breathing apparatus (SCBA).

Definitions

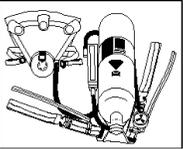
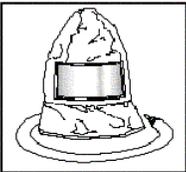
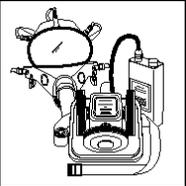
Air-purifying (AP) respirators use filters or sorbents to remove the harmful substances from the air. They do not supply oxygen; therefore, they must not be used in oxygen-deficient atmospheres

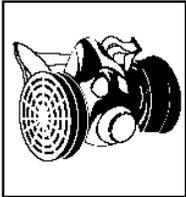
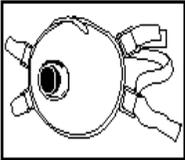
Supplied-air (SA) respirators are designed to provide breathable air from a clean air source other than the surrounding contaminated work atmosphere. Supplied-air respirators may restrict movement or present other potential hazards.

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.

It is best to offer a selection of products to the employee so they can determine what they like for their situation and comfort. After safety, comfort is the most important factor to the person, who wears that respirator. Therefore, given a choice of effective respirators, the most comfortable respirator is likely to be selected and worn.

The following are the different types of respirators.

Respirator Type	Description
	<p>SA Supplied-air respirators provide the highest level of protection against highly toxic and unknown materials. Supplied-air refers to airline and SCBA respirators. Supplied-air respiratory equipment is the only protection allowed when employees work in atmospheres having less than 19.5% oxygen.</p> <p>SCBAs have a limited air supply in a tank carried by the user. It allows for greater mobility and fewer restrictions than airline respirators.</p>
	<p>SA Airline respirators have an air hose connected to a breathable air supply source. The breathing air must meet at least Grade-D requirements, which means the compressed air needs to be filtered and tested.</p> <p>Some people cannot wear a respirator due to a poor face seal. A helmet or hood style respirator is an alternative a facemask.</p>
	<p>AP Powered air-purifying respirators use a blower to draw the contaminated air through a filter or chemical cartridge. The purified air is then delivered into a mask or hood. They are easier to breathe through when doing heavy work, such as lifting.</p> <p>The power is provided by rechargeable battery packs, which normally last for a full workshift. They cannot be used in oxygen deficient atmospheres. Oxygen levels below 19.5% require supplied-air respiratory protection.</p>
	<p>AP Gas mask respirators are designed for slightly higher concentrations of organic vapors, gases, dusts, mists and fumes. The higher volume of sorbent medium used is higher than in a chemical cartridge. This allows a person to work longer before the canister needs to be replaced.</p> <p>Like any air-purifying respirator, it cannot be used in an oxygen-deficient atmosphere. The chemical cartridges only absorb the airborne chemical and do not generate oxygen.</p>

Respirator Type	Description
	<p data-bbox="305 359 345 390">AP</p> <p data-bbox="370 359 1528 485">Air-purifying respirators can be either a full-face or a half mask equipped with mechanical filters for, fibers, dusts, mists, or fumes. Chemical cartridges absorb organic chemical vapors, gases or neutralize acidic mists. Respirators may be disposable or reusable. They have no replaceable parts except for the chemical cartridges or filters.</p> <p data-bbox="370 516 1528 606">The sorbent medium used in chemical cartridges absorbs or neutralizes the chemical contaminate. The absorption capacity of the filter is limited. A change-out schedule needs to be calculated. Don't wait for the wearer to detect an odor, irritation, or taste of the contaminant.</p>
	<p data-bbox="305 653 345 684">AP</p> <p data-bbox="370 653 1528 747">Disposable air-purifying filtering face pieces are the simplest, least expensive, and least protective. They only protect against particles, but <u>not</u> against chemical gases or vapors. These disposable masks are intended only for low hazard levels.</p> <p data-bbox="370 779 1528 930">NIOSH-approved models must have double-headband straps to hold the mask snugly against the wearer's face. Some models may have a thin metal band, which allows easy adjustment around that "hard-to-fit" nose area. The figure to the left shows a single exhalation valve to remove the hot, humid exhaled air. Disposable masks filter out particulates; therefore, a change-out schedule is not required.</p>

- Contact your safety equipment representative for advice and assistance when selecting the proper type of respirator for the circumstances at the facility. Try to provide three different manufacturers' brands and models of respirators in various sizes for the employees to wear and test.
- More than one style or brand of respirator may be needed to obtain the correct fit, comfort, and employee acceptance.
- Employee comfort usually means acceptance that eventually means the employee would be more likely to wear their assigned respirator properly.

An employer has to comply with explicit requirements in the respiratory standard if respiratory protection is required or allowed.