



DEPARTMENT OF  
ENVIRONMENTAL SAFETY,  
SUSTAINABILITY & RISK

# Respiratory Protection Program

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## **I. Purpose**

The University of Maryland, College Park (UMD) is dedicated to providing a safe environment for all employees and students. This document is designed to identify and designate responsibilities for implementation of the UMD Respiratory Protection Program. It has been developed in compliance with state laws, adopted from Federal Occupational Safety and Health Administration (OSHA) respiratory protection standard (29 CFR 1910.134).

## **II. Scope**

The respiratory protection program applies to all faculty, staff, and students who wear respiratory protection. This program includes procedures for the following:

- Selecting respirators for use in the workplace.
- Medical evaluations for respirator use.
- Training of employees in respiratory hazards, respirator use, and limitations.
- Fit testing procedures for tight-fitting respirators.
- Procedures for proper use of respirators in routine and emergency situations.
- Procedures and schedules for maintaining respirators.
- Procedures for evaluating the effectiveness of the Respiratory Protection Program.
- Forms for site-specific respiratory protection program information.

## **III. Responsibilities**

This section outlines responsibilities for The Department of Environmental Safety, Sustainability and Risk (ESSR), the Occupational Health Clinic of the University Health Center (UHC-OHU), directors, supervisors, laboratory managers, and respirator users.

### **A. The Department of Environmental Safety, Sustainability and Risk (ESSR)**

- Manage the overall respiratory protection program for UMD.
- Serve as the respiratory program administrator.
- Conduct analyses of respiratory hazards in the workplace when requested by an employee, supervisor, or other departmental representative.
- Assist with evaluating, developing, and implementing controls to reduce the need for respiratory protection through elimination, substitution, engineering, and/or administrative controls.
- Provide guidance and training to the campus community for respirator use when other controls cannot be implemented.
- Act as an information resource for problems and questions related to respiratory

protection.

- Provide fit testing for respiratory users.
- Maintain exposure monitoring, training, and fit testing records.
- Review and revise the respiratory protection program annually and as necessary.

**B.** The Occupational Health Unit of the University Health Center (UHC-OHU)

- Provide all required medical questionnaires and/or examinations for evaluation of respirator users.
- Maintain medical records relating to consultations, examinations, and medical surveillance as required by law.
- Provide certification that employees required to wear respirators are physically able to do so without adverse medical consequences.
- Periodically review the overall effectiveness of the provision of medical services related to the proper use of respirators as outlined in this program.

**C.** Directors, Supervisors, and Laboratory Managers

- Implement and oversee the respiratory protection program within the department.
- In partnership with ESSR personnel, identify potential respiratory hazards in the workplace.
- Provide respirators, spare parts, filters, and other applicable equipment to ensure employee access to properly functioning equipment.
- Schedule respirator physicals with the UHC-OHU.
- Schedule respiratory protection training and fit testing with ESSR.
- Departments with employees using respirators must provide site specific information to ESSR (located in the appendices) detailing the following:
  - Hazards requiring respiratory use (evaluated in partnership with ESSR personnel)
  - Personnel enrolled in the respiratory protection program
  - Respirator use procedures for the department/unit/laboratory
  - Locations for proper cleaning and storage of respirators
- Maintain records of exposure hazard evaluations, training, and fit testing for their employees enrolled in the respiratory protection program.
- The provision of respirators for voluntary use will be at the discretion of employees' department and ESSR. Provide voluntary use fact sheet to employees who voluntarily use respirators.

**D. Respirator Users**

- Comply with all components of this respirator program including medical monitoring, training, fit testing, use, cleaning, and storage.
- Follow job site and task specific procedures used for each department.
- Use the correct type of respiratory protection for the hazard(s).
- Properly inspect, clean, store, and maintain all assigned respirator equipment.
- Report any wear issues, respirator deficiencies, or malfunctions to your supervisor.

#### IV. Definitions

The following definitions are important terms used in the OSHA respiratory protection standard and the UMD respiratory protection program.

***Air-purifying respirator*** means a respirator equipped with filters, cartridges, and/or canisters that removes specific air contaminants in the air.

***Assigned protection factor (APF)*** means the workplace level of respiratory protection that a respirator or class of respirators is expected to provide to employees when the employer implements a continuing, effective respiratory protection program as specified by this section.

***Atmosphere-supplying respirator*** means a respirator 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.

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

***Demand respirator*** means an atmosphere-supplying respirator that admits breathing air to the facepiece only when a negative pressure is created inside the facepiece by inhalation.

