

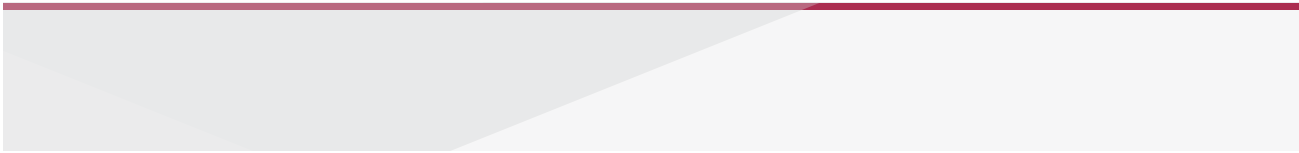
# RESPIRATORY PROTECTION PROGRAM

NOV 2021



**USC** University of  
Southern California

OFFICE OF ENVIRONMENTAL HEALTH & SAFETY



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## 1.0 Purpose and Scope

The University of Southern California Respiratory Protection Program provides a system for complying with the requirements of the applicable regulatory standards. The program defines the procedures for:

- Requesting/selecting respirators (which includes performance of a respiratory hazard evaluation)
- Medical evaluations
- USC respirator user training in:
  - Respirator use limitations
  - Fit-testing
  - Proper use of a respirator
  - Respirator care and maintenance
- Evaluating program effectiveness
- Voluntary use of respiratory protection.

When possible, engineering control measures (for example, enclosure or confinement of the operation, general and local ventilation, and substitution with less toxic materials) are implemented to prevent exposure to harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors.

When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators are used. The University of Southern California (USC), through the Office of Environmental Health & Safety (EH&S), selects and provides an appropriate respirator to personnel subject to this policy. Such personnel include, but are not limited to:

- A. USC personnel in areas known to have contaminant levels requiring the use of respiratory protection.
- B. USC personnel performing operations documented to be health hazardous.
- C. USC personnel performing operations suspected of being health hazardous but for which adequate sampling data has not been obtained.

**NOTE: Respiratory protection shall be used as a last resort in preventing harmful exposures to employees and not as a substitute for available or feasible control measures.**

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## 2.0 Regulations and Policies



### State

#### Cal/OSHA

- Title 8: Section 5144 [Respiratory Protective Equipment](#)
- [Respiratory Protection in the Workplace: A Practical Guide for Small Business Employers](#) 2nd Edition (2005)

### Injury and Illness Prevention Program

Title 8, Section 3203 of the California Code of Regulations requires every California employer to have an effective Injury and Illness Prevention Program (IIPP). The purpose of an IIPP is to establish a framework for identifying and correcting workplace hazards, ensuring employee training and compliance, and communicating information related to employee safety and health.



## Federal

### OSHA

- Title 29: Section 1910.134 [Respiratory Protection](#)
- [General Respiratory Protection Guidance for Employers and Workers](#)
- [Respiratory Protection eTool](#)
- [The Advisor Genius: Selecting an Appropriate Respirator](#)



### ANSI

- American National Standards Institute (ANSI), Z88.2-2015, Practices for Respiratory Protection (ASSE Tech Brief: [http://www.asse.org/assets/1/7/Z88.2-2015\\_Tech\\_Brief\\_\(3-2015\).pdf](http://www.asse.org/assets/1/7/Z88.2-2015_Tech_Brief_(3-2015).pdf))
- American National Standards Institute (ANSI), Z88.6-2006, "American National Standard for Respiratory Protection, Respirator Use - Physical Qualifications for Personnel"



### USC Policies and Standards

The following USC policies and standards have been established to create a safe and productive working and learning environment and ensure compliance with all regulatory requirements. Questions or concerns about individual policies should be directed to the "Responsible Office" listed at the end of each policy. USC reserves the right to revise the following policies at any time:

- Injury and Illness Prevention <https://policy.usc.edu/injury-prevention/>
- Personal Protective Equipment Standard <https://ehs.usc.edu/research/manage/ppe/>





