



Respiratory Safety

Introduction

Everyday thousands of workers are subjected to airborne contaminants. These different contaminants can cause great harm to the respiratory system and other vital systems if allowed to enter the human body. While the human body has natural defense mechanisms in place, they are no match for the harmful dust, mist, vapors and other airborne contaminants often created in the workplace. To protect you from such hazards, the Occupational Safety and Health Administration, or OSHA, created the Respiratory Protection Standard 29 CFR 1910.134.



Introduction

Approximately 5% of all U.S. workers in about 20% of all work establishments wear respirators **at least some of the time while performing their job functions**. These workers are employed at approximately 1.3 million establishments nationwide. A respirator is a personal protective device worn on the face, covers at least the nose and mouth, and is used to reduce the wearer's risk of inhaling hazardous airborne particles (including dust particles and infectious agents), gases or vapors. Certain respirators also provide protection for oxygen-deficient atmospheres. To provide the proper protection, employees must have a good knowledge and understanding of respirators. This training program was created to help ensure you understand the requirements for using respirators, how to properly select, don and use a respirator, and how to care for and maintain a respirator.

Scope and Application

In the control of occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors, the primary goal should be to prevent atmospheric contamination. This should be accomplished as much as possible by accepted engineering and administrative controls measures. For example: confining the work operation, installing ventilation systems, using water sprays and/or substitution of less toxic materials. These types of controls are generally regarded as the most effective methods to control exposure.



Scope and Application

When effective control measures are not feasible, or while they are being instituted, appropriate respirators must be used. OSHA considers respirators to be the least effective means of exposure control for the following reasons:

- Respirators only protect if properly fitted and worn
- Respirators only protect the employee wearing the respirator and not the workplace as a whole
- Respirators are uncomfortable to wear, difficult to use, and make communication difficult
- The cost, which includes medical examinations, fit testing, training, and purchasing is very expensive.

Scope and Application

The OSHA standard applies to all occupational exposures to contaminated air where an employee is:

- Exposed to a hazardous level of an airborne contaminant
- Required by the employer to wear a respirator
- Permitted to wear a respirator

Accordingly employers have four duties imposed upon them. They should:

- Use engineering and administrative controls where feasible to control the hazard.
- Provide appropriate respirators at no cost to the employee.
- Ensure the use of an appropriate respirator.
- Create and institute a written respiratory protection program that complies with the standard.

Respiratory Protection Program

In any workplace where respirators are necessary to protect the health of the employee or whenever respirators are required by the employer, the employer must establish and maintain a written respiratory protection program. Much pre-planning of the implementation steps is necessary to establish the written program. This pre-planning is by design and intended to ensure the employee is safely using the proper respirator.

The written program must contain worksite-specific procedures and elements for required respiratory use. The program must be administered by a suitably trained program administrator. Program must be updated as necessary to reflect changes in the workplace conditions that affect respirator use.

Respiratory Protection Program

As applicable, program must include:

- Procedures for selecting respirators for use in the workplace
- Medical evaluations of employees required to use respirators
- Fit testing procedures for tight-fitting respirators
- Procedures for proper use of respirators in routine and reasonably foreseeable emergency situations
- Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, and maintaining respirators
- Employee training in the proper use of respirators including putting on and removing, limitations on their use, and maintenance
 - Procedures for regular evaluations of the effectiveness of the program allows for continuous improvements or changes to be made, as necessary, to maintain a protective program

Voluntary Use of Respirators

Employers who allow their employees to wear respirators on a voluntary basis when not required by OSHA or the employer must implement limited provisions of a respiratory protection program.

- Employers may provide respirators at the request of employees
- May permit employees to use their own respirators if use does not create a hazard itself
 - Read and follow all instructions provided by manufacturer on use, maintenance, cleaning and care, and warnings regarding the respirators limitations
 - Choose a respirator certified for use to protect against the contaminant of concern
 - Don't wear respirator into atmospheres containing contaminants for which your respirator is not designed to protect against
 - Keep track of your respirator to avoid using someone else's respirator
 - Employer must establish and implement those elements of a written respiratory protection program necessary to ensure the employee voluntarily using a respirator is medically able to use the respirator and the respirator is cleaned, stored, and maintained so it does not present a health hazard to the user.
 - The voluntary use of a dusk mask, or filtering facepiece, does not require a written protection program.