***Emergency situation*** means 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*** means 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)*** means 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.

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

***Filter or air purifying element*** means a component used in respirators to remove solid or liquid aerosols from the inspired air.

***Filtering facepiece (dust mask)*** means a negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium.

***Fit factor*** means 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.

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

**Helmet** means a rigid respiratory inlet covering that also provides head protection against impact and penetration.

**High efficiency particulate air (HEPA) filter** means 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.

**Hood** means a respiratory inlet covering that completely covers the head and neck and may also cover portions of the shoulders and torso.

**Immediately dangerous to life or health (IDLH)** means an atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.

**Interior structural firefighting** means the 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. (See 29 CFR 1910.155)

**Loose-fitting facepiece** means a respiratory inlet covering that is designed to form a partial seal with the face.

**Maximum use concentration (MUC)** means the maximum atmospheric concentration of a hazardous substance from which an employee can be expected to be protected when wearing a respirator, and is determined by the assigned protection factor of the respirator or class of respirators and the exposure limit of the hazardous substance. The MUC can be determined mathematically by multiplying the assigned protection factor specified for a respirator by the required OSHA permissible exposure limit, short-term exposure limit, or ceiling limit. When no OSHA exposure limit is available for a hazardous substance, an employer must determine an MUC on the basis of relevant available information and informed professional judgment.

**Negative pressure respirator (tight fitting)** means a respirator in which the air pressure inside the facepiece is negative during inhalation with respect to the ambient air pressure outside the respirator.

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

**Physician or other licensed health care professional (PLHCP)** means an 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 OSHA 29 CFR 1910.134 paragraph (e).

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

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

**Pressure demand respirator** means a positive pressure atmosphere-supplying respirator that admits breathing air to the facepiece when the positive pressure is reduced inside the facepiece by inhalation.

**Qualitative fit test (QLFT)** means a pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.

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

**Respiratory inlet covering** means 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 facepiece, helmet, hood, suit, or a mouthpiece respirator with nose clamp.

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

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

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

**Tight-fitting facepiece** means a respiratory inlet covering that forms a complete seal with the face.

**User seal check** means an action conducted by the respirator user to determine if the respirator is properly seated to the face.

## V. Hazard Evaluation

Prior to the selection and use of respirators, supervisors assisted by ESSR personnel will identify and evaluate the respiratory hazard(s) for tasks in each work site to determine if respirator use is required or voluntary. The details of the hazard evaluation shall be documented by the department and sent to ESSR. A hazard assessment form is included in the appendices section.

This evaluation will include the following:

- Identify the hazardous substance(s) in use.
- Consider less hazardous materials, processes and/or engineering controls which would eliminate the need for respiratory protection.
- Determine the potential exposure levels to these hazardous substances, through evaluation of the process, discussions with employees, and/or air monitoring.

References such as product labels, safety data sheets (SDS), texts, and communication with product manufacturers will be used to determine the chemical and physical form of air contaminants.

Exposure monitoring will be used to quantify the level of employee exposure to air contaminants, where feasible. Contaminant identity and exposure levels will be compared to OSHA permissible exposure limits (PELs) and/or accepted consensus standards to determine the degree of respiratory protection required for each task.

In addition to employee exposures, other factors affecting respirator use and reliability will be considered. These include:

- Additional PPE needed for the job task which may affect respirator use.
- Duration and frequency of respirator use.
- If respirator use is routine, periodic, or for emergencies.
- Worksite factors (temperature, relative humidity, estimated physical effort).
- Any recommendations from the UHC-OHU regarding the employee's respirator use.

If new hazards are identified, or if new state or federal standards are implemented, additional hazard evaluations will be conducted.

## **VI. Voluntary Respirator Use**

Employees who voluntarily use respiratory protective equipment are covered in this program. Voluntary use is choosing to wear a respirator when there is no regulatory or exposure-based requirement. Voluntary use of respirators does not carry the same program requirements as required use.

The decision to use respirators voluntarily will be made by the department in consultation with ESSR. Situations may occur on sites such as: where nuisance dust is generated below the permissible exposure limit, when working with animals, or when mold exposure results in reactions in sensitive individuals.

If employees elect to voluntarily use disposable respirators, and if there are no identified inhalation hazards, they can be used as follows:

- Voluntary use of a filtering facepiece (i.e. N95) does not require medical clearance or fit testing prior to use.
- A hazard evaluation must be performed prior to voluntary use of a tight-fitting respirator (i.e. half-face air purifying, full-face air purifying, or supplied air) to determine if use is voluntary or required.
- Voluntary use of a tight-fitting respirator does require medical clearance prior to use (see medical evaluation section).
- The respirator must be cleaned, stored, and maintained so its use does not present a health hazard to the user.
  - This is not required if only disposable filtering facepieces are used.

