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SMALL ENTITY COMPLIANCE GUIDE
for the

REVISED RESPIRATORY PROTECTION STANDARD

FINAL DRAFT

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INTRODUCTION

This guide is intended to help small businesses comply with the Respiratory Protection standard. It provides guidance only, and does not alter or determine compliance responsibilities, which are set forth in Occupational Safety and Health Administration (OSHA) standards and the Occupational Safety and Health Act. The guide does not replace the official Respiratory Protection standard (29 CFR 1910.134), which is contained in Appendix I of this document. The reader must refer to the standard to ensure compliance. Moreover, because interpretations and enforcement policy may change over time, for additional guidance on OSHA compliance requirements, the reader should consult current administrative interpretations and decisions by the Occupational Safety and Health Review Commission and the courts.

The Respiratory Protection standard will protect an estimated 5 million respirator wearers working in 1.3 million workplaces. OSHA estimates that compliance with the standard will prevent hundreds of deaths and thousands of illnesses in U.S. workplaces each year.

The Respiratory Protection standard specifies only the minimum requirements for an effective respiratory protection program. You are encouraged to exceed these minimum criteria if doing so enhances the safety and health of your employees.

In 21 states and two territories, occupational respiratory requirements are enforced by the state agency responsible for the OSHA-approved state plan. These states are: Alaska, Arizona, California, Hawaii, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Nevada, New Mexico, North Carolina, Oregon, Puerto Rico, South Carolina, Tennessee, Utah, Vermont, Virginia, Virgin Islands, Washington and Wyoming. New York and Connecticut also operate OSHA-approved state plans limited in scope to state and local government employees.

State plans are required to adopt and enforce respiratory protection standards that are either identical to or at least as effective as the federal standard. These states are also required to extend the coverage of their respiratory protection standard to state and local government employees, including paid, and in some states, volunteer, firefighters, who are otherwise not covered by the federal standard. The information in this guide should be equally applicable to you if you are located in a state plan state, although you should check to see if there are any unique or additional requirements that may apply. (A list of phone numbers and addresses for the state programs is included in Appendix II.)

Who should read this guide?

You should read this guide if it is likely that you will need to establish and implement a respiratory protection program for your business. Under the Respiratory Protection standard, OSHA may require you to establish a respiratory protection program when exposure to an airborne contaminant or to low oxygen levels can cause illness or injury to a worker's health, and when these health effects can be prevented by the appropriate

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selection and use of a respirator.

How do I use this guide?

The guide is divided into chapters that correspond to the major provisions, or paragraphs, of the Respiratory Protection standard (e.g. respirator selection—paragraph (d), fit testing—paragraph (f)). Each chapter follows the same organization as the corresponding paragraph of the standard, providing more detail than the standard itself to help you better understand the requirements. Standard citations (e.g. (d)(3)(ii)) are provided in the margins to enable you to refer from the explanations provided in this guide to the original standard, which is included in Appendix I. Checklists are provided at the end of each chapter.

In addition, Appendix III of this document contains *Questions and Answers on the Respiratory Protection standard (Q&A)*. If you do not find the answers to your particular questions in this document, check the *Q&A*.

Appendix IV of this guide contains a sample respiratory protection program. This sample program was written for a hypothetical company to provide an example of how the requirements of the Respiratory Protection standard may be appropriately implemented. Keep in mind that there is often more than one way to implement certain requirements of the standard in a particular workplace setting.

What is a respirator?

Respirators are devices that protect workers from inhaling harmful substances. These substances can be in the form of airborne vapors, gases, dust, fogs, fumes, mists, smokes, or sprays. Some respirators also ensure that workers do not breathe air that contains dangerously low levels of oxygen.

There are two major types of respirators:

1. Air-purifying respirators, which remove contaminants from the air.
2. Atmosphere-supplying respirators, which provide clean air from an uncontaminated source.

Respirators provide protection from respiratory hazards only when they are used properly.

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Atmosphere supplying respirator



Air-purifying respirator

What is a respiratory protection program?

A respiratory protection program is a cohesive collection of worksite-specific procedures and policies that addresses all respiratory protection elements required by the standard. For example, a respiratory protection program must contain specific procedures describing how respirators will be selected, fitted, used, maintained and inspected in a particular workplace. Chapter (c) of this guide contains more information on respiratory protection programs.

When am I required to establish a respiratory protection program?

Generally, whenever you or OSHA requires your employees to wear respirators. For example, you may need to establish a respiratory protection program:

- # If your employees work in situations where the level of oxygen is insufficient, or potentially insufficient.
- # If your employees are potentially exposed to harmful levels of hazardous gases or vapors.
- # If your employees are exposed to other potential respiratory hazards, such as dust, mists, fumes, sprays, and other airborne particles.

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You need to supply workers with respirators when all preferred methods of protecting them from breathing contaminated air have been determined to be insufficient to reduce the contamination to nonhazardous levels. You must consider the potential for emergencies when making this determination. These preferred methods include:

- # Engineering controls, such as ventilation.
- # Substituting non-hazardous materials for the materials that pose respiratory hazards.
- # Administrative controls, such as scheduling major maintenance for weekends or times when few workers are present.

If you have any questions about when to supply your employees with respirators, refer to the standard in Appendix I.

What is OSHA's Respiratory Protection standard?

The Respiratory Protection standard requires employers to establish and maintain a respiratory protection program to protect their respirator-wearing workers. OSHA has issued a revised standard, which became effective on October 5, 1998. It updates and replaces a standard that OSHA adopted in 1971. (The complete text of the revised standard is included in Appendix I.)

The revised standard incorporates new scientific principles and technologies that have emerged since 1971. Because of advances in technology, many areas covered by the previous standard had become outdated.

The new standard is intended to:

- # Enhance the protection of worker health.
- # Promote more effective use of respirators.
- # Make it easier for you to comply with its provisions.
- # Make it easier to understand the policy and procedures you must follow when implementing a respiratory protection program.

How does the new standard differ from the old standard that it replaces?

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The new standard:

- # Contains new provisions that recognize the needs of small businesses.
- # Requires written respiratory protection programs to include work-site specific procedures. *(See Section (c) of this guide.)*
- # Requires that a qualified “program administrator” oversee the respiratory protection program. *(See page c-5 of this guide.)*
- # Provides:
 - Definitions that will eliminate confusion about terminology and how these terms apply to respirators and their use. *(See Section (b) of the standard in Appendix I.)*
 - Criteria for selecting respirators. *(See Section (d) of this guide.)*
 - Clear language on the requirement for medical examinations of workers and the use of medical questionnaires. *(See Section (e) of this guide.)*
- # Requires employers to perform a hazard determination to identify respiratory hazards and work conditions. *(See pages d-1 through d-4 of this guide.)*
- # Requires annual fit testing for all tight-fitting respirators, and it includes protocols for fit testing. *(See Section (f) of this guide and Appendix B of the standard in Appendix I of this guide.)*
- # Addresses the use of respirators in situations that OSHA characterizes as Immediately Dangerous to Life or Health (IDLH). *(See page g-6 of this guide.)*

How does the new Respiratory Protection standard recognize the needs of small businesses?

Among other things, the revised Respiratory Protection standard:

- # Allows the use of a medical questionnaire to screen for employee health conditions which could effect their ability to use a respirator. The questionnaire must be administered by a physician or other licensed health care professional. *(See page e-2 of this guide.)*

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- # Allows medical evaluations to be conducted either by a physician or by another licensed health care professional. *(See page e-2 of this guide.)*
- # Requires medical evaluations after the initial evaluation to be conducted only when specific conditions indicate a need for a reevaluation. *(See page e-3 of this guide.)*
- # Minimizes the amount of paperwork required in connection with medical evaluations. *(See pages e-5 through e-7 of this guide.)*
- # Establishes flexible requirements for cleaning and disinfecting respirators issued to individual employees “as necessary to be maintained in a sanitary condition.” *(See page h-1 of this guide.)*
- # Allows tags be used to document respirator inspections rather than written records. *(See page h-3 of this guide.)*
- # Allows you to obtain a certificate of breathing gas analysis from the supplier instead of requiring you to conduct your own gas analysis. *(See page i-2 of this guide.)*

Whom can I contact if I have additional questions about the Respiratory Protection standard that are not answered in the Small Entity Compliance Guide?

For additional assistance in establishing and implementing a respiratory protection program, contact the OSHA Area Office nearest you. If you are unable to contact your local OSHA Area Office, you can contact the appropriate OSHA Regional Office for information or assistance. A list of OSHA Area and Regional Offices is included as Appendix II.

The OSHA Consultation Service is an excellent resource for additional assistance. This free program helps employers find out about potential hazards and improve their occupational safety and health management systems. It is separate from the OSHA inspection effort. State OSHA Consultation programs are listed in Appendix II.

If you are located in a state that operates an OSHA-approved State Plan, you should contact the responsible state agency listed in Appendix II for information and assistance.

Section (a): PERMISSIBLE PRACTICE

(a)(1) ENGINEERING CONTROLS

To prevent illness or diseases caused by breathing hazardous air in the workplace, you must use engineering controls to the extent feasible to prevent contamination of the workplace atmosphere. When engineering controls are not feasible, or while engineering controls are being put in place, appropriate respirators must be used.

How do I know if the atmosphere in my workplace is hazardous?

An atmosphere is hazardous if it does not contain sufficient oxygen, or if it contains chemical, biological, or radiological contaminants in sufficient quantity to harm the health of employees. Section (d) of this guide contains information on how to identify and evaluate respiratory hazards in your workplace.

What are engineering controls?

Engineering controls physically change the work environment to reduce employee exposure to air contaminants. Such controls may include:

- # Change of the work process
- # Substitution of less hazardous substances for harmful materials
- # Isolation or enclosure of the work process or of employees
- # Local exhaust or general dilution ventilation

Where can I find guidance on the type of engineering controls I may need to put in place?

Potential sources for this type of information include:

- # Trade associations.
- # Manufacturers or suppliers of materials or equipment associated with the creation

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of air contaminants.

- # Your insurance carrier.
- # Government agencies (see Appendix II of this guide for a list of OSHA offices in your area).
- # OSHA Consultation Program (see Appendix II of this guide for the list of States with consultation programs).
- # Industrial hygiene consultants.

(a)(2) PROVIDING YOUR EMPLOYEES WITH RESPIRATORS

You must provide respirators when such equipment is necessary to protect the health of employees. The respirator provided must be suitable for its intended purpose. When you are required to provide respirators, you must establish and maintain a respiratory protection program. The requirements for a respiratory protection program are described in Section (c) of this guide.

How do I know if the engineering controls I install are sufficient to protect employee health?

The vendor who supplies your engineering controls may be able to help you determine whether the controls will adequately protect your employees from respiratory hazards. You can also evaluate the level of contamination in your workplace after the engineering controls are installed, as explained in Section (d) of this document.

How do I know what type of respirator is suitable for protecting the health of my employees?

Section (d) of this guide will answer your questions about selecting a suitable respirator.

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Is worker rotation acceptable as an interim control while engineering control measures are being developed and implemented?

Rotation is an acceptable practice for less-toxic contaminants. It is never permitted for protection against cancer-causing substances. In addition, many of OSHA's substance-specific health standards contain ceiling limits that do not allow the use of worker rotation. If respirators are also necessary to protect the health of the employee while engineering controls are being developed, they must be provided.

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Section (b): DEFINITIONS

This section of the Respiratory Protection standard contains definitions of important terms used in the text of the standard. The definitions are intended to clarify the requirements of the standard. They are contained in Paragraph (b) of the standard, which is included as Appendix I of this guide.

Section (c): RESPIRATORY PROTECTION PROGRAM

Whenever respirator use is required by you or by OSHA, this section of the Respiratory Protection standard dictates that you:

- # Develop a written respiratory protection program with procedures that are specific to your worksite.
- # Implement the program and update it as necessary.
- # Assign a qualified program administrator to run and evaluate the program.

Additionally, you are required to ensure that certain aspects of the respiratory protection program are followed by employees who wear a respirator voluntarily (that is, they wear respirators even though respirator use is not required by either you or OSHA).

(c)(1) PROGRAM DEVELOPMENT AND IMPLEMENTATION

You are required to develop and implement a written respiratory protection program and to update it as necessary.

Program Development

You must develop a written respiratory protection program that includes procedures for the use of respirators in any work areas where protection from respiratory hazards is required. The procedures in your program must be specific to your particular workplace.

All required elements of the respiratory protection program must be in writing unless a particular element does not apply to your workplace. For example, if you do not use atmosphere-supplying respirators, then you do not need to develop procedures for that type of respirator.

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Why a written program?

A written program is needed because health and safety programs can be more effectively implemented and evaluated if the procedures are available in a written form for study and review.

Also, a written respiratory protection program is the best way to ensure that the unique characteristics of the worksite are taken into account. Developing the written program encourages you to thoroughly assess and document information pertaining to respiratory hazards posed to your employees—both during normal operating conditions and during reasonably foreseeable emergencies.

Program Content

You are required to include the following elements (as applicable) in your respiratory protection program:

- # Procedures for
 - Selecting appropriate respirators for use in the workplace.
 - Fit testing tight-fitting respirators.
 - Using respirators properly in routine situations as well as in reasonably foreseeable emergencies.
 - Cleaning, disinfecting, storing, inspecting, repairing, removing from service or discarding, and otherwise maintaining respirators. Also, you must establish schedules for these elements.
 - Ensuring adequate air supply, quantity, and flow of breathing air for atmosphere-supplying respirators.
 - Regularly evaluating the effectiveness of the program.
- # Provisions for medical evaluation of employees who must use respirators.
- # Training employees in the proper use of respirators (including putting them on and removing them), the limitations on their use, and their maintenance.

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Appendix III, Sample Respiratory Protection Program, provides additional guidance on the required content of the respiratory protection program.

Program Implementation and Updating

Once you have established a written program covering all the required elements that apply to your workplace, you then must ensure that the program is appropriately implemented. Implementation of the program must be administered and overseen by your program administrator (see section (c)(3)).

Once your program has been implemented you must ensure that it is updated *as necessary* to reflect relevant changes in the workplace. That is, you need to revise only the elements of the program that have been affected by changes that relate to respiratory hazards in work areas. For example, you would need to revise the appropriate sections of your written program if new processes or new chemicals were introduced into the workplace that will impact respirator usage. In addition, if you make any changes in the types of respirators used or in any of the other elements of the respiratory protection program, you must make appropriate revisions to the written program.

(c)(2) VOLUNTARY RESPIRATOR USE

You are required to ensure that all employees who use a respirator voluntarily are provided with certain basic information on proper use. Additionally, you must ensure that certain of these workers are included in your program's provisions for medical evaluations, and for cleaning, storage, and maintenance of respirators.

What is meant by “voluntary” use of respirator equipment?

