



**ARIZONA STATE UNIVERSITY**  
**Department of Environmental Health & Safety**

**Respiratory Protection Program**  
**Pursuant to 29 CFR § 1910.134**

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## **INTRODUCTION**

Under the U.S. Department of Labor Occupational Safety and Health Administration's (OSHA) employers are required to establish and implement procedures for the proper use of respirators. The Respiratory Protection Standard, 29 CFR §1910.134, is designed to minimize employee exposure to hazardous contaminants in the workplace by providing a means by which employees are informed of potential hazards and made aware of what measures can be utilized to minimize or eliminate the potential for exposure. This program meets the requirements of §1910.134(a)(2) which requires an employer to establish and maintain a written respiratory protection program and contains all of the elements specified in §1910.134(c) of OSHA's Respiratory Protection Standard.

## **PURPOSE**

Arizona State University Department of Environmental Health & Safety (EH&S) has determined that some employees may be required to enter environments where airborne contaminants may be present exposing them to respiratory hazards during routine or non-routine operations. These hazards include dust, particulates, and vapors, and in some cases represent Immediately Dangerous to Life or Health (IDLH) conditions. The purpose of this program is to establish procedures that ensure that all ASU employees are protected from exposure to these respiratory hazards.

Permissible Exposure Limits (PELs) for airborne contaminants have been established and are enforceable through OSHA. Where a PEL is exceeded for a substance listed in Table Z of 29 CFR § 1910.1000 (Appendix VI), a citation may be incurred. Therefore, ASU is required to provide respiratory protection when engineering controls, work practice, or administrative controls are not feasible to protect employees from airborne contaminants.

Engineering controls, such as enclosure of the operation or local exhaust ventilation, work practice controls, such as training and housekeeping, and administrative controls, such as scheduling or substituting hazardous material with a less toxic material are the first line of defense when controlling occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors. These controls may not always be feasible for some operations, or cannot always completely control the identified hazards. In these situations, respirators and other protective equipment must be used. Respirators are also needed to protect employees' health during emergencies.

## **SCOPE AND APPLICATION**

This program applies to all ASU employees who are or may be required to wear respirators during routine work operations, and non-routine, or emergency operations, such as during the clean-up of a spill of a hazardous substance. In addition, requirements for voluntary use of respiratory protection for ASU employees are identified within the program.

It is the policy of ASU that employees participating in the respiratory protection program do so at no cost to them. The expense associated with training, medical evaluations, and respiratory protection equipment will be carried by the participating employee department.

A written respiratory protection program is required to protect employees from airborne workplace contaminants. The Program must include: medical evaluations, workplace specific procedures, selection of respirators, training, and use during routine and emergency situation, fit testing, donning, in-use monitoring, doffing, inspection, storage, maintenance, and regular evaluation of the program. See OSHA Respiratory Protection Standard 29 CFR §1910.134(c)(1)(vi) for additional information.

Once it has been determined that respiratory protection is necessary to protect employees from harmful airborne contaminants, those employees will participate in the respiratory protection program. Employees shall select respirators from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user. The chart located in Appendix VII, Air Purifying Respirators Canister Color Codes, will aid in the appropriate selection of canisters for specific air contaminants.

## **RESPONSIBILITIES**

### **Program Administrator – Environmental, Health and Safety (EH&S)**

The EH&S Director or designee is the Program Administrator and responsible for administering the respiratory protection program and has the authority to make decisions and implement changes, as necessary. Duties include:

- Identify work areas, processes, or tasks that require employees to wear respirators;
- Provide technical assistance to university departments and units in their effort to address the mandates established by the OSHA Respiratory Protection Standard;
- Evaluate hazards to determine the type of respirators and level of protection required and approving each department's standard operating procedures for respiratory protection;
- Monitor respirator use to ensure that respirators are used in accordance with their approval;
- Arrange and/or conduct required training and fit testing;
- Ensure standard operating procedures meet the requirements of this program including proper storage and maintenance of respiratory protection equipment;
- Verify the medical evaluation program for employees required to wear respiratory equipment;
- Establish periodic inspection schedule of those workplaces/conditions that require respiratory protection to determine exposure and/or changing situations;
- Develop procedures to ensure adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators;
- Maintain records (except medical records) required by the program;
- Evaluate the program for effectiveness; and

- Update the written program, as needed.

### **Supervisors – Department Dean, Chair, Director, or designee**

Each Department Head Official or designee is responsible for ensuring the respiratory protection program is implemented for their respirator program participants. Duties include:

- Ensure department specific standard operating procedures (SOPs) are developed and approved by the Program Administrator;
- Ensure the availability of respirators and accessories identified in department SOPs;
- Ensure employees under their supervision (including new hires) have received appropriate medical evaluations, training, and fit testing;
- Supervisor or designee attend respirator training and ensure program requirements are met;
- Be aware of tasks requiring hazard evaluation and the use of respiratory protection and ensure SOPs related to respirator use are being followed;
- Monitor and enforce proper use of respiratory protection;
- Ensure that respirators are properly cleaned, maintained, and stored as identified in department SOPs;
- Ensure respirators fit employee well and do not cause discomfort;
- Notify employees of respiratory protection changes whenever they are needed;
- Coordinate with the Program Administrator to address respiratory hazards or other concerns regarding this program; and
- Determine appropriate discipline for employees who fail to observe any portion of the ASU Respiratory Protection Program

### **Employees**

Each employee has the responsibility to wear his or her respirator as required by their department SOPs and in the manner in which they were trained. The employee shall ensure that nothing interferes with the facial seal for tight-fitting respirators including facial hair. . Duties include:

- Be familiar with the ASU Respiratory Protection program and their specific respiratory protection device(s);
- Attend training and fit test prior to initially using a respirator as required by department SOPs;
- Use, care for, maintain, and store their respirators as per their training and department SOP;
- Inform their supervisor if the respirator no longer fits well or is damaged or compromised, and request a new one that fits properly;
- Complete Medical Evaluation Questionnaires and participate in hazard evaluation as required prior to initial use of the respiratory protection device; and

- Inform their supervisor or the Program Administrator of any respiratory hazards that they feel is not adequately addressed in the workplace and any other concerns they have regarding the program.

## **RESPIRATORY PROTECTION PROGRAM ELEMENTS**

As part of this program, OSHA requires the following elements within the ASU Respiratory Protection Program. This is to ensure that workers are knowledgeable concerning the safe operation and use of respirators. Specific elements of the program include: (1) Selection of Respirators; (2) Medical Evaluations; (3) Fit Testing; (4) Respirator Use; (5) Maintenance and Care; (6) Training; and (7) Record keeping.

### **Selection Procedures**

The Program Administrator will select respirators to be used on site, based on the hazards to which workers are exposed and in accordance with all OSHA standards. The department supervisor will conduct a hazard evaluation for each operation, process, or work area where airborne contaminants may be present in routine operations or during an emergency and contact the Program Administrator.

Choosing the correct respiratory protection equipment involves several steps:

- a) Determination of the hazard;
- b) Choosing equipment that is certified for the hazard; and
- c) Assuring the device is performing as it is intended to do.

Proper selection of respirators must be made according to the OSHA requirements set forth in 29 CFR 1910.134 (d) All respiratory protective devices must be certified by National Institute for Occupational Safety and Health (NIOSH) for the contaminant or situation to which employees may be exposed. The respirator shall be used in compliance with the conditions of the NIOSH certification. In addition to the aforementioned, there are substance-specific OSHA standards that require additional criteria for respirator selection (for example, 29 CFR 1910.1001 (g) Asbestos). All such requirements of each applicable OSHA standard must be observed.