Employees who choose to voluntarily wear respirators are responsible for reading and following Appendix D of OSHA 29 CFR 1910.134, which details respirator limitations and use, as listed on the following page.

Appendix D to Sec. 1910.134 (Non-Mandatory) Information for Employees Using Respirators when not required Under the Standard

Respirators are an effective method of protection against designated hazards when properly selected and worn.

Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for workers. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the worker. Sometimes, workers may wear Page 10 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 follow 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.

## **VII. Required Respirator Use**

When respirator use is required, respirators must be provided at no cost to the employee by the employee's department or unit following their medical evaluation and training. All respirators used by UMD employees must be NIOSH-certified and used according to manufacturer's instructions.

### **A. Respirator Selection Procedures**

Respirators are selected as appropriate based on the assigned protection factor (APF) and maximum use concentration (MUC).

Supervisors are required to have respirator selection criteria reassessed whenever circumstances change that may compel use of different levels of respiratory protection or if the work environment places increased physical demands upon the employee.

#### *1. IDLH Atmospheres*

The following respirator types are approved for use in IDLH atmospheres:

- Full facepiece pressure demand SARs with auxiliary SCBA unit or full facepiece pressure demand SCBAs, with a minimum service life of 30 minutes, must be provided.
- Respirators used for escape only are NIOSH-certified for the atmosphere in which they will be used.
- Oxygen deficient atmospheres (<19.5%) are considered IDLH.

#### *2. Non-IDLH Atmospheres*

Selection of respirators for non-IDLH atmospheres shall be based on the following:

- The nature of the hazard
- The extent, concentration of the hazard
- Work requirements and conditions
- Characteristics and limitations of available respirators
- Exposure monitoring data (if needed and/or feasible)

## **B. Medical Evaluation for Respirator Use**

A medical evaluation is required to determine an employee's fitness for respirator use. The employee's department is required to arrange a medical evaluation through UHC-OHU. Medical certifications will be provided by a physician or other licensed health care professional (PLHCP) at the Health Center. Medical evaluations will be discontinued when the employee is no longer required to wear a respirator.

The UHC-OHU shall assure confidentiality of all examinations and questionnaires. The UHC-OHU shall maintain records of all medical testing, history questionnaires, and certifications of respirator use eligibility.

### **1. Medical Screening**

Medical screening shall be conducted as follows:

- The medical evaluation will be completed during normal working hours, or at a time and place that is convenient to the employee prior to fit testing.
- The medical evaluation will be conducted using the OSHA Respirator Medical Evaluation Questionnaire in Appendix C of section 1910.134. The PLHCP will provide a copy of this questionnaire, or it can be accessed at the following link:  
<http://www.health.umd.edu/sites/default/files/Respirator%20Questionnaire%20510.pdf>
- Based on the answers to the questionnaire, the UHC-OHU may request an in-person consultation. The supervisor is responsible for scheduling the appointment and assuring employee attendance.
- Medical evaluation parameters and frequency of evaluations are determined by the PLHCP.
- Employees, their supervisors, and ESSR will be provided a pass/fail document of medical clearance for respirator use and will include an expiration date for the clearance. The expiration date is at the discretion of the PLHCP.
- When an employee's medical certification is due for renewal, the supervisor shall schedule the individual for an appointment with the UHC-OHU at least 30 days prior to the expiration date.

### **2. Additional Medical Evaluations**

Additional medical evaluations may be required under the following circumstances:

- An employee reports signs and/or symptoms related to their ability to use a respirator, such as shortness of breath, dizziness, chest pains, or wheezing. The employee or supervisor should contact the UHC-OHU immediately if this occurs.
- The PLHCP determines the employee needs to be re-evaluated.
- Observations made during fit testing indicates a need for reevaluation.
- A change occurs in workplace conditions that may result in an increased physiological burden on the employee.

### **C. Training**

Employees required to wear respirators shall receive training prior to the first use of a respirator and annually thereafter. Employees shall be trained in the limitations, selection, care, and use of the equipment. Training will vary depending on the type of respirator issued and the nature of the inhalation hazard.

Initial respiratory protection training will be in-person. Annual refresher training may either be in-person or on-line. Training shall be conducted or coordinated by ESSR and will include all required components stipulated in OSHA 29CFR 1910.134.