Voluntary use is when an employee chooses to wear a respirator, even though the use of a respirator is not required by either you or by any OSHA standard.

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Providing Basic Information to Voluntary Respirator Users

You may allow an employee to use a respirator voluntarily, if you determine that the respirator itself will not present a hazard to the employee due to misuse, other hazards or conditions in the workplace, or employee medical conditions. In such cases, you may provide employees with respirators or allow them to use their own respiratory protection.

If you allow such use of a respirator, you must provide the voluntary respirator user with the advisory information in Appendix D of the standard (see Appendix I in this document). This appendix provides basic information on the proper use of respirators for employees who are voluntary users of the equipment and thus are not required to undergo training. These precautions can be presented to the employee either verbally or in a written form. (See also Section (k) of this guide on Training and Information.)

Applicable Components of the Respiratory Protection Program

You must ensure that certain aspects of your respiratory protection program are implemented for voluntary respirator users. This requirement, however, does not apply for employees who voluntarily wear dust masks (filtering facepieces).



Filtering facepieces

Elements of the program that apply to voluntary users (except those using filtering facepieces (dust masks) voluntarily) involve:

- # Provisions for medical evaluation of employees who use elastomeric respirators.
- # Procedures for cleaning, disinfecting, storing, inspecting, repairing, removing from service or discarding, and otherwise maintaining respirators. Also, you must establish schedules for these program elements.

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Implementing these aspects of the program for a voluntary respirator user will ensure that the respirator is used properly and does not create a hazard to the user. If these provisions are not implemented, potential hazards or problems could result:

- # A respirator wearer's health could be jeopardized due to an undetected medical condition (e.g., asthma, heart condition).
- # A dirty respirator could cause dermatitis.
- # A dirty or poorly disinfected respirator could cause an ingestion hazard.

What types of respirators do the voluntary use requirements apply to?

This requirement applies primarily to tight-fitting negative pressure APRs, and it would also apply to powered APRs if an employee elected to voluntarily use this type of respirator. It does not apply to dust masks (filtering facepieces).

Do I need to have a written respiratory protection program if only voluntary users wear respirators at my facility?

No, if the only respirators being worn voluntarily are filtering facepieces (dust masks). Yes, if APRs or powered APRs are being used voluntarily. But when this is the case, your written program needs to include only the elements that pertain to voluntary users: a section on medical evaluations, and one on inspection, care, and maintenance.

(c)(3) PROGRAM ADMINISTRATOR

You must designate a program administrator to run the program and evaluate its effectiveness. An individual is qualified to be a program administrator if he or she has appropriate training or experience in accord with the program's level of complexity.

This training or experience is appropriate if it enables the program administrator to fulfill the minimum standard requirements of recognizing, evaluating, and controlling the hazards in your workplace. For example, if your program requires air-supplying respirators for use in immediately dangerous to life or health (IDLH) environments, your program administrator must have training

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and experience pertaining to the use of this type of equipment. Similarly, if you don't use air-supplying respirators and don't have significant respiratory hazards at your workplace, someone with less sophisticated experience or training might be able to effectively serve in this position.

Ultimately, the appropriate qualifications for your program administrator must be determined based on the particular respiratory hazards that exist, or that are reasonably anticipated, at your workplace.

How do I, or a designated employee, become a qualified program administrator?

If your workers are exposed only to nuisance dusts and relatively low-toxicity materials, and they use only a few types of relatively simple respirators, knowledge of this guide and materials supplied by the manufacturer may be sufficient for you, or a designated employee, to serve as the program administrator.

If more dangerous chemicals are present, if the potential for high exposures exists, or if sophisticated respirators are used, the program administrator must have more extensive experience and/or training. In these circumstances, you may need to seek out the expertise needed or obtain appropriate training.

Is there a list of approved training courses I can send my program administrator to?

No. OSHA does not provide a training course specifically to train respiratory protection program administrators, nor does OSHA require program administrators to attend a specified course. OSHA only requires the program administrator to have an adequate level of training or experience to deal with the complexity of the respiratory protection program at the worksite.

You may want to check with trade associations or adult education programs run by universities or technical and vocational schools in your area. The OSHA Consultation Program can help you identify appropriate training courses, or, if you hire a consultant to help you with aspects of your respiratory protection program, he or she may be able to help you with this.

How will OSHA determine that a person is experienced and/or trained to be a respiratory protection program administrator?

Usually, the OSHA compliance officer will review the written program and interview the respiratory protection program administrator. Questions asked during the interview are likely to focus on determining how familiar the program administrator is with the OSHA Respiratory Protection standard and the use and application of the respirators at the particular workplace. Significant deficiencies in the written program also could indicate a lack of training and understanding of the standard.

Only one person can fulfill the primary responsibilities of running the program, unless your company has more than one worksite. Under that circumstance, you may have a program administrator for each site. Ordinarily, however, you cannot divide the responsibilities among several employees. Requiring an administrator with sole responsibility helps ensure the integrity of the program by maintaining continuous oversight from one person. Nonetheless, the administrator may rely on other employees to help run parts of the respiratory protection program (e.g., fit testing, medical evaluations).

One of the program administrator's primary responsibilities is to evaluate the program. Although OSHA recognizes the value of an objective assessment, the Agency did not want to burden small businesses with the cost of arranging for an outside party to conduct the evaluations, and the standard therefore allows program administrators to perform the program evaluations required under the standard.

(c)(4) EMPLOYER-PROVIDED RESPIRATORS

You must provide respirators, training, and medical evaluations at no cost to employees who are required to wear a respirator for protection from respiratory hazards at your workplace. This requirement reflects the philosophy that employers are obligated to provide and pay for necessary personal protective equipment (such as respirators) used by employees on the job.

Do I also have to pay for respirators for voluntary users?

No. You do not have to pay for respirators for voluntary respirator users. In such cases, you still must pay for required medical evaluations for voluntary users and provide voluntary users with appropriate facilities and time to clean, disinfect, maintain, and store respirators.

CHECKLIST FOR RESPIRATORY PROTECTION PROGRAMS

Check to ensure that your facility has:

- G** A written respiratory protection program that is specific to your workplace and covers the following:
 - G** Procedures for selecting respirators.
 - G** Medical evaluations of employees required to wear respirators.
 - G** Fit testing procedures.
 - G** Routine use procedures and emergency respirator use procedures.
 - G** Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, and maintaining respirators.
 - G** Procedures for ensuring adequate air quality for supplied air respirators.
 - G** Training in respiratory hazards.
 - G** Training in proper use and maintenance of respirators.
 - G** Program evaluation procedures.
 - G** Procedures for ensuring that workers who voluntarily wear respirators (excluding filtering facepieces) comply with the medical evaluation, and cleaning, storing and maintenance requirements of the standard .
- G** A designated program administrator who is qualified to administer the program.
- G** Updated the written program as necessary to account for changes in the workplace affecting respirator use.
- G** Provided equipment, training, and medical evaluations at no cost to employees.

Section (d): RESPIRATOR SELECTION

(d)(1) GENERAL GUIDELINES FOR SELECTION

You must base selections of respirators on the hazards to which your employees are exposed and must consider how workplace and user factors affect respirator performance and reliability.

What are workplace and user factors?

Some examples include the following:

- # The size and configuration of the workspace—Are workers equipped with air supplied respirators able to fit into any tight space in your workplace?
- # Ease of worker communication—Are your employees wearing respirators able to communicate with one another and warn one another of hazards?
- # Ease or difficulty of the work or rate of activity—Are your employees doing heavy lifting that may deplete the air supply of a self-contained breathing apparatus (SCBA)? Would a fast work pace lead to discomfort, causing the employee to move the respirator and, thus, affect the fit?
- # Workplace conditions such as temperature and humidity or the location and movement of other personnel and equipment—Would the temperature and humidity affect the effectiveness of filters, cartridges, and other respirator parts as well as the comfort of the wearer? Would the mobility of your employees or the presence of moving machinery entangle the airlines of atmosphere-supplying respirators?

(d)(1)(iii) You need to Identify and Evaluate Worksite Hazards

- # Identify the chemicals to which your employees are exposed and evaluate the hazards of those chemicals.
- # Determine the state and physical form of the chemical. Are they solids, liquids, or gases? Do the liquids and solids give off vapors or do they form dusts or mists?
- # Estimate or measure employee exposures to the hazards.

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Respiratory hazards may be present in the workplace in the following physical forms:

Dusts and fibers are solid particles that are formed or generated from solid materials through mechanical processes such as crushing, grinding, drilling, abrading or blasting. Examples are lead, silica, and asbestos.

Fumes are solid particles that are formed when a metal or other solid vaporizes and the molecules condense (or solidify) in cool air. Examples are metal fumes from smelting or welding. Fumes also may be formed from processes such as plastic injection or extrusion molding.

Mists are tiny droplets of liquid suspended in the air. Examples are oil mist produced from lubricants used in metal cutting operations, acid mists from electroplating, and paint spray mist from spraying operations.

Gases are materials that exist as individual molecules in the air at room temperature. Examples are welding gases, such as acetylene and nitrogen, and carbon monoxide produced from internal combustion engines.

Vapors are the gaseous form of substances that are normally in the solid or liquid state at room temperature and pressure. They are formed by evaporation. Most solvents produce vapors. Examples include toluene and methylene chloride.

Biological hazards include bacteria, viruses, fungi, and other living organisms that can cause acute and chronic infections if breathed in. Examples include Legionnaire's Disease, flour, and animal products (dander, excreta).

Some Suggestions for Measuring or Making “Reasonable” Estimates of Worker Exposures

- # Personal monitoring is the most accurate way of obtaining worker exposure information. Sampling equipment and analytical methods are available for the vast majority of substances regulated by OSHA's Air Contaminants standard (29 CFR 1910.1000 and 29 CFR 1926.55). OSHA has specific monitoring requirements for its substance-specific standards (i.e., benzene or asbestos). See Subpart Z of *Title 29 Code of Federal Regulations*, parts 1910 and 1926, for OSHA's substance-specific standards.

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- # You can also estimate exposures by monitoring fixed locations or by sampling for short time durations. If you do this, you should measure under worst case conditions to be sure you are providing adequate protection for your employees. For example, if you select a respirator based on a reading obtained from a fixed sample collected close to the source of emission, the respirator may provide adequate worker protection because workers generally move about and do not spend their workshift near the source of emissions. Similarly, a respirator selected on the basis of the reading obtained from a spot sample taken when the process is operating at peak conditions may provide adequate protection because process emissions under non-peak conditions are less than at peak conditions.
- # Data may be available to you from previous exposure measurements. For example, studies may have been conducted in your industry. Your trade association may have data, or, manufacturers of products or materials used in your workplace may have conducted laboratory tests that provide worker exposure data. To generalize from data obtained from these sources or an industry-wide survey, however, you must show that the conditions that existed in the survey, such as the processes, types of materials, control methods, work practices, and environmental conditions, are similar to those in your own workplace.
- # You should be aware that exposures can be quite variable from day to day and from worker to worker. It is therefore important always to err on the side of over- rather than underprotection.
- # You may wish to consult with health and safety professionals in evaluating exposures. However, consultation is not mandatory. The respiratory protection program administrator should have the necessary qualifications. You can probably obtain consultants through the organizations listed in the sources of help at the end of this chapter. The OSHA Consultation Program (see Appendix II for a list of programs by state) and your insurance carrier are other potential sources of assistance.

What if I am unable to determine my employees' exposure?

You must consider the worksite atmosphere IDLH, Immediately Dangerous to Life or Health and select respirators on that basis. IDLH means an atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere (29 CFR 1910.134 paragraph (b)). However, you may be able to demonstrate, through information on processes and reasonable assumptions about potential maximum concentrations, that IDLH conditions would not occur.

- (d)(1)(ii) You Must Select a Respirator Certified by the National Institute for Occupational Safety and Health (NIOSH).** The respirator must be used in compliance with the conditions of its

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certification. See the sources of help at the end of this chapter for addresses and telephone numbers of NIOSH.

(d)(1)(iv) **You must select respirators from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.** You should provide a sufficient assortment of respirators so that your employees will obtain acceptable fits. OSHA's requirement is performance oriented; however, if medical evaluations of employees show that their health may be impaired by using negative pressure respirators, you must provide them with powered air-purifying respirators.

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(d)(2) RESPIRATORS FOR IDLH ATMOSPHERES

(d)(2)(i) Types of respirators

IDLH environments require the highest level of respiratory protection and reliability. You must provide either of the following for use in IDLH environments:

- # Full-facepiece pressure-demand SCBAs that are certified by NIOSH for a minimum service life of 30 minutes.



Full facepiece SCBA

- # Combination full-facepiece pressure-demand supplied-air respirators with auxiliary self-contained air supply.



SAR with auxiliary SCBA.



SAR with auxiliary SCBA.

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(d)(2)(ii) Respirators for escape from IDLH atmospheres must be NIOSH certified for escape from the atmosphere in which they will be used. For example, for formaldehyde exposures, escape respirators may be a full facepiece with chin style, front, or back-mounted industrial canister approved against formaldehyde (29 CFR 1910.1048).



Emergency escape breathing apparatus

(d)(2)(iii) You must consider all oxygen-deficient atmospheres to be IDLH. Atmosphere-supplying respirators must be used in oxygen-deficient atmospheres (where oxygen is less than 19.5%). You may use any atmosphere-supplying respirator if you can demonstrate that, under all reasonable foreseeable conditions, the oxygen concentration in the work area can be maintained within the ranges specified in the following table (Table II of 29 CFR 1910.134). Otherwise, you must provide employees with full facepiece pressure demand SCBAs or combination full facepiece pressure demand supplied-air respirators with auxiliary self-contained air supply.

TABLE 1

Altitude	Oxygen deficient atmospheres (% O₂) for which the employer may rely on any atmosphere supplying respirator.
-----------------	---

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Less than	16.0-19.5
3001.....	16.4-19.5
3001-	17.1-19.5
4000.....	17.8-19.5
4001-	18.5-19.5
5000.....	19.3-19.5
5001-	
6000.....	
6001-	
7000.....	
7001-	
8000.....	

Above 8000 feet the exception does not apply. Oxygen-enriched breathing air must be supplied above 14,000 feet.

Table 1 specifies, by altitude, the oxygen concentrations in which any type of atmosphere-supplying respirators may be used. For example, if your workplace is located at sea level and you can demonstrate that the oxygen content in the oxygen deficient environment will be maintained between 17 and 19%, then you may use any atmosphere-supplying respirator.

Work operations being conducted in well-controlled atmospheres where oxygen levels are deficient (below 19.5 percent) are typically permit-required confined spaces (see OSHA’s Permit-Required Confined Space standard, 29 CFR 1910.146).