Selection of Respirators

Employers must select and provide an appropriate respirator based on the respiratory hazard to which the worker is exposed and workplace and user factors that affect respirator performance and reliability. Respirators must be certified by the National Institute for Occupational Safety and Health, or NIOSH, and used in compliance with the conditions of its certification. With few exceptions (some filtering facepiece respirators), the NIOSH approval number is not on the respirator itself, but on a separate NIOSH approval label which is found on, or within the packaging. Both an approval label and user instructions are supplied with all NIOSH-approved respirators. These documents, a single copy of which may accompany either a large or small package of respirators, should not be discarded before all of the respirators are used or discarded.

In addition to the approval number, the NIOSH approval label contains contact information for the respirator manufacturer/supplier, cautions, and limitations for use, and directions for proper use. It is very important to read and follow all of the manufacturer's instructions for the particular respirator you are using.

Selection of Respirators

Exposure Assessment

When employees are exposed to respiratory hazards and/or are required to wear a respirator, an exposure assessment must be made.

- Employers must identify and evaluate the respiratory hazard(s) in the workplace.
- Employers must make a "reasonable estimate" of the employee exposures anticipated to occur as a result of those hazards, including those likely to be encountered in reasonably foreseeable emergency situations.
- When the employer cannot identify or reasonably estimate the employee exposure, the atmosphere should be considered Immediately Dangerous to Life or Health (IDLH). IDLH means an atmosphere that poses an immediate threat to life and/or health or could impair an employee's ability to escape from a dangerous atmosphere.
- Specific characteristics of the airborne hazard must be established in order to select an appropriate respirator. Is the contaminant a particulate such as dust, fumes or mist or a gas/vapor? Is the contaminant a chemical and if so are there Material Safety Data Sheets available? Are there any mandatory or recommended occupational exposure levels for the contaminant? These questions must all be answered to ensure employee safety when selecting and using respirators.
 - Instances when an assessment should be considered include but are not limited to:
 - When employees notice symptoms or complain of respiratory health effects.
 - When the workplace contains visible emissions such as fumes, dust or aerosols.

Selection of Respirators

Factors That Can Influence Respirator Selection

Certain factors must be taken into consideration when selecting respirators.

- Workplace Factors

Tightly constrained areas may not permit the use of self-contained breathing apparatuses even though they might be an acceptable choice otherwise. Likewise, working around obstructions or moving machinery that can snag hoses may limit the use of airline respirators.

- User Factors

Wearing respiratory protection poses a physical burden on the wearer. When a worker's medical condition would prohibit restrictive breathing conditions, negative pressure respirators would not be an appropriate choice.

Worker preferences should be a consideration during the respirator selection process. Among air purifying respirators, powered air purifying helmets have been subjectively rated the best for breathing ease, skin comfort, and in-mask temperature and humidity while filtering face pieces rated high for lightness and convenience. Each, however, has its own drawbacks, and all these factors should be taken into account during selection.

Selection of Respirators

Assigned Protection Factors

The assigned protection factor (APF) of a respirator reflects the level of protection a properly functioning respirator would be expected to provide to a population of properly fitted and trained users. For example, an APF of 10 for a respirator means a user could expect to inhale no more than one tenth of the airborne contaminant present.

- APFs must be utilized to ensure a respirator meets or exceeds the required level of employee protection
 - OSHA will enforce the APFs listed in its standards unless an alternative APF has been granted by a specific OSHA interpretation.

Types of Respirators

There are two types of respirators: Air-Purifying and Atmosphere-Supplying. Respirators should be appropriate for the chemical state and physical form of the contaminant.

Air-Purifying Respirators: have filters, cartridges, or canisters that remove contaminants from the air by passing the ambient air through the air-purifying element before it reaches the user.

- The type of cartridge and the particular hazardous substance for which it provides protection is identified by labeling and a standardized color coding of the cartridge.
 - Also known as negative-pressure respirators because of the negative air pressure created by inhalation.
 - Offer no protection against oxygen-deficient atmospheres.
 - A leak-proof seal between the facepiece and the worker's face is essential for proper protection.
 - Leaks may be caused by improper fit, the presence of facial hair or foreign substances under the sealing surface, or cracked or damaged seals, valves or cartridges.

Types of Respirators

There are three different types of air-purifying respirators.

Particulate Respirator



Combination Respirator



Gas & Vapor Respirator



Types of Respirators

1. Particulate Respirator

capture particles in the air, such as dusts, mists, and fumes do not protect against gases or vapors generally become more effective as particles accumulate on the filter and plug spaces between the fiber.

