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Respiratory Protection in the Workplace

*A Practical Guide for
Small-Business Employers*



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Small-Business Employers



Publishing Information

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Contents

About This Booklet	v
Five Steps to Implementing a Respiratory Protection Program	2
Step 1: Eliminate the Need for Respiratory Protection	2
Step 2: Invest the Time to Become Knowledgeable About Respirators	2
Step 3: Plan to Seek the Help of Outside Experts	3
Step 4: Implement Your Written Respiratory Protection Program	3
Step 5: Establish a Process to Keep Your Program Effective	3
Facts About Respirator Use	6
When and Why Respirators Should Be Used	6
Voluntary Use of Respirators	7
Types of Respirators	9
How to Assess Employees' Exposure to Respiratory Hazards	14
Options for Obtaining Expert Advice	14
Factors in Assessing Respiratory Hazards	15
Methods for Assessing Employees' Exposure	15
Unknown Atmospheres	18

How to Develop Your Written Respiratory Protection Program	20
Respirator Selection	21
Medical Evaluations	24
Fit Testing	26
Use of Respirators	27
Maintenance and Care of Respirators	28
Breathing Air Quality and Use	29
Training and Information	29
Program Evaluation	30
 Resources	 34
Web Sites	34
Resource CD-ROM	35
 References	 38
 Acknowledgments	 42
 List of Figures	
Figure 1 - Respiratory Protection Program Evaluation Process	4
Figure 2 - Respirator-use Requirements Flow Chart	8

About This Booklet

This booklet provides general information about respiratory protection in the workplace. It offers an overview to help small-business employers with gaining an understanding of how to set up a respiratory protection program.

This booklet should be used as an introduction to respiratory protection. To gather more in-depth information, readers are advised to consult other resources, such as the *Small Entity Compliance Guide for the Revised Respiratory Protection Standard*, which is published by the United States Department of Labor, Occupational Safety and Health Administration (1998). Readers may also wish to attend classes in how to develop a comprehensive respiratory protection program.

The level of training and experience needed to run an effective respiratory protection program will vary depending on the complexity of the work environment, the nature of the hazard, and the type of respirators used. For information about more serious hazards or complex issues than those discussed in this booklet, readers may need to seek the advice of a safety and health professional who has experience and specialized training in respiratory protection.



Five Steps to Implementing a Respiratory Protection Program

Five Steps to Implementing a Respiratory Protection Program

WARNING!

Death or serious illness can occur when respirators are used improperly.

Using respiratory protection in the workplace can be beneficial, but it can also be a liability. Although providing workers with respiratory protection can reduce workers' exposure to airborne hazards, death or serious illness can occur when respirators are used improperly. This section outlines five steps that you, the small-business employer, can take to implement a respiratory protection program.

Step 1: Eliminate the Need for Respiratory Protection.

Using respirators is expensive and involves ongoing costs incurred through medical evaluations, annual fit testing, and purchases of equipment. Respirators can hinder employees' comfort and productivity, and their use always carries the risk of unexpected overexposures. The first step to ensuring employees' safety is to eliminate the need for respiratory protection by using less toxic materials or by providing engineering controls, when feasible, to reduce respiratory hazards. Respiratory protection should be used as the last resort in preventing harmful exposures to your employees and not as a substitute for other feasible control measures.

Step 2: Invest the Time to Become Knowledgeable About Respirators.

Your respiratory protection program should be implemented by a knowledgeable person. In becoming knowledgeable, that person should expect to invest some time in studying technical resources or in attending a class. The person you designate to run your program will be called the *respiratory protection program administrator*, and he or she will have specific duties and responsibilities that are detailed in the *California Code of Regulations, Title 8 (T8 CCR), Section 5144, Respiratory Protection*. For further technical guidance, refer to the resources listed at the back of this booklet.

Step 3: Plan to Seek the Help of Outside Experts.

Most small companies do not have the resources to make a respiratory hazard evaluation and to select the proper type of respirator. Plan to seek outside expert assistance to measure exposure levels so that the right respirators can be selected and to determine how often cartridges on air-purifying respirators should be changed. Expert assistance is available from safety and health professionals employed by:

- Workers' compensation carriers
- Cal/OSHA Consultation Service
- Private consulting firms
- Respirator product vendors
- Industry associations

Step 4: Implement Your Written Respiratory Protection Program.

Once you have made a respiratory hazard evaluation and have selected the right respirators, you must develop and implement written work site-specific procedures for proper respirator use, care, and maintenance. You must also train workers in all aspects of the respiratory protection program.

Step 5: Establish a Process to Keep Your Program Effective.

A successful respiratory protection program is regularly evaluated to ensure that it is up to date and effective. The frequency with which you must evaluate your respirator program will depend on the complexity and the extent of respiratory hazards in your workplace.