(d)(3) RESPIRATORS FOR NON-IDLH ATMOSPHERES

(d)(3)(i) You must provide respirators that are adequate to protect employee health and ensure compliance with all other OSHA requirements under routine and reasonably foreseeable emergency situations. Other OSHA regulations include the Air Contaminants standard, 29 CFR 1910.1000, the substance-specific standards, appropriate safety regulations such as the Hazardous Waste Operations and Emergency Response standard, 29 CFR 1910.120 paragraph (g)(2), and many construction and maritime standards.

Also, the General Duty Clause of the Occupational Safety and Health Act requires you to protect your employees from substances not regulated by OSHA, but which are known to be hazardous at levels encountered in the workplace. Consult the Material Safety Data Sheet (MSDS) sent by your chemical supplier if you have questions about the toxicity of a particular substance. For further assistance in ascertaining whether substances used in your workplace that are not regulated by OSHA are hazardous, see the sources of help (at the end of this chapter) and the list of OSHA Area Offices (Appendix II).

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(d)(3)(ii) **You must select respirators that are appropriate for the chemical state and physical form of the contaminant.** See the section discussing the identification of worksite hazards. You need different types of filters, cartridges, and canisters depending on whether dusts, fumes, mists, vapors, and gases are present in your workplace and depending on the kinds and concentrations of substances present. Refer to NIOSH and the other sources of help listed at the end of this chapter.

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(d)(3)(iii) Respiratory protection for gases and vapors

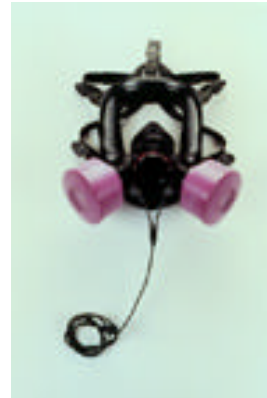
For protection against gases and vapors, you can select either atmosphere-supplying respirators or air-purifying respirators.



Half-facepiece SAR



Full-facepiece SCBA



Full facepiece PAPR



Half-facepiece APR

You must meet the following conditions if your employees use air-purifying respirators.

- # The respirator must be equipped with an end-of-service-life indicator (ESLI) certified by NIOSH for the contaminant; or
- # If there is no appropriate ESLI, you must implement a change schedule for canisters and cartridges based on objective information that will ensure that canisters and cartridges are changed before the end of their service life.

You do not want to have situations where the canisters or cartridges become saturated and the gases or vapors break through the canisters or cartridges, allowing the contaminants to get inside the mask and into your employees' breathing zones.

Why not just rely on the employee's ability to detect the odor of the substance when the gas or vapor breaks through?

You may not rely on the detection of odor as protection against respiratory hazards posed by gases and vapors because:

- # Most toxic substances do not have appropriate sensory (odor or irritant) warning properties.
- # Some chemicals have odors that are only detectable above their established exposure limits, meaning the employees will smell the chemical only after they have already been exposed to unsafe levels of the contaminant.
- # Individuals' abilities to perceive particular odors may differ quite markedly from the population average due to any of a variety of innate, chronic, or acute physiological conditions. For example, about 10 percent of people have a markedly impaired sense of smell.
- # There is no good screening mechanism to identify persons with sensory receptor problems.
- # Continuing exposure to the odor usually results in diminution or even disappearance of the smell sensation. This phenomenon is known as olfactory fatigue. When this happens, the worker unknowingly gets used to the contaminant breaking through the cartridge/canister and loses the ability to detect its smell.

What is an end of service life indicator (ESLI)?

An ESLI is a mechanism for warning the user that a respirator is approaching the end of its ability to provide protection. The warning appears on the cartridge itself. For example, after a period of use, an indicator on a cartridge with sorbent material will signal that protection against organic vapors is approaching saturation or is no longer effective.

So far, NIOSH has approved ESLIs for only four cartridges or canisters (mercury vapor, carbon monoxide, ethylene oxide and hydrogen sulfide). Thus, you most likely will have to establish change schedules to ensure that cartridges and canisters are changed before their end-of-service-life.

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What must be considered when developing change schedules?

You must develop cartridge change schedules based on available data or information that can be relied upon to ensure that cartridges are changed before the end of their useful service life.

You need to consider the following factors in determining change schedules:

- # The contaminants the respirator is to protect against.
- # The concentrations of contaminants in the work area.
- # Frequency of use—(e.g., is the respirator used continuously or intermittently throughout the shift?)
- # Temperature, humidity and air flow through the cartridge or canister.
- # Employees' work rates.
- # The presence of other potentially interfering chemicals.

You should assume worst case conditions to avoid breakthrough earlier than anticipated. You should document the information relied upon and the basis for the change schedules you use in your written respiratory protection program.

Where can I get help on developing change schedules?

You should consult with your respirator supplier or manufacturer for guidance on developing change schedules specific to your work conditions. Some suppliers have prepared materials that may assist you with developing change schedules for your worksite. Other possible sources of help include your trade association, and/or the resources listed at the end of this chapter.

Further information to help you develop change schedules is forthcoming. Several trade associations are currently gathering published information, such as breakthrough test data (i.e., how long it takes a substance to break through the cartridge or canister and get into the facepiece), and plan to produce a guidance document to help employers develop change schedules. OSHA is also developing instructional materials on change schedules, which will be a useful tool for employers

(d)(3)(iv) Respiratory protection for particulates

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What are my options for protection against particulates?

You have three options:

- # Atmosphere-supplying respirators.
- # Air-purifying respirators (including filtering facepieces) with filters certified by NIOSH under 30 CFR part 11 as high efficiency particulate (HEPA) filters, or filters certified by NIOSH under 42 part 84.
- # Air-purifying respirators with any filter certified for particulates by NIOSH for protection against contaminants consisting primarily of particles with mass median aerodynamic diameters (MMAD) of at least two micrometers.



Particulate APR, N95

See the sources of help section at the end of this chapter for advice and information in determining whether or not contaminants in your workplace consist primarily of particles of two micrometers or more.

What types of particulate filters are available for air-purifying respirators (APRs)?

Particulate-removing cartridges contain filters that reduce inhaled concentrations of toxic dusts and fiber, such as lead and asbestos, fumes, mists, and radioactive and biological materials (such as grain dusts). Powered and non-powered APRs require different particulate filters. Only HEPA filters are appropriate for protection against particulates for powered APRs.

The nine filter types for use with non-powered APRs are based on three levels of filter efficiency and three levels of resistance to degradation by oil. The three levels of filter efficiency are 95, 99, and 99.97 percent. These are referred to as 95, 99 and 100 filters, respectively. The three levels of oil resistance are N (non oil resistant), R (oil resistant)

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and P (oil proof). The most common commercially available cartridges are the “N95” (not oil resistant and 95 percent efficient) and “P100” (oil proof and 99.97 percent efficient). The P100 is comparable to the HEPA filter that is used with PAPRs.

Do I need to use particulate filters with ESLI?

ESLIs are not needed with particulate-removing filters. The employee should be trained to change the filter when he or she has difficulty breathing due to a lack of air being drawn through the filter. This is an indication that the filter has become loaded with particulate.

Where can I go for help?

Sources of help include:

- # *NIOSH Respirator Decision Logic*. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health. Request DHHS (NIOSH) Publication No. 87-108. NIOSH also has a help line. The telephone number is 1-800-35 NIOSH.
- # American National Standard for Respiratory Protection (ANSI Z88.2). American National Standards Institute, 11 West 42nd Street, New York, New York, 10036.
- # Respirator manufacturers provide advice through product literature, sales staff, and telephone help lines. The Industrial Safety Equipment Association (ISEA) has contact information. ISEA can be reached at: 1901 N. Moore Street, Suite 808, Arlington VA. 22209, or (703) 525-1695, or www.safetycentral.org/isea.
- # Chemical manufacturers may provide information on the nature and properties of substances to which your employees may be exposed. You should be able to obtain information from the Material Safety Data Sheets (MSDSs) provided by the supplier of the chemical.
- # You can contact the American Conference of Governmental Industrial Hygienists (ACGIH), 6500 Glenway Ave., Bldg. D-7, Cincinnati, Ohio, 45211-4438 for advice and information on exposure measurement and estimation and other related industrial hygiene subjects. ACGIH has published the ACGIH Ventilation Manual, which contains calculations applied to certain situations to estimate worker exposures.

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- # You can also contact the American Industrial Hygiene Association (AIHA), 2700 Prosperity Ave., Suite 250, Fairfax, Virginia, 22031 for advice and information on exposure measurement and estimation. Members of AIHA's Exposure Assessment Strategy's Committee are knowledgeable in worker exposure measurement and estimation.

- # The National Library of Medicine provides free online help about chemical hazards. Through TOXNET, located at <http://toxnet.nlm.nih.gov/servlets/simple-search>, you can search a number of databases on toxicology, hazardous chemicals and other related subjects for information on respiratory hazards.

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CHECKLIST FOR RESPIRATOR SELECTION

Check that at your facility:

- G** Respiratory hazards in your workplace have been identified and evaluated.
- G** Employee exposures that have not been, or cannot be, evaluated are considered IDLH.
- G** Respirators are NIOSH certified, and used under the conditions of certification.
- G** Respirators are selected based on the workplace hazards evaluated and workplace and user factors affecting respirator performance and reliability.
- G** A sufficient number of respirator sizes and models are provided to be acceptable and correctly fit the users.
- G** For IDLH atmospheres:
 - G** Full facepiece pressure demand SARs with auxiliary SCBA unit or full facepiece pressure demand SCBAs, with a minimum service life of 30 minutes, are provided.
 - G** Respirators used for escape only are NIOSH certified for the atmosphere in which they will be used.
 - G** Oxygen deficient atmospheres are considered IDLH.
- G** For Non-IDLH atmospheres:
 - G** Respirators selected are appropriate for the chemical state and physical form of the contaminant.
 - G** Air-purifying respirators used for protection against gases and vapors are equipped with ESLIs or a change schedule has been implemented.
 - G** Air-purifying respirators used for protection against particulates are equipped with NIOSH-certified HEPA filters or other filters certified by NIOSH for particulates under 42 CFR part 84.

Section (e): MEDICAL EVALUATION

This section of the Respiratory Protection standard requires employers to implement medical evaluations to determine a worker's ability to use a respirator.

This requirement is necessary because using a respirator may place a burden on a worker's health. This burden varies according to a number of factors, such as the weight and breathing resistance of the respirator and the workplace conditions under which the respirator is worn. Specific medical conditions that may place an employee at increased risk of illness, injury, or death include:

- # Cardiovascular and respiratory disease, such as high blood pressure, angina, asthma, chronic bronchitis, or emphysema.
- # Cardiovascular damage caused by heart attack or stroke.
- # Reduced lung function caused by factors such as smoking or prior exposure to respiratory hazards.
- # Neurological disorders, such as epilepsy.
- # Musculoskeletal disorders, such as lower back pain.
- # Psychological conditions, such as claustrophobia and severe anxiety.

(e)(1) EMPLOYER-PROVIDED MEDICAL EVALUATIONS

You must provide an employee with a medical evaluation to determine his or her ability to use a respirator. If a worker refuses to be medically evaluated for the use of a respirator, he or she cannot perform a job that requires a respirator.

When do I need to provide an employee with a medical evaluation?

The medical evaluation must be provided *before* the employee is fit tested and uses the respirator in your workplace for the first time.

You may stop providing a worker with medical evaluations when the worker is no longer required to use a respirator.

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Are medical evaluations required for all types of respirators?

Medical evaluations are required for both positive pressure and negative pressure respirators (except for filtering facepieces (dust masks)).

When elastomeric or supplied-air respirators are worn voluntarily by workers (not required by you or OSHA), you must ensure that the workers are medically able to wear the respirators and that they are provided with the information in Appendix D to the standard. The procedures for making this medical determination must be part of a written respiratory protection program. When your employees wear dust masks (filtering facepiece respirators), however, no written medical-determination procedures are required.

Do I need to provide medical evaluations for seasonal and temporary workers?

You must provide seasonal and temporary workers with medical evaluations. The frequency or length of a worker's term of employment does not affect the requirement for medical evaluations.

(e)(2) MEDICAL EVALUATION PROCEDURES

This portion of the standard specifies that the medical evaluation can be performed by using a medical questionnaire or by an initial medical examination that obtains the same information as the medical questionnaire.

Identification of a Medical Professional

Employers must identify a physician or another licensed health care professional (PLHCP) to perform the medical evaluations.

Who can perform a medical evaluation?

Physicians are not the only health care professionals allowed to perform medical evaluations for respirator use. The Respiratory Protection standard allows any PLHCP to administer the medical questionnaire (described below) or to conduct the medical examination if doing so is within the scope of the PLHCP's license. You must check with PLHCPs in your local area to see if performing the medical evaluation is within the scope of their professional license. Or you may check with your state licensing board. Appendix IV, Questions and Answers on the Respiratory Protection standard, lists state licensing

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boards.

Can a nurse perform a medical evaluation?

Any health care professional, including a nurse, who qualifies as a PLHCP can perform a medical evaluation. If a nurse does not qualify as a PLHCP, he or she may still be able to perform a medical evaluation if he or she is doing so under the supervision of a physician, and the physician performs the final review of the assessment.

Can an employee request to see his or her own physician for a medical evaluation?

Yes, but you may find this arrangement difficult to administer. If employees select their own physicians, you will need to maintain contact with each physician, and you will need to send each physician the supplemental information described in paragraph (e)(5) of the standard. You must allow the employee to be evaluated during the employee's normal working hours or at a time that is convenient to the employee, and you also are responsible for paying for this service (even if the employee has coverage under an insurance plan).

The Medical Questionnaire: The medical questionnaire is designed to identify general medical conditions that place employees who use respirators at risk of serious medical consequences.

If you choose to use the medical questionnaire to conduct the medical evaluation, you must use the questionnaire contained in the Respiratory Protection standard (Appendix C of the standard, Sections 1 and 2). The language in Appendix C of the standard is mandatory and cannot be altered. The PLHCP determines whether or not Part B of the questionnaire needs to be administered, and the PLHCP can alter the questions in Part B in any manner he or she thinks is appropriate.

You may choose to use medical examinations in place of the questionnaire, but you are not required to do so. Although the questionnaire does not have to be administered during the medical examination, the PLHCP must obtain the same information from the worker that is contained in the questionnaire.

(e)(3) FOLLOW-UP MEDICAL EXAMINATIONS

You must provide follow-up examinations for employees who give positive answers to any of the questions numbered 1 through 8 in Section 2, Part A. You must also provide follow-up exams to employees who will be using SCBAs or full-face respirators who respond positively to questions 10 through 15. See Appendix C of the standard (Appendix I of this document). Also, you must provide a follow-up examination if the questionnaire or initial medical examination indicates that one is necessary.

