**Respiratory Protection Program**

**Instructions**

The following sample program is provided to assist you with the preparation and implementation of an effective respiratory protection program.

You will need to provide information in several areas within the program. The information needed will be indicated by BLUE TEXT. If your organization is not using Self-Contained Breathing Apparatus (SCBA) or Supplied Air Respirators (SAR), the text and forms highlighted in yellow should be removed.

*NOTE: Although the regulations do not require volunteer users of respiratory protection to have a medical evaluation, the medical evaluation was written into this program for volunteer users as a best practice. This may be removed from the program at your discretion.*

**Name of Entity**

**Name of Department (Optional)**

**Respiratory Protection Program**

**Date**

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# Purpose

The NAME OF ENTITY is committed to maintaining an injury and illness free workplace and is making every effort to protect employees from harmful airborne substances.

Whenever it is feasible to do so, maintaining a safe atmosphere will be accomplished through engineering controls such as ventilation, substitution with a less harmful substance, atmospheric testing, and through administrative controls limiting the duration of exposure. When these methods are not adequate or if the exposures are brief and intermittent or simply to minimize employee exposure to airborne substances, respirators are provided to allow employees to breathe safely in potentially hazardous environments.

It is recognized that respirators have limitations, and their successful use is dependent on an effective Respiratory Protection Program. This Respiratory Protection Program meets the requirements of the [California Code of Regulations (CCR), Title 8, Section 5144](https://www.dir.ca.gov/title8/5144.html) and is designed to:

* Identify, evaluate, and control exposure to respiratory hazards;
* Select and provide the appropriate respirators; and
* Coordinate all aspects required for proper use, care, and maintenance of the equipment.

# Responsibilities

## Respiratory Protection Program Administrator

The Department Director or their assigned designee is the designated Respiratory Protection Program Administrator (RPPA) and is responsible for evaluating and modifying this program as warranted.

### Manager(s) or Supervisor(s):

1. Identify, locate, and maintain ongoing surveillance and evaluation of airborne exposures
2. Select respirator types for various exposures and uses
3. Arrange for medical screening for potential respirator users
4. Provide training in respirator care and use
5. Provide fit testing for potential respirator users
6. Ensure respirators are inspected and maintained

### Employees:

* Complete the respiratory protection safety training
* Follow all safety policies and procedures relating to tasks that require respiratory protection
* Report all hazardous conditions to supervisors immediately

# Procedures

## Contaminants

This program presents rules for the use of respirators by employees for protection against the following situations:

LIST DEPARTMENT SPECIFIC SITUATIONS

The division manager or supervisor will assess specific hazards related to respiratory protection, and record the assessment for each job and employee in the Respirator Issue Checklist form included in Appendix F. Any job hazard description may be reevaluated any time there is a change in the nature of the job or products or any time a complaint or problem with respirator use is identified by an employee.

## Physical Qualifications and Medical Examinations

Employees will not be assigned to tasks requiring use of respirators unless it has been determined they are physically able to perform the work while using the required respiratory equipment. A physician or other licensed health care professional (PLHCP) will determine what health and physical conditions are pertinent. The medical status of an individual assigned use of respiratory equipment will be determined prior to assignment to job tasks requiring respirator use and reviewed annually. The employee must complete a confidential medical evaluation questionnaire and supply it to the designated PLHCP for evaluation. *Please note: Due to HIPAA regulations, the employer must not see completed medical evaluations as they will contain protected health information (PHI) which is confidential.* The PLHCP will notify the employer if the employee has any restrictions on wearing a respirator. The medical evaluation form is available from the PLHCP or online at <https://www.dir.ca.gov/title8/5144c.html>.

Wearing of contact lenses will not be permitted in an atmosphere where a respirator is required. If corrective lenses are needed, a corrective lens kit will be supplied by the department for use with the respirator.

## Types of Respirators

**Air-Purifying Respirators (APR)**

An air-purifying respirator is a device that fits tightly to the face, covering at least the nose and mouth, and removes contaminants from the air. It consists of a half or full-face assembly and a pair of identical air purifying cartridges. It is the component that removes chemical contaminants from the air inhaled through it. Different air purifying cartridges are used to remove different chemical contaminants.

An air-purifying respirator with filters is designed to remove particulate material (dust, mists, and fumes) from the air. A filter or pre-filter is designed to remove dust and mist having a time-weighted average (TWA) not less than 0.05 mg/m3. The filter may be used alone or as a pre-filter with a gas or vapor cartridge assembly on a full-face respirator.

Air-purifying respirators are less cumbersome and allow more freedom of movement. However, every time the wearer inhales, a negative pressure is created in the mask relative to the outside of the atmosphere, which will draw contaminants into the facepiece through leaks in the seal. If the wearer of a gas/vapor air-purifying respirator begins to taste or smell or the air becomes irritating, this is an indication that a “breakthrough” has occurred, and the cartridges need to be replaced. Replace the filter in a particulate air-purifying respirator when it becomes harder to breathe because this indicates the filter is clogged with contaminants.

Selection of an air-purifying respirator should be made with consideration of all the following:

* The nature of the contaminant, (skin or eye irritant, skin absorption, warning properties, concentration, health effects, threshold limit value [TLV], or permissible exposure limit [PEL])
* The nature of the hazardous operation
* The location
* Respirator limitations
* Respirator protection factors
* Respirator approvals

Do not use air-purifying respirators in the following conditions or situations:

1. In atmospheres where chemical contamination is at or above the Immediately Dangerous to Life or Health (IDLH) level
2. In oxygen deficient atmospheres (less than 19.5% oxygen)
3. When the contaminant has poor warning properties; that is, when the contaminant cannot be recognized by taste or smell or irritations are at or below the PEL unless the respirator cartridges are equipped with an end-of-service life indicator (ESLI).