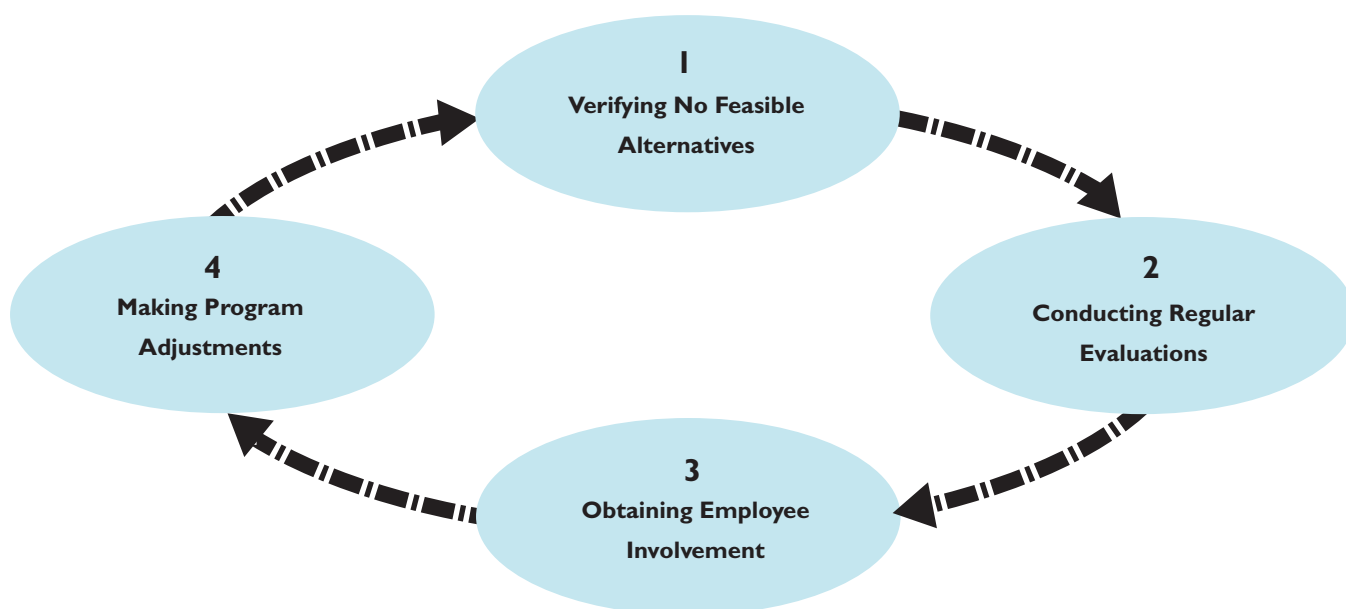
You must reevaluate respiratory hazards whenever changes take place in work area conditions (e.g., whenever new substances, processes, procedures, or equipment are introduced) that may change the degree of employees' exposures.

The process of evaluating your respiratory protection program consists of the following steps (see Figure 1):

1. Verifying that there are no feasible alternatives to respirators
2. Conducting regular workplace evaluations for respiratory hazards
3. Obtaining employees' active involvement in reviewing and updating the respirator program
4. Making program adjustments

Figure 1

Respiratory Protection Program Evaluation Process





Facts About Respirator Use

Facts About Respirator Use

If you plan to have your employees use respirators, you should ensure that the appropriate respirator is selected for the type of work being performed and the types of respiratory hazards present. By learning when and why respirators should be used and by familiarizing yourself with the different types of respirators available, you can provide your employees with appropriate protection and reduce losses resulting from accidents and illnesses.

When and Why Respirators Should Be Used

Respirators are devices used to reduce workers' exposure to respiratory hazards, such as fumes, mists, gases, vapors, or harmful dusts. Respirators are also used to protect workers against oxygen-deficient atmospheres. An oxygen-deficient atmosphere is defined as having an oxygen content of less than 19.5 percent.



Feasible Control Measures

The use of feasible control measures is required according to *T8 CCR*, Section 5141, *Control of Harmful Exposure to Employees*.

You must first try to control air contaminants by:

- Eliminating the contaminants or substituting them with less toxic materials
- Implementing engineering control measures (e.g., by enclosing or isolating the process or by using dilution ventilation or local exhaust ventilation)
- Using administrative controls (e.g., by reducing the amount of time that employees are exposed to toxic materials or by modifying the employees' work practices).



Refer to the Regulations

Refer to the appropriate substance-specific health standards (*T8 CCR*, sections 5190–5220) regarding the limitations of using administrative controls.

Appropriate respirators must be used:

- When the controls listed above are not feasible
- While the controls are being instituted
- When the controls are not sufficient to reduce respiratory hazards to a level below established exposure limits
- During emergencies

Voluntary Use of Respirators

Voluntary use of a respirator occurs when an employee requests a respirator even though the use of one is not required by a standard and you have determined that its use is not necessary to protect the health of the employee (see Figure 2).

You can provide respirators at the request of employees or permit employees to use their own respirators as long as you determine that the respirator's use will not in itself create a hazard. When respirators are used voluntarily, only certain respiratory protection program elements must be met (see "How to Develop Your Written Respiratory Protection Program," p. 20). Employers must:

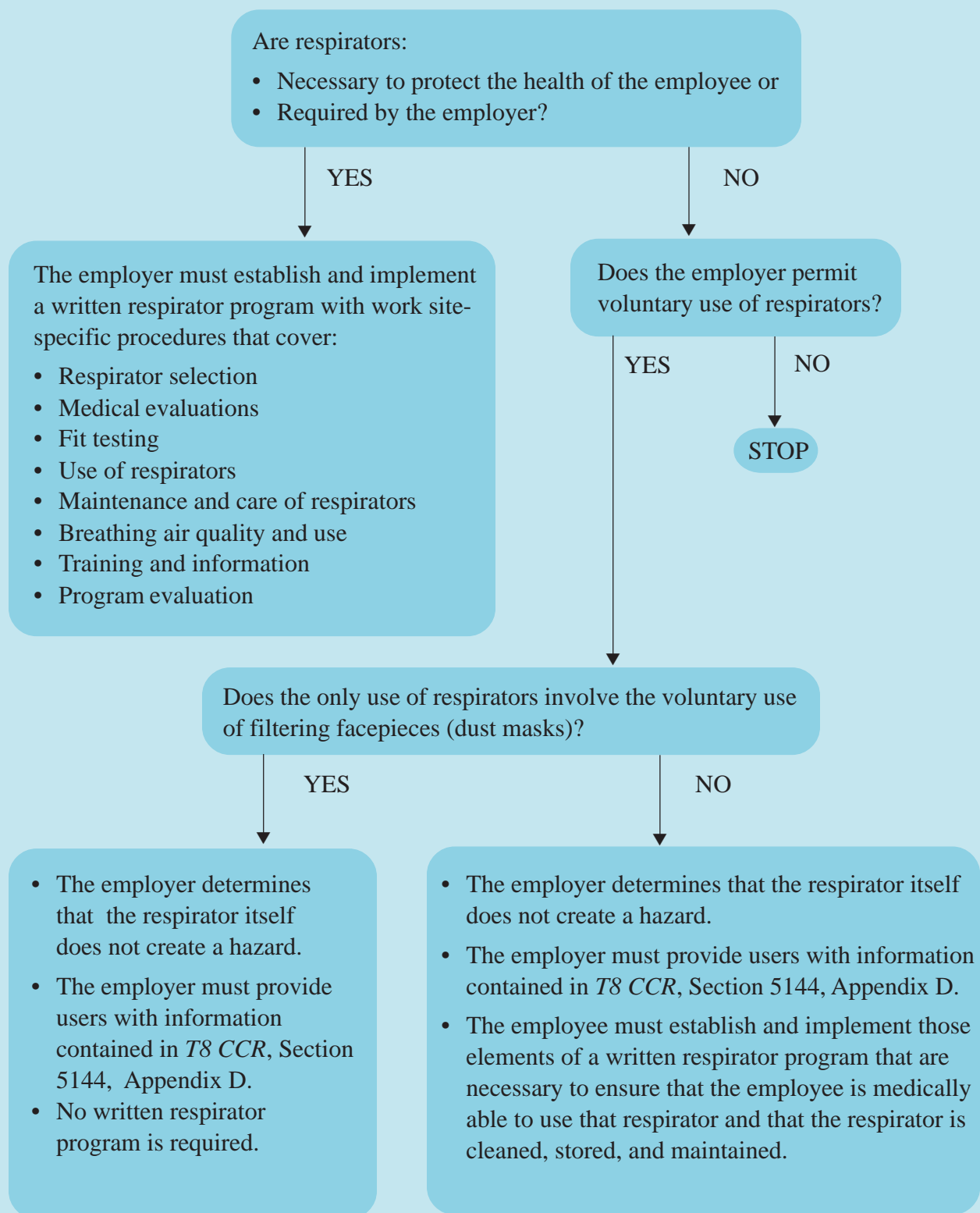
- Conduct employee medical evaluations.
- Establish procedures for cleaning, storing, and maintaining respirators.
- Give employees a copy of *T8 CCR, Section 5144, Appendix D, (Mandatory) Information for Employees Using Respirators When Not Required Under the Standard*, which provides basic information on the proper use of respirators.



Filtering Facepiece-Type Respirators

A written respiratory protection program is not required when employees request the use of filtering facepiece-type respirators (dust masks) and when the respirators are not used to control a respiratory hazard. Employers must provide employees only with the information in *T8 CCR, Section 5144, Appendix D, (Mandatory) Information for Employees Using Respirators When Not Required Under the Standard*.

Figure 2
Respirator-Use Requirements Flow Chart



Types of Respirators

Different types of respirators are designed to protect against specific respiratory hazards. The atmosphere and the air contaminant levels that workers encounter at a work site dictate the type of respirator that must be worn.

Respirators are available in many types, models, and sizes from several manufacturers for a variety of applications. Described below are two major types of respirators: air-purifying respirators and atmosphere-supplying respirators.

Air-Purifying Respirators

Air-purifying respirators (APRs) work by removing gas; vapor; particulate; or combinations of gas, vapor, and/or particulate from the air through the use of filters, cartridges, or canisters. To help employees with identifying the specific chemicals that the cartridges are designed for, all filters, cartridges, and canisters must be labeled and color-coded with an approval label provided by the National Institute for Occupational Safety and Health (NIOSH).

Examples of air-purifying respirators include:

- *Filtering facepiece respirators*, which are often called *dust masks*
- *Tight-fitting respirators*, which have either a half mask or a full facepiece
- *Powered air-purifying respirators* (PAPRs), which have a hood, a helmet, a tight-fitting facepiece, or a loose-fitting facepiece. PAPRs have a battery-powered blower to supply purified air.



*Filtering facepiece
(dust mask)*



*Tight-fitting respirator
(half mask)*



*Tight-fitting respirator
(full facepiece)*



Belt-mounted PAPR

WARNING!

Air-purifying respirators are not designed for use in conditions that are immediately dangerous to life or health and must not be used when entering an area that is oxygen deficient. *Immediately dangerous to life or health* (IDLH) is a term that is used to describe an atmosphere that poses an immediate threat to life, that would cause irreversible adverse health effects, or that would impair a person's ability to escape from a dangerous atmosphere.

Atmosphere-Supplying Respirators

Instead of filtering out contaminants, as air-purifying respirators do, atmosphere-supplying respirators work by providing clean breathing air from an uncontaminated source. These respirators consist of a hood, a helmet, a tight-fitting facepiece, or a loose-fitting facepiece. The breathing air is supplied by a compressor or a pressurized cylinder.