As part of the follow-up examination, the PLHCP may include any tests, consultations, or diagnostic procedures that are needed to make a final determination about an employee's ability to use a respirator. In some cases, all that might be needed is a phone call to the employee from the PLHCP to clarify an issue from the questionnaire.

A PLHCP may investigate a medical condition that is not addressed in the questionnaire if the PLHCP has reason to believe that the condition could affect the employee's ability to wear a respirator.

If the PLHCP is not a physician, some medical issues may arise during the follow-up examination that may be outside the scope of the PLHCP's license. In such cases, a physician must be involved.

(e)(4) ADMINISTRATION OF QUESTIONNAIRES AND EXAMINATIONS

Procedures for Administering the Medical Evaluation: When you provide a medical evaluation program:

- # You must protect the confidentiality of the employee who is being evaluated.
- # The questionnaire or medical examination must be given during an employee's normal work hours or at a time and place convenient to the employee.
- # The employee must understand the questions on the medical questionnaire.

Who pays for the medical evaluation?

You must pay for the medical evaluation and any related expenses—including travel costs—incurred by your employee during the evaluation.

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How can I ensure that an employee's medical evaluation remains confidential?

You must provide your employees with instructions on how to deliver or send the completed questionnaire to the PLHCP who will review it. This can be done, for example, by supplying them with stamped, pre-addressed envelopes for mailing their completed questionnaires to the PLHCP.

If an employee does not speak English or cannot read, how can I make sure that he or she understands the questions on the medical questionnaire?

You can send the employee directly to a PLHCP who is able to help the employee fill out the questionnaire. For non-English speakers, you may want to consider supplying an interpreter to help the PLHCP interpret the questionnaire for your employee. The standard does not require you to hire a professional interpreter; instead, you may use an English-speaking family member or friend of the employee, or another employee who speaks both English and the employee's language, who can help the employee fill out the questionnaire.

Employee's Right to Contact the PLHCP

The standard requires you to inform employees that a PLHCP is available to discuss the medical questionnaire with them, and to allow employees to discuss the results of their questionnaire with the PLHCP. This discussion will enable employees and PLHCPs to clarify questions that were asked on the questionnaire, and for employees to explain answers that they provided.

How can I notify employees about how to contact the PLHCP?

You could post the PLHCP's name and telephone number in a location that is easily accessible to all workers (such as a lunch room or break area). You could also include the information in a separate sheet with the medical questionnaire.

(e)(5) SUPPLEMENTAL INFORMATION FOR THE PLHCP

This portion of the Respiratory Protection standard requires you to provide the PLHCP with specific information to be used to make the determination about an employee's ability to use a respirator. This information includes:

- # The type and weight of the respirator to be worn by the employee.

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- # The duration and frequency of respirator use (including use for rescue and escape).
- # The level of physical effort that the employee would be expending while wearing a respirator.
- # Additional personal protective clothing and equipment that the employee would wear.
- # The temperature and humidity extremes that may be encountered in the work environment where respirator use is required.

In addition, you must provide the PLHCP with the following:

- # A copy of your written respiratory protection program.
- # A copy of the Respiratory Protection standard.

Why do I need to provide the PLHCP with a copy of the written respiratory protection program and the Respiratory Protection standard?

This requirement helps ensure that PLHCPs have a thorough understanding of their duties and responsibilities in the medical evaluation process. Your written respiratory protection program will provide the PLHCP with critical information about the working conditions that could increase the burden placed on the employee's health during respirator use.

Does the PLHCP need to visit the worksite to perform a medical evaluation?

No, the supplemental information required in this portion of the standard is sufficient for the PLHCP to make a valid recommendation on the employee's ability to wear a respirator. OSHA, however, encourages PLHCPs to visit the worksite if they believe the information obtained there would be useful to them.

If I select a new PLHCP, do I need to have my employees reevaluated?

No, but you must make sure that the new PLHCP has the information required in this section. You must either provide the information directly to the new PLHCP, or you must make sure that the information is transferred from the former PLHCP to the new PLHCP.

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How often do I need to provide the PLHCP with supplemental information?

You need to supply the information to the PLHCP only when the conditions of respirator usage change.

(e)(6) MEDICAL DETERMINATION

This portion of the standard requires you to obtain a recommendation from the PLHCP about the employee's ability to use a respirator. The PLHCP's recommendation must be in writing, and it must include the following information:

- # A determination of whether or not the employee is medically able to use a respirator.
- # Any limitations on respirator use related to the medical condition of the employee or to the workplace conditions in which the respirator will be used.
- # 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.

Note that you are required to have the PLHCP provide a copy of the written recommendation to each employee.

Who is responsible for making the final decision about an employee's ability to wear a respirator?

You are responsible for making the final determination. The PLHCP's opinion is an important factor that you must consider in making this determination.

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Is the information from the medical evaluation confidential, or can the PLHCP share this information with me?

The PLHCP must keep strictly confidential any information revealed during the medical evaluation; your access is limited to the information contained in the PLHCP's written recommendation.

Can I receive a copy of the employee's completed medical questionnaire?

No, you must only maintain a copy of the PLHCP's written recommendation in a confidential file.

Negative Pressure Respirators: If the PLHCP determines that an employee is unable to wear a negative pressure respirator, perhaps because of a breathing problem such as asthma or bronchitis, but would be able to wear a powered air-purifying respirator (PAPR), you must provide the employee with a PAPR. If, however, the PLHCP determines in a subsequent medical evaluation that the worker can wear a negative pressure respirator, you no longer need to provide the worker with a PAPR.



PAPR

(e)(7) ADDITIONAL MEDICAL EVALUATIONS

This portion of the standard requires you to provide an employee with additional medical evaluations whenever the following events occur:

- # The employee reports symptoms related to his or her ability to use a respirator.
- # The PLHCP, respiratory protection program administrator, or supervisor determines that a medical reevaluation is necessary.
- # Information from the respiratory protection program suggests a need for reevaluation.
- # Workplace conditions (such as protective clothing, temperature, or level of work effort) have changed so that an increased burden is placed on the employee's health.

Do I need to provide my employees with a medical reevaluation annually or according to some other fixed schedule?

Yes, you must provide medical reevaluations in accordance with the PLHCP's recommendation.

Do I need to provide an employee who is unable to use a respirator with an alternative job at no loss of pay and other benefits?

Although the standard does not require that employees receive such benefits, other OSHA substance-specific standards may contain this requirement.

CHECKLIST FOR MEDICAL EVALUATION

Check that at your facility:

- G** All employees have been evaluated to determine their ability to wear a respirator prior to being fit tested for or wearing a respirator for the first time in your workplace.
- G** A physician or other licensed health care professional (PLHCP) has been identified to perform the medical evaluations.
- G** The medical evaluations obtain the information requested in Sections 1 and 2, Part A of Appendix C of the standard, 29 CFR 1910.134.
- G** Employees are provided follow-up medical exams if they answer positively to any of questions 1 through 8 in Section 2, Part A of Appendix C, or if their initial medical evaluation reveals that a follow-up exam is needed.
- G** Medical evaluations are administered confidentially during normal work hours, and in a manner that is understandable to employees.
- G** Employees are provided the opportunity to discuss the medical evaluation results with the PLHCP.
- G** The following supplemental information is provided to the PLHCP before he or she makes a decision about respirator use:
 - G** Type and weight of the respirator.
 - G** Duration and frequency of respirator use.
 - G** Expected physical work effort.
 - G** Additional protective clothing to be worn.
 - G** Potential temperature and humidity extremes.
 - G** Written copies of the respiratory protection program and the Respiratory Protection standard.

CHECKLIST FOR MEDICAL EVALUATION (cont.)

- G** Written recommendations are obtained from the PLHCP regarding each employee's ability to wear a respirator, and that the PLHCP has given the employee a copy of these recommendations.

- G** Employees who are medically unable to wear a negative pressure respirator are provided with a powered air-purifying respirator (PAPR) if they are found by the PLHCP to be medically able to use a PAPR.

- G** Employees are given additional medical evaluations when:
 - G** The employee reports symptoms related to his or her ability to use a respirator.
 - G** The PLHCP, respiratory protection program administrator, or supervisor determines that a medical reevaluation is necessary.
 - G** Information from the respiratory protection program suggests a need for reevaluation.
 - G** Workplace conditions have changed in a way that could potentially place an increased burden on the employee's health.

Section (f): FIT TESTING

This section of the Respiratory Protection standard requires you to conduct fit testing on all employees who are required to wear a respirator that includes a tight-fitting facepiece.

Fit testing is a procedure used to determine how well a respirator “fits”—that is, whether the respirator forms a seal on the user’s face. If a good facepiece-to-face seal is not achieved, the respirator will provide a lower level of protection than it was designed to provide. For example, without a good seal, the respirator can allow contaminants to leak into the user’s breathing air.

This section also describes:

- # What types of respirators must be fit tested
- # How often fit testing must be conducted
- # What procedures must be used
- # How the results of fit testing should be used to guide respirator selection

INTRODUCTORY CONCEPTS

As a general introduction to the topic of fit testing, several fundamental concepts are defined below. These definitions expand on those provided with the actual standard (see Appendix I of this guide).

As described below, there are two types of fit testing: quantitative and qualitative.

What is quantitative fit testing (QNFT)?

Quantitative fit testing is a method of measuring the amount of leakage into a respirator. It is a numeric assessment of how well a respirator fits a particular individual.

To quantitatively fit test a respirator, a sampling probe or other measuring device must be placed on the inside of the respirator facepiece. The respirator wearer then performs the user seal checks followed by the selected QNFT.

- # For the generated aerosol QNFT, he or she stands inside a “test chamber” (booth or hood), where a nontoxic aerosol is introduced into the air. Measurements are

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then taken of the aerosol concentration both inside the test chamber and inside the respirator. An assessment of the quantitative fit is made based on the ratio of the aerosol concentration inside the test chamber to the concentration inside the facepiece.

- # For the condensation nuclei counter QNFT, ambient air particles are used as the test aerosol with measurements made of their concentration outside and inside the facepiece, and an assessment is made of the quantitative fit of the facepiece.
- # The controlled negative pressure QNFT method uses a fit test instrument to exhaust air from inside the respirator facepiece to maintain a constant negative pressure. The measurement of the exhaust stream required to maintain a constant negative pressure yields a measure of the leakage into the facepiece.

Detailed protocols for quantitative fit testing are provided as part of the standard (see Appendix A of the standard in Appendix I of this document).



Fit test adapter



Facepiece with fit test adapter inserted

What is qualitative fit testing (QLFT)?

Qualitative fit testing is a non-numeric pass/fail test that relies on the respirator wearer's response to a substance ("test agent") used in the test to determine respirator fit.

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In qualitative fit testing, after performing user seal checks, the respirator wearer stands in an enclosure and a test agent is introduced, such as:

- # Banana oil (isoamyl acetate)
- # Saccharin
- # Bitrex
- # Irritant smoke (without a test enclosure)

If the individual can smell the test agent (or is irritated by the smoke), this indicates that the agent leaked into the facepiece and that the respirator has failed the test because a good facepiece-to-face seal has not been achieved. If the employee cannot successfully complete the qualitative test with a particular respirator, the employee must then be tested with another make, size, or brand of respirator.

Detailed protocols for qualitative fit testing are provided as part of the standard (see Appendix B of the standard in Appendix I of this document).



Bitrex QLFT kit

What is a tight-fitting facepiece?

A tight-fitting facepiece is intended to form a complete seal with the respirator wearer's face. This seal must be sufficiently tight to prevent any contaminants in the work environment from leaking around the edges of the facepiece into the user's breathing air.

In contrast, a loose-fitting facepiece is specifically designed to form a partial seal with the user's face. Such a facepiece typically covers at least the head and includes a system through which clean air is distributed into the breathing zone. For example, hoods, suits, and helmets are all loose-fitting facepieces. Such equipment does not rely on a tight facepiece-to-face seal to protect the worker, and is useful for workers with facial hair or other physical characteristics that make it difficult to wear a tight-fitting facepiece.

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Tight-fitting facepiece



Loose-fitting hood

What are positive pressure and negative pressure respirators?

Positive pressure respirators maintain positive air pressure inside the facepiece throughout the user's breathing cycle. That is, the air pressure inside the facepiece remains greater than the air pressure outside the facepiece. Thus, any leakage around the facepiece seal should result in air escaping from inside the facepiece to the outside environment rather than worksite contaminants leaking into the facepiece and breathing air.

In contrast, a negative pressure respirator will have a lower air pressure inside the facepiece than outside during inhalation. If the facepiece-to-face seal leaks on these types of respirators, air contaminants will be drawn into the breathing air.

What is the fit factor?

The fit factor is a quantitative measure of how well a particular respirator fits (or provides protection to) an individual. It is the ratio of the concentration of a contaminant in the environment to the concentration inside the mask.

Fit factors are obtained from quantitative fit testing. For example, if an employee was in a test chamber that contained 300 ppm of aerosol and 3 ppm of the test agent was found inside the mask, the fit factor would be equal to 100.

***(f)(1)* RESPIRATORS THAT REQUIRE FIT TESTING**

You must ensure that quantitative or qualitative fit testing is conducted for all employees required to wear either positive or negative pressure tight-fitting facepiece respirators. This includes both air-purifying and atmosphere-supplying respirators operating in either a positive or negative

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pressure mode, but does not include any loose-fitting facepieces.

Must I perform fit testing for employees who voluntarily wear tight-fitting facepiece respirators ?

No. If an employee chooses to wear a tight-fitting facepiece respirator (including a negative pressure air-purifying respirator or a filtering facepiece (dust mask)) in a worksite environment where such equipment is not necessary, you are not required to conduct fit testing.

(f)(2) WHEN FIT TESTING MUST BE CONDUCTED: GENERAL REQUIREMENTS

You must ensure that fit testing is conducted for all employees required to wear tight-fitting facepiece respirators as follows:

- # Prior to initial use.
- # Whenever an employee switches to a different tight-fitting facepiece respirator (for example, a different size, make, model, or type).
- # At least annually.

(f)(3) WHEN FIT TESTING MUST BE CONDUCTED: CHANGES IN THE RESPIRATOR WEARER'S PHYSICAL CONDITION

You must ensure that an additional fit test is conducted if an employee experiences a change in physical condition that could affect the seal on the tight-fitting facepiece respirator. This requirement is triggered by a physical change:

- # Reported by the respirator user.
- # Observed by you, a physician or other licensed health care professional, the supervisor, or the program administrator.

Physical changes in the employee that might affect the facepiece-to-face seal could include, for example, an obvious change in body weight, facial scarring, extensive dental work, or cosmetic surgery.