Supervisors shall maintain all training records, and ensure all employee training is current. They are responsible for ensuring employees are issued respirators only if their training is up-to-date.

Specialized training will be required for personnel assigned to SCBA equipment.

### **D. Respirator Fit Testing**

Respirator users shall receive medical monitoring and respiratory protection training prior to fit testing. Additional training will be given during the respirator fit test.

Supervisors are responsible for ensuring employees are fit tested initially and annually, and shall not issue respirators to any employee who has not met the requirements outlined in this program.

Facial hair cannot interfere with either the sealing surface or function of the respirator.

Fit testing of respirators will be conducted by ESSR for all tight-fitting facepiece types for employees required to wear respirators. Quantitative fit testing (QNFT) will be

conducted with the respirator make, model, and size of the respirator that will be used. The respirator user shall be fit tested prior to initial use and at least annually thereafter.

A written passing certification will be presented to the employee following a successful fit test. This certificate will be kept on file in ESSR and with the supervisor.

ESSR will conduct additional fit testing if any change occurs that may alter respirator fit. These may include, but are not limited to, the following:

- facial scarring
- dental changes
- cosmetic surgery
- obvious change in body weight

#### 1. Quantitative Fit Tests

A particle counter is used to accurately measure respirator fit by comparing particles in the air with those inside the respirator. Particles will be produced by a salt generator. The ratio of these concentrations is the fit factor. For half-face or N95 respirators, the acceptable fit test is a measured fit factor of at least 100. Full face respirators must demonstrate an acceptable fit factor of at least 500.

A modified filter cartridge or facepiece equipped with a sampling port is used to collect air from inside the respirator. The user is asked to perform several exercises to challenge the respirator fit.

Fit tests shall be administered by ESSR using an OSHA accepted quantitative fit testing (QNFT) protocol as outlined in 29CFR 1910.134, which is listed on the following page.

## **Appendix A to § 1910.134: Fit Testing Procedures (Mandatory)**

Exercise regimen. Prior to the commencement of the fit test, the test subject shall be given a description of the fit test and the test subject's responsibilities during the test procedure. The description of the process shall include a description of the test exercises that the subject will be performing. The respirator to be tested shall be worn for at least 5 minutes before the start of the fit test.

The fit test shall be performed while the test subject is wearing any applicable safety equipment that may be worn during actual respirator use which could interfere with respirator fit.

Test Exercises.

a) Employers must perform the following test exercises for all fit testing methods prescribed in this appendix, except for the CNP quantitative fit testing protocol and the CNP REDON quantitative fit testing protocol. For these two protocols, employers must ensure that the test subjects (*i.e.*, employees) perform the exercise procedure specified in Part I.C.4(b) of this appendix for the CNP quantitative fit testing protocol, or the exercise procedure described in Part I.C.5(b) of this appendix for the CNP REDON quantitative fit-testing protocol. For the remaining fit testing methods, employers must ensure that employees perform the test exercises in the appropriate test environment in the following manner:

(1) Normal breathing. In a normal standing position, without talking, the subject shall breathe normally.

(2) Deep breathing. In a normal standing position, the subject shall breathe slowly and deeply, taking caution so as not to hyperventilate.

(3) Turning head side to side. Standing in place, the subject shall slowly turn his/her head from side to side between the extreme positions on each side. The head shall be held at each extreme momentarily so the subject can inhale at each side.

(4) Moving head up and down. Standing in place, the subject shall slowly move his/her head up and down. The subject shall be instructed to inhale in the up position (*i.e.*, when looking toward the ceiling).

(5) Talking. The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song.

### ***Rainbow Passage***

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.

(6) Grimace. The test subject shall grimace by smiling or frowning. (This applies only to QNFT testing; it is not performed for QLFT)

(7) Bending over. The test subject shall bend at the waist as if he/she were to touch his/her toes. Jogging in place shall be substituted for this exercise in those test environments such as shroud type QNFT or QLFT units that do not permit bending over at the waist.

(8) Normal breathing. Same as exercise (1).

(b) Each test exercise shall be performed for one minute except for the grimace exercise which shall be performed for 15 seconds. The test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried. The respirator shall not be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated.

## 2. *Qualitative Fit Tests*

Qualitative fit tests will be performed on an as-needed basis only when quantitative fit tests cannot be performed. The respirator user is exposed to an atmosphere containing an irritating or observable aerosol and then asked to perform several exercises to challenge the respirator fit. The user self-reports any noticeable irritation during this test.