## 3.0 Definitions

<b>AIR-PURIFYING RESPIRATOR</b>	A respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.
<b>ATMOSPHERE-SUPPLYING RESPIRATOR</b>	A respirator that supplies the user with breathing-quality air from a source independent of the work environment. This includes supplied-air respirators (SARs) and self-contained breathing apparatus (SCBA) units.
<b>CANISTER or CARTRIDGE</b>	A container with a filter, sorbent media, catalyst, or combination of these items, that removes specific contaminants from the air.
<b>DEMAND RESPIRATOR</b>	An atmosphere-supplying respirator that supplies breathing air to the user only when a negative pressure is created inside the facepiece by inhalation.
<b>EMERGENCY SITUATION</b>	Any occurrence that may result in an uncontrolled significant release of an airborne contaminant. This may include equipment failure, rupture of containers, or failure of control equipment.
<b>END-OF-SERVICE-LIFE INDICATOR (ESLI)</b>	A system that warns the respirator user of the approach of the end of adequate respiratory protection (e.g., sorbent media is approaching saturation or is no longer effective).
<b>ESCAPE-ONLY RESPIRATOR</b>	A respirator intended to be used only for emergency exit from a contaminated area.
<b>EXPOSURE (USC PERSONNEL)</b>	Exposure to a concentration of an airborne contaminant that would occur if USC personnel were not using respiratory protection.
<b>FILTER or AIR PURIFYING ELEMENT</b>	A component used in respirators to remove solid or liquid aerosols from the inspired air.
<b>FILTERING FACEPIECE (DUST MASK)</b>	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.
<b>FIT FACTOR</b>	A quantitative estimate of the fit of a particular respirator to a specific individual, and typically estimates the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn.
<b>FIT TEST</b>	The use of a protocol to qualitatively or quantitatively evaluate the fit of a respirator (see also Qualitative fit test QLFT and Quantitative fit test QNFT).

<b>HIGH EFFICIENCY PARTICULATE AIR (HEPA) FILTER</b>	A filter that is at least 99.97% efficient in removing monodisperse particles of 0.3 micrometers in diameter. The equivalent NIOSH 42 CFR 84 particulate filters are the N100, R100, and P100 filters.
<b>IMMEDIATELY DANGEROUS TO LIFE OR HEALTH (IDLH)</b>	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.
<b>LOOSE-FITTING FACEPIECE</b>	A respiratory inlet covering that is designed to form a partial face-to-facepiece seal.
<b>NEGATIVE PRESSURE RESPIRATOR (TIGHT FITTING)</b>	A respirator which uses a tight face-to-facepiece seal to create negative pressure inside the mask during inhalation with respect to the ambient air.
<b>OXYGEN DEFICIENT ATMOSPHERE</b>	An atmosphere with oxygen content below 19.5% by volume.
<b>PHYSICIAN or OTHER LICENSED HEALTH CARE PROFESSIONAL (PLHCP)</b>	An individual whose legally permitted scope or practice (i.e., license, registration, or certification) allows him or her to independently provide, or be delegated the responsibility to provide, some or all of the health care services required by the regulations.
<b>POSITIVE PRESSURE RESPIRATOR</b>	A respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.
<b>POWERED AIR-PURIFYING RESPIRATOR (PAPR)</b>	An air-purifying respirator that uses a built-in fan to actively filter ambient air through air-purifying elements to the inlet covering.
<b>PRESSURE DEMAND RESPIRATOR</b>	A positive pressure atmosphere-supplying respirator that supplies breathing air to the facepiece when the pressure inside the facepiece is reduced by inhalation.
<b>QUALITATIVE FIT TEST (QLFT)</b>	A pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.
<b>QUANTITATIVE FIT TEST (QNFT)</b>	An assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.
<b>RESPIRATORY INLET COVERING</b>	The portion of a respirator that forms the protective barrier between the user's respiratory tract and an air-purifying device or breathing air source, or both. It may be a facepiece, helmet, hood, suit, or a mouthpiece respirator with nose clamp.
<b>SELF-CONTAINED BREATHING APPARATUS (SCBA)</b>	An atmosphere-supplying respirator for which the breathing air source is contained within a portable compressed gas cylinder designed to be carried by the user.

<b>SERVICE LIFE</b>	The period of time that a respirator, filter or sorbent media, or other respiratory equipment provides adequate protection to the wearer.
<b>SUPPLIED-AIR RESPIRATOR (SAR) or AIRLINE RESPIRATOR</b>	An atmosphere-supplying respirator for which the air supply is provided by an external, fixed compressed gas source or compressor. The SAR air supply is not typically carried by the user.
<b>TIGHT-FITTING FACEPIECE</b>	A respiratory inlet covering that forms a complete face-to-facepiece seal.
<b>USER SEAL CHECK</b>	An action conducted by the respirator user to determine if the respirator is properly seated to the face.