(f)(4) WHEN FIT TESTING MUST BE CONDUCTED: UNACCEPTABLE FIT AS DETERMINED BY AN EMPLOYEE AFTER FIT TESTING

If, after fit testing, an employee reports that his or her respirator does not fit properly, you must allow the employee a reasonable opportunity to select a different tight-fitting facepiece respirator. After another respirator is selected, you must conduct a new fit test on the employee's replacement equipment.

An employee might determine that the facepiece does not establish an effective facepiece-to-face seal, for example, upon smelling a worksite contaminant while wearing the respirator with new cartridges. Or an employee might hear or feel air leaking around the facepiece-to-face seal. The employee's determination also can be based on factors unrelated to the particular worksite. For example, the employee might find that he or she can't wear the respirator for extended periods without experiencing irritation or pain.

(f)(5) FIT TESTING PROCEDURES: GENERAL REQUIREMENTS

You must ensure that all fit testing conducted for employees required to wear tight-fitting facepiece respirators follows the OSHA approved protocols.

Detailed protocols for qualitative and quantitative fit testing are provided as part of the standard (see Appendices A and B of the standard in Appendix I of this document). These protocols specify that you must have on hand during fit testing all types and sizes of respirators that are available for use at the worksite. This allows you to ensure that each employee is tested with the same type of respirator (make, model, style, and size) that he or she will wear at the worksite.

(f)(6) LIMITATION ON USE OF QUALITATIVE FIT TESTING

The table at the end of this chapter summarizes acceptable means of fit testing (QLFT versus QNFT) for different types of respirators. For more information, consult OSHA's web site at [www@OSHA.gov](http://www.OSHA.gov).

Qualitative fit-testing may be used to fit test all positive pressure respirators (air-supplying and PAPRs), and any negative pressure air-purifying respirators that must achieve a fit factor of 100 or less. Dividing the fit factor of 100 by a standard safety factor of 10 indicates that the negative pressure air-purifying respirators that have successfully completed a qualitative fit test can be relied on to reduce a worker's exposure by a protection factor of 10. The safety factor of 10 is used because protection factors that workers achieve at work sites tend to be much lower than the fit factors achieved during fit testing.

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In practice, this means that any negative pressure air-purifying respirator (APR) may be qualitatively fit tested if the APR is to be used in workplace atmospheres where the level of the hazardous contaminant is 10 times or less than the permissible exposure limit (PEL) and lower than the level that is immediately dangerous to life or health (IDLH). For example, if the PEL for a specific workplace contaminant is 5 ppm, you could use a qualitative fit test to fit test a negative pressure APR to be used in the workplace at exposure levels up to 50 ppm (ten times the PEL or less). If the workplace exposure level is greater than 50 ppm, however, you must use quantitative fit testing.

Both half-facepiece APRs and full-facepiece APRs may be qualitatively fit tested if they are to be worn in work areas where the concentration of contaminant is no more than ten times the PEL.

What is a PEL?

OSHA PELs (permissible exposure limits) establish the maximum level of a specific contaminant that a worker can be exposed to, averaged over an 8-hour work day (8-hour time-weighted average, or TWA) or over a specified portion of a work day (for example, a 15 minute short-term exposure limit, or STEL). (PELs are listed in 29 CFR 1910.1000, and 1926.55. Also see the substance-specific standards for general industry and construction.)

(f)(7) USE OF QUANTITATIVE FIT TESTING

If quantitative testing is used to fit test a tight-fitting facepiece respirator, respirator fit is not acceptable unless:

- # For a half or quarter facepiece: The fit factor achieved in the test is greater than or equal to 100
- # For a full facepiece: The fit factor achieved in the test is greater than or equal to 500

(f)(8) FIT TESTING FOR ATMOSPHERE-SUPPLYING AND POWERED AIR-PURIFYING RESPIRATORS

You must ensure that all fit testing conducted for employees issued tight-fitting atmosphere-supplying respirators and powered air-purifying respirators is conducted in the negative pressure mode, even if the respirator is to be worn with positive pressure.

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This is because it is difficult outside of a laboratory test situation to accurately perform fit testing on positive pressure respirators.

In what circumstances might an atmosphere-supplying or powered air-purifying respirator perform like a negative pressure respirator?

For example, if the blower component of a powered air-purifying respirator loses power because it is turned off or the batteries run out, the respirator will become a negative pressure respirator. Similarly, atmosphere-supplying respirators can shift momentarily to negative pressure respirators if the air supply is restricted or the system fails.

Also, powered air-purifying respirators and self-contained breathing apparatus units can perform like negative pressure respirators as the user increases his or her inhalation rate during heavy work. The increased inhalation rate can result in negative pressure spikes inside the facepiece that are greater than the positive pressure of the air being supplied. This is called overbreathing the respirator. Therefore, positive air flow alone cannot be counted on to prevent the leakage that can occur with a poorly fitting facepiece.

You can conduct qualitative or quantitative fit testing of tight-fitting atmosphere-supplying respirators and powered air-purifying respirators according to the following requirements.

Qualitative fit testing. To conduct qualitative fit testing on an atmosphere-supplying respirator, you must do one of the following:

- # Temporarily convert the user's actual facepiece into a negative pressure respirator by installing the appropriate filters. If you are not sure how to do this, check with the respirator manufacturer or your supplier.
- # Use an identical negative pressure facepiece (size, make, model).

You can conduct qualitative fit testing on a powered air-purifying respirator by simply turning off the blower.

Quantitative fit testing. To conduct quantitative fit testing on an atmosphere-supplying respirator, you must temporarily or permanently install a sampling probe or adaptor inside the facepiece.

In preparation for testing, you should contact the respirator manufacturer or supplier for information on whether a sampling adaptor can be temporarily installed in the facepiece. Any modifications made to a respirator for testing purposes must be removed before use.

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If temporary modifications cannot be made, you will need to permanently convert the facepiece to allow for testing. If you permanently convert the facepiece—for example, by drilling a hole in the respirator facepiece to insert the probe—you cannot repair the hole and put the respirator back in service. Once a hole is drilled in the facepiece, the respirator can only be used for fit testing purposes. It is no longer approved for workplace use.

TABLE 2

Acceptable Fit-testing Methods		
Respirator	QLFT	QNFT
Half-Face, Negative Pressure, APR (<100 fit factor)	Yes	Yes
Full-Face, Negative Pressure, APR (<100 fit factor) used in atmospheres up to 10 times the PEL	Yes	Yes
Full-Face, Negative Pressure, APR (>100 fit factor)	No	Yes
PAPR	Yes	Yes
Supplied-Air Respirators (SAR), or SCBA used in Negative Pressure (Demand Mode) (>100 fit factor)	No	Yes
Supplied-Air Respirators (SAR), or SCBA used in Positive Pressure (Pressure Demand Mode)	Yes	Yes
SCBA - Structural Fire Fighting, Positive Pressure	Yes	Yes
SCBA/SAR - IDLH, Positive Pressure	Yes	Yes
Mouthbit Respirators	Fit-testing Not Required	
Loose-fitting Respirators (e.g., hoods, helmets)		

CHECKLIST FOR FIT TESTING

Check that at your facility:

- G** Employees who are using tight fitting respirator facepieces have passed an appropriate fit test prior to being required to use a respirator.
- G** Fit testing is conducted with the same make, model, and size that the employee will be expected to use at the worksite.
- G** Fit tests are conducted annually and when different respirator facepieces are to be used.
- G** Provisions are made to conduct additional fit tests in the event of physical changes in the employee that may affect respirator fit.
- G** Employees are given the opportunity to select a different respirator facepiece, and be retested, if their respirator fit is unacceptable to them.
- G** Fit tests are administered using OSHA-accepted QNFT or QLFT protocols.
- G** QLFT is only used to fit test either PAPRs, SCBAs, or negative pressure APRs that must achieve a fit factor of 100 or less.
- G** QNFT is used in all situations where a negative pressure respirator is intended to protect workers from contaminant concentrations greater than 10 times the PEL.
- G** When QNFT is used to fit negative pressure respirators, a minimum fit factor of 100 is achieved for tight-fitting half-facepieces and 500 for full-facepieces.

CHECKLIST FOR FIT TESTING (cont.)

- G** For tight-fitting atmosphere-supplying respirators and powered air-purifying respirators:
 - G** Fit tests are conducted in the negative pressure mode.
 - G** QLFT is achieved by temporarily converting the facepiece into a negative pressure respirator with appropriate filters, or by using an identical negative pressure APR
 - G** QNFT is achieved by modifying the facepiece to allow for sampling inside the mask midway between the nose and mouth. The facepiece is restored to its NIOSH approved configuration before being used in the workplace.

Section (g): USE OF RESPIRATORS

As part of your written program, you must establish and implement procedures for the proper use of respirators in both routine jobs and emergencies. Specific use procedures are required to:

- # Prevent leaks in the respirator facepiece seal.
- # Prevent employees from removing respirators in hazardous environments.
- # Ensure that respirators operate effectively throughout the work shift.
- # Protect employees entering IDLH atmospheres and interior structural firefighting situations.

(g)(1) PREVENTING LEAKS IN THE FACEPIECE SEAL

Facepiece seals and valves are important in tight-fitting respirators. Tight-fitting respirators have a complete seal to the face. If there is a leak in the seal of a tight-fitting respirator or valve, then the respirator cannot reduce the wearer's exposures to respiratory hazards. You must be sure that nothing interferes with the seal of the respirator to the worker's face or with the valves.

Conditions that can interfere with the seal or valve are specified in the standard and include:

- # Facial hair,
- # Facial scars,
- # Jewelry or headgear that projects under the facepiece seal,
- # Missing dentures, and
- # Corrective glasses or goggles or other personal protective equipment:
 - Face shields
 - Protective clothing
 - Helmets
 - Eyeglass insert or spectacle kits

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Workers may use this equipment with tight-fitting respirators if you ensure that the equipment is worn in a way that:

- # Does not interfere with the face-to-facepiece seal.
- # Does not distort the worker's vision.
- # Does not cause physical harm to the worker (e.g., if the eyeglass insert did not fit properly so that the tight fit of the respirator caused the insert to press against his or her forehead, eyes, or temples).

You must make sure that the respirator does not interfere with the worker's eyewear or force the worker to remove the eyewear altogether.

What if a worker has a condition that does not interfere with the face-to-facepiece seal?

As long as the condition does not interfere with the function of the respirator valves, then the worker can wear a tight-fitting respirator, provided that the worker has no other conditions that interfere with the face-to-facepiece seal or valve. For example, a mustache may not interfere with the facepiece seal but may interfere with the valve function.

Do these restrictions apply to all types of respirators?

The restrictions for facial hair and other conditions apply ONLY to tight-fitting respirators. Several respiratory protection alternatives, such as loose-fitting hoods or helmets, are available to accommodate workers with facial hair or with other conditions that might interfere with the seal of the facepiece to the face of the user.

Can employees wear contact lenses?

Contact lenses can be safely worn with respirators.

You must be sure that workers perform user seal checks each time they put on a tight-fitting respirator. User seal checks are a quick and easy way for workers to verify that they have put on their respirators correctly and that the respirators are working properly.

To conduct a user seal check, the worker must follow either the procedures for a user seal check that are contained in Appendix B-1 of the Respiratory Protection standard or equally effective procedures that the respirator manufacturer recommends for conducting a user seal check.

How are user seal checks conducted?

To conduct a user seal check, the worker performs a negative **or** positive pressure fit check.

For the negative pressure check, the worker:

- covers the respirator inlets (cartridges, canisters, or seals)
- gently inhales, and
- holds breath for 10 seconds.

The facepiece should collapse on the worker's face and remain collapsed.

For the positive pressure check, the worker:

- covers the respirator exhalation valve(s); and
- exhales.

The facepiece should hold the positive pressure for a few seconds. During this time, the worker should not hear or feel the air leaking out of the face-to-facepiece seal.

Appendix B-1 of the Respiratory Protection standard provides detailed instructions on how to conduct the user seal check.

The manufacturer's recommended procedures for checking the facepiece seal may be used if the employer demonstrates that the manufacturer's procedures are as effective as those described in Appendix B-1 of the Respiratory Protection standard, e.g., these procedures are effective in identifying respirators that fit poorly when put on or adjusted.

Can a user seal check be used as a substitute for a qualitative fit test?

A user seal check is **not** a substitute for a qualitative fit test. Fit testing is a more rigorous procedure that is used to determine whether the respirator fits the face of the worker. Section (f) of this Compliance Guide contains a complete discussion on respirator fit testing.

How can employers ensure that workers perform user seal checks?

The intent of the standard is that you make sure that the fit and performance of the respirator is not compromised. You must take actions that will result in safe work practices. Examples of these actions include:

- # Providing training to workers
- # Routinely observing work practices
- # Routinely monitoring site conditions
- # Consulting employees

(g)(2) CONTINUING RESPIRATOR EFFECTIVENESS

You must be aware of conditions in work areas where employees are using respirators. You must also allow employees to leave the respirator use area to perform any activity that involves removing or adjusting a respirator facepiece, or if there is any indication that a respirator may not be fully effective. If there is any indication that they are not functioning properly, you must replace, repair, or discard respirators, before allowing employees to return to an area in which respirator use is required.

How can I conduct appropriate surveillance?

“Appropriate surveillance” means that you must routinely look for any changes that may affect the effectiveness of a respirator. You must look for changes in the work area, such as changes in work tasks or processes, that can result in changes in the hazard or the time period of exposure, or that put the employee in closer proximity to the hazard. Another change might be the addition of new machinery that would cause an employee to exert more energy and breathe harder.

By “appropriate surveillance” OSHA means that you must routinely observe employees as they work while wearing respirators. By observing respirator use under actual workplace conditions, you can determine:

- # Whether other protective equipment is interfering with respirator use.
- # Whether a change in working conditions may result in exposure to new contaminants.

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- # Whether workers are experiencing discomfort, such as skin irritation or breakthrough of contaminants through cartridges and canisters.

If any of these conditions exist, you must make adjustments—such as providing a more protective respirator or a different size or style of respirator, or altering work practices to reduce the stress on workers—to ensure that workers continue to receive adequate respiratory protection.

When must I allow workers to leave the respirator use area?

To maintain their respirators, workers may, from time to time, need to leave the area where respirator use is required and go to a safe area free of respiratory hazards and contaminants.

Workers must leave the respirator use area:

- # If the worker needs to wash his or her face or the respirator facepiece to prevent eye or skin irritation associated with respirator use.
- # If the worker detects vapor or gas breakthrough (that is, the cartridge or canister is saturated with contaminant and needs to be changed).
- # If the worker notices that the facepiece is leaking.
- # If the worker observes a change in breathing resistance (that is, the filter is full of dust or other particles and needs to be changed).
- # If the respirator or parts of the respirator, such as valves or straps, are not working properly and need to be replaced.

