University of Nebraska Lincoln

Environmental Health and Safety

RESPIRATORY PROTECTION PROGRAM

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1 Introduction

In the course of their employment at the University of Nebraska-Lincoln (UNL), some employees may be required to use respiratory protection equipment (RPE) to reduce exposure to airborne hazards that may cause occupational injuries or illnesses. These airborne hazards may occur in the form of a gas, vapor, fume, smoke, fog, dust, mist, bio-aerosols, lack of sufficient oxygen in the space, or extreme temperatures.

Control of exposures to respiratory hazards must be accomplished, as far as reasonably achievable, by accepted engineering controls. Engineering controls may include isolation, confinement, local or general ventilation, and/or substitution of less hazardous materials. Respiratory protection may be used to protect employees from respiratory hazards only when engineering controls are not feasible, while they are being implemented or evaluated, or when needed as a supplement to engineering controls. This written program establishes the procedures for use of RPE at UNL to protect employee health and safety and to comply with regulatory requirements.

1.1 Regulatory Authority

The development and implementation of the UNL Respiratory Protection Program is in accordance with the regulations of the State of Nebraska Department of Labor, Title 230, Chapter 6 – Workplace Safety Consultation Program. This regulation references the OSHA standards. The specific OSHA standard for Respiratory Protection Equipment is 29 CFR 1910.134 – Respiratory Protection.

There are other specific OSHA standards with requirements for use of RPE (e.g., formaldehyde, cadmium, beryllium, etc.). These are usually referred to as Subpart Z standards. This Respiratory Protection Program also applies to specific OSHA standards that require RPE. All state and federal regulations relating to procedures in this document are available upon request from the UNL Department of Environmental Health and Safety (EHS).

1.2 Application

This program is applicable to all UNL employees who, during the course of their work duties, are required to use RPE to control their exposure to respiratory hazards and those who are not required to use RPE but voluntarily choose to do so. This program is applicable both to short- and long-term use of RPE. Roles and responsibilities are also assigned to supervisors of employees who are required to use RPE and their respective department leaders.

1.3 Glossary

Definitions for terms used in this program and referenced standards or regulations are provided in Appendix A.

1.4 Overview

Major components of the UNL Respiratory Protection Program are as follows.

- Notification to EHS of potential tasks or jobs that may require the use of respiratory protection (Section 2.1).
- EHS assessment of hazards to determine the type of protection, if any, that may be needed (Section 2.2). When feasible, hazards will be reduced or eliminated by other means such as substitution of a less toxic product or use of engineering controls.
- Selection of the appropriate type(s) of RPE for a given task with consideration given to data gathered during the assessment process and the ability of a particular individual to wear a certain type of respirator (Section 2.3).
- Medical evaluation of employees who are required to wear RPE (Section 2.4).
- Fit-testing of employees who are medically-qualified to wear RPE (Section 2.5), and assigned to wear tight-fitting respirators, including filtering facepieces.
- Training (Section 2.6).
- Use of RPE (Section 2.7).
- Maintenance of RPE, including stocking of replacement parts and cleaning supplies for the equipment (Section 2.8).
- Recordkeeping to demonstrate compliance with the requirements of the UNL Respiratory Protection Program (Section 2.9).

Section 3 summarizes roles and responsibilities. Appendix B provides information about specific types of respiratory protection equipment.

2 Program Elements

2.1 Notification to EHS of Operations that may Require RPE

Anyone with knowledge of existing or planned operations that may present a respiratory hazard, particularly supervisors, must notify EHS to initiate an evaluation. Examples of operations that may require RPE include those that generate fumes or dusts such as welding, woodworking, and farming. Other operations that may require RPE include painting when using oil-based paints or epoxies, pesticide application, fumigation, chemical usage without adequate engineering controls, laboratory operations that may generate uncontained bioaerosols, animal handling, and asbestos removal. This list of operations that may require RPE is not exhaustive. Supervisors and employees should consult with EHS if they have any questions about their particular operations.

EHS will also utilize the following tools to identify potential respiratory hazards: workplace surveys (audits), injury/illness reports, Institutional Animal Care and Use protocols/evaluations, Radiation Safety protocols/evaluations, Institutional Biosafety protocols/evaluations, Unit Safety Committees, confined space entry permits, and campus communication (e.g., newsletters, listserv announcements, letters to new faculty, etc.).

2.2 Assessment of the Hazards of a Job or Task by EHS

Following identification of operations may require RPE, EHS will conduct and document (***Hazard Assessment Form***) an assessment to determine if RPE is needed. During the assessment, EHS will identify potential exposures associated with the operation, the form of the materials involved such as gas, vapor, or mist, and the level of exposure expected or measured. EHS will also assess the circumstances and conditions of use, as well as user-unique factors. EHS will use the information from the assessment to determine if feasible engineering and administrative controls are or should be implemented; and the appropriate type(s) of respiratory protection equipment. This information will be provided to the occupational medicine provider, as well as the employee and their supervisor.