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## 4.0 Roles and Responsibilities

### Department Head/Chair

Provide the necessary resources to ensure the health and safety of their employees, identify individuals as supervisors and ensure they are trained on their health and safety responsibilities, and ensure the use of respiratory protection equipment has been evaluated and approved by EH&S.

### Manager/Supervisor

The USC department manager/supervisor/PI/administrator shall be responsible for adhering to instructions and implementing the recommendations provided by EH&S. The instructions are intended to minimize, reduce, or eliminate USC personnel exposures and may include engineering controls, administrative controls, or the use of personal protective equipment. EH&S shall work collaboratively with the affected USC department to develop worksite-specific procedures. The affected department shall be responsible for implementing and maintaining the worksite-specific procedures and provide necessary resources to maintain all necessary controls.

### Employee (User)

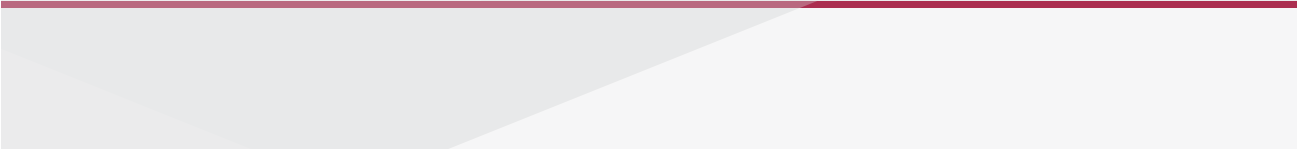
USC personnel shall be responsible for:

- Adhering to EH&S respiratory specific requirements.
- Following worksite-specific procedures.
- Maintaining current status of annual fit test and training.
- Maintaining and cleaning respiratory equipment.
- Notifying EH&S when respiratory protection is no longer in use, when a change in procedure occurs or if there is a question involving a respirator.

### Office of Environmental Health and Safety (EH&S)

USC shall be responsible for the establishment, implementation, and maintenance of a written respiratory protection program as administered by the EH&S program administrator. EH&S shall:

- Conduct the respiratory hazard evaluation.
- Provide guidance with respiratory selection.
- Perform the respirator fit test and respirator use training, including provision of the suitable respirator for the task, as determined by the evaluation.
- Assess the effectiveness of the program as described in this document.
- Provide guidance for respirator selection.

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- Maintain records on respiratory protection equipment, equipment assignments, fit testing and training.
  - Work collaboratively with the affected USC departments to develop worksite-specific procedures.

The program shall be updated as necessary to reflect changes in workplace conditions that affect respirator use.



## 5.0 Program Components

### Workplace Exposure Assessment

Initially and whenever supervisors identify new substances, processes, or equipment that may represent an occupational health airborne hazard, they shall contact EH&S at [injuryprevention@usc.edu](mailto:injuryprevention@usc.edu) or (323) 442-2200 to request a workplace exposure assessment/hazard evaluation. NOTE: All respiratory protection equipment selection shall be performed by EH&S.

The assessment includes a reasonable estimate of USC personnel exposures to respiratory hazard(s) and an identification of the contaminant(s). The contaminant(s) may be chemical or biological in nature. If personnel exposure cannot be identified or reasonably estimated, the atmosphere shall be considered immediately dangerous to life and health (IDLH).

1. All oxygen-deficient atmospheres shall be considered IDLH.
2. No USC personnel shall be authorized to enter an atmosphere immediately dangerous to life and health (IDLH).

If the assessment/hazard evaluation determines that respirator use is not required, the USC personnel may still choose to use respiratory protection. If users choose to wear respirators voluntarily, they must read and sign the [Voluntary Use of Filtering Facepiece Respirator](#) form.