Workers need a “safe area” in the workplace where they can safely remove their respirators to wash or conduct the maintenance necessary to ensure the respirator’s adequate operation.

Where does the safe area need to be located?

The safe area must be located in a place that is free of respiratory hazards or contamination. As long as these conditions are met, the safe area can be in a location that minimizes interruptions to work flow.

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When must I replace or repair respirators?

You must replace or repair respirators that are not working properly. Respirators should not be used if they are defective in any way. You must replace or repair a defective respirator whenever the worker detects vapor or gas breakthrough, changes in breathing resistance, or facepiece leakage, before allowing the worker to return to the work area where respirator use is required.

How often do respirators need to be replaced or repaired?

There is no required replacement schedule for respirators in general. However, damaged respirators cannot properly protect employees. Respirators need to be replaced or repaired when one or more of their components is missing, damaged, or visibly deteriorated.

(g)(3) PROCEDURES FOR IMMEDIATELY DANGEROUS TO LIFE OR HEALTH ATMOSPHERES (IDLH) AND FOR INTERIOR STRUCTURAL FIREFIGHTING

This section of the Respiratory Protection standard contains requirements for respirator use in IDLH environments. The standard defines IDLH as “an atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual’s ability to escape from a dangerous atmosphere.” Section d of this Compliance Guide (Selection of Respirators) contains additional information about IDLH environments.

The provisions of paragraph (g)(3) of the Respiratory Protection standard are requirements for respirator use in all IDLH atmospheres. Paragraph (g)(4) contains additional requirements applicable only to the extra-hazardous environments encountered during interior structural fire fighting (two-in/two-out; use SCBAs only). OSHA considers interior structural firefighting environments to be IDLH environments. These two paragraphs ((g)(3) and (g)(4)) deal with requirements for standby personnel and the respirator users inside the IDLH atmosphere. The standard requires standby personnel when workers use respirators in IDLH environments. These two provisions are intended to ensure that adequate rescue capability exists in case of respirator failure or some other emergency inside the IDLH environment.

Who are standby persons?

Standby personnel remain outside the IDLH atmosphere. They must be available, trained, and equipped to assist respirator users inside the IDLH atmosphere, and to provide effective emergency rescue, when needed.

You must be sure that standby personnel maintain visual, voice, or signal line communication with the workers in the IDLH environment. Standby personnel may use radios to communicate with workers inside the IDLH environment. You must be sure that standby personnel notify you or

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your designated representative before entering the IDLH atmosphere. Once notified, you must provide necessary assistance appropriate to the situation.

When do I need to have more than one standby person located outside the IDLH environment?

A single standby person is adequate if an IDLH environment is well-characterized and controlled and if one person can easily maintain communication with all workers in the IDLH environment. Two stand-by personnel are required for interior structural firefighting. An IDLH atmosphere is “well-characterized” if it has been monitored and the results of the monitoring have been analyzed, or if it has been through a process hazard analysis. (Chemical plants conduct comprehensive process hazard analyses as required by OSHA’s Process Safety Management standard [29 CFR 1910.119] to determine which process units pose IDLH hazards.)

Often, only one respirator user at a time is exposed to an IDLH atmosphere, and a single standby person can easily monitor that worker’s status. Even in situations where more than one respirator user is inside an IDLH environment, a single standby person can often provide adequate communication and support. For example, one standby person can easily communicate with more than one employee working inside a small pump room or shed.

More than one standby person may be required for other situations. For example, to clean and paint the inside of a multi-level, multi-portal water tower, a process that often generates a deadly atmosphere as a result of cleaning solution and paint solvent vapors, employees often enter the tower through different portals to work on different levels. In such a situation, there will be a need for good communication at each entry portal, and more than one standby person would be needed to maintain adequate communication and accessibility.

For interior structural firefighting, you must have two employees enter the IDLH atmosphere and remain in visual or voice contact with one another at all times. You must also have two standby personnel located outside the IDLH atmosphere; all employees engaged in interior structural fire fighting must use SCBAs.

When must standby personnel maintain communication with workers in the IDLH atmosphere?

At all times. Voice and visual or hand signal line communication must be maintained between the employee(s) in the IDLH environment and the standby person. Because IDLH conditions present the potential for serious injury or death, there is little margin for error in an IDLH environment. Equipment malfunction in an IDLH environment can

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swiftly disable workers, prevent them from leaving the environment, and lead to severe injury or death. For this reason, close communication between standby personnel and respirator users in the IDLH environment is critical.

When is radio communication acceptable?

Standby personnel may communicate by radio with workers inside the IDLH environment. Although workers inside the IDLH atmosphere may also communicate by radio, these workers must remain in visual contact.

Is voice communication the only acceptable method for workers in the IDLH environment and standby personnel to communicate with one another?

No. Communication can be in the form of hand signals if the workers in the IDLH atmosphere and the standby personnel remain in view of one another. Signal lines may also be used. It is also advisable to have several means of communication systems on hand, in the event that one form of communication fails.

What is appropriate training and equipment for the standby personnel?

You must train the standby personnel to:

- # Provide effective emergency rescue; **and**
- # Notify you or your designated representative before the standby personnel enter the IDLH atmosphere to provide emergency rescue.

You must equip your standby personnel with the following:

- # Pressure demand or other positive pressure SCBAs, or a pressure demand or other positive pressure supplied-air respirator with auxiliary SCBA; **and**
- # Either appropriate retrieval equipment for removing the workers inside the IDLH atmosphere where retrieval equipment would contribute to the rescue of the workers inside the IDLH atmosphere and would not increase the overall risk resulting from entry; **or**
- # Equivalent means for rescue where retrieval equipment could increase the overall risk resulting from entry.

For workers involved in interior structural firefighting, standby personnel must be equipped with

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SCBAs.

Rescue personnel must be properly trained and protected before they enter the IDLH environment. The Hazardous Waste Operations and Emergency Response standard (29 CFR 1910.120) and the Permit-Required Confined Spaces standard (29 CFR 1910.146) provide guidance on the training and protective equipment that is required. Situations exist in which retrieval lines (harnesses, wristlets, anklets) may pose an entanglement problem, especially in areas in which air lines or electrical cords are present in the work areas in which the IDLH atmosphere occurs. Most of the time, however, rescue with retrieval equipment is effective, and much safer for the rescuers, because the standby personnel do not have to enter the IDLH atmosphere.

If there is an emergency can the standby provide immediate rescue assistance?

Your standby personnel must inform either you or your designated representative before attempting emergency rescue within an IDLH environment. Your designated representative may be a properly trained employee or response team or local firefighting and emergency rescue personnel. In any case, proper arrangements and procedures must be in place before you can allow your workers to enter an IDLH environment. Once notified, you must provide necessary assistance appropriate to the situation.

This provision of the standard is intended to ensure that you know when an emergency has occurred so that you or your designated representative can send in immediate additional assistance to help in the rescue.

When should standby personnel enter the IDLH environment?

Under most circumstances, standby personnel should not enter the IDLH environment until you or your designated representative has responded to the notification acknowledging that an emergency exists, that rescue personnel are entering the IDLH environment, and that emergency response units are on their way to provide additional assistance. You must provide standby personnel (rescuers) with proper respiratory equipment, and you must train and prepare your standby personnel to facilitate rescue attempts.

This notification provision is not intended to suggest that standby employees should wait indefinitely for you or your authorized designee to respond to notification before entering the IDLH atmosphere when your workers inside are in danger and standby personnel are appropriately trained and equipped to provide assistance. In the majority of cases, however, rescuers should not enter the IDLH environment until receiving some response from you (i.e., you or your designated representative should know that the rescuers are entering and emergency response units should be on their way to the incident).

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How must I provide appropriate assistance in emergencies?

Once you or your designated representative has been notified, you or your representative must provide the necessary assistance appropriate for the situation. You must make sure that:

- # Rescue operations are carried out appropriately
- # Rescuers are provided with proper respiratory equipment
- # Designated employees are adequately prepared to conduct rescue attempts

You may not always need to send standby personnel into the hazardous atmosphere. In some cases, the worker within the IDLH environment will be able to get out on his or her own, or retrieval equipment may enable rescuers to retrieve the worker without entering the hazardous atmosphere. In these instances, you will need to provide workers inside IDLH atmospheres and standby personnel employees with emergency medical treatment. If standby employees do need to enter the hazardous environment to perform rescue operations, however, you must make sure that those rescuers are fully protected.

You should consult OSHA's rules on confined spaces (29 CFR 1910.146) and on hazardous waste operations and emergency response (29 CFR 1910.120) for other provisions that may apply to IDLH environments.

(g)(4) PROCEDURES FOR INTERIOR STRUCTURAL FIREFIGHTING

This portion of the standard applies to workers engaged in interior structural firefighting only.

What is interior structural firefighting?

Firefighting to control or extinguish a fire in an advanced stage of burning inside a building. Because the fire is producing large amounts of smoke, heat, and toxic products of combustion, exposure to firefighters is extremely hazardous and the environment is considered IDLH.

Are all firefighters engaged in interior structural firefighting covered by the standard?

The Respiratory Protection standard applies directly to private sector workers engaged in firefighting, including those working in industrial fire brigades and private incorporated fire companies, and to federal employees covered under Section 19 of the Occupational Safety and Health Act.

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Federal OSHA’s jurisdiction does not extend to employees of state and local governments; therefore, public sector firefighters are covered only in the 25 states which operate their own OSHA-approved occupational safety and health state programs and are required to extend the provisions of their state standards to these workers. These states and territories are: Alaska, Arizona, California, Connecticut, Hawaii, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Nevada, New Mexico, New York, North Carolina, Oregon, Puerto Rico, South Carolina, Tennessee, Utah, Vermont, Virginia, Virgin Islands, Washington, and Wyoming.

Coverage of volunteers varies by state and depends on state law. State and local government employees in states that do not operate OSHA-approved state plans are not covered by these requirements, unless the requirements are voluntarily adopted for local applicability.

What additional requirements apply to interior structural firefighting?

In addition to the requirements for all IDLH atmospheres, if your workers are involved in interior structural firefighting, you must be certain that:

- # At least two employees enter the IDLH atmosphere and remain in visual or voice contact with one another at all times.
- # At least two employees are located outside the IDLH atmosphere.
- # All employees engaged in interior structural firefighting use SCBAs.

Although two individuals must always be located outside the IDLH atmosphere, one may be assigned to an additional role, such as incident command, pump operations, or operator of the fire apparatus—so long as this individual is able to perform assistance or rescue activities without jeopardizing the safety or health of any firefighter working at the incident. Any assignment of additional duties to the second firefighter must be weighed against the potential for the additional duties to interfere with assistance or rescue activities.

Must firefighters wait until four workers are assembled before attempting to rescue victims inside the burning structure?

No. There is an explicit exemption in the Respiratory Protection standard that states that, if life is in jeopardy, the “two-in, two-out” requirement is waived. The incident commander and the firefighters at the scene must decide whether the risks posed by entering the interior structural fire before at least four firefighters have assembled is outweighed by the need to rescue a victim whose life may be at risk.

CHECKLIST FOR PROPER USE OF RESPIRATORS

Check your facility to be certain that:

- G** Workers using tight-fitting respirators have no conditions, such as facial hair, that would interfere with a face-to-facepiece seal or valve function.
- G** Workers wear corrective glasses, goggles, or other protective equipment in a manner that does not interfere with the face-to-facepiece seal or valve function.
- G** Workers perform user seal checks prior to each use of a tight-fitting respirator.
- G** There are procedures for conducting ongoing surveillance of the work area for conditions that affect respirator effectiveness, and that, when such conditions exist, you take steps to address those situations.
- G** Employees are permitted to leave their work area to conduct respirator maintenance, such as washing the facepiece, or to replace respirator parts.
- G** Employees do not return to their work area until their respirator has been repaired or replaced in the event of breakthrough, a leak in the facepiece, or a change in breathing resistance.
- G** There are procedures for respirator use in IDLH atmospheres and during interior structural firefighting to ensure that: the appropriate number of standby personnel are deployed; standby personnel and employees in the IDLH environment maintain communication; standby personnel are properly trained, equipped, and prepared; you will be notified when standby personnel enter an IDLH atmosphere; and you will respond to this notification.
- G** Standby personnel are equipped with a pressure demand or other positive pressure SCBA, or a positive pressure supplied air respirator with an escape SCBA, and appropriate retrieval equipment or other means for rescue.
- G** Procedures for interior structural firefighting require that: at least two employees enter the IDLH atmosphere and remain in contact with one another at all times; at least two standby personnel are used; and all firefighting employees use SCBAs.

Section (h): MAINTENANCE AND CARE OF RESPIRATORS

You must provide respirator users with equipment that is clean, sanitary, and in good working order. To accomplish this you must have a system of respirator care and maintenance as a component of your respiratory protection program. Regular care and maintenance is important to ensure that the equipment functions as designed and protects the user from the threat of illness or death.

Your system of respirator care and maintenance must provide for:

- # cleaning and disinfection procedures
- # proper storage
- # regular inspections
- # repair methods

(h)(1) CLEANING AND DISINFECTING

Respirator equipment must be regularly cleaned and disinfected according to specified procedures (see Appendix B-2 of the standard in Appendix I of this document) or according to manufacturer specifications that are of equivalent effectiveness.

Cleaning and disinfection procedures are divided into the following:

- # Disassembly of components
- # Cleaning and disinfecting
- # Rinsing, drying, and reassembly
- # Testing

How often must respirators be cleaned and disinfected?

The frequency of cleaning and disinfecting or sanitizing respirators will depend in part on whether your employees share the equipment or are issued respirators for their exclusive use. Worksite conditions also will dictate cleaning frequency, e.g., working in a dirty

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environment will require that the respirator facepiece, in particular, be cleaned more frequently.



Respirator wipes are useful for cleaning

At a minimum:

If a respirator is...	Then...
issued for the exclusive use of an individual employee	the equipment must be cleaned and disinfected as often as necessary to be maintained in clean and sanitary condition.
used by more than one employee	the equipment must be cleaned and disinfected <i>before</i> being used by different individuals.
maintained for use in emergencies, testing, and training exercises	the equipment must be cleaned and disinfected <i>after</i> each use.

Who is responsible for cleaning and disinfecting respirators?

You may choose the program that best meets the needs of your workplace. For example, you may use a centralized operation where employees receive respirators that have been cleaned, disinfected and repaired by workers assigned to this task. You also may require that each respirator wearer be responsible for cleaning and maintaining his or her equipment. In either case, you must provide appropriate training, on-the-job-time, and the necessary equipment and supplies.

In addition, if individual employees are required to clean their own respirators, you must

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allow time during work hours for users to perform this function.

h(2) **STORAGE**

What are the proper storage procedures for respirators?