The NAME OF ENTITY has selected only National Institute for Occupational Safety and Health (NIOSH)/Mine Safety and Health Administration (MSHA) approved respirators for this program. A brief description and use for each type of respirator is listed below:

* The OSHA or MSHA PEL, NIOSH recommended exposure limit or the occupational exposure limit for the contaminant
* The hazard ratio (HR) (i.e. the airborne particulate concentration divided by the exposure limit)
* The Assigned Protection Factor (APF) for the class of respirator (the APF should be greater than the HR)
* The IDLH concentration, including oxygen deficiency (NIOSH)
* Any service life information available for combination cartridges or canisters

Multiplying the occupational exposure limit by the APF for a respirator gives the maximum workplace concentration in which that respirator can be used. For example, if the commonly accepted APF for a half-mask respirator is 10 and the PEL is 5 milligrams per cubic meter, then 50 milligrams per cubic meter is the highest workplace concentration in which a half-mask respirator can be used against that contaminant. If the workplace concentration is greater than 50 milligrams per cubic meter, a more protective respirator (with a higher APF) must be used. In no case should an air-purifying respirator be used in IDLH atmospheres or in areas that are oxygen deficient, and do not exceed the manufacturer’s guidelines.

*N*, *R*, and *P* designations dictate usage of the filter. N-series filters are not resistant to oil, R-series filters are resistant to oil, and P-series filters should be selected if there are oil aerosols (e.g., lubricants, cutting fluids) or non-oil aerosols in the workplace. N-series filters should be used only for non-oil aerosols (e.g., solid and water-based). The service life of all three filter categories (*N*, *R*, and *P*) is limited by considerations of hygiene, damage, and breathing resistance. All filters should be replaced whenever they are damaged or soiled or causing noticeable increased breathing resistance.

| **Dust/Mist Particle Mask**  **Description of filter classes certified under 42 CFR 84** | | | | | |
| --- | --- | --- | --- | --- | --- |
| Class of filter | Efficiency | Test agent | Test maximum loading (mg) | Type of contaminant | Service time 1 |
| N-series:  N100  N99  N95 | 99.7  99  95 | NaCl2 | 200 | Solid and water-based particulates (i.e., non-oil aerosols) | Nonspecific3,4 |
| R-series:  R100  R99  R95 | 99.7  99  95 | DOP  oil5 | 200 | Any | One work shift3,6 |
| P-series:  P1007  P99  P95 | 99.7  99  95 | DOP  oil5 | Stabilized efficiency | Any | Nonspecific3 |

NOTES:

1. NIOSH will be conducting and encouraging other researchers to conduct studies to assure that these service time recommendations are adequate. If research indicates the need, additional service time limitations may be recommended by NIOSH for specific workplace conditions.
2. NaCl = sodium chloride
3. Limited by considerations of hygiene, damage, and breathing resistance.
4. High (200mg) filter loading in the certification test is intended to address the potential for filter efficiency degradation by solid or water-based (i.e., non-oil) aerosols in the workplace. Accordingly, there is no recommended service time limit in most workplace settings. However, in dirty workplaces (high aerosol concentration), service time should only be extended beyond 8 hours of use (continuous or intermittent) by performing an evaluation in specific workplace settings that demonstrates (a) that extended use will not degrade or (b) that the total mass loading of the filter is less than 200 mg (100 mg per filter for dual-filter respirators).
5. DOP oil = dioctyl phthalate
6. No specific service time limit when oil aerosols are not present. In the presence of oil aerosols, service time may be extended beyond 8 hours of use (continuous or intermittent) by demonstrating (a) that extended use will not degrade the filter efficiency below the certified efficiency level or (b) that the total mass loading of the filter is less than 200 mg (100 mg per filter for dual-filter respirators).
7. The P100 filter must be color-coded magenta. The Part 84 Subpart KK HEPA filter on a PAPR will also be magenta, but the label will be different from the P100 filter, and the two filters cannot be interchanged.

Air-purifying cartridges are labeled and color-coded for each type of atmospheric contaminant. A reference guide of atmospheric contaminants and their color codes is outlined below:

| **Color** | **Description** | **Approved For** |
| --- | --- | --- |
| Black | Organic Vapors | Organic vapors |
| Yellow | Organic Vapors/ Acid Gases | Organic vapors, chlorine, chlorine dioxide, hydrogen chloride or sulfur dioxide; hydrogen sulfide (escape only) |
| White | Acid Gases | Chlorine, hydrogen chloride, formaldehyde, sulfur dioxide; hydrogen sulfide (escape only) |
| Green | Ammonia | Ammonia or methylamine |
| Magenta | HEPA | Dust, fumes, and mists with a TWA less than 0.05 mg/m3 including asbestos-containing dusts/mist and radionuclides. |
| Olive | Uni-Sorb | Organic vapors, formaldehyde, ammonia, methylamine, chlorine, hydrogen chloride, sulfur dioxide, chlorine dioxide; hydrogen sulfide (escape only) |

Cartridges for the air purifying respirators and their replacement parts can be obtained from the department supervisor. The following table gives the air-purifying respirator cartridge type for the hazard types and areas encountered at NAME OF ENTITY DEPARTMENT. LIST DEPARTMENT SPECIFIC HAZARDS

|  |  |  |
| --- | --- | --- |
| **Type of Hazard** | **Area** | **Color** |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

**Powered Air Purifying Respirator (PAPR)**

Powered air-purifying respirator (PAPR) means an air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering. PAPR is often used with a hood or a helmet that may be used for persons who cannot achieve a proper seal during fit testing. In addition, PAPRs generally have a higher APF due to being a positive pressure design. Respirator cartridges for a PAPR are selected in the same manner as an APR.