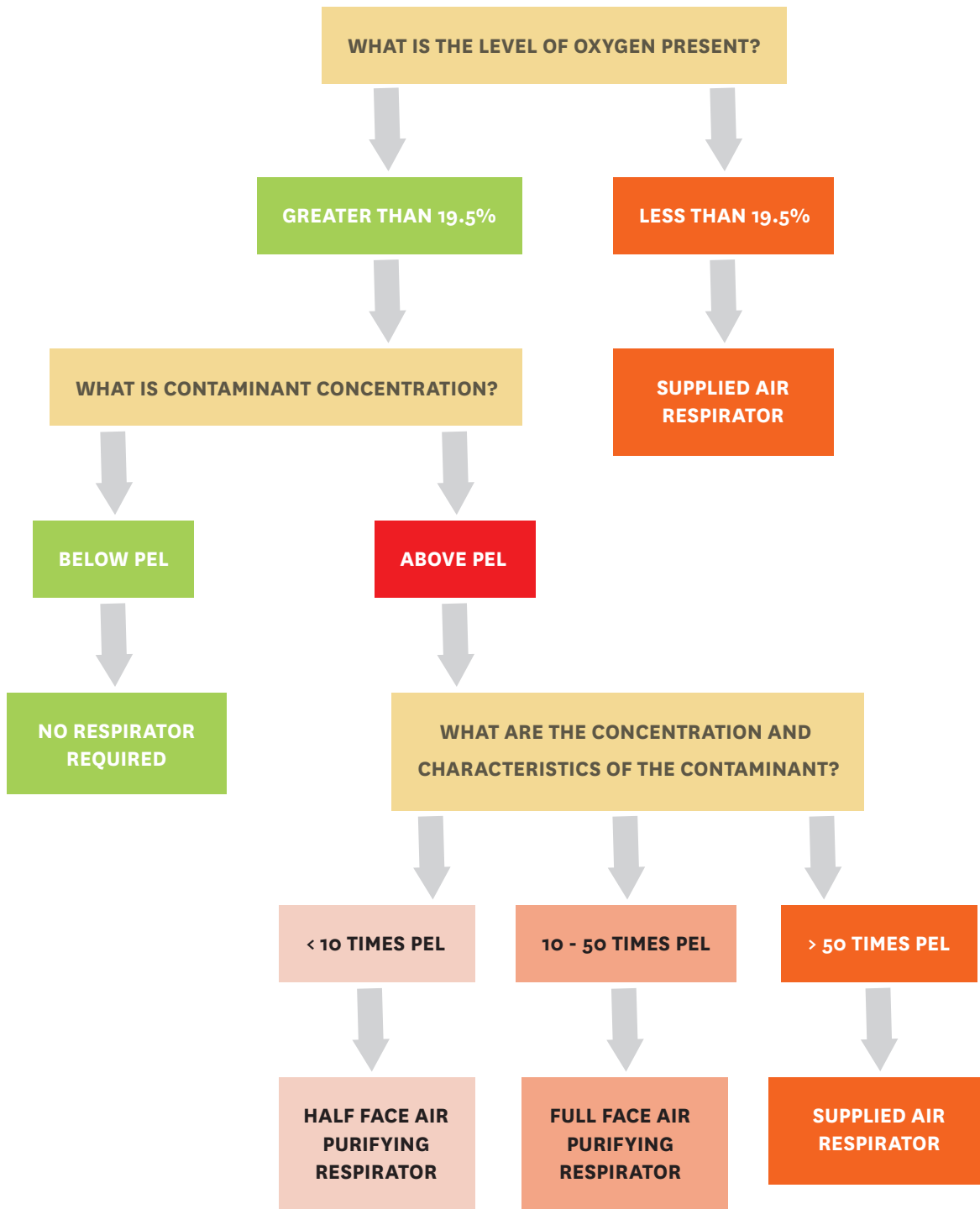
### Respirator Selection

If a hazard assessment/evaluation determines that a respirator is required, EH&S will recommend the appropriate respiratory equipment. EH&S shall only issue NIOSH-certified respirators. Its use shall comply with the conditions of its certification. The respirators that are appropriate for the hazard, the cartridges and canisters used in the workplace shall be labeled and color-coded with the NIOSH approval label.

EH&S shall maintain the respiratory equipment inventory.

The Figure 4.1 on the following page depicts a simplified process for respirator selection. Table 4.1 indicates the various types of respirators available, and the maximum assigned protection factor assigned to each.