2. Combination Respirator

are normally used in atmospheres that contain hazards of both particulates and gases
have both particulate filters and gas/vapor filters

Types of Respirators

3. Gas and Vapor Respirator

- Are normally used when there are only hazardous gases and vapors in the air.
- Use chemical filters (called cartridges or canisters) to remove dangerous gases or vapors and protect against specific gases or vapors, not airborne particles.
- Provide protection only as long as the filter's absorbing capacity is not depleted.
- Generally equipped with an end-of-service-life indicator (ESLI) certified by NIOSH to warn user of the approaching end of adequate respiratory protection.
 - If no ESLI is present, a change schedule is necessary. The change schedule is part of the written respirator program and states how often cartridges should be replaced and what information was relied upon to make this judgment.
 - The service life (how long it provides adequate protection) of the filter depends upon many factors including environmental conditions, breathing rate, cartridge filtering capacity, and the amount of contaminants in the air.
 - A safety factor should be applied to the service life estimate to assure the change schedule is a conservative estimate.
Safety factors are reductions to an estimated service life to ensure the actual service life will not be exceeded.

Types of Respirators

Atmosphere-Supplying Respirators: supply clean air directly to the user from a source other than the air surrounding the user and also known as positive-pressure respirators. There are three different kinds of atmosphere-supplying respirators.

1. Supplied-Air Respirator (SAR)

- Makes use of a hose to deliver clean, safe air from a stationary source of compressed air.
- Provides clean air for long periods of time and is light weight for the user.
 - Limits the range of user-mobility and may fail due to hose damage.
 - Also called airline respirators.
 - Are normally used when there are extended work periods required in atmospheres that ARE NOT immediately dangerous to life and health (IDLH).

Types of Respirators

2. Combination Respirator

- Have an auxiliary self-contained air supply to be used if the primary supply fails.
- The self-contained portion can be small since it only needs to supply enough air for escape.
- Can be used for entry into confined spaces.
- Are normally used when there are extended work periods required in atmospheres that ARE OR MAY BE immediately dangerous to life and health (IDLH).



Types of Respirators

3. Self-Contained Breathing Apparatus (SCBA)

- Consists of a wearable, clean-air supply pack.
- Doesn't restrict movement with a hose connection.
- The closed-circuit type can provide air up to 4 hours.
- The open-circuit type only provides air for 30 - 60 minutes.
- Are normally used when there is a short-time needed to enter and escape from atmospheres which ARE OR MAY BE immediately dangerous to life and health (IDLH).



Immediately Dangerous to Life or Health (IDLH)

Employees working in atmospheres considered to be IDLH must be provided with the following respirators:

- A full facepiece pressure demand SCBA certified by NIOSH for a minimum service life of 30 minutes, or
- A combination full facepiece pressure demand supplied-air respirator (SAR) with auxiliary self-contained air supply.
 - Respirators provided only for escape from IDLH atmospheres should be NIOSH certified for escape from the atmosphere in which they will be used.
 - All oxygen-deficient atmospheres are considered to be IDLH.

Medical Evaluations

Using a respirator may place a physiological burden on employees that varies with the type of respirator worn, the job and workplace conditions in which the respirator is used and the medical status of the employee.

- Some conditions that may adversely affect the health of some employees who wear respirators include: negative-pressure respirators which restrict breathing, some respirators can cause claustrophobia and self-contained breathing apparatuses are heavy.
- Employees need to be medically cleared to wear respirators before commencing use.
 - A physician or other licensed health care professional operating within the scope of his/her practice needs to medically evaluate employees to determine under what conditions one can safely wear a respirator.

Fit Testing

All respirators that rely on a mask-to-face seal need to be annually checked with either qualitative or quantitative methods to determine whether the mask provides an acceptable fit to a wearer.

- The qualitative fit test procedures, often referred to as QLFT, rely on a subjective sensation (taste, irritation, smell) of the respirator wearer to a particular test agent.
- Qualitative fit testing is accomplished by temporarily converting the respirator user's actual face piece into a negative pressure respirator.
- The quantitative test often referred to as QNFT, uses measuring Instruments to measure face seal leakage.



Fit Testing

- Quantitative fit testing is accomplished by modifying the face piece to allow sampling inside the face piece in the breathing zone of the user, midway between the nose and the mouth.
- Any modifications to the respirator face piece for fit testing must be completely removed and the face piece restored to NIOSH-approved configuration before the face piece can be used.
 - The relative workplace exposure level determines what constitutes an acceptable fit and which fit test procedure is required.
 - For negative pressure air purifying respirators, users may rely on either a qualitative or a quantitative fit test procedure for exposure levels less than 10 times the occupational exposure limit.