Examples of atmosphere-supplying respirators include:

- *Supplied-air respirators (SARs)*, which provide breathing air through an airline from a source outside the contaminated work area
- *Self-contained breathing apparatuses (SCBAs)*, which allow the user to carry a pressurized (compressed) breathing air cylinder
- *Combination respirators*, which are SARs that have an auxiliary SCBA that is used to escape from a hazardous environment
- *Escape-only respirators*, which are intended for use only during an emergency exit. Escape-only respirators cannot be used to enter an area that has a hazardous atmosphere.



*Supplied-air respirator
(abrasive blasting helmet)*



*Self-contained breathing
apparatus (SCBA)*



*Combination SAR with
auxiliary SCBA*



*Escape-only
respirator*

Continuous flow and *pressure demand* respirators belong to different classes of atmosphere-supplying respirators.

- The continuous flow feature provides a continuous flow of breathing air to the respirator inlet covering.
- The pressure demand feature admits breathing air to the facepiece when the positive pressure inside the facepiece is reduced by inhalation.

Atmosphere-supplying respirators are mostly used in high-hazard atmospheres. High-hazard atmospheres can be encountered during emergency situations, chemical spills, very high concentrations of air contaminants, or the use of materials that have poor warning properties. Atmosphere-supplying respirators must also be used in the following situations:

- In atmospheres for which there are no approved cartridges (e.g., in an atmosphere where methylene chloride is present)
- During certain welding operations that involve toxic metals
- During procedures that involve abrasive blasting
- When escaping from a hazardous environment
- In oxygen-deficient atmospheres
- In conditions that are IDLH

Employee training, documentation, and respirator program oversight requirements for the use of atmosphere-supplying respirators are much more extensive than for the use of air-purifying respirators.

Negative- and Positive-Pressure Respirators

Both air-purifying respirators and atmosphere-supplying respirators may be further classified on the basis of their functioning as either negative-pressure respirators or as positive-pressure respirators.

Negative-pressure respirators are tight-fitting respirators that work by creating pressure differences between the volume of air inside and outside the respirator. As the wearer of a respirator breathes in, the pressure inside

the facepiece is reduced, which forces air from outside the facepiece to be pulled through the inlet covering to replace what was inhaled. Types of negative-pressure respirators include filtering facepiece “dust masks”; half masks; and full-facepiece, air-purifying respirators.

Positive-pressure respirators are respirators that have a breathing air source that pushes air through the inlet covering of the respirator. The pressure inside the respirator exceeds the air pressure outside the respirator.



How to Assess Employees' Exposure to Respiratory Hazards

How to Assess Employees' Exposure to Respiratory Hazards

Many accidents or illnesses can occur when an employee exposure assessment is not performed. For this reason, it is crucial to identify carefully *all* the respiratory hazards in a workplace and to measure or to estimate workers' exposures to these hazards. This section of the booklet discusses what small-business employers should know about conducting a respiratory hazard assessment.

Options for Obtaining Expert Advice

As a small-business employer, you must be informed about the respiratory hazards in the workplace and their health effects so that you can select the right respirators and ensure that they are used properly. You must know the limitations of the respirators and their maintenance requirements. In many cases, gathering this information presents technical demands that exceed the capabilities of small businesses; however, you have several options for obtaining expert advice. You may consider:

- Training one of your staff members to become a safety and health expert
- Requesting an evaluation by your workers' compensation carrier
- Calling the Cal/OSHA Consultation Service for assistance
- Consulting with an industrial hygienist or safety professional to assist with setting up your program

Factors in Assessing Respiratory Hazards

The safety and health professional with whom you consult will have to assess several factors before you can select the appropriate respiratory protection. He or she must:

1. Identify the respiratory hazards to which your employees are exposed.
2. Determine the state and the physical form of the chemicals. Are they solids, liquids, or gases? Do the liquids and solids give off vapors, or do they form dusts or mists? Does an oxygen-deficient atmosphere exist in your workplace, or are any combination of these hazards present?
3. Evaluate the extent of the hazards from chemicals that may be present. Are employees working in conditions that exceed or fall below acceptable exposure limits? How many employees are exposed?
4. Determine the kinds of adverse health effects that result from the products or materials used.

Methods for Assessing Employees' Exposure

The method used to assess employees' exposure to respiratory hazards depends on the complexity of the work environment and the nature of the hazards. Employees' exposure to respiratory hazards can be estimated by measuring the concentration of contaminants in the air. The process for taking this measurement is called *air monitoring* or *sampling*, which is done by using various types of instruments.

Air Monitoring

Air monitoring is used to assess the concentration of air contaminants that your employees may be breathing. Measurements can be made by using instruments that directly read exposure levels or by collecting air samples that require lab analysis.

Measuring your workers' exposure to respiratory hazards may appear simple, but it can actually be complex. It involves knowing how to use and to calibrate sampling equipment. It also involves understanding the effects

of numerous workplace environmental factors, such as ambient temperature, ambient humidity, process temperature, general facility conditions, and chemical interferences and interactions.

When assessing the concentration of air contaminants, you will have to answer the following questions:

- What are the exposure levels under normal conditions of use?
- What are the exposure levels in a reasonably foreseeable emergency?
- When are you going to perform air monitoring and for how long?
- Are exposures constant throughout a shift, or are there processes that create high concentrations for short periods of time?
- Will you monitor all employees or a representative number of exposed employees?
- Did you assume worst-case conditions to evaluate the highest foreseeable employee exposure levels?
- How much air monitoring is needed to make a reliable evaluation?



Monitoring the Work Environment

The airborne contaminants regulation (*T8 CCR*, Section 5155[e][1]) contains requirements to monitor the work environment when it is reasonable to suspect that employees may be exposed to concentrations of airborne contaminants in excess of established exposure limits.