**Filtering Facepiece Respirator**

Filtering facepiece (dust mask) means a negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium. Dust masks that are NIOSH approved have two straps and are stamped “NIOSH approved.”

**Self-Contained Breathing Apparatus (SCBA)**

SCBAs will be worn in atmospheres of LIST SPECIFIC HAZARD exceeding the IDLH value of LIST SPECIFIC VALUE FOR HAZARD ppm and in oxygen-deficient or oxygen-enriched atmospheres (less than 19.5% or greater than 23.5% oxygen content). Pressure-demand open circuit type SCBAs are provided for emergency response by department personnel to accidental releases of LIST SPECIFIC HAZARD and for use within oxygen-deficient or oxygen-enriched confined spaces. These respirators give the user an independent air supply that is not mixed with the outside air. The supervisor will confirm the amount of compressed breathing air contained in the cylinder before use. Air is exhaled directly into the outside atmosphere. Positive pressure is maintained inside the facepiece. Respirators of any type will not protect against skin absorption of toxins.

Proper SCBA care guidelines include the following:

* Ensure the unit has a full tank.

Compressed breathing air will meet at least the requirements for Grade D breathing air described in ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-1989. Refer to Appendix L for specific requirements.

* The person who uses the respirator is responsible for inspecting it.
* Do not use faulty equipment.
* Do not attempt repairs yourself. The manufacturer or a factory qualified service technician should make all repairs.
* Respirator mask should be thoroughly cleaned after each use, dried, made ready for use, then replaced in its re-sealable plastic bag and stored with other personal protective equipment issued to an employee.
* SCBAs should be stored in an appropriate holder or storage case or inside a SCBA cabinet.
* Before using the respirator, it should be wiped with a proper disinfectant towelette. Examine the condition of the mask, straps, valves, and filter elements. Any malfunction of a respirator should be reported to your supervisor.
* All respirators must be inspected and cleaned monthly by the person assigned the respirator or by the individual responsible for the inspection of the SCBAs.
* All inspections must be recorded in the respirator logbook.
* To obtain SCBA gear, contact your department manager or supervisor.

No one is to use an SCBA unless they have been trained and certified in SCBA use and care.

**Supplied–Air Respirator (SAR)**

Supplied-air respirator (SAR) or airline respirator means an atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user. Compressed breathing air will meet at least the requirements for Grade D breathing air described in ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-1989. Refer to Appendix L for specific requirements.

## Respirator Fitting

Proper fitting of the respirator is essential if the user is to be protected. An improper fit will allow contaminated air to pass through the non-sealed edges of the respirator, rather than through the filtering system. An employee with a beard may not wear a tight-fitting facepiece respirator. The beard interferes with the seal between the face and facepiece and also interferes with the respirator’s valves. It is a policy at NAME OF ENTITY that any employee who is required to wear a tight-fitting facepiece respirator as part of their job will be clean shaven at all times.

The department RPPA may assign a PAPR to an employee who cannot wear a tight fitting facepiece respirator. The RPPA must ensure the PAPR assigned will provide the needed protection factor for the hazard presented by the operation.

A proper fit is not possible on a full-face respirator if one wears regular eyeglasses. The temple bars prevent a seal at the sides of the head. Facial scars, beards, and sideburns also interfere with a proper fit. This problem is especially acute for cartridge type respirators when a negative pressure is created during inhalation. When an employee requires prescription eyeglasses and their job description requires them to use a respirator, special prescription eyeglasses will be provided by the NAME OF ENTITY.

When a respirator is first issued to the wearer, they should try on a variety of sizes to get a comfortable fit. After making a preliminary selection, the test subject will be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension, and how to determine a comfortable fit. An assessment of comfort will include reviewing the following items with the test subject and allowing the test subject adequate time to determine the comfort of the respirator. The test subject will conduct the negative and positive pressure fit checks listed below. Then the wearer will be required to undergo an appropriate fit test.

The negative and positive pressure fit tests are to be performed every time an employee puts on a respirator.

**Negative Pressure Fit Check Procedure**

The wearer closes off the respirator inlet and inhales. A vacuum and partial inward collapse of the mask should result. If a vacuum cannot be maintained for at least ten seconds, readjust the facepiece and try again.

**Positive Pressure Fit Check Procedure**

The wearer closes off the exhalation valve and breathes out gently. This will create a pressure inside the mask. This pressure must remain constant for approximately ten seconds. If air should escape through any gaps in the seal reposition the mask and try again.

**Fit Testing**

NAME OF ENTITY has established a record of the qualitative fit tests (QLFT) and quantitative fit tests (QNFT) administered to an employee including:

* 1. The name or identification of the employee tested;
  2. Type of fit test performed;

1. Specific make, model, style, and size of respirator tested;
2. Date of test; and
3. The pass/fail results forQLFTsor the fit factor and strip chart recording or other recording of the test results for QNFTs.

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

**Qualitative Fit Testing**

There are four accepted test methods for QLFT. These are isoamyl acetate (more commonly known as banana oil), saccharin, Bitrex®, and irritant smoke (stannic chloride). These test methods all follow essentially the same format. The test method performed will differ depending on the type of air-purifying element that is used on the facepiece. The isoamyl acetate QLFT requires respirators equipped with organic vapor cartridges. Both the saccharin and Bitrex® QLFT require respirators equipped with particulate filters (95, 99, or 100 series filters are acceptable). To perform the irritant smoke test, the respirator needs to be equipped with either a P100 series particulate filter or HEPA filter. It is important to note that when performing the irritant smoke test, no form of enclosure or hood for the test subject is to be used. The other QLFTs all require the use of an enclosure. For test protocols, refer to [Title 8 CCR Section 5144 Appendix A](https://www.dir.ca.gov/title8/5144a.html).