Chemical and physical properties of the contaminant, as well as the toxicity and concentration of the hazardous material and the amount of oxygen present must be considered in selecting the proper respirator. The nature and extent of the hazard, the work rate, the area to be covered, mobility, length of exposure time, work requirements and conditions, as well as the limitations and characteristics of the available respirators, also are selection factors that must be considered.

There are two typical types of respirator protection: air-purifying and atmosphere-supplying respirators:

Air-Purifying Respirators (APR) are respirators with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element. Air-purifying respirators may not be used in an oxygen-deficient atmosphere or within conditions immediately dangerous to life and health.

Atmosphere-Supplying Respirators (ASR) are respirators that supplies the respirator user with breathing air from a source independent of the ambient atmosphere, and includes supplied air respirators (SARs) and self-contained breathing apparatus (SCBA) units.

A self-contained breathing apparatus provides respiratory protection for a relatively short period. An air-line respirator provides protection for as long as the face piece is supplied adequate respirable air and the contaminated material has not penetrated other personal protective equipment. Particulate-filter respirators can provide protection as long the filter does not experience a "breakthrough" of contaminant through the filter. For longer periods of use, ASR respirators offer the advantage of longer use in high contaminant concentrations and reduce the concern regarding chemical warning properties of the airborne toxic material. Those respirators also cause less discomfort than air-purifying respirators because the wearer need not overcome filter resistance to inhale air.

Air-purifying respirators present minimal interference with the wearer's movement. Supplied air respirators with trailing hoses restrict the area the wearer can move and present a potential hazard where the trailing hose can come in contact with machinery. A self-contained breathing apparatus presents a size and weight constraint that may restrict climbing and movement in tight places.

The wearer's work rate determines the volume of air breathed per minute, maximum respiratory flow rate, and the tolerable inhalation and exhalation breathing resistance. The respiratory minute volume is of great significance in self-contained and air-line respirators operated from air supplied cylinders since it determines their operating life.

Peak airflow rate is important in the use of constant low air-line equipment. The air supply rate should always be greater than the peak respiratory flow rate to maintain the respiratory enclosure under positive pressure. High breathing resistance of air-purifying respirators under conditions of heavy work can result in distressed breathing. Stress resulting from use of a respirator should be minimized by using a respirator with minimum weight and breathing resistance.

Unless a specific OSHA standard exists containing specific requirements, respirators shall be selected according to 1910.134 (d) and the following table may be used for reference:

<b>Hazard</b>	<b>Respirator</b>
Oxygen Deficiency	(IDLH condition) Full face pressure demand SCBA with a minimum of 30 minutes of air
Gas & Vapor Contaminants	(IDLH condition) Positive-pressure SCBA. Combination positive pressure supplied-air respirator and auxiliary self-contained air supply.  (Not IDLH condition) Supplied-air respirator or APR with proper chemical cartridge.
Particulate Contaminants	Supplied-air respirator including abrasive blasting respirator. Powered air-purifying respirator equipped with high-efficiency filters. Air-purifying respirator with particulate filter.
Gaseous & Particulate Contaminants	(IDLH condition) Positive-pressure, self-contained breathing apparatus. Combination positive pressure, supplied-air respirator and auxiliary self-contained air supply.  (Not IDLH condition) Supplied-air respirator or APR.
Escape from contaminated atmospheres that may be immediately dangerous to life or health.	Self-contained breathing apparatus or combination air-line respirator with escape self-contained breathing apparatus.

NIOSH recommends that when exposures to carcinogens or unknown concentrations of chemical mixtures occur in the workplace, only use full face piece self-contained breathing apparatus respirator operated in a positive-pressure mode, or a full face piece supplied-air respirator operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary SCBA operated in a pressure-demand or other positive-pressure mode.

### **Hazard Assessment and Area Identification**

It is mandatory that employees wear the appropriate respirator when working where engineering controls are not feasible or cannot completely control the airborne concentrations of regulated substances below the OSHA permissible exposure limit (PEL).

The hazard evaluation will include:

- Identification and development of a list of hazardous substances used in the workplace, by department or work process;
- Review of work processes to determine where potential exposures to these hazardous substances may occur. This review shall be conducted by surveying the

workplace, reviewing process records, and talking with employees and supervisors;  
and

- Exposure monitoring to quantify potential hazardous exposures. Monitoring will be coordinated and performed by EH&S when needed.

The Department Supervisor must revise and update the hazard assessment as needed (i.e., any time work process changes may potentially affect exposure). If an employee feels that respiratory protection is needed during a particular activity, he/she is to contact his/her supervisor or the ASU Program Administrator. The Department Supervisor will evaluate the potential hazard, arranging for outside assistance as necessary. The ASU Program Administrator is available to provide assistance. The Department Supervisor will then communicate the results of that assessment back to the employees. If it is determined that respiratory protection is necessary, all other elements of this program will be in effect for those tasks and this program will be updated accordingly.

An example of a hazard assessment evaluation worksheet is attached in Appendix IV.

## **Certification**

All respirators must be certified and labeled by the National Institute for Occupational Safety and Health (NIOSH) or the Mine Safety and Health Administration (MSHA) and shall be used in accordance with the terms of that certification. Also, all filters, cartridges, and canisters must be labeled with the appropriate NIOSH or MSHA approval label. The label must not be removed or defaced while it is in use.

## **Voluntary Respirator Use**

The Program Administrator may authorize voluntary use of respiratory protective equipment at the request of employees, managers or department supervisors. The employer may provide or permit employees to use their own respirator if the Program Administrator determines that any voluntary use will not create a hazard. The employer shall provide employees voluntarily using respirators the information in Appendix D of the OSHA Respirator Protection Standard 29 CFR 1910.134 (See Appendix V of this Program to view the OSHA requirements for voluntary use of respirators by employees). Employees choosing to voluntarily wear a respirator, other than a filtering facepiece (dust mask), must comply with ASU Respiratory Protection Program for the medical evaluation, selection of respirators and respirator training.

## **Medical Evaluation**

Employees who are either required to wear respirators, or who choose to wear an APR voluntarily, must pass a medical evaluation using a medical questionnaire or an initial medical examination that obtains the same information as the medical questionnaire before

the employee is fit tested or required to use the respirator at ASU. The fitness requirement will be at the discretion of the examining physician, but if any respirator user's physical ability changes at any time, they must notify their supervisor at once and cease respirator use until medical approval for resuming respirator use has been obtained. Any employee refusing the medical evaluation will not be allowed to work in an area requiring respirator use.

A Professionally Licensed Healthcare Provider (PLHCP), preferably an industrial or occupational physician, will provide medical evaluations. Medical evaluation procedures are as follows:

#### Administration of the Medical Questionnaire

The medical evaluation will be conducted confidentially using the medical questionnaire provided in Appendix II. A medical questionnaire will be provided to all employees requiring a medical evaluation. The complete medical questionnaire and additional medical records will be maintained by the PLHCP, ASU Health Services, or ASU Human Resources;

The questionnaire will be administered in a way that ensures that the employee understands the content. To the extent feasible, assistance for employees who are unable to read the questionnaire will be provided (by providing help in reading the questionnaire); and

All affected employees will be given a copy of the medical questionnaire to fill out and are permitted to fill out the questionnaire during their normal working hours or at a time and place convenient to the employee.

#### Follow-up Examinations

A follow-up medical examination shall include any medical tests, consultations, or diagnostic procedures that the PLHCP deems necessary to make a final determination. All employees will be granted the opportunity to speak with the PLHCP about their medical evaluation, if they so request.