## VIII. **Respirator Use**

### A. **Face Seals**

- Facial hair shall not interfere with the sealing surface of the face piece or the valve function of the respirator.
- Users of tight-fitting respirators shall perform a seal check each time they put on the respirator using the procedures in OSHA's Appendix B-1 as described below:

#### **Appendix B-1 to Sec. 1910.123: User Seal Check Procedures (Mandatory)**

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

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 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 may be used instead of the positive and/or negative pressure check procedures provided the employer demonstrates the manufacturer's procedures are equally effective.**

**B. Corrective glasses/goggles**

- Corrective glasses or goggles or other personal protective equipment shall not be worn in a manner that interferes with the face piece seal.
- If necessary, corrective lenses shall be incorporated into the respirator with a kit specific to the brand and type of respirator.

**C. Identification of Filters, Cartridges, and Canisters**

All filters, cartridges, and canisters shall be labeled and include the NIOSH approved color coded label. Labels must not be removed and shall remain legible at all times.

**IX. Continuing Respirator Effectiveness**

Employees shall leave the respirator use area for a safe area whenever necessary to perform the following operations:

- Respirator inspection.
- To wash faces and/or respirator face pieces as necessary to prevent eye or skin irritation.
- If vapor or gas breakthrough is detected.
- If changes in breathing resistance occurs.
- If face piece leakage is detected.
- To replace the respirator, filters, cartridges, or canisters.

Supervisors are responsible for respirator oversight and monitoring. When there is a change in the following, the respirator shall be re-evaluated for effectiveness:

- Change in work area conditions.
- Employee exposure or stress which may affect respirator effectiveness.

## **X. Procedures for Respirator Use in IDLH Atmospheres**

### **A. IDLH Atmosphere Respirator Types**

The following respirator types are approved for use in IDLH atmospheres:

- Full facepiece pressure demand SARs with auxiliary SCBA unit or full facepiece pressure demand SCBAs, with a minimum service life of 30 minutes, must be provided.
- Respirators used for escape only are NIOSH-certified for the atmosphere in which they will be used.
- Oxygen deficient atmospheres (<19.5%) are considered IDLH.

### **B. IDLH Respirator Procedures**

The following procedures apply to all IDLH atmospheres:

- At least one employee will be located outside the IDLH atmosphere with a line of communication in case of emergency. These employees will be trained and equipped to provide emergency rescue, if needed.
- Visual, voice, or signal line communication will be maintained between employees inside and outside of the IDLH atmosphere.
- Supervisors shall be notified if emergency rescue is needed, following contact with emergency services.
- Employees outside the IDLH atmosphere will be equipped with the following:
  - Pressure demand or other positive pressure SCBA or supplied air respirator with auxiliary SCBA.
  - Appropriate retrieval and/or rescue equipment for removing the employee(s) who enter IDLH atmospheres.

## **XI. Supplied Air Respirator Use Requirements**

The use, inspection, and maintenance of supplied air respirators requires implementation of additional procedures. Airline respirators and SCBA must deliver acceptable air quality to the user.

### **A. Air Quality - SCBA and other cylinder supplied respirators**

- Only grade D breathing air shall be used. Grade D breathing air is described in ANSI/Compressed Gas Association Commodity Specification for air, G-7.1-1989 and includes:
  - Oxygen content (v/v) of 19.5% - 23.5%
  - Hydrocarbon (condensed) content of 5 mg/m<sup>3</sup> of air or less
  - Carbon monoxide content of 10 ppm or less
  - Carbon dioxide content of 1,000 ppm or less
  - Lack of noticeable odor
- The supervisor is required to document breathing air quality from the supplier. A form for this documentation is listed in the appendix.
- Supplier documentation of breathing air quality should be obtained yearly.

### **B. Air Compressor – construction and use**

Air compressors must be constructed and used according to the following:

- Contaminated air cannot be entrained into the air supply system.
- Moisture content is minimized (dew point at 1atm is 10°F below the ambient temperature).
- Suitable in line air purifying sorbent beds and filters are installed to ensure breathing air quality.
- Sorbent beds and filters are maintained/replaced per the manufacturer's instructions.
- Carbon monoxide concentrations must not exceed 10ppm.
- Compressors shall have a tag containing the most recent change date and the signature of the person authorized to perform the change. The tag will be maintained at the compressor.

## **XII. Cleaning, Storage, Inspection, and Maintenance**

Site-specific cleaning, storage, inspection, and maintenance procedures shall be determined by the supervisor and documented in the "Site-Specific Procedures" section in the appendices.