Breathing Zone Air Monitoring

Breathing zone air monitoring is the best and most reliable method for assessing the concentration of air contaminants in a given circumstance. During an air monitoring survey, an employee wears a personal air pump that draws air through sampling media in the breathing zone of the employee. The *breathing zone* is the area around the employee's head and shoulders where the contaminants collected represent what the worker is inhaling. The sampling media can be either filter cassettes that collect dust or particulate or charcoal tubes that trap and hold gases or vapors. After the samples are collected, they are sent to a lab for analysis. The lab results are used to calculate the employee's exposure level.



Personal air pump and sampling media used to measure air contaminants during spray painting

In some instances it may be useful to collect air samples at fixed locations near the source of contamination. This method of air monitoring does not provide a true estimate of employees' exposures. Instead, it is used as a screening tool to help with pinpointing high exposure areas; evaluating the atmosphere in confined spaces; evaluating the effectiveness of control measures; supplementing breathing zone air monitoring; or obtaining background airborne concentrations.



Worst-Case Conditions

You should take measurements in worst-case conditions to ensure that you have collected air samples during the highest possible concentrations.

Objective Data

Objective data is defined as specific and reliable information that indicates whether the use or handling of a product or material will release concentrations of a respiratory hazard that exceed a level that would

trigger the need for respirator use. You can use data on the physical and chemical properties of air contaminants in combination with information on room dimensions, air exchange rates, and contaminant release rates to estimate the maximum exposure that could be anticipated in the workplace.



Limitations of Objective Data

The substance-specific health standards (*T8 CCR*, sections 5190–5220) may limit the use of objective data and require breathing zone air monitoring.

WARNING!

When using objective data, you must assume worst-case conditions to evaluate the highest foreseeable employee exposure levels. Always err on the side of higher—rather than lower—estimated exposures to account for uneven dispersion of the contaminant in the air and the proximity of the worker to the emission source.

Unknown Atmospheres

When there are no reliable data to identify or to reasonably estimate exposure levels (e.g., in confined space entries, during emergency rescue procedures, at chemical spills, when firefighting, and during some maintenance operations and repair activities), the atmosphere must be considered IDLH, and the highest level of respiratory protection must be used. Employers must provide employees with one of the following respirators in atmospheres that are considered IDLH: a full-facepiece, pressure-demand SCBA that is certified for a minimum service life of 30 minutes; or a combination full-facepiece, pressure-demand SAR with an auxiliary self-contained air supply.



How to Develop Your Written Respiratory Protection Program

How to Develop Your Written Respiratory Protection Program

To ensure the safe use of respirators, you must develop a written respiratory protection program that is tailored to the specific conditions of your work site. Developing and writing down work site-specific procedures is the most efficient way to ensure that the program reflects the unique characteristics of your workplace.

This section of the booklet provides an overview of the program elements required by the Cal/OSHA regulation on respiratory protection, *T8 CCR*, Section 5144. The regulation applies to all workplace respirator use. Firefighters are subject to additional regulations concerning their protective clothing and equipment as covered under *T8CCR*, Section 3409.

Depending on the respiratory hazards that employees may be exposed to and the work activities they perform (e.g., work that involves exposure to lead; asbestos and other regulated carcinogens; spray painting; hazardous waste operations; welding on toxic metals; or abrasive blasting), other sections in *T8 CCR* may have requirements in addition to those stated in *T8CCR*, Section 5144.



Asbestos removal



Lead abatement

The required elements of a written respiratory protection program are:

- Respirator selection
- Medical evaluations
- Fit testing
- Use of respirators
- Maintenance and care of respirators
- Breathing air quality and use (when atmosphere-supplying respirators are used)
- Training and information
- Program evaluation

Respirator Selection

After identifying and evaluating the respiratory hazards in your workplace, you must determine which respirators your employees will need.

You must select a NIOSH-certified respirator. All respirators must be chosen and used according to the limitations that are listed on the NIOSH certification, which appears on the NIOSH certification label (found on the respirator box, instructions, or cartridge label). The respirator must be appropriate for the contaminant's physical form and chemical state and the conditions under which the respirator will be used.

To select a respirator with the right level of protection, compare the results of your air monitoring survey with permissible exposure limits (PELs) set by Cal/OSHA. Are employees exposed at levels that exceed or fall below these allowable limits? Respirators must be capable of protecting employees against overexposure by reducing and maintaining exposure levels at or below the relevant exposure limits.

The PELs for specific respiratory hazards can be found in *T8CCR*, Section 5155, Table AC-1, *Airborne Contaminants*. In addition to consulting the Cal/OSHA limits, you should refer to the American Conference of Governmental Industrial Hygienists (ACGIH) recommended Threshold Limit Values (TLVs); the NIOSH Recommended Exposure Limits (RELs); or other occupational exposure guidelines (see the "Resources" section of this booklet for a list of helpful Web sites). You are required under *T8CCR*, Section 5141, to control respirator hazards whether or not they have established PELs.

If you used an outside professional to help with determining airborne exposure levels, the same person may be able to help you with selecting the proper respirator. Consult with your workers' compensation carrier or Cal/OSHA Consultation Service to confirm that the appropriate respirator has been selected. The respirator manufacturer's technical support personnel can also help with respirator selection.