Fit Testing

- Exposure levels greater than 10 times the occupational exposure limit must utilize a quantitative fit test procedure for these respirators.
- Fit testing of tight-fitting atmosphere-supplying respirators and tight-fitting powered air-purifying respirators shall be accomplished by performing quantitative or qualitative fit testing in the negative-pressure mode.
- A record of the fit test must be retained until the next test is administered.

Record must include:

- Name of employee tested
- Type of test performed
 - Specific make, model, style and size of respirator tested
 - Date of test
 - The pass/fail results for QLFTs or the fit factor and strip chart recording or other recording of the test results for QNFTs.

User Seal Check

Employees who use a tight-fitting respirator must perform a user seal check to ensure an adequate seal is achieved each time the respirator is used. Both a positive and a negative seal check are required. User seal checks are not substitutes for qualitative or quantitative fit tests.

- Positive Pressure Check

Close off the exhalation valve and exhale gently into the face piece. The face fit is considered satisfactory if a slight positive pressure can be built up inside the face piece without any evidence of outward leakage of air at the seal. For most respirators this method of leak testing requires the wearer to first remove the exhalation valve cover before closing off the exhalation valve and then carefully replacing it after the test.



User Seal Check

Negative pressure check.

Close off the inlet opening of the canister or cartridge(s) by covering with the palm of the hand(s) or by replacing the filter seal(s), inhale gently so the facepiece collapses slightly, and hold the breath for ten seconds. The design of the inlet opening of some cartridges cannot be effectively covered with the palm of the hand. The test can be performed by covering the inlet opening of the cartridge with a thin latex or nitrile glove. If the face piece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is considered satisfactory.



Manufacturer's Recommended User Seal Check Procedures

The respirator manufacturer's recommended procedures for performing user seal check may be used instead of the positive and/or negative pressure check procedures provided the employer demonstrates the manufacturer's procedures are equally effective.

Maintenance and Care

The proper functioning of respirators and ensuring the devices themselves do not pose a hazard to the user require a regular maintenance and cleaning schedule. In general, respirators should be inspected for basic function prior to each use and cleaned as often as necessary to prevent the occurrence of unsanitary conditions.

Inspections: Type and Frequency

- Respirators used in routine situations-inspect before each use and during cleaning.
 - Respirators maintained for emergency use-inspect monthly and according to manufacturer's recommendations.
 - Emergency escape-only respirators-inspect before being carried into the workplace for use.

Maintenance and Care

Cleaning: Type and Frequency

- Respirators issued for the exclusive use of an employee - Clean as often as necessary to be maintained in a sanitary condition.
- Respirators issued to more than one employee - Clean and disinfected before being worn by different individuals.
- Respirators maintained for emergency use - Clean and disinfected after each use.
- Respirators used in fit testing and training - Clean and disinfected after each use.
- Self-contained breathing apparatus (SCBA) must be inspected monthly. Air and oxygen cylinders must be maintained in a fully charged state and should be recharged when the pressure falls to 90% of the manufacturer's recommended pressure level.

•Storage and Repairs

Respirators should be stored to protect them from damage, contamination, dust, sunlight, extreme temperatures, excessive moisture and damaging chemicals. They should also be stored to prevent deformation of the face piece and exhalation valve.

Respirators that fail inspection or are found to be defective must be removed from use and discarded or repaired by appropriately trained persons using the manufacturer's NIOSH-approved parts designed for the respirator.

Training

Employees who are required to use respirators must be properly trained. Training must be comprehensive, understandable and recur at least annually. Employees who are permitted to use respirators voluntarily must also be provided basic information and training. Employees must be able to demonstrate knowledge of at least the following:

- Why the respirator is necessary and how improper fit, usage or maintenance can compromise the protective effect.
- What are the limitations and capabilities
 - How to use the respirator effectively in emergency situations.
 - How to inspect, put on and remove, use and check the seals.
 - Procedures for maintenance and storage.
 - How to recognize medical signs and symptoms that may limit or prevent effective use of the respirator.





Quiz

Click on the link below to take a 5-Question Quiz.

https://secure.rutherfordcountyttn.gov/Respirator_2011/

You must take the quiz to receive credit for the Safety Training.

Once you have linked to the quiz, please enter your Social Security Number at the top. You will need to enter it according to the example shown (ex. 999-99-9999 with hyphens included). Once finished with the questions, please click the submit button and your training will be recorded.