### **A. Cleaning**

Respirators must be cleaned and disinfected using the procedures in OSHA's 29 CFR 1910.134 Appendix B-2, or procedures recommended by the respirator manufacturer, provided such procedures are as effective. The respirators shall be cleaned and disinfected at the following intervals:

- Respirators for the exclusive use of the employee are to be cleaned as often as necessary to maintain sanitary conditions.
- Respirators for shared use shall be cleaned after each use.

### **B. Inspection**

Respirators shall be inspected before and after each use, and during cleaning. Inspections for each respirator type should include the following:

1. Filtering facepiece respirators
  - holes in filter
  - elasticity of straps
  - functionality of metal nose clip
2. Air-purifying respirators
  - facepiece is clean, intact and free of cracks and/or damage
  - buckles or attachments are intact
  - breathing tube is intact and connectors are in place
  - valves and valve seats are not damaged, worn, dirty, or stuck in place
  - straps are elastic and not overstretched
  - proper cartridges/filters are being used and fit properly into respirator
3. Supplied air respirators
  - facepiece is clean, intact, and free of cracks and/or damage

- head straps retain elasticity and are free of breaks or tears
- buckles or attachments are intact
- hoods/helmets are intact, headgear is properly suspended
- Protective face shields/screens have no breaks and fit correctly into hoods
- Breathing air quality is correct (as described in “air quality” section)
- Supply hoses and fittings have no breaks or kinks
- Regulators and valves are properly set and connections are tight
- Adequate pressure and/or airflow
- Alarms function

### **C. Respirator Maintenance**

#### **1. Respirators Maintained for Emergency Use**

- The respirator will be certified by documenting the date of inspection, the name and signature of the person who made the inspection, the findings, required remedial action, and a means of identifying the inspected respirator.
- The information will be attached to the storage bag or area for the respirator.

#### **2. Respirator Repairs**

- Repairs or adjustments to respirators will be made only by persons trained to perform them using only the respirator manufacturer’s NIOSH-approved parts designed for the respirator.
- Repairs will be made according to the manufacturer’s recommendations and specifications for the type and extent of repairs to be performed.

### **D. Storage**

Respirators and cartridges shall be kept in a sealed container and stored in a clean, dry, temperature controlled environment under the following conditions:

- Gas and vapor cartridges must be kept in a sealed container so they do not passively adsorb gasses and vapors from the storage area as this would reduce their service life.
- Particulate filters will be protected from dust and dirt.
- Emergency use respirators should be stored in a sturdy compartment that is quickly accessible and clearly marked.

Storage procedures will be outlined in the site-specific respiratory protection information included in the appendices section.

### **XIII. Cartridge Change-Out Schedule**

In partnership with ESSR, the supervisor of each worksite utilizing air-purifying respirators equipped with cartridges must develop a cartridge change schedule. Forms for change-out schedules are included in the appendices section. Change-out schedules can be determined through one of several methods, including experimental tests, math model tables, manufacturer's recommendations, end of service life indicators, or workplace audits. These are outlined below.

#### **A. Cartridge Service Life**

The service life of a cartridge depends upon many factors including:

- Environmental conditions
- Breathing rate
- Cartridge filtering capacity
- Concentration of contaminant(s) in the air

#### **B. Cartridge Change-Out Schedule**

Cartridge change-out schedules will be determined by one of the following methods:

- Experimental tests
- Manufacturer's recommendation
- Mathematical model table
- End of service life indicator (ESLI)

### **XIV. Evaluation of Respirator Program Effectiveness**

The following information can serve as an indication of the degree of protection provided by respirators and the effectiveness of the respirator program. Action shall be taken to correct any deficiencies noted with the program.

#### **A. Periodic Surveys**

ESSR will conduct periodic surveys to determine the effectiveness of the respiratory protection program. This will include the following:

- Worksite inspections to evaluate site-specific programs are being properly implemented.

- Interviews with respirator users
- Review of records
- Air monitoring

#### **B. Respirator User Interviews**

Respirator users will be interviewed periodically regarding their respirator use. Consultation will include interviewing respirator users of the following regarding their respirator use:

- Appropriate respirator selected for hazards present
- Respirator fit and comfort
- Respirator maintenance and storage
- Any problems with respirator use

#### **XV. Workplace Audits**

Supervisors are required to annually evaluate the use of respiratory protection for their areas/employees. The purpose of the audit is to identify deficiencies and issues that require correction or action. A form for audits is included in the appendices. At a minimum, the following should be evaluated:

- Use of new materials which may require hazard assessment.
- Employees using respirators have current training, medical monitoring, and fit testing.
- Respirators are being properly used, maintained, and stored.
- Information for site-specific respiratory use as stated in the UMD Respiratory Protection Program is current and has been submitted to ESSR.
- All employees who voluntarily wear respirators have received a copy of the Voluntary Use Fact Sheet.
- Cartridges and filters are changed according to the change-out schedule as outlined in this program.
- Employees are routinely inspecting respirators.
- Inspections are conducted and documented for emergency use respirators.

