

## **THE RESPIRATORY PROTECTION PROGRAM: EMPLOYER TRAINING**

This easy-to-use Leader's Guide is provided to assist in conducting a successful presentation. Featured are:

**INTRODUCTION:** A brief description of the program and the subject that it addresses.

**PROGRAM OUTLINE:** Summarizes the program content. If the program outline is discussed before the video is presented, the entire program will be more meaningful and successful.

**PREPARING FOR AND CONDUCTING THE PRESENTATION:** These sections will help you set up the training environment, help you relate the program to site-specific incidents, and provide program objectives for focusing your presentation.

**REVIEW QUESTIONS AND ANSWERS:** Questions may be copied and given to participants to document how well they understood the information that was presented. Answers to the review questions are provided separately.

### **INTRODUCTION**

To protect employees from respiratory hazards and environments that are oxygen deficient, employers may require the use of respiratory protection. When respiratory protection is used, employers must follow the regulations laid out in OSHA's Respiratory Protection Standard, 1910.134. This video provides an overview of the employer's responsibilities and discusses key components of a proper Respiratory Protection Program.

Topics include various types of respirators, filters and cartridges, exposure limits, Assignment Protection Factors and Maximum Use Concentrations, medical surveillance, qualitative and quantitative fit tests and maintenance and storage of respirators.

### **PROGRAM OUTLINE**

#### **BACKGROUND**

- There are a variety of dangerous chemicals found in industrial, manufacturing and chemical processing environments. These chemicals can be found in the form of dusts, fumes, mists, gases and vapors, which can be hazardous to the respiratory system.
- Exposure to such contaminants can cause lung damage, cancer and other serious ailments to vital organs and the central nervous system. To protect employees from these adverse health affects and from environments that are oxygen deficient, employers may employ the use of respiratory protection.
- When respiratory protection is used, employers must follow the regulations laid out in the Occupational Safety and Health Administration's Respiratory Protection Standard, 1910.134. This program will provide an overview of the employer's responsibilities as well as discussing key components of a proper Respiratory Protection Program.

#### **IDENTIFYING & CONTROLLING RESPIRATORY HAZARDS**

- A workplace evaluation must be performed to determine whether a respiratory protection program is necessary. This involves identifying areas of the plant that have respiratory dangers and determining whether hazardous exposures to employees exist.
- Various methods of testing, monitoring and sampling may be used to determine whether hazardous exposures are occurring. Once identified, these hazards must be eliminated or controlled.
- Administrative and engineering controls, such as isolation of the area or improved ventilation, are the preferred methods to reduce worker exposure to respiratory hazards.

## **THE WRITTEN RESPIRATORY PROTECTION PROGRAM**

- Until these controls are implemented or if they are not feasible or effective, respiratory protection must be used and affected employees enrolled in a respiratory protection program. OSHA requires that the written respiratory program must be made available for employee review.
- A suitably trained program administrator must be designated to oversee the program. The program administrator must be familiar with the respiratory hazards on-site, be involved in the training of employees about those hazards and ensure the proper selection and use of respirators to control the hazards.
- Employers must understand that there are many types and styles of respirators, each designed to control a specific type of hazard. Properly selecting respirators to control site specific hazards is critical to a successful program.

## **OXYGEN-DEFICIENT & IDLH ATMOSPHERES**

- It's important to understand that some atmospheric hazards are caused by a lack of oxygen, while other atmospheric hazards are due to the presence of harmful chemicals.
- This is a key point because an air-purifying respirator only filters the air and has no ability to add oxygen to the air; each year workers are killed by mistakenly wearing air-purifying respirators into oxygen deficient atmospheres.
- Atmospheres deficient in oxygen are often referred to as IDLH atmospheres. IDLH stands for Immediately Dangerous to Life and Health. IDLH atmospheres can also be caused by high chemical concentrations.
- These types of atmospheres require a self-contained breathing apparatus (SCBA) or a supplied-air respirator (SAR) with an auxiliary self-contained air supply to be used.

## **AIR-PURIFYING RESPIRATORS**

- As long as IDLH conditions do not exist and the hazards are due to dusts, fumes, mists, gases or vapors, an air purifying respirator may be used. Air-purifying respirators are designed to remove airborne contaminants through filters; the type of contaminant determines what type of filter material is needed.
- There are two general types of filters or cartridges used with an air-purifying respirator. The first is a chemical cartridge, which protects against certain gases and all but the most toxic organic vapors.
- The second is a mechanical filter, which protects against particulates such as dusts, mists, or fumes. All filters and cartridges are certified by the National Institute of Occupational Safety and Health (NIOSH) and rated for use against specific chemical hazards or contaminants.