* 1. QLFT is performed by NAME OF VENDOR. This fit test vendor must provide the department a record of certification that its equipment and fit testing procedures meet with current Cal/OSHA regulations ([Title 8 CCR Section 5144 Appendix A](https://www.dir.ca.gov/title8/5144a.html)).

**(OR)**

* 1. QLFT is performed by trained NAME OF ENTITY staff. The department will maintain training records for staff performing fit testing that meet current Cal/OSHA regulations ([Title 8 CCR Section 5144 Appendix A](https://www.dir.ca.gov/title8/5144a.html)).

**Quantitative Fit Testing**

The following QNFT procedures have been demonstrated to be acceptable:

* QNFT using a non-hazardous test aerosol (such as corn oil, polyethylene glycol 400 [PEG 400], di-2-ethyl hexyl sebacate [DEHS], or sodium chloride) generated in a test chamber and employing instrumentation to quantify the fit of the respirator
* QNFT using ambient aerosol as the test agent and appropriate instrumentation (condensation nuclei counter) to quantify the respirator fit
* QNFT using controlled negative pressure and appropriate instrumentation to measure the volumetric leak rate of a facepiece to quantify the respirator fit

Persons administering QNFT are able to calibrate equipment and perform tests properly, recognize invalid tests, calculate fit factors properly, and ensure test equipment is in proper working order.

QNFT equipment is kept clean and is maintained and calibrated according to the manufacturer's instructions so as to operate at the parameters for which it was designed.

## Respirator Cleaning and Maintenance

**Inspections**

Respirators for normal, non-emergency work must be inspected before and after each use. Emergency respirators must be inspected after each use and at least once a month.

Inspect for the following:

1. Holes in filters
2. Loss of elasticity or tears in straps and hoses
3. Broken or loose connectors and fittings
4. Cracks or scratches on the facepiece
5. Detergent residue or dirt on inhalation and exhalation valves

**Repair**

Continued use of respirators may require periodic repair or replacement of component parts. Such repairs must be done by a qualified individual.

Replacement of parts and repair of air-purifying respirators should be done by a properly trained employee. Replacement parts for any respirator must be those of the manufacturers of the equipment involved. Substitution of parts from a different brand, model, or type of respirator will invalidate the approval of the respirator and is prohibited.

Notify your supervisor if a SCBA requires repair. SCBA equipment requires only qualified and authorized manufacturer technicians repair and/or adjust the unit, Use only original equipment manufacturer replacement parts for the same type and brand of equipment.

**Air Purifying Respirator Cartridges**

New cartridges for APRs and PAPRs must be stored in the original packaging until fitted in the respirator for immediate use.

Used cartridges must be replaced with new, sealed cartridges units on the following schedule:

1. When the ESLI, if equipped, indicates the need;
2. If the respirator becomes difficult to breathe through;
3. If the employee can smell the contaminant while wearing the respirator; or
4. Whenever the employee uses the respirator for the first time that day.

**Cleaning and Disinfecting Respirator Facepieces**

After each use, perform the following procedure:

* Clean and disinfect respirator facepiece.
* Remove filters, screens, and headbands.

The respiratory protection equipment will be washed with detergent in warm water 43°C (110°F) using a soft brush, thoroughly rinsed in warm clean water 43°C (110°F), and then air-dried in a clean place. Care must be taken to prevent damage from rough handling.

If possible, use detergents containing a bactericide. Organic solvents should not be used, as they can deteriorate the rubber/silicone facepiece and are dangerous. If the above combination is not available, a detergent may be used followed by a disinfecting rinse.

* Scrub the respirator in detergent and warm water 43°C (110°F).
* Rinse in warm water 43°C (110°F) and treat the respirator with disinfectant.
* Hypochlorite solution (50 ppm chlorine) is made by adding 2 tablespoons of chlorine bleach (laundry bleach) per gallon of water. A sufficient immersion time of at least 2 minutes disinfects the respirator.
* The cleaned and disinfected respirators will be rinsed thoroughly in clean warm water 43°C (110°F) to remove all traces of detergent, cleaner, sanitizer, and disinfectant. This is very important to prevent dermatitis.
* The respirators may be allowed to air-dry on a clean surface. They may also be hung from a horizontal wire or rope, but care must be taken not to damage the facepiece.
* Do not dry rubber parts under heat or sunlight.
* Never use solvents to clean plastic or rubber.
* Place respirators in individual sealable plastic bags.

**Storage of Respirators**

Equipment must be stored to protect it from dust, sunlight, heat, extreme cold, moisture, damaging chemicals, and physical damage. They will be stored in a single layer with the facepiece and exhalation valve in a more or less normal position to prevent the rubber or plastic from taking a permanent distorted shape.

Air-purifying respirators kept ready for non-routine or emergency use will be stored in a cabinet with individual compartments. Storage cabinets will be located in non-contaminated but readily accessible locations. Store them in one layer, with facepiece and exhalation valve in a normal position.