Any problems or deficiencies identified during the audit must be expeditiously corrected. ESSR can assist supervisors with appropriate guidance when requested.

## **XVI. Recordkeeping**

Medical evaluation record required by this program will be retained by the University of MD Occupational Health Center and made available in accordance with 29 CFR 1910.1020.

Fit testing records will be established and maintained by ESSR including:

- The name and UID of the employee tested
- Type of fit test performed
- Specific make, model, style, and size of respirator tested
- Date of fit test
- Pass/fail results for qualitative fit tests

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

ESSR will retain a copy of the current written respirator program.

Written materials, which are required to be retained under the respiratory protection standard, will be made available upon request to affected employees and to the authorities having jurisdiction or designee for examination and copying.

## **XVII. Site Specific Respiratory Protection Information**

### **A. Site-Specific Respiratory Protection Forms**

The site specific respiratory protection forms (included in the appendices section) shall be written and maintained by the supervisor and submitted to ESSR. ESSR personnel can assist supervisors in the collection of data necessary to complete this document, if needed. This form includes information regarding the following:

- Hazard evaluations (performed in partnership with ESSR personnel)
- Tasks requiring use of respirators
- Employees using respirators
- Respirator cartridge change-out schedules
- Cleaning, storage, and maintenance of respirators

### **B. Modification of Site-Specific Respiratory Protection Forms**

The supervisor is responsible for ensuring the above information is completed, maintained, and submitted to ESSR. Modification of these sections may be required when any of the following situations present:

- Addition or removal of employees to the respirator program
- Equipment or process additions and/or modifications
- Work practice alterations

- New inhalation hazards
- Any condition that may affect the proper use of respirator equipment

## Appendices

### Respiratory Hazard Evaluation Form

Date:	Contact name:
Department:	Location(s):

Will work be performed in an oxygen-deficient atmosphere (<19.5%) Yes      No

List any of the following hazards below

Gas/vapor hazards	Particulate (dust, fume, mist) hazards	To be completed by ESSR Personnel PEL, STEL, and/or TLV

List any specific characteristics to any contaminants/hazards listed above (e.g., gas, mist, vapor, dust, fume, biological, etc.)

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Describe the job tasks, frequency, and potential respiratory hazards associated with each task.  
List any products and materials which may be applicable

<b>Job tasks</b>	<b>Task frequency (routine, non-routine, emergency use only)</b>	<b>Potential respiratory hazards</b>	<b>Additional PPE Required for this task</b>

List any engineering controls currently in place

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What other engineering controls could be added to reduce exposures?

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List any other additional observations/recommendations

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Hazard Assessment Performed by	Date

## Respirator Protection Factors

The following table indicates the various types of respirators available, and the maximum OSHA assigned protection factor to each.

Respirator Type	Assigned Protection Factor (APF)
Filtering facepiece*	10
Half mask (elastomeric)*	10
Full facepiece (elastomeric)*	50
Powered air-purifying respirator (PAPR) – loose fitting or hood	25/1000**
Powered air-purifying respirator (PAPR) – tight fitting full facepiece	1,000
Supplied-Air Respirator (SAR) or Airline Respirator (helmet/hood)	25/1,000**
Self-Contained Breathing Apparatus (SCBA)	10,000

\*needs to be fit tested

\*\*Must have evidence provided by the respirator manufacturer that testing of hood PAPRs demonstrates performance at a level of protection of 1,000 or greater to receive an APF of 1,000. Absent such testing, all other PAPRs and SARs with hoods/helmets are to be treated as loose-fitting facepiece respirators and receive an APF of 25.

## Qualitative Fit Testing Procedures (OSHA 29 CFR 1910. 134 Appendix A)

Exercise regimen. Prior to the commencement of the fit test, the test subject shall be given a description of the fit test and the test subject's responsibilities during the test procedure. The description of the process shall include a description of the test exercises that the subject will be performing. The respirator to be tested shall be worn for at least 5 minutes before the start of the fit test.

The fit test shall be performed while the test subject is wearing any applicable safety equipment that may be worn during actual respirator use which could interfere with respirator fit.