You must store respirators in a manner that:

- # Protects them from contamination, dust, sunlight, extreme temperatures, excessive moisture, damaging chemicals, or other destructive conditions.
- # Prevents the facepiece or valves from becoming deformed.
- # Follows all storage precautions issued by the respirator manufacturer.

In addition, if a respirator is intended for emergency use, it must be:

- # Kept accessible to the work area, but not in an area that may itself become involved in an emergency and become contaminated or inaccessible.
- # Stored in a compartment or cover (e.g., on a fire truck) that is clearly identified as containing emergency equipment.

h(3) **INSPECTION**

How often must respirators be inspected, and what procedures do I follow?

The frequency of and procedures for inspections depend on whether the respirator is intended for non-emergency, emergency, or escape-only use.

All respirator inspections must include:

- # A check of respirator function, i.e., visual inspection to identify any parts that may be missing, distorted, blocked, loose, deteriorated, or otherwise interfere with proper performance.
- # A check of elastomeric (rubber) parts for pliability and deterioration.

In addition, inspect:

- # **Non-emergency use equipment.** *Before* each use and *during* cleaning and disinfection.

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- # **Self-contained breathing apparatus (SCBA).** *Monthly*, making sure the air and oxygen cylinders that are available for immediate use are maintained in a fully charged state (i.e., pressure is not below 90% of manufacturer's recommended level). You must also activate the regulator and low pressure warning devices to ensure that they function properly.

- # **Emergency use respirators.** *At least monthly*, checking for proper functioning *before and after each use*. When inspecting these types of respirators you must:
 1. Document the date of inspection, name or signature of inspector, inspection findings, any remedial action required, and serial number or other identification of the respirator.
 2. Retain this information with the respirator, storage compartment, or inspection report until next certification. You may use tags to document the inspections.

- # **Emergency escape-only equipment.** *Before* being carried into the workplace for use.



Inspection of SCBA nosecup

***h(4)* REPAIRS**

What do I do if a respirator fails to pass inspection?

If a respirator does not pass inspection, you must remove the respirator from service and discard, repair, or adjust it. Tagging out of service respirators is a good means for ensuring that defective respirators are not inadvertently used.

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Who performs the repair work?

Respirators may be repaired only by an appropriately trained person, who must use NIOSH-approved parts that are designed for the particular respirator being repaired.

Valves, regulators, and alarms must be adjusted and repaired only by the manufacturer or a technician trained by the manufacturer.

What are some examples of when a respirator should be removed from service?

- # A cartridge has become saturated or a contaminant has broken through the cartridge and must be replaced.
- # An alarm system is not functioning on an SCBA.
- # A respirator strap, buckle, or connection is damaged or missing.
- # The mask portion of a respirator is misshapen or degraded and can no longer form a good seal around the user's face.

CHECKLIST FOR RESPIRATOR MAINTENANCE AND CARE

Check to make sure that your facility has met the following requirements:

Cleaning and Disinfecting

- G** Respirators are provided that are clean, sanitary, and in good working order.
- G** Respirators are cleaned and disinfected using the procedures specified in Appendix B-2 of the standard.
- G** Respirators are cleaned and disinfected:
 - G** As often as necessary when issued for the exclusive use of one employee.
 - G** Before being worn by different individuals.
 - G** After each use for emergency use respirators.
 - G** After each use for respirators used for fit testing and training.

Storage

- G** Respirators are stored to protect them from damage from the elements, and from becoming deformed.
- G** Emergency respirators are stored:
 - G** To be accessible to the work area.
 - G** In compartments marked as such.
 - G** In accordance with manufacturer's recommendations.

Inspections

- G** Routine-use respirators are inspected before each use and during cleaning.
- G** SCBAs and emergency respirators are inspected monthly and checked for proper function before and after each use.
- G** Emergency escape-only respirators are inspected before being carried into the workplace for use.

CHECKLIST FOR RESPIRATOR MAINTENANCE AND CARE (cont.)

- G** Inspections include:
 - G** Check of respirator function
 - G** Tightness of connections
 - G** Condition of the facepiece, head straps, valves, and cartridges.
 - G** Condition of elastomeric parts.

- G** For SCBAs, inspection includes checking that cylinders are fully charged, and that regulators and warning devices function properly.

- G** Emergency use respirators are certified by documenting the inspection, and by tagging the information either to the respirator or its compartment, or storing it with inspection reports.

Repairs

- G** Respirators that have failed inspection are taken out of service .

- G** Repairs are made only by trained personnel.

- G** Only NIOSH-approved parts are used.

- G** Reducing and admission valves, regulators and alarms are adjusted or repaired only by the manufacturer or a technician trained by the manufacturer.

Section (i): BREATHING AIR QUALITY AND USE

This section of the Respiratory Protection standard requires you to provide workers who are wearing atmosphere-supplying respirators with breathing air of high purity. Respirators that supply breathing air are generally used in highly hazardous work environments. It is critical that such respirator systems provide breathing air of optimal quality and that the equipment operates reliably.

More broadly, you are required to establish or continue a respiratory protection program that follows performance standards for the operation and maintenance of breathing air compressors, methods for ensuring breathing air quality, and requirements for the quality of purchased breathing air.

The requirements detailed in this section are critical for ensuring the integrity of high purity breathing air for use with respirators, whether the air is delivered in tanks by a supplier or produced on site using a compressor. Also, it is your responsibility to ensure that practices are in place for protecting the quality of breathing air while stored in containers and when being used by employees. These requirements are essential for protecting respirator-wearing workers from the threat of illness or death.

As detailed below, when using atmosphere-supplying respirators you must:

- # Provide breathing air that meets certain specifications.
- # Develop procedures to ensure the proper use of compressed gas cylinders and air compressors.
- # Implement certain precautions to avoid improper use of couplings on airline systems and confusion about breathing air containers.
- # Implement certain precautions to prevent exposure to carbon monoxide when using air compressors.

ATMOSPHERE-SUPPLYING RESPIRATORS

Atmosphere-supplying respirators are used to provide breathing air from a source independent of the ambient atmosphere. The two types of such equipment are:

- # Self-contained breathing apparatus (SCBA) units, for which air is supplied from a tank (a cylinder of compressed air or oxygen). For this type of respirator, the source of the breathing air is designed to be transported by or with the equipment user.
- # Supplied-air respirators (SARs) (also known as airline respirators), which receive air from a connecting hose. The source of air is either a pressurized cylinder or an air compressor. Because the employee does not carry the air on his or her back when using a SAR, breathing air can be provided over a longer time than is the case with a SCBA.

How is breathing air delivered to the respirator user?

Air compressors capture air from the surrounding environment, filter it, remove oil (if necessary), compress it to increase its density, and deliver the air through a system of regulators that brings the air back down to a breathable pressure for the respirator user.

With SCBA units, the pressurized breathing air is transferred from the tank to the respirator user through regulators that decrease the pressure to a level that a human can breathe. Because there is a fixed amount of air in the tank, the user can only rely on it for a given period of time. That time varies based on the size of the tank, the amount of pressure in the tank, and the physical effort required by the respirator user. Use times range from 20 minutes for low pressure tanks (2,500 psi) to 45 minutes for high pressure tanks (4,500 psi).

The air delivered by both types of system is at slightly greater than atmospheric pressure, which assists in preventing contaminated air from seeping through gaps in the facepiece or other areas.

(i)(1) SPECIFICATIONS FOR BREATHING AIR

You must ensure that compressed air, compressed oxygen, liquid air, and liquid oxygen meet certain specifications as outlined below for breathing by employees wearing atmosphere-supplying respirators. Unless you produce your own breathing air from a compressor, you can rely on certificates of analysis from air suppliers to ensure that breathing air meets the required

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specifications.

Types of Breathing Air

Compressed air is the most common type of breathing air system used in worksite applications because it is the most convenient and least expensive. Compressed air is provided either through compressed air cylinders or air compressors at relatively high pressures. Regulators are used to ensure that breathing air supplied to respirators is provided at pressures that are safe for workers to breathe.

Other types of breathing air systems include liquid air, compressed oxygen, and liquid oxygen. Liquid air is air that exists in a liquid state, which is achieved by compressing purified air and chilling it to a temperature below the boiling point of its principal components (i.e., nitrogen and oxygen). Compressed oxygen systems are used in limited applications because they present a significant fire hazard. Liquid oxygen is quite expensive and also presents a significant fire hazard. It is generally used only in very specialized applications.

Specifications

- (i)(I)(i) Compressed and liquid oxygen.** Such forms of oxygen must meet the U.S. Pharmacopoeia requirements for medical or breathing oxygen.
- (i)(I)(ii) Compressed breathing air.** Any compressed breathing air must meet at least the requirements for Grade D breathing air described in ANSI/Compressed Gas Association Commodity Specification for Air (G-7.1-1989). This specification requires that:

 - (A) #** Oxygen content in compressed breathing air must be 19.5 to 23.5 percent of the total volume of air.
 - (B) #** Condensed hydrocarbon content in compressed breathing air must be 5 milligrams (mg) per each cubic meter (m³) of air or less.
 - (C) #** Carbon monoxide content in compressed breathing air must be 10 parts per million (ppm) or less.
 - (D) #** Carbon dioxide content in compressed breathing air must be 1,000 ppm or less.
 - (E) #** There must be a lack of any noticeable odor from the compressed breathing air.

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(i)(2)&(3) OXYGEN USE

Explosion/fire hazard from compressor oil and grease. You must prohibit employees from using compressed oxygen in respirators that have previously been used with compressed air. The reason for this prohibition is that oil and grease can be introduced into respirator airlines used for compressed air, posing a danger of fire or explosion from the high pressure oxygen coming in contact with the oil or grease. Airline systems contain inline filters for capturing impurities so that the respirator user will not inhale the oil or grease.

Explosion/fire hazard from high concentration oxygen. You must ensure that employees use oxygen concentrations greater than 23.5 percent only with equipment designed specifically for oxygen service and distribution. Such equipment is specifically designed to minimize the risk of fire or explosion posed by the high concentration of oxygen.

(i)(4) CYLINDER USE

You must ensure that cylinders used with atmosphere-supplying respirators meet the following requirements:

- # Cylinders of breathing air must be tested and maintained according to Department of Transportation (DOT) Shipping Container Specification Regulations (49 CFR Parts 173 and 178), which include provisions for the construction, testing, and maintenance of cylinders. These steps are necessary to prevent explosions that can result from a rupture in a breathing air cylinder under high pressure. (Additional guidance is available in OSHA 29 CFR 1910.101(b), which includes provisions for in-plant handling and storage of compressed gas cylinders.)
- # Cylinders of purchased breathing air must be accompanied by a certificate from the supplier indicating that the contents of each cylinder have been tested and found to meet the criteria for Grade D breathing air. This certification will provide you with a reasonable assurance that the breathing air supplied to your employees is safe.
- # Cylinder contents must have a moisture level that does not exceed a dew point of minus 50°Fahrenheit (F) (minus 45.6°Celsius [C]) at 1 atmosphere pressure. (Dew point refers to the temperature at which the air is saturated with moisture.) This requirement is intended to prevent respirator valves from freezing when excess moisture accumulates on the valves, which can cause blockages in the flow of breathing air. You should verify with the supplier that the breathing air meets this requirement.

(i)(5)-(7) COMPRESSOR USE

General Requirements

You must ensure that compressors used with atmosphere-supplying respirators provide breathing air according to the following requirements:

(i)(5)(i) Location of compressor during use. The location of an air compressor during use is very important to maintain the purity of the supplied breathing air. For this reason, an air compressor in use must be located so that the air intake component is not drawing from areas that contain:

- # Combustion exhaust from vehicles or the compressor itself.
- # Plant process exhaust, which should be exhausted to the outside by the facility's ventilation system.
- # Contaminated air from hazardous work areas.

(i)(5)(ii) Low moisture content of ambient air. The moisture content of compressed air must be kept to a minimum to prevent freezing of respirator valves at cold temperatures, which can cause blockages in the flow of breathing air. To ensure a low moisture content, the dew point at one atmosphere must be 10E F (5.56E C) below the ambient temperature (in plant).

Are there any systems for keeping moisture from getting into a compressor?

Water traps or desiccators can keep moisture out of a compressor. These systems remove the water from the air as it is run through the compressor, ensuring a certain level of dryness when it comes out. Such systems, like all other parts of a compressor, must be maintained in accordance with the manufacturer's instructions to properly remove the moisture.

(i)(5)(iii) Inline air purification. Suitable air-purifying beds and filters must be used in the supply lines to ensure delivery of a continuous flow of Grade D breathing air to the respirator user. (A sorbent bed is a filter designed to capture impurities in the air.) You must maintain, refurbish, or replace inline sorbent beds and filters as specified by the equipment manufacturer.

(i)(5)(iv) Tracking of bed and filter changes. You must ensure that a tag is maintained at/on the compressor with a note indicating when the sorbent beds and filters were last changed. The notation must include the signature of the person you have authorized to perform the bed and filter maintenance. Only a tag indicating the *most recent* filter and bed changes needs to be retained at/on the compressor.

Requirements Regarding Carbon Monoxide

You must take certain precautions in regard to carbon monoxide when using compressors with atmosphere-supplying respirators. These precautions are required because:

- # Exposure to carbon monoxide above certain levels can be fatal.
- # Sources of this potentially lethal gas are fairly common in many worksites. (In fact, one source of carbon monoxide is the exhaust from the compressor itself.)
- # You will not be able to detect the presence of carbon monoxide because it is an odorless gas.

The types of precautions you will need to take depend on the type of compressor you use.

(i)(6) Compressors that are not oil lubricated. With this type of compressor, you must ensure that carbon monoxide in the breathing air is less than or equal to 10 ppm. This can be achieved by:

- # Locating the compressor's air intake component in an area free of contaminants
- # Conducting continuous or frequent monitoring of the breathing air supply
- # Using inline carbon monoxide filters
- # Using high-temperature alarms or shut-off devices

Must each of these methods be used for compressors that are not oil lubricated?

No. You must use whichever of the above methods are necessary to ensure that carbon monoxide does not contaminate the breathing air. In some cases, one method may be all that is needed. In other cases, you may be required to use more than one of these methods. You must evaluate your own worksite conditions to determine which measures are needed to prevent carbon monoxide from contaminating breathing air.

(i)(7) Compressors that are oil lubricated. With this type of compressor, carbon monoxide can be generated when oil enters the combustion chamber and is partially combusted. Therefore, you must ensure that the compressor operates with a carbon monoxide alarm or a high-temperature alarm.

Carbon monoxide alarms provide better protection than high-temperature alarms because the high-temperature alarms only detect carbon monoxide generated in the combustion chamber, and

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not carbon monoxide resulting from a poorly located compressor intake. Furthermore, high-temperature alarms are installed more for the purpose of protecting the compressor from damage than guarding employees from exposure to carbon monoxide. Because of this, the alarm component of the system is often located with the alarm sensor, where it may not be heard by the respirator users. Consequently, if the compressor has only a high-temperature alarm, you must ensure that air quality is frequently monitored to confirm that carbon monoxide levels stay below 10 ppm.