## Inspection Procedures and Schedules

The RPPA has developed an inspection checklist for respiratory protective equipment (Appendix A). Department supervisors will be responsible for ensuring inspections and cleaning of equipment is being completed. All respiratory protective equipment must be inspected by the user:

* Before and after each use
* During cleaning

Equipment designated for emergency use, such as SCBA must be inspected:

* Before and after each use
* During cleaning
* At least monthly by the designated department supervisor

## Training

Employees must become familiar with the details of this program. Each employee who will use a respirator will be trained in its proper use and maintenance prior to engaging in job tasks requiring respirator use and re-trained annually. A written training quiz form is included in Appendix B. If questions are missed, the employee will be re-trained to ensure reasonable understanding of all questions. Written training quiz results will be maintained according to the record retention schedule in Appendix I.

## Program Evaluation

The Respiratory Protection Program will be evaluated annually by the RPPA to ensure proper implementation. The RPPA will regularly communicate with department management and employees about the effectiveness of the program and to identify any problems. The evaluation will ensure:

* Proper procedures for purchasing approved equipment are in place.
* Employees are properly fit tested.
* Employees have adequate training.
* Equipment is cleaned, inspected, and maintained.
* Program documentation is complete.
* Procedures are revised to correct deficiencies.

## Record Keeping

This section requires the employer to establish and retain written information regarding medical evaluations, fit testing, and the respirator program. This information will facilitate employee involvement in the respirator program, assist the employer in auditing the adequacy of the program, and provide a record for compliance determinations by Cal/OSHA.

Fit Testing

NAME OF ENTITY retains a record of the QLFTs and QNFTs administered to an employee including:

1. The name or identification of the employee tested;
2. Type of fit test performed;
3. Specific make, model, style, and size of respirator tested;
4. Date of test; and
5. The pass/fail results for QLFTs or the fit factor and strip chart recording or other recording of the test results for QNFTs.

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

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A written copy of the current respirator program shall be retained by the employer.

Written materials required to be retained under this subsection shall be made available upon request to affected employees and to the Chief or designee for examination and copying

Inspection Records

A record must be kept of inspection dates and findings for respirators kept for emergency use. In addition, a log of routine inspections of all other respiratory protective equipment will be maintained. An Inspection and Cleaning Record form is included in Appendix A for air-purifying respirator inspection and cleaning. An SCBA inspection form is included in Appendix J for SCBA inspections. Inspection records will be retained in accordance with Appendix I – Records Retention Schedule.

**Training Records**

Training records, including quiz results, will be retained in accordance with Appendix I – Records Retention Schedule.

**Medical & Exposure Records**

Records of medical evaluations are retained and will be made available in accordance with [Title 8 Section 3204, *Access to Employee Exposure and Medical Records*](https://www.dir.ca.gov/title8/3204.html). Employee medical evaluation records are to be maintained for the length of employment, plus 30 years. Employee fit test and training records are to be maintained for 5 years.

**Program Evaluation Records**

Program evaluation records will be retained in accordance with Appendix I – Records Retention Schedule.

## Voluntary Respirator Use

Employees will be allowed to use a respirator on a voluntary basis if requested.

A workplace exposure assessment will be performed to determine whether the work activity requires the use of a respirator or if the use of the respirator itself would create a hazard.

Employees requesting the voluntary use of a respirator must:

* Undergo the same medical evaluation as those employees required to wear respirators to ensure they are medically able to wear a respirator. (Not required if the employee requests the use of a single strap dust filtering facepiece.)
* Maintain their respirators to the same cleaning, storage, and inspection requirements as those employees required to wear respirators.

Employees requesting the voluntary use of a respirator will be provided the CCR, Title 8, Section 5144, Appendix D, “Information for Employees Using Respirators When Not Required Under the Standard” (Appendix G of this document).

Employees requesting the voluntary use of a respirator will be provided an approved respirator upon request.

If the employee chooses to supply their own respirator for voluntary use, the employee must provide the RPPA with the make, model, and cartridge information. Employees must follow all provisions of CCR, Title 8, Section 5144, Appendix D.

Employees must sign the voluntary use agreement acknowledgement form located in AppendixG of this document. The original form will be retained in accordance with Appendix I – Records Retention Schedule.

**Appendix A - Air-Purifying Respirator Inspection & Cleaning Record**

Type of Respirator: Half and full-faceair-purifying respirator

Check all that apply:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Cleaned: |  |  | Filters inspected: |  |
| Facepiece inspected: |  |  | Harness assembly inspected: |  |
| Inhalation valve inspected: |  |  | Gaskets inspected: |  |
| Exhalation valve inspected: |  |  | Connections inspected: |  |
| Headband inspected: |  |  | Other defects noted and reported: |  |
| Cartridge holder inspected: |  |  |  |  |

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| --- | --- | --- |
| **Date** | **Inspected By** | **Comments/Corrective Actions** |
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**Appendix B- Respirator Training Quiz**

Employee name: Date:

1. What would you do if you could smell the contaminant through the respirator?

1. Describe the positive and negative fit test procedures.

1. How do you clean the respirator?

1. Can you use paint thinner to clean paint off a respirator? \_\_\_\_\_\_
2. Can you use a dust mask for painting? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Do some respirators protect against higher levels of contaminants? Explain:
4. Do all contaminants affect the body in the same ways?

Explain:

1. Can you use an air-purifying respirator in all atmospheres?

1. What signs indicate cartridge breakthrough has occurred and the cartridges need to be replaced?

1. You have a green colored cartridge on your respirator. From what type of contaminant will it protect you?

**Passing Grade is 80%**

**Appendix C - Employee Training Record**

I have been informed by my supervisor at the Name of Entity/Department of the following:

1. The consequences of equipment misuse.
2. Limitations of a respirator.
3. Putting on the respirator.
4. Wearing the respirator.
5. Maintenance of the respirator.
6. Inspecting the respirator.
7. Proper fit-testing techniques.
8. Purpose of medical evaluation.