### Test Exercises.

a) Employers must perform the following test exercises for all fit testing methods prescribed in this appendix, except for the CNP quantitative fit testing protocol and the CNP REDON quantitative fit testing protocol. For these two protocols, employers must ensure that the test subjects (*i.e.*, employees) perform the exercise procedure specified in Part I.C.4(b) of this appendix for the CNP quantitative fit testing protocol, or the exercise procedure described in Part I.C.5(b) of this appendix for the CNP REDON quantitative fit-testing protocol. For the remaining fit testing methods, employers must ensure that employees perform the test exercises in the appropriate test environment in the following manner:

(1) Normal breathing. In a normal standing position, without talking, the subject shall breathe normally.

(2) Deep breathing. In a normal standing position, the subject shall breathe slowly and deeply, taking caution so as not to hyperventilate.

(3) Turning head side to side. Standing in place, the subject shall slowly turn his/her head from side to side between the extreme positions on each side. The head shall be held at each extreme momentarily so the subject can inhale at each side.

(4) Moving head up and down. Standing in place, the subject shall slowly move his/her head up and down. The subject shall be instructed to inhale in the up position (*i.e.*, when looking toward the ceiling).

(5) Talking. The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song.

### ***Rainbow Passage***

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.

(6) Grimace. The test subject shall grimace by smiling or frowning. (This applies only to QNFT testing; it is not performed for QLFT)

## Site-Specific Respiratory Protection Plan

The supervisor is responsible for ensuring the information in this site-specific respiratory protection plan is completed, and updated, when necessary. Prior to completing this plan, contact ESSR for a hazard evaluation to determine if respirator use is required, and assist with respirator and filter/cartridge selection if needed.

This site-specific plan should include the following information, listed below:

- Hazard assessment (performed in partnership with ESSR personnel)
- Departmental respirator users and site-specific program information
- Respirator cleaning, maintenance, and storage procedures
- Additional relevant information and/or documentation
- Emergency respirator use – record of monthly inspection (if relevant to the program)

### Hazard Assessment

Attach the hazard assessment to the site-specific respiratory protection plan. This will document the tasks, task frequency, air contaminants, engineering controls, and any pertinent additional information present regarding respirator use.

### Respirator Users and Program Information

List the following information below:

- Employee name
- Respirator model, size, filters, and/or cartridges used
- Respirator physical date (conducted by Occupational Unit of the University Health Center)
- Initial training and/or online refresher date (note: initial training must be completed in-person at ESSR)
- Fit test date (conducted by ESSR personnel)

Employee name and job title	Respirator model/filters/cartridges	Respirator physical date	Initial training/online refresher date	Fit test date

**Cleaning, maintenance, and storage procedures**

List respirator cleaning procedures (using procedures in OSHA’s 29 CFR 1910.134 Appendix B-2, or others recommended by the manufacturer)

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List respirator maintenance procedures (location of spare parts, filters, other applicable equipment and/or procedures)

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List respirator storage location(s)

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List any additional relevant information and/or documents pertaining to this site-specific respiratory protection program. Attach supporting documents to this plan (e.g., air monitoring results, breathing air quality test data, respirator manufacturer’s literature, fit test certifications, etc.).

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## Emergency Respirator Use – Record of Inspection

**Complete this record of monthly inspection for each respirator used for emergency use in the department.**

*Inspection Procedure for Emergency Use Respirators*

1. Straps: Headbands, fasteners, and adjusters are tight and elastic.
2. Inhalation/exhalation valves: No cracks, tears, or dirt between valve and valve seat.
3. Facepiece: Ensure it is not cut, torn, modified, deteriorated, or dirty.
4. Lens: Should not be scratched, cracked, broken, or otherwise damaged, and completely sealed around the face-piece.
5. Cartridge holders: Gaskets are in place and not cracked or damaged. Remove the gaskets to check for dirt under them.
6. Cartridges/filters: Use the cartridge appropriate for the hazard. Inspect cartridges for cleanliness, dents, scratches, or damage to the seals. Do not wash cartridges or clean with compressed air.

**Record inspection information below**

<b>Respirator User:</b>	<b>Respirator make:</b>	<b>Respirator Model:</b>
<b>Respirator size:</b>	<b>Respirator ID#</b>	<b>Location:</b>

Date	Inspector Initials	Valves inspected (Y/N)	Facepiece inspected (Y/N)	Lens inspected (Y/N)	Straps inspected (Y/N)	Action items/comments

## Health Center Respiratory Protection Program Forms