#### Supplemental Information for the PLHCP

The Program Administrator has provided the PLHCP with a copy of this program and a copy of the Respiratory Protection Standard.

#### Medical Determination

If the employee's respirator is a negative pressure respirator and the PLHCP finds a medical condition that may place the employee's health at increased risk if the respirator is used, the employee shall be provided a PAPR if the Pluck's medical evaluation finds that the employee can use such a respirator; if a subsequent medical evaluation finds that the employee is medically able to use a negative pressure respirator, then the employee is no longer required to use a PAPR.

### Additional Medical Evaluations

After an employee has received medical clearance and begun to use their respirator, additional medical evaluations will be provided under the following circumstances:

An employee reports medical signs or symptoms that are related to ability to use a respirator;

A PLHCP, supervisor, or program administrator informs the employee supervisor that an employee needs to be reevaluated;

Information from the respiratory protection program, including observations made during fit testing and program evaluation, indicates a need for employee reevaluation; or

A change occurs in workplace conditions (e.g., physical work effort, protective clothing, and temperature) that may result in a substantial increase in the physiological burden placed on an employee.

A list of ASU job descriptions which may require a medical surveillance is provided in Appendix III of this program.

### **Fit Testing**

Before an employee may be required to use any respirator with a negative or positive pressure tight-fitting face piece, the employee must be fit tested with the same make, model, style, and size of respirator that will be used by the employee. Employees voluntarily wearing half-face piece APRs may also be fit tested upon request. Employees will be provided with several models and sizes of respirators so that they may find an optimal fit. Fit testing of positive pressure respirators is to be conducted in the negative pressure mode. Fit testing is required:

- Prior to being allowed to use any respirator with a tight fitting face piece;
- Annually; and
- When there are changes in the employee's physical condition that could affect respiratory fit (e.g., obvious change in body weight, facial scarring, etc.).

The Program Administrator or other qualified individual or company will conduct fit tests following an OSHA-Accepted Fit Test Protocol and Procedure. Qualitative fit testing (QLFT) involves the introduction of a harmless, odorous or irritating substance into the breathing zone of the wearer. A proper fit is indicated if the wearer cannot detect the irritating substance within the respirator. Quantitative fit testing (QNFT) offers more detailed information on respirator fit. It involves the introduction of an aerosol to the wearer while they wearing the respirator. Both fit testing methods are conducted while the employee

performs exercises that could induce face piece leakage; the air inside the face piece is measured for the presence of the aerosol.

Each respirator user will receive fitting instructions that include demonstrations and practice on how the respirator should be worn, how to adjust and determine if the respirator fits properly. Although respirators are designed for maximum efficiency, they cannot protect the wearer without a tight seal between the face piece and wearer. Beards and other facial hair can substantially reduce the effectiveness of a respirator. The absence of dentures can seriously affect the fit of a face piece. To assure proper protection for a face piece, it must be checked by the wearer each time the respirator is donned (see user seal check procedures below).

Corrective lenses worn by employees also present a problem when fitting respirators. Special mountings to hold corrective lenses inside full face pieces are available. If corrective lenses are needed, the face piece and lens must be fitted by a qualified individual to provide good vision, comfort, and proper sealing. Contact lens should not be worn while wearing a respirator in a contaminated area.

Full face piece and half face piece respirators have different fitting characteristics. Any employee who finds they cannot obtain a proper fit with their respirator must notify their supervisor immediately. Upon notification by any worker of any respirator's improper fit, the supervisor shall not permit the employee to work in any area where respiratory protection is required until the employee is equipped with a proper-fitting respirator. The supervisor of each respirator wearer is responsible for ensuring that the appropriate face piece fit test has been conducted and that the result of such testing has indicated a proper fit.

## **Respirator Use**

### **General Use Procedures:**

Respiratory protection will be required for the personnel conducting specific tasks identified in Department SOPs. The SOP is provided during training and/or fit testing. Contact the Department Supervisor or ASU Program Administrator for a copy of the SOP;

Employees will use their respirators under conditions specified by this program, and in accordance with the training they receive on the use of each particular model. In addition, the respirator shall not be used in a manner for which it is not certified by NIOSH, MSHA, or by its manufacturer;

All employees must conduct positive and negative seal checks each time that they wear their respirator;

If corrective lenses are needed, special mountings to hold corrective lenses inside full face pieces should be made available;

All employees shall be permitted to leave the work area to go to the locker room to maintain their respirator for the following reasons: to clean their respirator if the respirator is impeding their ability to work, change filters or cartridges, replace parts, or to inspect respirator if it stops functioning as intended. Employees should notify their supervisor before leaving the area; and

Employees are not permitted to wear tight-fitting respirators if they have any condition, such as facial scars, facial hair, or missing dentures that may prevent them from achieving a good seal. Employees are not permitted to wear headphones, jewelry, or other articles that may interfere with the face piece-to-face seal. Additionally, it is the policy of ASU that employees may not use respirators with tight-fitting face pieces who have facial hair that comes between the sealing surface of the face piece and the face, or that interferes with valve function. Employees with beards may use types of respirators that do not require a face seal and can be worn by bearded employees.

### **User Seal Check Procedures**

The individual who uses a tight-fitting respirator is to perform a user seal check to ensure that an adequate seal is achieved each time the respirator is put on. Either the positive and negative pressure checks listed below or the respirator manufacturers recommended user seal check method shall be used. User seal checks are not substitutes for qualitative or quantitative fit tests.

#### Face piece Positive and/or Negative Pressure Checks

Positive pressure check. Close off the exhalation valve and exhale gently into the face piece. The face fit is considered satisfactory if a slight positive pressure can be built up inside the face piece without any evidence of outward leakage of air at the seal. For most respirators this method of leak testing requires the wearer to first remove the exhalation valve cover before closing off the exhalation valve and then carefully replacing it after the test.

Negative pressure check. Close off the inlet opening of the canister or cartridge(s) by covering with the palm of the hand(s) or by replacing the filter seal(s), inhale gently so that the face piece collapses slightly, and hold the breath for ten seconds. The design of the inlet opening of some cartridges cannot be effectively covered with the palm of the hand. The test can be performed by covering the inlet opening of the cartridge with a thin latex or nitrile glove. If the face piece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is considered satisfactory.

## Manufacturer's Recommended User Seal Check Procedures

The respirator manufacturer's recommended procedures for performing a user seal check are used instead of the positive and/or negative pressure check procedures provided that the employer demonstrates that the manufacturer's procedures are equally effective.

## Emergency Procedures

Employees should refer to their specific Department SOPs or ASU Emergency Response Guide for emergency procedure descriptions (including proper evacuation routes).

## Respirator Malfunction

APR Respirator Malfunction: For any malfunction of an APR (e.g., such as breakthrough, face piece leakage, or improperly working valve), the respirator wearer should inform his or her supervisor that the respirator no longer functions as intended, and go to the designated safe area to maintain the respirator. The supervisor must ensure that the qualified employee is provided with a new respirator.

Atmosphere-Supplying Respirator Malfunction: All workers wearing atmosphere-supplying respirators will work with a buddy. Buddies shall assist workers who experience a SAR malfunction as follows: If a worker experiences a malfunction of an SAR, he or she should signal to the buddy that he or she has had a respirator malfunction. The buddy shall don an emergency escape respirator and aid the worker in immediately exiting the area.

## Defective Respirators

Respirators that are defective or have defective parts shall be taken out of service immediately, disposed of, and replaced with proper working equipment

## IDLH Procedures

Employees using self-contained breathing apparatus or supplied-air respirators where the atmosphere may be immediately dangerous to life and health (IDLH) must be medically qualified, trained, and fit tested before they may wear an appropriate respirator for IDLH situations. Only authorized ASU employees who have this additional training and fit testing are allowed to participate in these situations.