**Figure 4.1 Respirator Selection Flowchart**





**Table 4.1 Assigned Protection Factors for Assorted Respirators**

Type of Respirator <sup>1,2</sup>	Assigned Protection Factors <sup>5</sup>			
	Half Mask	Full Facepiece	Helmet/Hood	Loose-Fitting Facepiece
Air-Purifying Respirator	10 <sup>3</sup>	50	-	-
Powered Air-Purifying Respirator (PAPR)	50	1,000	25/1,000 <sup>4</sup>	25
Supplied-Air Respirator (SAR) or Airline Respirator				
Demand mode	10	50	-	-
Continuous Flow mode	50	1,000	25/1,000 <sup>4</sup>	25
Pressure-Demand or other positive-pressure mode	50	1,000	-	-
Self-Contained Breathing Apparatus (SCBA)				
Demand mode	10	50	50	-
Pressure-Demand or other positive-pressure mode (e.g., open/closed circuit)	-	10,000	10,000	-

1 Employers may select respirators assigned for use in higher workplace concentrations of a hazardous substance for use at lower concentrations of that substance, or when required respirator use is independent of concentration.

2 The assigned protection factors in Table 1 are only effective when the employer implements a continuing, effective respirator program as required by this section, including training, fit testing, maintenance, and use requirements.

3 This APF category includes filtering facepieces, and half masks with elastomeric facepieces.

4 The employer must have evidence provided by the respirator manufacturer that testing of these respirators demonstrates performance at a level of protection of 1,000 or greater to receive an APF of 1,000. This level of performance can best be demonstrated by performing a Workplace Protection Factor (WPF) or simulated WPF study or equivalent testing. Absent such testing, all other PAPRs and SARs with helmets/hoods are to be treated as loose-fitting facepiece respirators, and receive an APF of 25.

5 These APFs do not apply to respirators used solely for escape. For escape respirators used in association with substances covered by substance-specific standards in Title 8, Division 1, Chapter 4, Subchapters 4, 7, and 18, employers must refer to the appropriate substance-specific standards. Escape respirators for other IDLH atmospheres are specified by subsection 8CCR5144(d)(2)(B).

## Gases and Vapors

EH&S will issue respirators that protect against gases and vapors:

1. Atmosphere-supplying respirator
2. Air-purifying respirator with a cartridge/canister that has an End-of-Service-Life-Indicator (ESLI).
  - a. In the absence of an ESLI, a "Change-Out Schedule" for the cartridge/canister will be provided. The Change-Out Schedule will be based on the information and data collected and recorded on the respiratory hazard evaluation.
  - b. The cartridge/canister may be discarded after each use (maximum 8-hour use limit) if a Change-Out Schedule is not used.

## **Particulates**

EH&S will issue respirators that protect against particulates.

1. An atmosphere-supplying respirator
2. An air-purifying respirator equipped with a High-Efficiency-Particulate-Air (HEPA) filter cartridge.
  - a. Any NIOSH-certified filters may be used to protect against particulates of mass median aerodynamic diameters (MMAD) of at least 2 micrometers.
3. A filtering facepiece.

## **Reporting Requirements**

To ensure continuing respirator effectiveness, the USC respirator user shall report changes in the following to the EH&S Respiratory Program Administrator:

- Work area conditions
- Degree of the exposure to the contaminant
- Stress that may affect respirator effectiveness

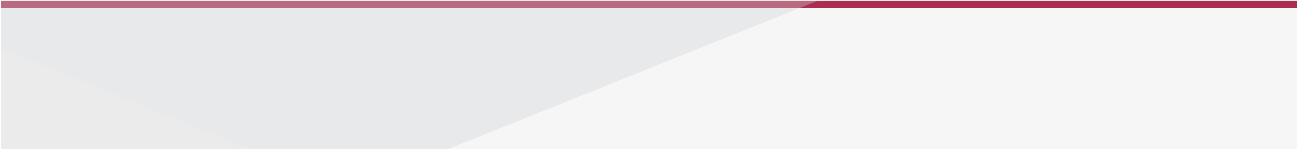


## 6.0 Medical Evaluation

Individuals that are required to wear respirators as determined by a workplace exposure assessment/hazard evaluation will have to be medically evaluated before they may use respiratory protection. Voluntary respirator users may also require medical evaluation. Contact [injuryprevention@usc.edu](mailto:injuryprevention@usc.edu) or (323) 442-2200 for more information.