## **CLASSES OF MECHANICAL FILTERS**

- Mechanical filters, which contain fibrous material in the filter to trap particles, are divided into three classes, or series, based on the particles they are designed to remove.
- N-series filters are used for non-oil contaminants, such as solid and water-based particulates. N stands for not resistant to oil.
- R-series filters are resistant to oil. They can be used for work areas that contain oil-mist. R-series are only designed for use during one shift and must then be discarded.
- P-series filters are considered oil proof. They can be used for work areas that contain oil-mist and are designed to be re-used rather than disposable.

- Within each series, the respirator will be given a classification number: 100, 99, or 95. This is the percentage of efficiency that a filter has at capturing airborne particles. These series and classification numbers will be displayed either on the filter or the respirator.
- The higher the percentage number, the more particles it will filter out; however, the higher the efficiency percentage, the more effort is required to breathe.
- It's important to select the proper respirator for the job; selecting a higher efficiency than necessary places unnecessary strain on the user, while selecting too low an efficiency may not provide enough protection.
- Mechanical filters should be replaced whenever noticeable changes in breathing resistance occur.

### **CHEMICAL CARTRIDGES**

- Chemical cartridges use a filtering medium of activated carbon, which retains the contaminant. Its primary function is to remove organic vapors, but filters also can be added for protection from a variety of specific gases; the correct cartridge for the material to be filtered must be in place.
- OSHA requires employers to establish a change-out schedule for chemical cartridges. Employers must ensure that chemical cartridges are changed out before the end of their service life and before "breakthrough" occurs.
- Breakthrough is when an employee detects vapor or gas in their respirator. The data used to make the decisions for changing out the cartridges should be included in the written respiratory protection program.
- The chemical cartridge manufacturer's information on cartridge service life must be consulted to determine appropriate change-out schedules for your cartridge application. Ambient temperatures and humidity, as well as gas and vapor concentrations in the air greatly impact the life of a cartridge.
- To select the correct respirator and cartridges, as applicable, for the job, the identity and concentrations of the chemicals in the air should be known from the hazard assessment and air sampling.

### **EXPOSURE LIMITS**

- Next, the occupational exposure limits for those contaminants should be consulted. OSHA regulates chemical exposures for a number of workplace chemicals. A list of these chemicals can be found in the "Z-Tables" under 29 CFR, Subpart Z.
- The Z-Tables list substances alphabetically along with their permissible exposure limits (PEL). The permissible exposure limit is the maximum amount of a contaminant to which an employee is permitted to be exposed.
- Work areas with concentrations below the OSHA permissible exposure limit (PEL) do not require respirators be worn, while work areas with concentrations above the PEL require a respirator that will reduce an employee's exposure to levels below the PEL.
- There are three common types of exposure limits. The first are "Eight-Hour Time Weighted Averages (TWA's)", which are limits based on average chemical exposures over an eight-hour work shift that should not be exceeded.
- The second are "Ceiling Limits", which are concentrations that should not be exceeded at any time.
- The last are Short-Term Exposure Limits (STEL's), which are 15-minute average exposures not to be exceeded. Most exposure limits are expressed in terms of parts per million (ppm) or milligrams per cubic meter (mg/m<sup>3</sup>).

### **ASSIGNED PROTECTION FACTORS (APF'S)**

- To help simplify the selection of a respirator which will properly reduce exposure below the PEL, OSHA's respirator standard and many manufacturers have assigned a "protection factor" to common respirator classes and styles.
- This "Assigned Protection Factor," commonly called an APF, gives an indication of how much the respirator will reduce the user's level of exposure compared to the level of contaminant in the ambient air.
- For example, the PEL of hexavalent chromium (chromium 6) is 5 micrograms per cubic meter ( $5 \mu\text{g}/\text{m}^3$ ). Suppose an air sample taken from the workplace contains 80 micrograms of chromium 6 per cubic meter of air. If we divide the actual contaminant level ( $80 \mu\text{g}/\text{m}^3$ ) by the permissible exposure limit of  $5 \mu\text{g}/\text{m}^3$ , we find that the air contains 16 times more chromium 6 than the permissible exposure limit.
- This ratio is also called the hazard ratio. This hazard ratio of 16 means that we need to reduce the employee's exposure by a factor of 16 in order to be at or below the PEL for chromium 6. To accomplish this, a respirator with an assigned protection factor (APF) greater than 16 must be selected. Understanding how to use the APF rating of respirators is an important tool in selecting the proper respirator for the job.
- The most current OSHA respiratory standard includes definitions for the assigned protection factor (APF) of a respirator or class of respirators. In addition, many manufacturers publish APF's for their products.