## Air Quality

For supplied-air respirators, only Grade D breathing air shall be used in the cylinders/compressors. The Program Administrator will establish testing and documentation requirements for each system supplying supplied air for respiratory protection in each affected department's SOPs.

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:

- 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 used, Compressed and liquid oxygen shall meet the United States Pharmacopoeia requirements for medical or breathing oxygen. Compressed oxygen is not to be used in atmosphere-supplying respirators that have previously used compressed air.

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

Compressors used to supply breathing air to respirators will be constructed and situated so as to prevent entry of contaminated air into the air-supply system; Minimize moisture content so that the dew point at 1 atmosphere pressure is 10 degrees F (5.56 deg.C) below the ambient temperature; and will 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.

Each system will 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 compressors that are not oil-lubricated the department shall ensure that carbon monoxide levels in the breathing air do not exceed 10 ppm through use of continuous carbon monoxide monitors calibrated per the manufacturer's instructions.

For oil-lubricated compressors, both a high-temperature and carbon monoxide alarm will be used to prevent carbon monoxide in the breathing air from exceeding 10 ppm.

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

## **Cleaning, Maintenance, and Storage**

### **Cleaning**

Respirator shall be regularly cleaned and disinfected by the respirator user. This shall be done as frequently as necessary to ensure proper protection is being provided to the wearer.

A cleaning and disinfecting solution shall be provided for use in cleaning each respirator. It should be located adjacent to each respirator storage facility. Respirators issued for the exclusive use of an employee shall be cleaned as often as necessary, but at least once a day for workers who don respirators daily. No one should ever use a respirator that has previously been used by another person, without first cleaning and disinfecting the respirator. Before putting a respirator on, the user shall inspect the respirator for defects and cleanliness. This must be done every time a respirator is put on.

Atmosphere supplying and emergency use respirators are to be cleaned and disinfected after each use.

The following procedure is to be used when cleaning and disinfecting respirators:

- Disassemble respirator, removing any filters, canisters, or cartridges;
- Wash the face piece and associated parts in a mild detergent with warm water or approved cleaner/sanitizer. Do not use organic solvents;
- Rinse completely in clean warm water;
- Wipe the respirator with disinfectant wipes (Isopropyl Alcohol) to kill germs;
- Air-dry in a clean area;
- Reassemble the respirator and replace any defective parts;
- Place in a clean, dry plastic bag or other airtight container; and
- DO NOT store items on top of the respirator.

Note: The supervisor will ensure an adequate supply of appropriate cleaning and disinfection materials are available to employees. If supplies are low, employees should contact their supervisors.

### **Maintenance**

Respirators are to be properly maintained at all times in order to ensure that they function properly and adequately protect the employee. Maintenance involves a thorough visual inspection for cleanliness and defects. Worn or deteriorated respirators shall be disposed of and a new respirator shall be issued to the employee.

The following checklist will be used when inspecting respirators:

- Face piece: cracks, tears, or holes facemask distortion cracked or loose lenses/face shield;
- Head straps: breaks or tears, broken buckles;
- Valves: residue or dirt, cracks or tears in valve material;
- Filters/Cartridges: approval designation, gaskets, cracks or dents in housing, and proper cartridge for hazard; and
- Air Supply Systems: breathing air quality/grade, condition of supply hoses, hose connections, and settings on regulators and valves.

Employees are permitted to leave their work area to perform limited maintenance on their respirator in a designated area that is free of respiratory hazards. Situations when this is permitted include: to wash face and respirator face piece to prevent any eye or skin irritation; to replace the filter, cartridge or canister if vapor or gas breakthrough or leakage in the face piece is detected; if any other damage to the respirator or its components is detected; or if there is a change in the environment that will effect respirator use.

### **Storage**

When not in use, each respirator shall be stored in a manner to protect it against dust, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals, and must be stored in accordance with the manufacturer's recommendations. The respirator should be inspected after taking it off and prior to putting the respirator in storage. Each employee will clean and inspect their own air-purifying respirator in accordance with the provisions of this program and will store their respirator in a plastic bag in a designated area. Each employee will have his/her name on the bag and that bag will only be used to store that employee's respirator.

Dust respirators must be stored in a clean plastic bag. Each employee who has finished wearing a disposable respirator or a respirator that is to be used only once shall place the respirator in the appropriate trash or disposal container. It shall not be taken from the premises for additional use or used a second time under any circumstances.

All respirators must be stored so the face piece and exhalation valve will rest in a normal position and function will not be impaired by the elastomer setting in an abnormal position. Respirators shall never be stored in such places as lockers or tool boxes unless they are in clean carrying cases or cartons and the cleaning and storage conditions listed above can be assured. No employee shall remove a respirator from the premises unless directed to do so by his or her immediate supervisor.

Each respirator not routinely used, but kept ready for emergency use, shall be inspected after each use and at least monthly to assure it is in satisfactory working condition.

### **Change Schedules**

For self-contained breathing apparatus, a warning of service life is available. It may be a pressure gauge or timer with audible alarm or a window indicator for canisters. The respirator user must understand the operation and limitations of each type of warning device.

Some new cartridge/canister air purifying respirators are equipped with an end-of-service-life indicator (ESLI), a system that warns the respirator user of the approach of the end of adequate respiratory protection, for example, that the sorbent is approaching saturation or is no longer effective (US DOL OSHA, 1998). If there is no ESLI appropriate for conditions in the employer's workplace, the canisters and cartridges must be replaced according to a change schedule for canisters and cartridges based on objective information or reliable data to ensure that canisters and cartridges are changed before the end of their service life. The canister and cartridge manufacturer will provide information regarding recommended change schedule determination. Employees voluntarily wearing APRs regularly with organic vapor cartridges shall change the cartridges on their respirators if they detect breakthrough, i.e., odor or irritation. However, the following chemicals have substance-specific standards under OSHA and cartridges must be changed accordingly:

- Acrylonitrile - ESLI or end of shift, whichever occurs first.
- Benzene - ESLI or beginning of shift, whichever occurs first.
- Butadiene - Every 1, 2, or 4 hours dependent on concentration and at beginning of shift.
- Formaldehyde - Every three hours or end of shift, whichever occurs first.
- Vinyl chloride - ESLI or end of shift in which they are first used, whichever occurs first.
- Methylene chloride – Must use an atmosphere-supplying respirator in accordance with OSHA 29 CFR 1910.1052(g)(3)

Employees wearing APRs or PAPRs with P100 filters for protection against dust and other particulates shall change the cartridges on their respirators when they first begin to experience resistance in breathing while wearing their respirator.

The following guidelines will be utilized for determining change out schedules for canisters and cartridges:

Availability of objective data: Determine if respirator manufacturers, industry organizations, trade associations, professional societies, chemical manufacturers, or academic institutions can provide objective data for the particular make and model of the respirator canisters/cartridges and if this data is sufficient to develop change out schedules.

Use of inappropriate respirator cartridge/canister: Determine if APRs are appropriate for the conditions in the workplace. Some chemicals break through canisters and

cartridges so quickly that canisters and cartridges may not be appropriate for the workplace. In this case, employers should consult with respirator manufacturers and material safety data sheets for instruction.

Change schedule for mixtures: Chemical mixtures can present a difficult task when developing change schedules. This is best determined by experimental methods, not predictive mathematical models. Schedules should be calculated by assuming the mixture stream behaves as a pure system of the most rapidly migrating component or compound with the shortest breakthrough time, i.e., sum up the concentration of the components. A margin of safety for the user should be included.