### Process

1. Individuals will complete one of the following forms where applicable:
  - a. OSHA Respirator Medical Evaluation Questionnaire (Mandatory)" form - personnel required to wear a respirator.
  - b. [Voluntary Use of Filtering Facepiece Respirator](#) - voluntary respirator user
2. The medical questionnaire will be sent to a USC-appointed licensed health care professional (PLHCP) by the applicant.
3. The medical questionnaire will be evaluated by the PLHCP and discussed confidentially (if needed) with the applicant during normal working hours or at a time and place convenient to the applicant.
  - a. The PLHCP will determine if the individual is medically fit to wear respiratory protection.
  - b. Additional medical evaluations will be provided:
    - i. As deemed necessary by the PLHCP, USC personnel supervisor, or the Respirator Program administrator.
    - ii. If the individual reports medical signs or symptoms that are related to his/her ability to wear a respirator.
    - iii. If a change occurs in the workplace conditions that may result in a substantial increase in the physiological burden placed on the USC personnel. Such conditions include, but are not limited to, physical work effort, protective clothing, or temperature.
4. A follow-up medical evaluation may be required at the discretion of the PLHCP.
5. The PLHCP will provide the following documentation upon approval of the applicant's use of a respirator:
  - a. Results of the medical determinate to the applicant
  - b. A Respirator Clearance Statement letter to the EH&S Respiratory Program Administrator that stipulates:
    - i. Any limitations on respirator use related to the medical condition of the USC personnel.
    - ii. Any limitations on respirator use relating to the workplace conditions in which the respirator will be used.

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- iii. The applicant is medically able to use the respirator.
  - iv. Follow-up medical evaluations, if needed.
  - v. The PLHCP has provided the applicant with a copy of the "Respirator Clearance Statement" letter.



## 7.0 Training

### Introduction

Individuals that are cleared to use respiratory protection (mandatory or voluntary) must first complete respirator fit testing and use training by EH&S prior to donning respiratory protection. Topics discussed in the training include:

- USC Respiratory Protection Program
- Cal/OSHA Respiratory Protection Standard (Title 8 CCR Section 5144)
- Respiratory hazards encountered at workplace and their health effects
- Proper selection and use of respirators
- Limitations of respirators
- Respirator donning and user seal checks
- Fit testing
- Emergency use instructions
- Maintenance and storage
- Medical signs and symptoms limiting the effective use of respirators

Personnel must complete fit testing and use training annually. Supplemental or re-training may be needed if the following occur:

- Changes in the workplace or the type of respirator render previous training obsolete.
- Individuals demonstrate lack of knowledge or skill when using a respirator.
- Any situation that arises in which re-training appears necessary to ensure safe respirator use.

Competency is assessed during the fit-test and training. The respirator user is asked to demonstrate proper donning, doffing, fit-check, and cleaning procedures. Competency is further assessed during the follow up visit/program evaluation.

Training requirements and elements are specified in the Program Components. Training and fit testing frequency are annual except for voluntary users of filtering facepieces and PAPRs with loose fitting facepiece.

Contact [injuryprevention@usc.edu](mailto:injuryprevention@usc.edu) or (323) 442-2200 to request training.

### Respiratory Hazards and Proper Respirator Use

Respirator users will be educated on the respirator hazards they will encounter based on their workplace exposure assessment/hazard evaluation.

Topics will include:

- Identification and discussion of the respiratory hazard
- Review of Safety Data Sheet(s) (SDS)
- Discussion of permissible exposure limit(s) of the respiratory hazard(s)
- Discussion of the respiratory hazard assessment(s), including monitoring results
- Hazard reduction

Proper use training will include:

- Why the respirator is necessary
- Proper fit, usage, and maintenance
- Limitations and capabilities of the respirator
- Effective use of respirators in emergency situations, if applicable
- Pre-inspection, donning, doffing, and use of the respirator (including seal check)
- Procedures for maintenance and storage of the respirator
- Conditions that may limit or prevent the effective use of respirators

## Fit Testing: Tight-Fitting Respirators

Fit testing is required to be performed prior to initial use of any negative or positive pressure tight-fitting facepiece respirator, with the same make, model, style, and size of the respirator that will be used.

Fit test will either be qualitative fit test (QLFT) or quantitative fit test (QNFT).