### **MAXIMUM USE CONCENTRATIONS (MUC'S)**

- Another ratio that aids in respirator selection is the Maximum Use Concentration or MUC. This is the maximum atmospheric concentration in which a specific respirator is effective.
- Maximum Use Concentrations can be determined through a simple calculation. Multiplying the occupational exposure limit, such as the PEL, by the APF for a respirator gives the maximum workplace concentration in which that respirator can be used.
- For example, if the commonly accepted APF for a half-mask respirator is 10 and the PEL is  $5 \mu\text{g}/\text{m}^3$ , multiplying 5 times 10 yields  $50 \mu\text{g}/\text{m}^3$ .  $50 \mu\text{g}/\text{m}^3$  is the highest workplace concentration in which a half-mask respirator with an APF of 10 can be used while limiting exposure to a PEL of  $5 \mu\text{g}/\text{m}^3$ .

### **MEDICAL SURVEILLANCE**

- All respirators cause some type of discomfort, such as restricted breathing, limitations to vision and movement and heat related discomfort; therefore, before they begin using respirators, employees must undergo a medical evaluation to assess their capability to handle these stresses.
- This will be administered by a physician or other licensed health care professional using a medical questionnaire or an initial medical examination.
- The required medical information needed can be found in OSHA Standard 1910.134 Appendix C. Periodic evaluations may also take place to assure that workers are still medically fit to wear their respirators.
- Pulmonary function tests and X-rays may be necessary to test fitness.
- Medical records should be maintained in a confidential file for use by the physician. The health care professional will advise the employer in writing if the employee is fit, fit with limitations or unfit to perform his duties without revealing confidential information.

### **FIT TESTING RESPIRATORS TO EMPLOYEES**

- When the employee has been cleared medically to use a respirator, the next step is fit testing the employee with the same, make, model, style and size of respirator they will be using.

- The trainer will show the employee how to put on the respirator, how it should be positioned on the face, how to set strap tension and how to determine an acceptable fit.
- To help ensure a proper fit, OSHA requires employers to select NIOSH-certified respirators from a sufficient number of models and sizes so that the respirator is acceptable to and correctly fits the user.
- There are a number of criteria when evaluating the general fit of the respirator. First of all, there can not be anything facially that would interfere with the seal, such as beards or sideburns. The position of the mask on the face and chin should allow for a good seal when the straps are tightened.

#### **POSITIVE & NEGATIVE SEAL CHECKS**

- OSHA requires employees to perform a seal check each time the respirator is worn.
- With the positive check, the wearer closes off the exhalation valve and then exhales gently. If it seals correctly, there will be a slight positive pressure inside the face piece but no outward evidence of leakage at the seal.
- With the negative check, the inlet opening is covered and the wearer inhales gently and holds their breath for about 10 seconds. If the face piece collapses slightly, stays collapsed and there is no inward leakage of air detected, the tightness of the respirator is considered satisfactory.

#### **QUALITATIVE & QUANTITATIVE FIT TESTS**

- Fit testing for tight fitting respirators involves either an appropriate qualitative fit test (QLFT) or a quantitative fit test (QNFT).
- Qualitative fit tests are only good for certifying respiratory protection to an APF of 10.
- Quantitative fit tests are necessary for certifying an APF greater than 10, as in the case of full-face respirators.
- A qualitative test uses scented chemicals, smoke or other irritant to determine if you can smell or taste it through your respirator. If you can smell or taste the irritant, then you don't have a good fit and must be re-fitted.
- A quantitative test uses an instrument to numerically measure the leakage of a substance into the respirator.
- While undergoing fit testing, the subject will be asked to perform several exercises to simulate the movements that occur during respirator use such as deep breathing, turning the head from side-to-side, talking to the trainer or reading out loud, grimacing and bending at the waist.
- Fit testing will be done on the type, style and size respirator you will be wearing while performing your job. A properly fitting respirator is essential to providing protection from respiratory hazards.
- These tests must be able to be performed without any noticeable gaps or openings between the respirator and the employee's face. Each test, with the exception of the grimace test, should be performed for one minute. Appendix A of the 1910.134 standard has details on how to perform each of these tests.

#### **MAINTENANCE & STORAGE OF RESPIRATORS**

- In addition to a proper fit, respirators must be well maintained to be effective. Procedures for proper storage, cleaning, maintenance and replacement of respirators must also be part of the written respiratory protection program.
- The respirators that are provided to employees should be clean, sanitary and in good working order. Disposable respirators are simply discarded after use.