Chemical contaminant migration: When organic materials with a boiling point below 65 degrees Centigrade are imbedded in a carbon filter, some may have a tendency to migrate through the sorbent material during periods of storage or when not in use. This can rapidly increase breakthrough and could present an additional exposure to the user. Whenever migration is possible, canisters and cartridges should be changed after every work shift.

## **Training**

EH&S or other qualified individual or company will provide training to respirator users and their supervisors on the contents of the ASU Respiratory Protection Program, their responsibilities, and the OSHA Respiratory Protection Standard. Workers must be trained prior to using a respirator at ASU. Supervisors will also be trained prior to using a respirator in the workplace or prior to supervising employees required to use respirators.

The training course will cover the following topics:

- The ASU Respiratory Protection Program;
- Department Specific SOPs;
- The OSHA Respiratory Protection Standard;
- Respiratory hazards encountered at ASU and their health effects;
- Proper selection and use of respirators;
- Limitations of respirators;
- Respirator donning and user seal (fit) checks;
- Fit testing;
- Emergency use procedures;
- Maintenance and storage; and
- Medical signs and symptoms limiting the effective use of respirators.

Employees will be retrained annually or as needed, e.g., if they change departments and need to use a different respirator. Employees must demonstrate their understanding of the topics covered in the training through hands-on exercises. Respirator training will be documented by the Program Administrator and the documentation will include the type and

model of respirator for which each employee has been trained and fit tested (see Appendix VI of this program). Each supervisor will provide their employees with supplemental respirator training and instruction, as necessary for their area of supervision to protect the health and safety of employees.

## **PROGRAM EVALUATION**

The Program Administrator will conduct evaluations of the workplace to ensure that the written respiratory protection program is being properly implemented, and to consult employees to ensure that they are using the respirators properly.

## **DOCUMENTATION AND RECORD-KEEPING**

A written copy of this program and the OSHA standard are kept in EH&S and available to all employees. Additionally, employees may access the written program through the ASU EH&S website.

Training and fit test records are maintained in EH&S. These records will be updated as new employees are trained, as existing employees receive refresher training, and as fit tests are conducted.

The Program Administrator will ensure copies of the medical records for all employees covered under the respirator program are properly maintained. The completed medical questionnaire and the PLHCP's documented findings are confidential and will remain with the healthcare facility. ASU EH&S will only retain the physician's written recommendation regarding each employee's ability to wear a respirator.

Fit test records shall be retained for respirator users until their next fit test is administered.

## **APPLICABLE REGULATIONS**

U.S. Department of Labor Occupational Safety and Health Administration Federal Register. (1998). 29 CFR parts 1910 and 1926, Respiratory protection; Final rule (Docket No. H-049, RIN 1218-AA05). Washington, DC: U.S. Government Printing Office.

# **Appendix I**

## **Definitions**

**ACGIH** - American Conference of Governmental Industrial Hygienists.

**Adsorption** - The condensation of gases, liquids, or dissolved substances on the surfaces of solids.

**Air-purifying respirator** - Respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.

**Atmosphere-supplying respirator** - Respirator that supplies the user with supplied-air, including Supply Air Respirators (SARs) and Self-Contained Breathing Apparatus (SCBA) units.

**Breakthrough** - The point at which a gas or vapor passes through the canister or cartridge and into the respirator.

**Canister or cartridge** - Container with a filter, sorbent, or catalyst, or combination of these items, which removes specific contaminants from the air passed through the container.

**Ceiling limit** - Airborne concentration of a toxic substance in the work environment which should never be exceeded.

**CDC** - Centers for Disease Control.

**Demand respirator** - Atmosphere-supplying respirator that admits breathing air to the face piece only when a negative pressure is created inside the face piece by inhalation.

**Dusts** - Solid particles that are formed or generated from solid materials through mechanical processes such as crushing, grinding, drilling, abrading, or blasting.

**Electrocardiogram (EKG)** - Tracing made by an instrument for recording the changes of electrical potential occurring during the heartbeat used in diagnosing abnormalities of heart action.

**Emergency situation** - Any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that may or does result in an uncontrolled significant release of an airborne contaminant.

**Employee exposure** - Exposure to a concentration of an airborne contaminant that would occur if the employee were not using respiratory protection.

**End-of-service-life indicator (ESLI)** - System that warns the respirator user of the approach of the end of adequate respiratory protection, for example, that the sorbent is approaching saturation or is no longer effective.

**Escape-only respirator** - Respirator intended to be used only for emergency exit.

**Filter or air purifying element** - Component used in respirators to remove solid or liquid aerosols from the inspired air.

**Filtering face piece (dust mask)** - Negative pressure particulate respirator with a filter as an integral part of the face piece or with the entire face piece composed of the filtering medium.

**Fit factor** - 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.

**Fit test** - Use of a protocol to qualitatively or quantitatively evaluate the fit of a respirator on an individual. (See also Qualitative fit test and Quantitative fit test.)

**Fumes** - Solid particles that are formed when a metal or other solid vaporizes and the molecules condense (or solidify) in cool air.

**Gases** - Formless fluids that occupy space or enclosures and which can be changed to liquid or solid state only by the effect of increased pressure and or decreased temperature. Examples are welding gases such as acetylene and nitrogen, and carbon monoxide produced from internal combustion engines.

**High efficiency particulate air (HEPA) filter** - Filter that is at least 99.97% efficient in removing mono-disperse particles of 0.3 micrometers in diameter. The equivalent NIOSH 42 CFR § 84 particulate filters are particulate filters are the N100, R100, and P100 filters.

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

**Interior structural fire-fighting** - Physical activity of fire suppression, rescue or both, inside of buildings or enclosed structures which are involved in a fire situation beyond the incipient stage.

**Mists** - 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 spraying mist from spraying operations.

**N series filter** - Respirator filter cartridge that filters particulates, but does not resist oil.

**Negative pressure respirator** (tight fitting) - Respirator in which the air pressure inside the face piece is negative during inhalation with respect to the ambient air pressure outside the respirator.

**NIOSH** - National Institute of Occupational Safety and Health is the research arm of OSHA. NIOSH performs testing and certification of personal protective equipment.

**OSHA** - Occupational Safety and Health Administration is responsible for the promulgation, modification, and enforcement of occupational safety and health standards.

**Oxygen deficient atmosphere** - Atmosphere with an oxygen content below 19.5% by volume.

**P series filter** - Respirator filter cartridge that is oil proof.

**Permissible Exposure Limit (PEL)** - Exposure limit published and enforced by OSHA as a legal standard.

**Physician or other licensed health care professional (PLHCP)** - Individual whose legally permitted scope of 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 Respiratory Protection Standard.

**Positive pressure respirator** - Respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.

**Powered air-purifying respirator (PAPR)** - Air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.

**Pressure demand respirator** - Positive pressure atmosphere-supplying respirator that admits breathing air to the face piece when the positive pressure is reduced inside the face piece by inhalation.

**Protection factor (PF)** - With respiratory protective equipment - the ratio of the ambient airborne concentration of the contaminant to the concentration inside the face piece.

**Qualitative fit test (QLFT)** - 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)** - Assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

**R series filter** - Respirator filter cartridge that resists oil.

**Radionuclides** - Materials that spontaneously emit ionizing radiation.

**Respiratory decision logic** - To enhance technical accuracy and uniformity between substances in the selection of respirators and to provide necessary criteria to support this selection, the decision logic is a step-by-step elimination of inappropriate respirators until only those which are acceptable remain.