,

(Print Name of Employee)

Employee received training in respirator use and maintenance.

Employee received a copy of Name of Entity and Department Respiratory Protection Program and understands the information presented.

Employee successfully passed the respirator training quiz.

Employee received an evaluation by a physician or other licensed health care professional.

Employee was fit tested.

Employee’s signature:

Trainer signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Training date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Appendix D - Respiratory Compliance Letter**

#### Name of Employee:

#### Date of Examination:

#### In accordance with Cal-OSHA CCR Title 8 §5144 “Respiratory Protection,” employees will not be assigned to tasks requiring the use of respirators unless it has been determined that they are physically able to perform the work while using the required respiratory equipment. Medical evaluations will include at a minimum the items in Title 8 CCR §5144 Appendix C, OSHA Respirator Medical Evaluation Questionnaire.

#### *Physician*: *“As a result of my findings from the pulmonary function test, medical history, and any other required medical test(s), the employee named above* 🞎 *may* 🞎 *may not engage in work duties where respiratory equipment is required.”*

Comments:

|  |
| --- |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Printed Name & Title of Physician / Health Care Professional Signature  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Name of Clinic or Medical Facility Date  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Facility Address Phone Number |

**Appendix E - Respirator Fit-Test Record**

*Instructions for Tester: COMPLETE this form for each employee and each type of respirator issued.*

|  |  |  |  |
| --- | --- | --- | --- |
| Name of Employee: | | | |
| Department: | | | |
| Position: | | | |
|  | |  | |
| **Respirator** | | | |
| Manufacturer: | | | Model No.: |
| Type: | Size: | | Approval No.: |
| Task(s) Requiring Use: | | | |

|  |  |  |
| --- | --- | --- |
| ✓ | Test Procedure | Comments |
|  | No facial hair or seal interference. |  |
|  | Respirator worn per manufacturer’s instructions1. |  |
|  | Respirator worn for a familiarization period (5-mins.) |  |
|  | Respirator is reasonably comfortable. |  |
|  | No leakage under mild facepiece pressure or vacuum. |  |
|  | Test agent: 🞎 isoamyl acetate 🞎 Bitrex® 🞎 smoke 🞎 saccharin |  |
|  | * Normal breathing and no sensation. |  |
|  | * Deep breathing and no sensation. |  |
|  | * Turn head from side-to-side and no sensation. |  |
|  | * Nod head up and down and no sensation. |  |
|  | * Talk with jaw action and no sensation. |  |
|  | * Grimace, smile, and frown with no sensation. |  |
|  | * Bend at waist and touch toes with no sensation. |  |
|  | * Breathing and exercise performed (2-mins.) with no sensation of in-leakage. |  |
| 1Including facial positioning and strap tension adjusting. | | |

|  |
| --- |
| I hereby attest this qualitative fit-test was conducted according to the regulatory procedures in T8 CCR §5144 Appendix A, to the best of my knowledge. The information and responses on this form are correct.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Name of Test Conductor Test Date  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Title Name of Department or Agency (if applicable) |

**Appendix F - Respirator Issue Checklist**

#### *Instructions for Supervisors: Complete this form for each employee who must wear a respirator. All items must be completed/approved before the employee is authorized to use a respirator.*

|  |  |
| --- | --- |
| Name of Employee: | Date: |
| Department: |  |
| Position: |
| Name of Supervisor: |

|  |  |  |  |
| --- | --- | --- | --- |
| Requirement | Activity | Yes | No |
| Hazard Assessment | Identify atmospheric hazards (i.e., chlorine gas, confined space, welding fumes, etc.): |  |  |
| 1. |  | |
| 2. |  | |
| 3. |  | |
| Medical Evaluation, Compliance Letter | Medical approval to wear respirator and compliance letter are stored in an employee medical file in Human Resources Department. |  |  |
|  | |
| Program Training | Employee has completed Respiratory Protection Program training and the training record is on file with the supervisor. |  |  |
|  | |
| Fit-Testing | Employee has been properly fit-tested, and the record is on file with the supervisor. |  |  |
|  | |
| Issuance | The following respirator(s) is/are issued and assigned to this employee (include manufacturer, model, and type): |  |  |
|  | |
| 1. |  | |
| 2. |  | |
| 3. |  | |

#### Note: Employee must obtain an annual medical evaluation approval and be fit tested for each type of respirator in order to continue using it.

#### \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signature of Supervisor Date

**Appendix G - Voluntary Respiratory Use Handout & Agreement Form**

#### Subchapter 7. General Industry Safety Orders Group 16. Control of Hazardous Substances Article 107. Dusts, Fumes, Mists, Vapors and Gases §5144. Respiratory Protection.

Appendix D to Section 5144: (Mandatory) Information for Employees Using Respirators When Not Required Under the Standard

Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged even when exposures are below the exposure limit, to provide an additional level of comfort and protection for workers. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the worker. Sometimes, workers may wear respirators to avoid exposures to hazards, even if the amount of hazardous substance does not exceed the limits set by OSHA standards. If your employer provides respirators for your voluntary use, or if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not present a hazard.

You should do the following:

1. Read and heed all instructions provided by the manufacturer on use, maintenance, cleaning and care, and warnings regarding the respirators limitations.
2. Choose respirators certified for use to protect against the contaminant of concern. NIOSH, the National Institute for Occupational Safety and Health of the U.S. Department of Health and Human Services, certifies respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is designed for and how much it will protect you.
3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designated to protect against. For example, a respirator designed to filter dust particles will not protect you against gases, vapors or very small solid particles of fumes or smoke.
4. Keep track of your respirator so that you do not mistakenly use someone else's respirator.