Important Considerations

Keep in mind some of the selection factors that can affect respirator performance and reliability:

- Certain models or types of respirators may be uncomfortable to wear or cumbersome to use, or they may cause anxiety for some users. A sufficient number of respirator models and sizes that provide the same or greater protection must be made available to employees.
- Respirators must not impair to the point of being hazardous the worker's vision or hearing or interfere with communication, which can often be critical in performing a job safely.
- The physical stress of wearing a respirator may aggravate underlying acute or chronic diseases, particularly diseases related to the heart and lungs. When a worker's medical condition, as determined by a physician or other licensed health care professional (PLHCP), would prohibit the use of a negative-pressure respirator, employers are required to provide that worker with a PAPR or other appropriate respirator.

Assigned Protection Factors

Different types of respirators have different limits on how effective they are in protecting against air contaminants. The *assigned protection factor* (APF) of a respirator reflects the level of protection that a properly maintained and functioning respirator can be expected to provide to a population of properly fitted and trained users.

Different types of respirators have different APFs. Tight-fitting, half-mask, air-purifying respirators have the lowest APF, and SCBAs have the highest protection factor. An APF of 10 means that the concentration of air contaminants inside the respirator facepiece is reduced by a factor of 10.

Federal OSHA is in the process of updating APFs. Until the update has been completed, employers may rely on APFs published by NIOSH and the American National Standards Institute (ANSI) (see the “Resources” section of this booklet for a list of helpful Web sites). Cal/OSHA has enforceable APFs that are contained in substance-specific health standards.

Cartridge and Canister Warning Systems

The useful service life of a cartridge or canister is defined by how long it provides employees with adequate protection from harmful chemicals in the air. The service life of a cartridge depends on many factors, including environmental conditions (e.g., high humidity), breathing rate, cartridge capacity, the amount of contaminant in the air, and how many hours the cartridge is used each day.

For air-purifying respirators that protect against gases and vapors, a system must be in effect that will reliably warn respirator wearers of contaminant breakthrough. These systems include an end-of-service-life indicator (ESLI) or an established and enforced cartridge or canister change schedule.

Some cartridges and canisters are equipped with an ESLI system that warns the user of the end of adequate respiratory protection. The indicator is usually a sorbent material that changes color when the cartridge approaches saturation or is no longer effective. However, few cartridges are currently equipped with an ESLI. Most employers will have to develop a cartridge or canister change schedule or provide employees with atmosphere-supplying respirators.

A cartridge or canister change schedule is the part of your respiratory protection program that explains how often cartridges must be replaced and which information was relied on to make this determination. You must base your change schedule on the results of exposure monitoring surveys relevant to your specific workplace, the respirator manufacturer’s cartridge capacity data, or other reliable data. You should use a conservative estimate when establishing the change schedule.



Cartridge change schedule

Medical Evaluations

Using a respirator may place a physiological burden on employees. As the employer, you must provide all employees using a respirator with a medical evaluation, and you must protect the confidentiality of the employee who is being evaluated. Medical evaluations must be performed before fit testing a respirator on an employee or when an employee wears a respirator in the workplace for the first time.

You must follow several requirements when setting up a medical evaluation for your employees. For example, you must:

- Identify a physician or PLHCP to perform the medical evaluations.
- Ensure that a medical questionnaire or an initial medical examination that obtains the same information as the medical questionnaire is used. (The information required is discussed in *T8CCR*, Section 5144, Appendix C, *OSHA Respirator Medical Evaluation Questionnaire [Mandatory]*.)
- Ensure that the medical questionnaire and examinations are administered confidentially during the employee's normal working hours or at a time and a place convenient to the employee.
- Provide the employee with an opportunity to discuss the questionnaire and examination results with the PLHCP.

To ensure that employees' medical evaluations remain confidential, you must provide your employees with instructions on delivering or sending the completed questionnaire directly to the PLHCP who will review it. For example, you may supply employees with stamped, pre-addressed envelopes for mailing their completed questionnaires to the PLHCP.

Information that must be given to the PLHCP includes:

- The type and weight of the respirator
- The duration and frequency of the respirator's use (including its use for rescue and escape)
- The expected physical work effort
- The additional protective clothing and equipment to be worn
- The temperature and humidity extremes that may be encountered
- A copy of the written respiratory protection program
- A copy of *T8CCR*, Section 5144(e).

Be sure to obtain a recommendation in writing from the PLHCP regarding an employee's ability to use a respirator. The written opinion of the PLHCP must not reveal specific findings or diagnoses unrelated to an employee's occupational exposures. Your access is restricted to the following information:

- Any limitations on respirator use related to the medical condition of the employee or related to the workplace conditions in which the respirator will be used and whether the employee is medically able to use the respirator
- The need, if any, for follow-up medical evaluations
- A statement that the PLHCP has provided the employee with a copy of the PLHCP's written recommendation

The regulation on respirator protection, *T8CCR*, Section 5144, does not require an annual review of the medical status of employees who wear respirators; however, additional medical evaluations are required, at a minimum, when:

- An employee reports medical signs or symptoms related to his or her ability to use a respirator.
- The PLHCP, program administrator, or supervisor recommends re-evaluation.
- Information from the respirator program, including observations made during fit testing and program evaluation, indicates a need.
- Change occurs in workplace conditions that may substantially increase the physiological burden on an employee.

Fit Testing

To obtain adequate respiratory protection, a proper match must exist between the respirator and the wearer. Respirators that do not seal properly around an employee's face offer only the illusion of protection. To accommodate different face sizes, many manufacturers offer facepieces in several sizes and models.



Fit Testing Protocol

The fit test must be administered by using an OSHA-accepted QLFT or QNFT protocol, as contained in *T8 CCR*, Section 5144, Appendix A, *Fit Testing Procedures (Mandatory)*.