**Respirable size particulate** - Particulates in the size range that permits them to penetrate deep into the lungs upon inhalation.

**Respiratory inlet covering** - That 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 face piece, helmet, hood, suit, or a mouthpiece respirator with nose clamp.

**Self-contained breathing apparatus (SCBA)** - Atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user.

**Service life** - Period of time that a respirator, filter or sorbent, or other respiratory equipment provides adequate protection to the wearer.

**Short term exposure limit (STEL)** - A 15-minute TWA concentration, which should not be exceeded at any time during a workday, even if the 8-hour TWA is within the TLV. The duration of a STEL exposure should not be repeated more than four times per day and there should be at least 60 minutes between successive exposures at the STEL.

**Smoke** - Aerosol formed from the combustion of organic material.

**Spirometry** - Measurement of lung capacity and function.

**Supplied-air respirator (SAR) or airline respirator** - Atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user.

**Threshold limit value (TLV)** - A time weighted average concentration under which most people can work consistently for 8 hours a day, day after day, with no harmful effects.

**Time weighted average (TWA)** - Refers to concentrations of airborne toxic materials which have been weighted for a certain time duration, usually 8 hours.

**Tight-fitting face piece** - Respiratory inlet covering that forms a complete seal with the face.

**User seal check** - Action conducted by the respirator user to determine if the respirator is properly seated to the face.

**Vapors** - 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.

## **Appendix II**

# **OSHA Respirator Medical Evaluation Questionnaire**

**Cited from: OSHA Regulations (Standards - 29 CFR)  
OSHA Respirator Medical Evaluation Questionnaire (Mandatory). - 1910.134  
Appendix C**

- \* Standard Number: 1910.134 Appendix C
- \* Standard Title: OSHA Respirator Medical Evaluation Questionnaire (Mandatory).
- \* SubPart Number: I
- \* SubPart Title: Personal Protective Equipment

To the employer: Answers to questions in Section 1, and to question 9 in Section 2 of Part A, do not require a medical examination.

To the employee: Can you read? (circle one): Yes / No

Your employer must allow you to answer this questionnaire during normal working hours, or at a time and place that is convenient to you. To maintain your confidentiality, your employer or supervisor must not look at or review your answers, and your employer must tell you how to deliver or send this questionnaire to the health care professional who will review it.

**Part A. Section 1.** (Mandatory) The following information must be provided by every employee who has been selected to use any type of respirator (please print).

1. Today's date: \_\_\_\_\_  
\_\_\_\_\_
2. Your name & ASU ID#: \_\_\_\_\_
3. Your Department name: \_\_\_\_\_  
\_\_\_\_\_
4. Your age (to nearest year): \_\_\_\_\_  
\_\_\_\_\_
5. Sex (circle one): Male / Female
6. Your height: \_\_\_\_\_ ft. \_\_\_\_\_ in.
7. Your weight: \_\_\_\_\_ lbs.

8. Your job title: \_\_\_\_\_  
\_\_\_\_\_
9. A phone number where you can be reached by the health care professional who reviews this questionnaire (include the Area Code): \_\_\_\_\_
10. The best time to phone you at this number: \_\_\_\_\_
11. Has your employer told you how to contact the health care professional who will review this questionnaire (circle one): Yes / No
12. Check the type of respirator you will use (you can check more than one category):
- a. \_\_\_\_\_ N, R, or P disposable respirator (filter-mask, non- cartridge type only).
  - b. \_\_\_\_\_ Other type (for example, half- or full-face piece type, powered-air purifying, supplied-air, self-contained breathing apparatus).
    - 1. Have you worn a respirator? (circle one): Yes / No
    - 2. If "yes," what type(s):

**Part A. Section 2.** (Mandatory) Questions 1 through 9 below must be answered by every employee who has been selected to use any type of respirator (please circle "yes" or "no").

1. Do you currently smoke tobacco, or have you smoked tobacco in the last month? Yes / No
2. Have you ever had any of the following conditions?
  - a. Seizures (fits): Yes / No
  - b. Diabetes (sugar disease): Yes / No
  - c. Allergic reactions that interfere with your breathing: Yes / No
  - d. Claustrophobia (fear of closed-in places): Yes / No
  - e. Trouble smelling odors: Yes / No
3. Have you ever had any of the following pulmonary or lung problems?
  - a. Asbestosis: Yes / No
  - b. Asthma: Yes / No
  - c. Chronic bronchitis: Yes / No
  - d. Emphysema: Yes / No
  - e. Pneumonia: Yes / No
  - f. Tuberculosis: Yes / No
  - g. Silicosis: Yes / No
  - h. Pneumothorax (collapsed lung): Yes / No
  - i. Lung cancer: Yes / No
  - j. Broken ribs: Yes / No
  - k. Any chest injuries or surgeries: Yes / No
  - l. Any other lung problem that you've been told about: Yes / No

4. Do you currently have any of the following symptoms of pulmonary or lung illness?
  - a. Shortness of breath: Yes / No
  - b. Shortness of breath when walking fast on level ground or walking up a slight hill or incline: Yes / No
  - c. Shortness of breath when walking with other people at an ordinary pace on level ground: Yes / No
  - d. Have to stop for breath when walking at your own pace on level ground: Yes / No
  - e. Shortness of breath when washing or dressing yourself: Yes / No
  - f. Shortness of breath that interferes with your job: Yes / No
  - g. Coughing that produces phlegm (thick sputum): Yes / No
  - h. Coughing that wakes you early in the morning: Yes / No
  - i. Coughing that occurs mostly when you are lying down: Yes / No
  - j. Coughing up blood in the last month: Yes / No
  - k. Wheezing: Yes / No
  - l. Wheezing that interferes with your job: Yes / No
  - m. Chest pain when you breathe deeply: Yes / No
  - n. Any other symptoms that you think may be related to lung problems: Yes / No
  
5. Have you ever had any of the following cardiovascular or heart problems?
  - a. Heart attack: Yes / No
  - b. Stroke: Yes / No
  - c. Angina: Yes / No
  - d. Heart failure: Yes / No
  - e. Swelling in your legs or feet (not caused by walking): Yes / No
  - f. Heart arrhythmia (heart beating irregularly): Yes / No
  - g. High blood pressure: Yes / No
  - h. Any other heart problem that you've been told about: Yes / No
  
6. Have you ever had any of the following cardiovascular or heart symptoms?
  - a. Frequent pain or tightness in your chest: Yes / No
  - b. Pain or tightness in your chest during physical activity: Yes / No
  - c. Pain or tightness in your chest that interferes with your job: Yes / No
  - d. In the past two years, have you noticed your heart skipping or missing a beat: Yes / No
  - e. Heartburn or indigestion that is not related to eating: Yes / No
  - f. Any other symptoms that you think may be related to heart or circulation problems: Yes / No
  
7. Do you currently take medication for any of the following problems?
  - a. Breathing or lung problems: Yes / No
  - b. Heart trouble: Yes / No
  - c. Blood pressure: Yes / No
  - d. Seizures (fits): Yes / No

8. If you've used a respirator, have you ever had any of the following problems? (If you've never used a respirator go to question 9)
- a. Eye irritation: Yes / No
  - b. Skin allergies or rashes: Yes / No
  - c. Anxiety: Yes / No
  - d. General weakness or fatigue: Yes / No
  - e. Any other problem that interferes with your use of a respirator: Yes / No
9. Would you like to talk to the health care professional who will review this questionnaire about your answers to this questionnaire? Yes / No

Questions 10 to 15 below must be answered by every employee who has been selected to use either a **full-face piece respirator or a self-contained breathing apparatus (SCBA)**. For employees who have been selected to use other types of respirators, answering these questions is voluntary.