### **Qualitative Fit Test (QLFT):**

QLFT may only be used to fit test negative pressure air-purifying respirators that must achieve a fit factor of 100 or less. The 3M FT-30 Qualitative Fit Test Apparatus (Bitter) is used for this purpose.

### **Quantitative Fit Test (QNFT):**

QNFT is passed when the fit factor for:

1. Tight-fitting half facepieces is equal to or greater than 100.
2. Tight-fitting full facepieces is equal to or greater than 500.

Additional fit testing will be performed:

- Whenever a different respirator facepiece (size, style, model, or make) is used.
- When there are changes in the individual's physical condition that could affect respirator fit. Such conditions include, but are not limited to, facial scarring, dental changes, cosmetic surgery, or an obvious change in body weight.

Subsequent fit testing and training will recur annually.

## Additional Requirements

When wearing tight-fitting respirators, individuals may not have facial hair that comes between the sealing surface of the facepiece and the face or that interferes with valve function; or any condition that interferes with the face-to-facepiece seal or valve function. USC respirator users shall be instructed of this requirement during the initial fit test and training.

Use of corrective glasses or goggles or other personal protective equipment must be worn in a manner that does not interfere with the seal of the facepiece to the face of the USC personnel. The USC personnel shall be instructed of this requirement during the initial fit test and training.

The USC personnel shall be trained on the specific limitations and proper use of the issued respirator during the initial fit test and training.

When donning a tight-fitting respirator (including a filtering facepiece), the USC personnel shall perform a user seal check.

The respirator user shall immediately leave the respirator use area if:

- Breathing becomes difficult;
- Dizziness or other distress occurs;
- Contaminant breakthrough is detected through smell, taste, or sense irritation;
- The End-of-Service-Life Indicator (ESLI) on the canister/cartridge changes color to indicate expiration;
- The respirator becomes damaged.

These issues must be addressed, and corrections must be made before returning to the respirator use area.

**USC personnel are not permitted to enter atmospheres immediately dangerous to life and health (IDLH).**

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## 8.0 Care and Maintenance

USC respirator users are required to routinely inspect, clean and disinfect, properly store, and the respirators. Necessary repairs must be reported to the EH&S Respiratory Program administrator.

### Inspection

Respirator users must inspect their respirator prior to each use and during cleaning.

The respirator inspection must include a check of:

- Respirator function
- Tightness of connections
- Condition of the various parts including, but not limited to, the facepiece, head straps, valves, connecting tube, and cartridges, canisters or filters
- Elastomeric parts for pliability and signs of deterioration

### Cleaning and Disinfecting

The respirator user must clean and disinfect the respirator as per manufacturer recommendations or as often as necessary to keep it in a clean condition.

### Storage

All respirators shall be stored in a manner that will protect them from damage, contamination, dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals, and they shall be packed or stored to prevent deformation of the facepiece and exhalation valve.

### Repairs

Respirators that fail an inspection or are found to be defective shall be reported to the EH&S Respiratory Program administrator. The failed/defective respirator shall be removed from service, then repaired or discarded pursuant to all regulatory requirements and manufacturer's recommendations.

### Atmosphere Supplying Respirators

Use of atmosphere supplying respirators, such as self-contained breathing apparatus (SCBA) or supplied-air respirators, at USC is subject to the requirements of the USC EH&S Respiratory Protection Program and must receive approval from the EH&S Respiratory Program Administrator.

USC EH&S personnel are the general users of self-contained breathing apparatus (SCBA). The SCBAs are used during emergency situations.

- a. All respirators maintained for use in emergency situations shall be inspected at least monthly and in accordance with the manufacturer's recommendations and shall be checked for proper function before and after each use.
- b. For respirators maintained for emergency use, a responsible person designated by the responsible department shall:
  - i. Certify the respirator by documenting the date the inspection was performed, the name (or signature) of the person who made the inspection, the findings, required remedial action, and a serial number or other means of identifying the inspected respirator; and
  - ii. Provide this information on a tag or label that is attached to the storage compartment for the respirator, is kept with the respirator, or is included in inspection reports stored as paper or electronic files. This information shall be maintained until replaced following a subsequent certification.
- c. Respirators maintained for emergency use shall be cleaned and disinfected after each use.

All atmosphere-supplying respirators shall be inspected monthly. The inspection protocol and documentation shall follow the same procedures as above.