Employees using a negative-pressure or a positive-pressure, tight-fitting facepiece respirator must be provided with a *qualitative fit test* (QLFT) or a *quantitative fit test* (QNFT). A qualitative fit test is a pass/fail test that is used to assess the adequacy of a respirator's fit by relying on a person's response to a test agent. A quantitative fit test assesses the adequacy of a respirator's fit by numerically measuring the amount of leakage into the respirator.



Fit testing

The primary purpose of fit testing is to identify the specific make, model, style, and size of the respirator that is best suited for each employee. In addition, fit testing both provides an opportunity to check for problems with respirator use and reinforces respirator training by giving employees an opportunity to review the proper methods for putting on and wearing the respirator.

Fit testing is required before the initial use of a respirator, whenever an employee uses a different respirator facepiece, and at least annually. An additional fit test is required whenever the employee reports changes or whenever the employer or PLHCP observes changes in the employee's physical condition that could affect respirator fit (e.g., facial scarring, dental changes, cosmetic surgery, or an obvious change in body weight).



Facial Hair

Employees cannot have facial hair that interferes with the face-to-facepiece seal during the fit testing procedures.

If a specific respirator model or size cannot be found or an employee cannot be properly fit tested, you must provide the employee with a PAPR or an atmosphere-supplying respirator that has a hood, a helmet, or a loose-fitting facepiece that provides the employee with adequate protection.

Use of Respirators

Once the respirator has been properly selected and fit tested, it is necessary to ensure that the respirator is used properly in the workplace. You should be aware of the following situations that can compromise the effective use of respirators and jeopardize workers' protection:

- The person wearing the respirator fails to properly perform seal checks.
- The person wearing the respirator is also using personal protective equipment or other equipment that interferes with the face-to-facepiece seal.
- The respirator is not properly repaired, and its defective parts are not replaced.
- Modifications are made to the respirator, or nonapproved replacement parts are used.



Face-to-Facepiece Seal

Employees who have facial hair or any condition that interferes with the face-to-facepiece seal or valve function must not use tight-fitting respirators.

In these circumstances, employees may have a false sense of security in feeling that they are protected when they are not.



Positive-pressure seal check



Negative-pressure seal check

Each time they put on a tight-fitting respirator, employees must perform a positive-pressure and/or a negative-pressure seal check by using the procedures provided in *T8 CCR*, Section 5144, Appendix B-1, *User Seal Check Procedures (Mandatory)* or equally effective manufacturer's procedures.

For more detail on using respirators in routine or reasonably foreseeable emergency situations and for more information about the procedures for using respirators in IDLH atmospheres, refer to *T8CCR*, Section 5144(g).

Maintenance and Care of Respirators

You are required to provide each respirator user with a respirator that is clean, sanitary, and in good working order. These requirements are a vital part of any successful respiratory protection program. To ensure that the respirator remains serviceable and delivers effective protection, a maintenance program must be in place before respirators are used in a workplace. At a minimum, all maintenance programs are required to include information about:



Respirator cleaning

- Cleaning and disinfecting procedures
- Proper storage
- Inspections for defects before each use and during cleaning of a respirator
- Repair methods

The procedures for cleaning and disinfecting respirators are described in *T8CCR*, Section 5144, Appendix B-2, *Respirator Cleaning Procedures (Mandatory)*, or the manufacturer's procedures may be used. Clean and disinfect respirators at the following intervals:

- Exclusive-use respirators—as often as necessary to maintain a sanitary condition
- Shared respirators—before being worn by different persons
- Emergency-use respirators—after each use
- Respirators used in fit testing and training—after each use

Breathing Air Quality and Use

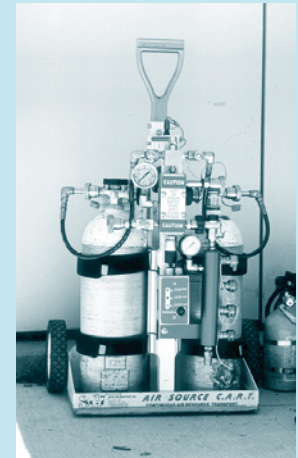
Procedures must be developed to ensure adequate air quality for atmosphere-supplying respirators. Breathing air must be of high purity, meet quality levels for content, and not exceed certain contaminant levels and moisture levels. Compressed breathing air must meet the requirements for Grade D breathing air, which is described in the ANSI/Compressed Gas Association's publication *Commodity Specification for Air, G-7.1* (see the "References" section of this booklet for more information). Compressed breathing air must contain:

- An oxygen content of 19.5 percent to 23.5 percent
- A hydrocarbon (condensed) content of 5 milligrams per cubic meter of air or less
- A carbon monoxide (CO) content of 10 parts per million (ppm) or less
- A carbon dioxide content of 1,000 ppm or less
- A lack of noticeable odor

Training and Information

Educating employees about the respiratory hazards to which they are exposed is a very important part of an effective respiratory protection program. People who use respirators should be trained in the following areas:

- Why the respirator is necessary and how improper fit, use, or maintenance can compromise the protective effect of the respirator
- The capabilities and the limitations of the respirator
- Use of the respirator in emergency situations
- How to inspect, put on, remove, and use the respirator and how to check the seals
- Procedures for maintaining and storing a respirator
- Recognition of the medical signs and the symptoms that may limit or prevent an employee's effective use of a respirator
- General requirements of the respirator regulation



Compressed Breathing Air

Refer to *T8CCR*, Section 5144(i) for requirements concerning the use of cylinders and compressors that supply breathing air to respirators.