How often should I check on carbon monoxide levels?

Periodic monitoring for carbon monoxide is acceptable when using newer, well-maintained compressors. Continuous monitoring, however, is recommended for older compressors. In older equipment, oil may enter the air supply more readily due to piston ring or cylinder wear. Continuous monitoring also should be conducted for rented or second-hand compressors because the maintenance history is likely to be unknown or uncertain.

How do I check carbon monoxide levels?

Carbon monoxide levels can be tested with two general types of devices:

- # Direct reading instruments that use electrochemical sensors
- # Chemical detector tubes

Although the electrochemical devices tend to be more expensive, they are also more accurate (i.e., they have a 5 percent error rate). Also, such devices must be calibrated periodically (usually monthly) to achieve accurate readings. Chemical detector tubes have a higher error rate of 10 to 15 percent. Carbon monoxide filters (i.e., filters that convert carbon monoxide to carbon dioxide) with color-change indicators may not be used as carbon monoxide monitors because the color change indicates the presence of moisture, not carbon monoxide.

(i)(8) PRECAUTIONS REGARDING COUPLINGS

You must ensure that couplings used on airlines for atmosphere-supplying respirators are *incompatible* with outlets for nonbreathable worksite air or other gas systems. This precaution must be taken to avoid the chance of inadvertently connecting a respirator to a source other than

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the breathing air. Such a mistake could result in serious illness or death.

Also, you must ensure that at no time is an asphyxiating substance introduced into a respirator's airlines. For example, an inert gas such as nitrogen must not be used to purge or clean breathing airlines.

(i)(9) LABELING OF BREATHING GAS CONTAINERS

You must ensure that breathing air containers are labeled in keeping with the NIOSH respirator certification standard (42 CFR 84). The NIOSH standard incorporates ANSI's Method of Marking Portable Compressed Gas Containers to Identify Material Contained (Z48.1-1971). Proper labeling of containers will avoid the possibility of confusion when connecting the breathing air source to the respirator.

CHECKLIST FOR BREATHING AIR QUALITY AND USE

Check that at your facility:

General

- G** Compressed breathing air meets the requirements for Grade D breathing air.
- G** Compressed oxygen is not used in respirators that have previously used compressed air.
- G** Oxygen concentrations greater than 23.5 percent are used only in equipment designed for oxygen service or distribution.
- G** Breathing air couplings are incompatible with outlets for other gas systems.
- G** Breathing gas containers are marked with appropriate NIOSH certification.

Breathing Air Cylinders

- G** Cylinders are tested and maintained according to DOT 49 CFR Part 173 and 178.
- G** A certificate of analysis for breathing air has been obtained from the supplier.
- G** Moisture content in the cylinder does not exceed a dew point of -50° F at 1 atmosphere pressure.

CHECKLIST FOR BREATHING AIR QUALITY AND USE (cont.)

Compressors

- G** Are constructed and situated to prevent contaminated air from getting into the system.
- G** Are set up to minimize the moisture content.
- G** Are equipped with in-line air-purifying sorbent beds and/or filters that are maintained or replaced following manufacturer's instructions.
- G** Are tagged with information on the most recent change date of the filter and an authorizing signature.
- G** Carbon monoxide does not exceed 10 ppm in the breathing air from compressors that are not oil-lubricated.
- G** High-temperature and carbon monoxide alarms are used on oil-lubricated compressors, or that the air is monitored often enough to ensure that carbon monoxide does not exceed 10 ppm if only a high-temperature alarm is used.

Section(j): IDENTIFICATION OF FILTERS, CARTRIDGES AND CANISTERS

This section of the standard requires you to ensure that all filters, cartridges and canisters used are labeled and color coded with the NIOSH approval label. You must also ensure that the label is not removed and remains legible.

To fulfill these requirements, you should adopt appropriate procedures for ensuring that:

- # Only NIOSH-approved filters, cartridges, and canisters are used
- # Labels are not removed, defaced, or obscured during respirator usage

These procedures may be included in your written respiratory protection program.

What is included on the NIOSH label?

The label clearly states the class of contaminants for which the filter, cartridge, or canister may be used (e.g., permissible particulate respirator filter for dusts, fumes and mists, including asbestos containing dusts and mists and radionuclides). The NIOSH approval number, and any limitations or precautions are also included on the label.

What is the purpose of the label?

The NIOSH label serves several purposes. It ensures selection of the appropriate cartridge/canister for the contaminants found in the workplace. Also, it permits the employee using the respirator to check and confirm that the respirator has the appropriate filters before the respirator is used. Further, the color coding scheme allows fellow employees, supervisors, and the respiratory protection program administrator to readily determine that the employee is using the appropriate filter.

Can I write the date of initial use on the label?

Yes. Marking the initial use date on the label can be done in a way that does not obscure the information on the label.

Section (k): TRAINING AND INFORMATION

Employee training is a critical part of a successful respiratory protection program and is essential for correct respirator use. You must provide training to your employees who are required to wear respirators.

(k)(1) CONTENT OF TRAINING

You must ensure that each employee can demonstrate knowledge of at least the following:

Why the respirator is necessary and how improper fit, usage, and maintenance can make the respirator ineffective.

Training must address the identification of hazards, the extent of employee exposure to those hazards, and the potential health effects of exposure. The training that is required under the Hazard Communication standard (29 CFR 1910.1200) can satisfy this requirement for chemical hazards. Employees must understand that proper fit, usage, and maintenance of respirators is critical to ensure that they can perform their protective function.

What the limitations and capabilities of the selected respirator are.

Training must cover how the respirator operates. Included must be an explanation of how the respirator provides protection by filtering the air, absorbing the gas or vapor, or by supplying a clean source of air. Limitations on the use of the equipment, such as prohibitions against using an air-purifying respirator in an IDLH atmosphere, and why not, must also be explained.

How to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions.

Training must address the possibility of respirator malfunction and the development of emergency situations specific to the worksite. Employees must understand what procedures are to be followed in such circumstances, and which procedures require use of a different respirator.

How to inspect, put on and remove, and check the seals of the respirator.

You must train employees how to recognize problems that may decrease the effectiveness of the respirator and what steps to follow if a problem is detected, such as the person to whom problems should be reported and where replacement equipment can be obtained if

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needed. If specialized personnel conduct inspections, individual respirator wearers only need to be taught about the portions of the inspection process that are their responsibility. You must also cover how to properly put on and remove the respirator to ensure that respirator fit in the workplace is as close as possible to the fit obtained during fit testing. Employees must be trained to perform user seal checks (see Appendix B-1 of the standard in Appendix I of this document).

What the respirator maintenance and storage procedures are.

The extent of training required may vary according to workplace conditions. If employees are individually responsible for storing and maintaining respirators, detailed training may be necessary. If specialized personnel perform these functions, employees only need to be informed of the maintenance and storage procedures.

How to recognize medical signs and symptoms that may limit or prevent effective use of the respirator.

You must instruct employees to recognize medical signs and symptoms, such as shortness of breath or dizziness, that may limit or prevent effective use of respirators. Examples of medical conditions and signs and symptoms that may affect an employee's ability to use a respirator are described in Appendix C of the standard in Appendix I of this document.

The general requirements of the Respiratory Protection standard.

You must ensure that employees are aware, in general, of your obligations under the standard. This discussion need not focus on the standard's provisions but could, for example, simply inform employees that employers are obligated to develop a written program, properly select respirators, evaluate respirator use, correct deficiencies in respirator use, conduct medical evaluations, provide for the maintenance, storage and cleaning of respirators, and retain and provide access to specific records.

Do I Need to Follow a Particular Format?

No. As long as the required topics are addressed, you can use whatever training method is effective. Prepared materials, such as audiovisual and slide presentations, formal classroom instruction, informal discussions during safety meetings, training programs developed or conducted by unions or respirator manufacturers, or a combination of these methods may be used.

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In what sense are employees expected to be able to “demonstrate knowledge” of proper respirator use based on the training?

You must ensure that, before an employee is required to use a respirator in the workplace, he or she understands the information provided and can use the respirator properly. This can be done by reviewing the training with the employee either orally or in writing, and by reviewing the employee’s hands-on use of respirators.

(k)(2) COMPREHENSION OF TRAINING

Training must be conducted in a manner that is understandable to your employees. This means that your program should be tailored to your employees’ education level and language background.

(k)(3) TIMING OF TRAINING

You must provide the required training prior to requiring an employee to use a respirator in the workplace.

(k)(4) PORTABILITY OF TRAINING

If you can demonstrate that a new employee has received training within the last 12 months and can demonstrate the necessary knowledge, you are not required to repeat this training. In cases where training in some elements is lacking or inadequate, you are required to provide training in those elements. Previous training not repeated initially must be provided no later than 12 months from the date of the previous training.

(k)(5) RETRAINING

You must retrain employees in the proper use of respirators annually. You must also retrain employees when:

- # Changes in the workplace or the type of respirator make previous training obsolete.
- # The knowledge and skill necessary to use the respirator properly has not been retained by the employee.
- # Any other situation arises in which retraining appears necessary to ensure safe respirator

use.

(k)(6) INFORMATION FOR VOLUNTARY RESPIRATOR USERS

For employees who choose to wear a respirator but are not required to do so, you are only required to provide the advisory information in Appendix D of the standard. This basic information on the proper use of respirators can be presented to the employee either verbally or in written form. Training is not required for employees who are not required to wear respirators, i.e., for employees who are wearing respirators voluntarily.

TRAINING AND INFORMATION CHECKLIST

Check that at your facility:

- G** Employees can demonstrate knowledge of:
 - G** Why the respirator is necessary and the consequences of improper fit, use, or maintenance.
 - G** Limitations and capabilities of the respirator.
 - G** How to effectively use the respirator in emergency situations.
 - G** How to inspect, put on, remove, use, and check the seals of the respirator.
 - G** Maintenance and storage procedures.
 - The general requirements of the respirator standard.

- G** Training is understandable to employees.

- G** Training is provided prior to employee use of a respirator.

- G** Retraining is provided:
 - G** Annually.
 - G** Upon changes in workplace conditions that affect respirator use.
 - G** Whenever retraining appears necessary to ensure safe respirator use.

- G** Appendix D of the standard is provided to voluntary users.

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Section (I): PROGRAM EVALUATION

(I)(1) CONDUCTING PROGRAM EVALUATIONS

You must perform evaluations of the workplace as necessary to make sure that your written respiratory protection program is working effectively.

How often do I need to evaluate my written respiratory protection program?

You do not need to review your respiratory protection program according to any fixed schedule. The frequency with which you need to evaluate your respiratory protection program will depend on the complexity and/or variability of the program and factors such as:

- # The type and extent of hazards in your workplace.
- # The types of respirators used by your employees.
- # The number of your employees who use respirators.
- # The amount of experience your respirator-wearing employees have in using respirators.

You must evaluate respirator use with sufficient frequency to ensure that all elements of the respiratory protection program are being effectively implemented.

(I)(2) CONSULTING WITH EMPLOYEES

You must regularly consult with employees required to wear respirators to assess their views on the effectiveness of the respiratory protection program and to identify any problems that they may be encountering with the use of respirators. You must correct any problems that are identified. At a minimum, you must assess:

- # Whether proper fit of respirators is being achieved, and whether respirator use is interfering with effective work performance.
- # Whether appropriate respirators have been selected.
- # Whether respirators are being properly used.

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- # Whether respirators are being properly maintained.

When I consult with my employees, what should I ask them?

You may want to ask your employees questions such as:

- # Does your respirator interfere with your hearing or vision?
- # Do you experience fatigue or have difficulty breathing during respirator use?
- # Does your respirator restrict your movements or interfere with your job performance in any way?
- # Is your respirator uncomfortable?
- # Are you confident that you are using your respirator correctly?
- # Are you confident that your respirator is performing adequately?

PROGRAM EVALUATION CHECKLIST

Check that at your facility:

- 9 Workplace evaluations are being conducted as necessary to ensure that the written respiratory protection program is being effectively implemented.
- 9 Employees required to wear respirators are being regularly consulted to assess the employees' views and to identify problems with respirator fit, selection, use and maintenance.
- 9 Any problems identified during assessments are corrected.

Section (m): RECORDKEEPING

To assist you in auditing the adequacy of your respiratory protection program, to facilitate employee involvement, and to provide a record for compliance determinations by OSHA, you must retain certain records.

(m)(1) MEDICAL EVALUATION RECORDS

Records of medical evaluations required by the standard and described in section (e) of this guide must be retained and made available to the affected employees in accordance with OSHA's Access to Employee Exposure and Medical Records standard (29 CFR 1910.1020).

(m)(2) RESPIRATOR FIT TESTING RECORDS

You are required to retain written records of the qualitative and quantitative fit tests administered to your employees. These records need to include:

- # The name or identification of the employee tested.
- # The type of fit test performed.
- # The make, model, and size of the respirator tested.
- # The date of the fit test.
- # Pass/fail results if a qualitative fit test (QLFT) is used, or the fit factor and strip chart recording or other record of the test results if a quantitative fit test (QNFT) is used.

How long do I need to retain fit test records?

Fit test records must be retained for respirator users until the next fit test is administered.

Do I need to retain records of fit tests for employees who are no longer using respirators?

No. Fit test records do not need to be retained for these employees.

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(m)(3) WRITTEN RESPIRATORY PROTECTION PROGRAM

You must retain a written copy of your current respiratory protection program.

(m)(4) ACCESS TO RECORDS

Written materials required to be retained must be made available upon request to the affected employees, their designated representatives, and to OSHA. See 29 CFR 1910.1020 for more information.

Do I need to allow employees and OSHA to make copies of these materials?

Yes. You need to make these materials available for inspection and for copying.

Must employees be allowed access to the records of other employees?

No. Each affected employee can have access to his or her records only.

RECORDKEEPING CHECKLIST

Check that at your facility:

- G** Records of medical evaluations have been retained.
- G** Fit testing records have been retained.
- G** A copy of the current respiratory protection program has been retained.
- G** Access to these records is provided to affected employees.

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Section (n): DATES

This portion of the Respiratory Protection standard sets forth the dates by which you must meet the requirements of the revised Respiratory Protection standard.

(n)(1) EFFECTIVE DATE

The revised Respiratory Protection standard became effective on October 5, 1998.

(n)(4) EXISTING RESPIRATORY PROTECTION PROGRAMS

You may use the results of training, fit testing, or program or medical evaluations conducted within twelve months prior to April 8, 1998 to comply with the revised Respiratory Protection standard, if the results meet the requirements of the standard.