- Respirators worn by a single person need to be cleaned and disinfected once a day or as often as needed to keep it sanitary, while respirators shared among employees must be cleaned and disinfected after each individual's use.
- First, remove any filters, cartridges or canisters. Disassemble the face piece and remove the straps. Inspect the tightness of all connections and the condition of the various pieces such as straps, tubes, diaphragms and cartridges.
- Any defective parts should be repaired or replaced by a qualified person.
- Wash all parts of the respirator with a detergent recommended by the manufacturer and warm water; a bristle brush will remove excess dirt.
- Use warm water to rinse all of the parts. Be sure to rinse off all of the detergent because the residue can dry on the rubber and crack it or corrode metal.
- After thoroughly rinsing and draining, the parts should be immersed in a disinfectant of bleach, iodine or cleanser approved by the respirator manufacturer for two minutes. Once removed, the pieces should be completely rinsed, drained and then dried, either with a lint-free cloth or air-dried.
- When the respirator is reassembled and ready to store, put it in its case or a plastic bag. Store it in a clean, dry place approved by your company.

#### **RECORDKEEPING**

- Recordkeeping is an important part of the respiratory protection program. The entire respiratory program for the company should be documented.
- This includes the types and locations of respiratory hazards, procedures for air sampling and testing, procedures for selecting the proper respirators for the hazards, records of employee fit testing and non-confidential records of medical evaluations.
- Also, the written plan must include procedures for evaluating the respiratory protection program regularly to ensure it contains the most up-to-date information.

## **PREPARE FOR THE SAFETY MEETING**

Review each section of this Leader's Guide as well as the videotape. Here are a few suggestions for using the program:

Make everyone aware of the importance the company places on health and safety and how each person must be an active member of the safety team.

Introduce the videotape program. Play the videotape without interruption. Review the program content by presenting the information in the program outline.

Copy the review questions included in this Leader's Guide and ask each participant to complete them.

Copy the attendance record as needed and have each participant sign the form. Maintain the attendance record and each participant's test paper as written documentation of the training performed.

### **Here are some suggestions for preparing your Videotape equipment and the room or area you use:**

Check the room or area for quietness, adequate ventilation and temperature, lighting and unobstructed access.

Check the seating arrangement and the audiovisual equipment to ensure that all participants will be able to see and hear the videotape program.

## **CONDUCTING THE PRESENTATION**

Begin the meeting by welcoming the participants. Introduce yourself and give each person the opportunity to become acquainted if there are new people joining the training session.

Explain that the primary purpose of the program is to show employers the responsibilities they have as part of the company's Respiratory Protection Program.

Introduce the videotape program. Play the videotape without interruption. Review the program content by presenting the information in the program outline. Lead discussions about your company's Respiratory Protection Program and how it works to protect employees from respiratory hazards. Use the review questions to check how well the program participants understood the information.

After watching the videotape program, the viewer will be able to identify the following:

- How air-purifying respirators are properly selected and used;
- How Assignment Protection Factors and Maximum Use Concentrations are calculated;
- How fit tests and seal checks are properly conducted;
- How respirators should be cleaned, maintained and stored.

**THE RESPIRATORY PROTECTION PROGRAM:  
EMPLOYER RESPONSIBILITIES  
REVIEW QUIZ**

Name \_\_\_\_\_ Date \_\_\_\_\_

*The following questions are provided to check how well you understand the information presented during this program.*

1. OSHA requires that the written respiratory protection program must be made available for employee review.
  - a. true
  - b. false
  
2. Which filter respirator is resistant to oil but must be discarded after use on a single work shift?
  - a. N-Series
  - b. R-Series
  - c. P-Series
  
3. Chemical cartridges should only be changed after an employee experiences breakthrough in their respirator.
  - a. true
  - b. false
  
4. A Short-Term Exposure Limit is a \_\_\_\_\_ minute average exposure that must not be exceeded.
  - a. 15
  - b. 30
  - c. 60
  
5. Dividing the actual contaminant level in an area by the permissible exposure limit of the contaminant gives you the \_\_\_\_\_ of that contaminant.
  - a. Maximum Use Concentration
  - b. Hazard Ratio
  - c. Ceiling Limit
  
6. OSHA requires employees to perform a seal check each time their respirator is worn.
  - a. true
  - b. false
  
7. Which type of fit test is only good for certifying respiratory protection to an APF of 10?
  - a. Quintessential
  - b. Quantitative
  - c. Qualitative
  
8. Which user seal test consists of placing both hands over the respirator's inhalation valves and breathing in gently?
  - a. positive
  - b. negative
  - c. neutral



***ANSWERS TO THE REVIEW QUESTIONS***

1. a

2. b

3. b

4. a

5. b

6. a

7. c

8. b