An employee must be trained before he or she can use a respirator unless another employer has provided acceptable training within the past 12 months. In addition, retraining is required at least annually and when workplace conditions change, when new types of respirators are used, or when inadequacies in the employee's knowledge or use of respirators indicate a need for more training.

The basic advisory information in *T8CCR*, Section 5144, Appendix D, *(Mandatory) Information for Employees Using Respirators When Not Required Under the Standard*, must be given to employees who wear voluntary-use respirators.

Program Evaluation

You must conduct ongoing evaluations of your respiratory protection program to identify deficiencies and to make corrections as needed. The process of evaluating the effectiveness of your program includes the following steps:

Alternatives to Respirators

Verify that there are no feasible alternatives to respirators. Can you eliminate the need for respirators or reduce the level of respiratory protection by using less toxic materials or by implementing engineering controls or administrative controls?

Workplace Evaluations

Conduct regular workplace evaluations for respiratory hazards. These evaluations will determine whether the correct respirators are being used and worn properly. Such evaluations will also serve to determine whether the training program needs to be changed or updated.

Employee Involvement

Obtain the active involvement of employees in reviewing and updating the respiratory protection program. Consult regularly with employees to learn their views on program effectiveness and to identify any problems.

Employee assessment must determine whether respirators are:

- Interfering with effective workplace performance
- Properly fitted
- Correctly selected for the hazards that employees encountered
- Being worn properly and used when necessary
- Being properly maintained

Program Adjustments

Make appropriate changes to the respiratory protection program when problems are identified during the assessment process.



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Resources

The following sources of information are provided to supplement the information offered in this booklet.

Web Sites

[<http://www.acgih.org/home.htm>](http://www.acgih.org/home.htm)

The American Conference of Governmental Industrial Hygienists (ACGIH) Web site contains information about Threshold Limit Values, Biological Exposure Indices, and work practice guides for various occupational safety and health topics. You may also get in touch with ACGIH by calling (513) 742-2020.

[<http://www.ansi.org>](http://www.ansi.org)

The American National Standards Institute (ANSI) Web site contains guidelines on respiratory protection and information on other nationally accepted standards for safety and health. You may also call the institute by dialing (212) 642-4900.

[<www.dir.ca.gov/DOSH/dosh1.html>](http://www.dir.ca.gov/DOSH/dosh1.html)

The California Department of Industrial Relations, Division of Occupational Safety and Health (Cal/OSHA) Web site contains bulletins, *Title 8* regulations, and publications on various occupational safety and health topics.

[<www.cdc.gov/niosh/homepage.html>](http://www.cdc.gov/niosh/homepage.html)

The National Institute for Occupational Safety and Health (NIOSH) Web site contains publications; research reports; databases; and information on recommended exposure limits, assigned protection factors, and various occupational safety and health topics.

[<www.osha.gov>](http://www.osha.gov)

The United States Department of Labor, Occupational Safety and Health Administration (Federal OSHA) Web site contains safety-related technical links, statistics, publications, regulations, and so forth.

[<www.osha-slc.gov/SLTC/respiratory_advisor/mainpage.html>](http://www.osha-slc.gov/SLTC/respiratory_advisor/mainpage.html)

The Federal OSHA Respiratory Protection Advisor Web site contains information and instructions on the proper selection of respiratory protection and the development of change schedules for gas/vapor cartridges.

Resource CD-ROM

The Resource CD-ROM contains a collection of reference materials related to the respiratory protection standard. For ease of use and access, all the references are presented as Adobe Acrobat Reader PDF files.

The Resource CD-ROM can be obtained from Cal/OSHA Consultation Service, Research and Education Unit; fax (916) 574-2532; e-mail DOSHEducation@dir.ca.gov.



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References

References

Breathe Right! OR-OSHA's Guide to Respiratory Protection for Small-Business Owners and Managers. Salem: Oregon Occupational Safety and Health Division, February 2000. This document is available online at www.cbs.state.or.us/external/osha/ or by calling (503) 378-3272.

Commodity Specification for Air, G-7.1. Arlington, Va.: Compressed Gas Association, Inc., 1989. You may also get in touch with the association by calling (703) 788-2700.

Major Requirements of OSHA's Respiratory Protection Standard, 29 CFR 1910.134. Washington, D.C.: OSHA Office of Training and Education, March 1998.

OSHA Technical Manual, Section VIII, Chapter 2, OSHA Instruction, TED 1-0.15A. Washington, D.C.: OSHA Office of Science and Technology Assessment, January 1999.

Preamble, Respiratory Protection Final Rule, Chapter VII, *Federal Register*, Vol. 63, No. 5, (January 1998) 1178–1269.

California Code of Regulation, Title 8, Respiratory Protection, Section 5144, Subchapter 7, General Industry Safety Orders, Register 98, No. 35, August 1998.

T8 CCR, Section 5144, Appendix A, Fit Testing Procedures (Mandatory)

T8 CCR, Section 5144, Appendix B-1, User Seal Check Procedures (Mandatory)

T8 CCR, Section 5144, Appendix B-2, Respirator Cleaning Procedures (Mandatory)

T8 CCR, Section 5144, Appendix C, OSHA Respirator Medical Evaluation Questionnaire (Mandatory)

T8 CCR, Section 5144, Appendix D, (Mandatory) Information for Employees Using Respirators When Not Required Under the Standard

Small Entity Compliance Guide for the Revised Respiratory Protection Standard. Washington, D.C.: Occupational Safety and Health Administration, September 1998. This document is available online at [<www.osha.gov>](http://www.osha.gov) or by calling (202) 693-1888.



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