10. Have you ever lost vision in either eye (temporarily or permanently)? Yes / No

11. Do you currently have any of the following vision problems?

- a. Wear contact lenses: Yes / No
- b. Wear glasses: Yes / No
- c. Color blind: Yes / No
- d. Any other eye or vision problem: Yes / No

12. Have you ever had an injury to your ears, including a broken ear drum? Yes / No

13. Do you currently have any of the following hearing problems?

- a. Difficulty hearing: Yes / No
- b. Wear a hearing aid: Yes / No
- c. Any other hearing or ear problem: Yes / No

14. Have you ever had a back injury? Yes / No

15. Do you currently have any of the following musculoskeletal problems?

- a. Weakness in any of your arms, hands, legs, or feet: Yes / No
- b. Back pain: Yes / No
- c. Difficulty fully moving your arms and legs: Yes / No
- d. Pain or stiffness when you lean forward or backward at the waist: Yes / No
- e. Difficulty fully moving your head up or down: Yes / No
- f. Difficulty fully moving your head side to side: Yes / No
- g. Difficulty bending at your knees: Yes / No
- h. Difficulty squatting to the ground: Yes / No
- i. Climbing a flight of stairs or a ladder carrying more than 25 lbs: Yes / No

- j. Any other muscle or skeletal problem that interferes with using a respirator: Yes / No

**Part B.** Any of the following questions, and other questions not listed, may be added to the questionnaire at the discretion of the health care professional who will review the questionnaire, (please complete this section).

1. In your present job, are you working at high altitudes (over 5,000 feet) or in a place that has lower than normal amounts of oxygen? Yes / No
2. If "yes," do you have feelings of dizziness, shortness of breath, pounding in your chest, or other symptoms when you're working under these conditions? Yes / No
3. At work or at home, have you ever been exposed to hazardous solvents, hazardous airborne chemicals (e.g., gases, fumes, or dust), or have you come into skin contact with hazardous chemicals? Yes / No
4. If "yes," name the chemicals if you know them:
5. Have you ever worked with any of the materials, or under any of the conditions, listed below:
  - a. Asbestos: Yes / No
  - b. Silica (e.g., in sandblasting): Yes / No
  - c. Tungsten/cobalt (e.g., grinding or welding this material): Yes / No
  - d. Beryllium: Yes / No
  - e. Aluminum: Yes / No
  - f. Coal (for example, mining): Yes / No
  - g. Iron: Yes / No
  - h. Tin: Yes / No
  - i. Dusty environments: Yes / No
  - j. Any other hazardous exposures: Yes / No
6. If "yes," describe these exposures:
7. List any second jobs or side businesses you have:
8. List your previous occupations:
9. List your current and previous hobbies:
10. Have you been in the military services? Yes / No
11. If "yes," were you exposed to biological or chemical agents (either in training or

combat)? Yes / No

12. Have you ever worked on a HAZMAT team? Yes / No

13. Other than medications for breathing and lung problems, heart trouble, blood pressure, and seizures mentioned earlier in this questionnaire, are you taking any other medications for any reason (including over-the-counter medications): Yes / No

14. If "yes," name the medications if you know them: \_\_\_\_\_

15. Will you be using any of the following items with your respirator(s)?

- a. HEPA Filters: Yes / No
- b. Canisters (for example, gas masks): Yes / No
- c. Cartridges: Yes / No

16. How often are you expected to use the respirator(s) (circle "yes" or "no" for all answers that apply to you)?

- a. Escape only (no rescue): Yes / No
- b. Emergency rescue only: Yes / No
- c. Less than 5 hours per week: Yes / No
- d. Less than 2 hours per day: Yes / No
- e. 2 to 4 hours per day: Yes / No
- f. Over 4 hours per day: Yes / No

17. During the period you are using the respirator(s), is your work effort:

a. Light (less than 200 kcal per hour): Yes / No

If "yes," how long does this period last during the average shift:

\_\_\_\_\_hrs. \_\_\_\_\_mins. Examples of a light work effort are sitting while writing, typing, drafting, or performing light assembly work; or standing while operating a drill press (1-3 lbs.) or controlling machines.

b. Moderate (200 to 350 kcal per hour): Yes / No

If "yes," how long does this period last during the average shift:

\_\_\_\_\_hrs. \_\_\_\_\_mins. Examples of moderate work effort are sitting while nailing or filing; driving a truck or bus in urban traffic; standing while drilling, nailing, performing assembly work, or transferring a moderate load (about 35 lbs.) at trunk level; walking on a level surface about 2 mph or down a 5-degree grade about 3 mph; or pushing a wheelbarrow with a heavy load (about 100 lbs.) on a level surface.

c. Heavy (above 350 kcal per hour): Yes / No

If "yes," how long does this period last during the average shift:

\_\_\_\_\_hrs. \_\_\_\_\_mins. Examples of heavy work are lifting a heavy load (about 50 lbs.) from the floor to your waist or shoulder; working on a loading dock;

shoveling; standing while bricklaying or chipping castings; walking up an 8-degree grade about 2 mph; climbing stairs with a heavy load (about 50 lbs.).

18. Will you be wearing protective clothing and/or equipment (other than the respirator) when you're using your respirator? Yes / No

If "yes," describe this protective clothing and/or equipment:

19. Will you be working under hot conditions (temperature exceeding 77 deg. F)? Yes / No

20. Will you be working under humid conditions? Yes / No

21. Describe the work you'll be doing while you're using your respirator(s):

22. Describe any special or hazardous conditions you might encounter when you're using your respirator(s) (for example, confined spaces, life-threatening gases):

23. Provide the following information, if you know it, for each toxic substance that you'll be exposed to when you're using your respirator(s):

1. Name of the first toxic substance:
  - a. Estimated maximum exposure level per shift:
  - b. Duration of exposure per shift:
2. Name of the second toxic substance:
  - a. Estimated maximum exposure level per shift:
  - b. Duration of exposure per shift:
3. Name of the third toxic substance:
  - a. Estimated maximum exposure level per shift:
  - b. Duration of exposure per shift:
4. The name of any other toxic substances that you'll be exposed to while using your respirator:

24. Describe any special responsibilities you'll have while using your respirator(s) that may affect the safety and well-being of others (for example, rescue, security):

## **Appendix III**

### **Respiratory Protection Personnel Possible Tasks Requiring Respiratory Protection**

- Maintenance or construction operations - sawing, sanding, cutting, crushing, screening, blasting, insulating, grinding, or any operation that releases a respirable fraction;
- Processes involving metals (fumes or particles)-soldering, brazing, pickling, etching, plating, galvanizing, welding, smelting, photography, printing, paints containing heavy metals;
- Processes involving liquids-spray processes, pesticides, open pouring or transfer of liquids;
- Processes involving heating (vapor degreasing);
- Processes where material is atomized or sprayed;
- Processes involving combustion;
- Processes involving chemical reactions;
- Processes using carcinogens, sensitizers, or highly toxic materials;
- Other situations-confined space entry, fire-fighting, chemical spill clean-up, emergency back-up (chlorine system), asbestos abatement, etc.; and
- Indicators that respirators may be required - employee complaints, employee symptoms, results of medical tests.

# **Appendix IV Hazard Assessment**



## **Appendix V**

### **(Mandatory) Information for Employees Using Respirators When not Required by Standard 1910.134 Appendix D**

## **(Mandatory) Information for Employees Using Respirators When not Required Under Standard 1910.134 Appendix D**

Standard Number: 1910.134 App D

Standard Title: (Mandatory) Information for Employees Using Respirators When not Required Under Standard.