Air and oxygen cylinders shall be maintained in a fully charged state and shall be recharged when the pressure falls to 90% of the manufacturer's recommended pressure level. The regulator and warning devices shall be maintained in good working order.

### **Breathing Air Quality and Use:**

The compressed air, compressed oxygen, liquid air, and liquid oxygen used for respiration shall meet the following specifications:

- a. Compressed and liquid oxygen shall meet the United States Pharmacopoeia requirements for medical or breathing oxygen.
- b. Compressed breathing air shall 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:
  - i. Oxygen content (v/v) of 19.5-23.5%
  - ii. Hydrocarbon (condensed) content of 5 milligrams per cubic meter of air or less
  - iii. Carbon monoxide (CO) content of 10 ppm or less
  - iv. Carbon dioxide content of 1,000 ppm or less
  - v. Lack of noticeable odor

Compressed oxygen shall not be used in atmosphere-supplying respirators that have previously used compressed air.

Oxygen concentrations greater than 23.5% shall only be used in equipment designed for oxygen service or distribution.

Cylinders used to supply breathing air to respirators shall meet the following requirements:

- a. Cylinders are tested and maintained as prescribed in the Shipping Container Specification Regulations of the Department of Transportation (49 CFR 173 and part 178).
- b. Cylinders of purchased breathing air have a certificate of analysis from the supplier that the breathing air meets the requirements for Grade D breathing air.
- c. The moisture content in the cylinder does not exceed a dew point of -50 deg. F (-45.6 deg. C) at 1 atmosphere pressure.

The compressors used to supply breathing air to respirators shall be constructed and situated to:

- a. Prevent entry of contaminated air into the air-supply system.
- b. Minimize moisture content so that the dew point at 1 atmosphere pressure is 10 degrees F (-5.56 deg. C) below the ambient temperature.
- c. Have suitable in-line air-purifying sorbent beds and filters to further ensure breathing air quality. Sorbent beds and filters shall be maintained and replaced or refurbished periodically following the manufacturer's instructions.
- d. 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 shall be maintained at the compressor.

For oil lubricated compressors, a high-temperature or carbon monoxide alarm, or both, shall be used to monitor carbon monoxide levels. If only high-temperature alarms are used, the air supply shall be monitored at intervals sufficient to prevent carbon monoxide in the breathing air from exceeding 10 ppm.

Breathing air couplings shall be incompatible with outlets for nonrespirable worksite air or other gas systems. No asphyxiating substance shall be introduced into breathing air lines.

The breathing gas containers shall be marked in accordance with the NIOSH respirator certification standard, 42 CFR part 84.

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## 9.0 Recordkeeping

Medical Clearance letters, fit-test results, and training records shall be maintained by the Office of Environmental Health & Safety.

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## 10.0 Program Effectiveness

EH&S will conduct evaluations of the workplace as necessary to ensure that the provisions of the current written program are being effectively implemented and that it continues to be effective.

EH&S will interview USC respirator users to assess the program's effectiveness and to identify any problems. Any problems that are identified during this assessment are corrected.

The assessment will be performed during:

- a. A follow-up site-visit conducted after the initial fit-test and training
- b. A follow-up communication (email, voice call) conducted after the initial fit-test and training
- c. Annual fit-test and training

Factors to be assessed include, but are not limited to:

- a. Respirator fit (including the ability to use the respirator without interfering with effective workplace performance)
- b. Appropriate respirator selection for the hazards to which the USC personnel is exposed
- c. Proper respirator use under the workplace conditions the USC personnel encounters
- d. Proper respirator maintenance

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## Appendix A Forms

Respirator Use Profile	<a href="http://tiny.cc/usc-RPP-user-prfl">http://tiny.cc/usc-RPP-user-prfl</a>
Respirator User Questionnaire	<a href="http://tiny.cc/usc-RPP-user-qstn">http://tiny.cc/usc-RPP-user-qstn</a>
Voluntary Use of Filtering Facepiece Respirator	<a href="http://tiny.cc/usc-RPP-volntry">http://tiny.cc/usc-RPP-volntry</a>
Record of Respirator Fit Test	<a href="http://tiny.cc/usc-RPP-fT-rcd">http://tiny.cc/usc-RPP-fT-rcd</a>