NOTE

Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New appendix D to section 5144 filed 8-25-98; operative 11-23-98 (Register 98, No. 35).

**APPENDIX G (CONT.) – VOLUNTARY RESPIRATOR USE AGREEMENT**

I acknowledge that I have received CCR, Title 8, Section 5144, *Appendix D* and that it is my responsibility to read the contents in its entirety. I understand that it is my responsibility to follow all safety policies and procedures outlined below:

1. Read and heed all instructions provided by the manufacturer on use, maintenance, cleaning and care, and warnings regarding the respirator’s limitations.
2. Choose respirators certified for use to protect against the airborne contaminant of concern by NIOSH, the National Institute for Occupational Safety and Health. A label or statement of certification should appear on the respirator or respirator packaging.
3. Notify my supervisor of the make, model, and cartridge information for the respirator I am using on a voluntary basis.
4. Do not wear the respirator into atmospheres containing airborne contaminants for which it is not designed to provide protection.
5. Keep track of the respirator so I do not mistakenly use someone else’s respirator.

Respirator

Make: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Model: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Cartridge name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

I further understand that failure to abide by these policies, procedures, and safe work practices may result in disciplinary action up to and including termination.

Employee’s name (please print): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Employee signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Employee ID #: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Location: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Supervisor (please print): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date: \_\_\_\_\_\_\_\_\_\_

RPPA (please print): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Human Resources \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**This form is to be kept in the employee’s employment file.**

**Appendix H – Definitions**

**Air purifying respirator**

A respirator that removes contaminants from the inhaled air There are two major sub-categories of air purifying respirator systems: mechanical filter type, used to remove particulates (dusts, mists, fogs, smokes, and fumes) and chemical cartridge type (absorption or adsorption or modification of gases or vapors). Some respirators combine both types of systems.

**Atmosphere-supplying respirator**

A respirator that supplies the respirator user with breathing air from a source independent of the ambient atmosphere. This includes supplied-air respirators (SAR) and self-contained breathing apparatus (SCBA) units.

**Dusts**

Solids broken down into fine airborne particles.

**Filter or air purifying element**

A component used in respirators to remove solid or liquid aerosols from the air.

**Filtering facepiece (dust mask)**

A negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium.

**Fumes**

Solids vaporized under high heat and condensed into very fine particles.

**Gases**

Vapors that can spread freely throughout an area.

**Immediately dangerous to life or health** **(IDLH)**

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.

**Maximum use limitations (MULs)**

Set by NIOSH for cartridge respirators used for specific contaminants and state the maximum concentrations within which the cartridge can be used. These can be found in the respirator manufacturer’s literature.

**Mists**

Liquids atomized and condensed

**Odor threshold**

Chemical must have an odor threshold level at which it can be detected by a respirator user below the TLV or an air-purifying respirator may not be used.

**Physician or other licensed health care professional (PLHCP)**

An individual whose legally permitted scope of practice allows him or her to independently provide, or be delegated the responsibility to provide, some or all of the health care services required by these regulations. This can include physicians (including occupational medicine physicians), Doctors of Osteopathy, physician assistants, registered nurses, nurse practitioners, and occupational health nurses.

**Protection factor**

If no maximum use limitations (MULs) are published, a general protection factor is used to determine the level of contaminant against which the respirator can be used.

* Full Facepiece, Supplied Air or Pressure Demand = 1000 × TLV
* Full Facepiece Air Purifying = 50 × TLV
* Powered Air Purifying Respirator = 25 × TLV
* Air Purifying Half Mask = 10 × TLV

**Qualitative fit test (QLFT)**

A pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.

**Quantitative fit test (QNFT)** means an assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

**Respirator**

A device designed to protect the wearer from inhalation of hazardous atmospheres.

**Respiratory Protection Program Administrator (RPPA)**

A person who is qualified by appropriate training or experience that is commensurate with the complexity of the respiratory protection program and demonstrates knowledge necessary to administer a respiratory protection program. Such training or experience includes, but is not limited to, reading and understanding either the American National Standard for Respiratory Protection publication (ANSI Z88.2) or the U.S. Department of Labor's “Small Entity Compliance Guide for the Revised Respiratory Protection Standard” or taken specific course work on developing a respiratory protection program from a college or a respirator manufacturer's authorized representative or is an American Board of Industrial Hygiene Certified Industrial Hygienist.

**Threshold limit value (TLV)**

A time weighted average safe exposure limit for a contaminant over an eight-hour day and a 40-hour week.

**Vapors**

Gaseous state of substances that are liquids or solids at room temperature (evaporate easily).

**Appendix I – Records Retention Schedule**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Respiratory Protection** | **Location** | **Retention Schedule** | **Statutory Reference** | **Notes** |
| Employee Training | **Department or Human Resources** | Length of employment | **Name of Entity** policy |  |
| Fit Testing Results | **Department or Human Resources** | 5 years | CCR, Title 8, §5144 |  |
| Medical Evaluation | **Department or Human Resources** | Length of employment + 30 years | CCR, Title 8, §5144 |  |
| Pass/Fail Medical Opinion | **Department or Human Resources** | 5 years | CCR, Title 8, §5144 |  |
| Respirator Assignment | **Department or Human Resources** | 5 years | CCR, Title 8, §5144 |  |
| Annual Program Evaluation | **Department or Human Resources** | 5 years | CCR, Title 8, §5144 |  |
| Voluntary Use Acknowledgement | **Department or Human Resources** | 5 years | CCR, Title 8, §5144 |  |