SubPart Number: I

SubPart Title: Personal Protective Equipment

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 designed 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.

[63 FR 1152, Jan. 8, 1998; 63 FR 20098, April 23, 1998]

# **Appendix VI**

## **Department Specific Respirator Standard Operating Procedure (SOP) Form**

**Department Specific SOP Form  
Respirator Standard Operating Procedure  
Positions Affected: (i.e. Research Assistant or Hazardous Waste Specialist)**

**1. Job/Task Respirator is required for:**

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Wearing the selected respirator will prevent potential exposures to potential air contaminants that could reach or exceed the maximum recommended exposure levels in air. Failure to follow this procedure could result in improper fitting, use or maintenance of respiratory protection and potential overexposure to these air contaminants.

**2. Material/Substance involved:** \_\_\_\_\_ (list contaminants respirator is selected for)

**3. Type of Respirator Selected:** (Including limitations, instructions on cartridge service-life, and settings if applicable.) The respirators selected for these operations are

- a. \_\_\_\_\_  
—
- b. \_\_\_\_\_  
—

(Identify any additional equipment the respirator must be used with such as air control valves (vortex cooler, stubby or vortemp heater, hoses approved for breathing air use, or any required equipment such as a portable air compressor).

Note: Maximum recommended hose length is 50 feet in order to minimize potential tripping hazards.

Note: For supplied air respirators include this statement: "The respirator is operated on a Breathing Air System that is tested to ANSI/CGA Grade D (19.5 to 23.5% Oxygen; <5.0 mg/M3 oil mist; <1000ppm CO2; <10 ppm CO)."

Note: For all respirators except SCBAs include this statement: "These respirators are NOT to be used for fire fighting or entry into oxygen-deficient or other atmospheres

considered Immediately Dangerous to Life and Health (IDLH).”

**4. Instructions for emergency situations: (EXAMPLE STATEMENTS)**

If any of the following occur, leave the area immediately, go to a location free from the source of air contaminants and remove the respirator. You become dizzy, light-headed or experience difficulty in breathing or you smell an unusual odor. If

Note: For supplied air respirators use this statement instead: “if air flow stops or does not seem adequate, you become dizzy or disoriented, the carbon monoxide (CO) monitor alarms, or a general emergency alarm occurs. If you require medical attention notify your Supervisor immediately or ASU Police at (480) 965-3456 if your supervisor is unavailable.

**5. Reason for Selecting this Type of Respirator (EXAMPLE STATEMENTS)**

These respirators were selected based on their assigned protection factor addressing the levels of contaminants measured or anticipated to be present and for ease of use.

Concentration of air contaminant is known and this respirator will provide adequate protection.

The following levels of contamination have been measured in at least one of the ballistic labs: Exposure levels are given in parts per million (ppm) for gases or vapors and milligrams per cubic meter (mg/m<sup>3</sup>) for particulates:

Contaminant	Measured Concentration	Allowable Limit (PEL or TLV)
Carbon Monoxide	81-376 ppm	50 ppm (TWA)
Sodium Azide	<0.03 mg/m <sup>3</sup>	0.29 mg/m <sup>3</sup> (Ceiling)
Sodium Hydroxide	0.36 – 1.5 mg/m <sup>3</sup>	2 mg/m <sup>3</sup> (TWA)
Lead	4.9 – 9.6 µg/m <sup>3</sup>	50 µg/m <sup>3</sup> (TWA)

A review of data indicates that applicable PELs and TLVs may be exceeded.

**6. Type of Fit Test Required (include instructions for donning, doffing and seal checks):**

**7. Donning and Doffing (EXAMPLE STATEMENTS)**

To don respirator: ensure you are wearing a clean pair of gloves or hands are free of contamination before touching the interior of the respirator; check for and remove any anything that may interfere with the facial seal of the respirator, connect the lower strap around neck, position respirator on face and connect and adjust remaining straps, conduct a positive/negative pressure test and adjust fit until there is no leakage. Repeat these steps each time respirator is donned.

Note: For supplied air hoods include instructions such as inserting the breathing tube by inserting into sleeve of hood at one end and to the air control valve on the belt and securing with the clamp; ensure headband or hard hat is inserted and properly seated; ensure panel pressure settings are within manufacturers recommended range and hose connection is clean; fasten and adjust the waist belt to be comfortable; connect airline into air control valve and ensure air is flowing. Lift respirator over head and lower hood over head and lower until elastic collar has closed around neck. Make sure the hose is not twisted or in your path of travel. Monitor the hose position such that it is not a trip hazard.

To remove respirator: go to a safe location; disconnect or adjust straps to remove respirator. Be careful not to touch the interior of the respirator with contaminated gloves or surfaces, and place respirator in a designated storage location or clean as store as identified below.

Note: For supplied air respirators include instructions such as: "disconnect airline from temperature control system; carefully lift respirator off head exercising caution to avoid touching the inner surfaces or collar with contaminated coveralls, gloves or other PPE; and store on a hanger in an approved location.

#### **8. Respirator Storage, Cleaning and Maintenance Instructions: (EXAMPLE STATEMENTS)**

Store in approved locations such as inside clean plastic bags or lockers outside of contaminated areas such that the interior of the respirator does not become contaminated. Do not put respirators away with the interior wet from perspiration, condensation or rinsing. Either dry them off or allow to air dry. You must be able to identify your respirator – sharing of respirators is prohibited. Do not use contaminated equipment. Lightly contaminated equipment can be cleaned by rinsing in a designated area or wiping with a wet cloth providing you are protected from exposure.

Each respirator may be disassembled and cleaned according to manufacturer's instructions. Do not use replacement parts from another type of respirator to make repairs. Use only approved replacement parts specified by the manufacturer.

The complete requirements of the Respiratory Protection Program including general requirements, medical surveillance, fit testing, usage, maintenance and care, breathing air quality, training, program evaluation and record keeping are described in the Respiratory Protection Program available at <http://www.asu.edu/fm/Risk/specialprojects.htm>.

<b>Procedure Written By:</b>	<b>Date:</b>
<b>Name: (Printed)</b>	<b>Name: (Signature)</b>
<b>Trainer:</b>	<b>Date:</b>

## **Appendix VII**

# **Air Purifying Respirators Canister Color Codes**

## Air Purifying Respirators Canister Color Codes

Atmospheric contaminants to be protected against	Color Assignment
Acid gases	White
Hydrocyanic acid gases	White with ½ inch green stripe completely around the canister near the bottom
Chlorine gas	White with ½ inch yellow stripe completely around the canister near the bottom
Organic vapors	Black
Ammonia gas	Green
Acid gases & ammonia gases	Green with ½ inch white stripe completely around the canister near the bottom
Carbon Monoxide	Blue
Acid gases & organic vapors	Yellow
Hydrocyanic acid gas & chloropicrin vapor	Yellow with ½ inch blue stripe completely around the canister near the bottom
Acid gases, organic vapors, & ammonia gases	Brown
Particulates	Purple (magenta)
Radioactive materials, excepting tritium & noble gases	Purple (magenta)
Particulates (dusts, fumes, mists, fogs, or smokes) in combination with any of the above gases or vapors	Canister color for contaminant, as designated above, with ½ inch gray stripe completely around the canister near the top
All of the above atmospheric contaminants	Red with ½ inch gray stripe completely around the canister near the top

Gray shall not be assigned as a main color for a canister designed to remove acids or vapors.

Plog, B. A., Niland, J., & Quinlan P. J. (1996). Fundamentals of industrial hygiene. United States: National Safety Council