**Appendix J - Self Contained Breathing Apparatus Inspection & Cleaning Record**

Type of Respirator: Half and Full-face Self Contained Breathing Respirator

Check all that apply:

|  |  |
| --- | --- |
| Cleaned: |  |
| Facepiece inspected (deterioration, tearing, contamination): |  |
| Hose stretched and inspected (ease of assembly, cracking): |  |
| Harness assembly inspected: |  |
| Cylinder gauge inspected (% full): |  |
| Compare regulator gauge to cylinder gauge: |  |
| Inspect and listen for leakage |  |
| Check for alarm: |  |
| Other defects noted and reported: |  |

|  |  |  |
| --- | --- | --- |
| **Date** | **Inspected By** | **Comments/Corrective Actions** |
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**Appendix K - Monthly SCBA Inspection Form**

*Instructions:*

* *This checklist form contains spaces for 12 monthly inspections. Place (✓) in boxes.*
* *After inspection, make all necessary repairs before equipment is returned to service.*
* *Place this form in the SCBA storage case.*

|  |  |  |
| --- | --- | --- |
| Manufacturer: | Regulator Serial No.: | |
| Model: | Inventory No.: | |
| Last Regulator Test/Overhaul Date: | Last Hydrostatic Test Date: | |
| Regulator Test/Overhaul Due Date: | Hydrostatic Test Due Date: | |
| Supervisor: |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **YEAR:** | | | | | | | | | | | | |
| **Parts and Conditions** | | J | F | M | A | M | | J | J | A | S | O | N | D | |
|  | *Write numerical day of month (i.e., 1,2,3)* |  |  |  |  |  |  | |  |  |  |  |  |  | |
| 1. | Facepiece (contamination, damage, deterioration) |  |  |  |  |  |  | |  |  |  |  |  |  | |
| 2. | Hose (tightness of assembly, cracking) |  |  |  |  |  |  | |  |  |  |  |  |  | |
| 3. | Harness Assembly (wear and function) |  |  |  |  |  |  | |  |  |  |  |  |  | |
| 4. | Exhalation Valve (deterioration/damage) |  |  |  |  |  |  | |  |  |  |  |  |  | |
| 5. | Operational Check: |  |  |  |  |  |  | |  |  |  |  |  |  | |
|  | a. Cylinder Gauge (full indication) |  |  |  |  |  |  | |  |  |  |  |  |  | |
|  | b. Cylinder Valve: (open and close) |  |  |  |  |  |  | |  |  |  |  |  |  | |
|  | c. Regulator Function (shut off and flow) |  |  |  |  |  |  | |  |  |  |  |  |  | |
|  | d. Alarm Function |  |  |  |  |  |  | |  |  |  |  |  |  | |
| 6. | Clean and Disinfect Facepiece |  |  |  |  |  |  | |  |  |  |  |  |  | |
|  | (List any other items to inspect on this unit): |  |  |  |  |  |  | |  |  |  |  |  |  | |
| 7. |  |  |  |  |  |  |  | |  |  |  |  |  |  | |
| 8. |  |  |  |  |  |  |  | |  |  |  |  |  |  | |
| 9. |  |  |  |  |  |  |  | |  |  |  |  |  |  | |
| 10. |  |  |  |  |  |  |  | |  |  |  |  |  |  | |
| Discrepancies Noted: | |  |  |  |  |  |  | |  |  |  |  |  |  | |
|  | |  |  |  |  |  |  | |  |  |  |  |  |  | |
| This SCBA was inspected by: | |  |  |  |  |  |  | |  |  |  |  |  |  | |
| *(write employee initial* | |  |  |  |  |  |  | |  |  |  |  |  |  | |
| *under column for inspection month)* | |  |  |  |  |  |  | |  |  |  |  |  |  | |

**Appendix L - Breathing Air Quality and Use**

Department management will ensure employees using atmosphere-supplying respirators (supplied-air) with breathing gases of high purity. Department management will ensure compressed air used for respiration meets the following specifications:

* Compressed breathing air will meet at least the requirements for Grade D breathing air described in ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-1989, to include:
  + Oxygen content (v/v) of 19.5-23.5%;
  + Hydrocarbon (condensed) content of 5 milligrams per cubic meter of air or less;
  + Carbon monoxide (CO) content of 10 ppm or less;
  + Carbon dioxide content of 1,000 ppm or less; and
  + Lack of noticeable odor.
* If the department is filling/refilling SCBA bottles from an outside source, department management must obtain an air quality certificate meeting the above specifications for each fill.

Department management will ensure breathing air compressors used to supply breathing air to respirators are constructed and situated to:

* Prevent entry of contaminated air into the air-supply system intake;
* Minimize moisture content so the dew point at 1 atmosphere pressure is 10 degrees F (-12.2 degrees C) below the ambient temperature;
* Have suitable in-line air-purifying sorbent beds and filters to further ensure breathing air quality. Sorbent beds and filters will be maintained and replaced or refurbished periodically following the manufacturer's instructions; and
* Have a tag containing the most recent change date and the signature of the person authorized by the employer to perform the change. The tag will be maintained at the compressor.

For compressors that are not oil-lubricated, department management will ensure carbon monoxide levels in the breathing air do not exceed 10 ppm.

For oil-lubricated compressors, department management will use a high-temperature alarm and a carbon monoxide alarm to monitor carbon monoxide levels in the breathing aid do not exceed 10 ppm.

Department management will ensure breathing air couplings are incompatible with outlets for non-respirator work-site air or other gas systems so no asphyxiating substances will be introduced into breathing air lines.

Department management will use breathing air containers marked in accordance with the NIOSH respirator certification standard, 42 CFR Part 84.