For each use where RPE is determined to be necessary and therefore required, EHS will review the assessment at the time of refresher training to confirm that the conditions of use have remained stable; and if not, conduct a new assessment. EHS will also review the assessment upon notification of potential changed conditions by the respirator user or their supervisor, or other indication that a review is warranted.

2.3 Selection of Respiratory Protection Equipment

There is a wide variety of respiratory protection equipment available, and it is important to assure that the equipment used is appropriate for the employee, the hazard, and the work conditions. Appendix B provides general information on the different types of RPE. Of the types described in Appendix B, nearly all uses at UNL involve air-purifying respirators. In all circumstances, only NIOSH-approved respirators are appropriate. Devices that are not NIOSH-approved are not considered respirators and should never be used for protection against over exposure to any atmospheric hazard.

EHS will use OSHA's Assigned Protection Factors (APFs) and the criteria established by NIOSH in its publication "NIOSH RESPIRATOR DECISION LOGIC," the Safety Data Sheet or other reputable sources of hazard information, information obtained during the assessment, and professional judgment to determine appropriate respiratory protection device(s) for a given job situation. When more than one type of respirator is suitable for a given task or job, final selection will be based on the opinion of the medical provider and other relevant factors.

When respirators are being used in a clinical setting for the purpose of disease control or prevention (medical purposes), they are also subject to FDA approval. In these limited circumstances, dual NIOSH and FDA approval of the respirator is required.

SCBAs are not used at UNL. Any anticipated use of a SCBA requires notification to EHS so that appropriate procedures can be developed and implemented.

2.4 Medical Evaluation

Every employee who is ***required to use*** a respirator (including filtering facepieces) to protect their health and all persons who ***voluntarily use*** a respirator (other than filtering facepieces) must be medically evaluated and qualified before using RPE. The purpose of this evaluation is to determine whether the employee is physically and

psychologically able to perform their work while wearing RPE. Voluntary use of only filtering facepieces is not subject to medical qualification. See EHS SOP, ***Voluntary Use of Respiratory Protection Equipment*** and Section 2.7.5 of this document.

At a minimum, medical evaluation consists of review of a medical history questionnaire. At the discretion of the attending medical professional, a physical exam or other follow-up tests may be required. Medical qualification must be obtained initially before an employee is allowed to wear a respirator. Medical re-evaluation is required:

- At the intervals specified by the medical professional;
- When an employee reports medical signs or symptoms related to the ability to use a respirator;
- When observations are made that indicate a need for employee re-evaluation (i.e., by an employee's supervisor during conduct of work, by EHS during fit-testing, etc.);
- When change(s) occur in workplace conditions that may result in substantial increase in the physiological burden placed on the employee during respirator use (e.g., increase in physical work effort, protective clothing, temperature, etc.).

The required medical evaluation questionnaire is contained in Appendix C of 29 CFR 1910.134, and is reprinted in ***Medical Evaluation Questionnaire Form***.

EHS will provide a copy of the EHS Exposure Assessment to the attending medical professional to assist him/her in their determination of whether an employee is able to wear a respirator. Following evaluation of the questionnaire, exposure assessment, and/or physical examination, the attending medical professional makes one of three decisions: 1) the employee is capable of wearing designated RPE without limitations; or, 2) the employee is capable of wearing designated RPE but with prescribed limitations; or, 3) the employee is not capable of wearing any RPE.

If the medical professional determines that the employee can wear RPE, they will provide the employee, their supervisor, and EHS with copies of the written authorization (***Medical Surveillance Assessment Form***, or equivalent) including:

- A description of any limitations on the use or type of a respirator because of medical reasons;
- The need and interval for additional or recurring medical evaluations.

If the medical professional determines that the employee is not able to wear a respirator, (s)/he will provide a written denial to the employee and EHS. The written denial must not contain confidential medical information. If an employee is disqualified from use of a respirator, the supervisor may contact UNL Human Resources for consultation regarding potential impacts to employment.

2.5 Fit-testing of Respirators (Tight-fitting Respirators)

In general, users of all tight-fitting respirators (including filtering facepieces) must be fit-tested by EHS prior to initial use and at least annually thereafter. Fit-testing is not

required for loose-fitting respirators, or voluntary use of respirators. Additional fit-testing is required if:

- An employee is assigned a different make, model, style, or sized respirator;
- If the employee has a change in condition that may affect the fit of the respirator (e.g., facial scarring, change in body weight, dental or facial structural changes, etc.).

Supervisors and employees are responsible to ensure that fit-testing at the specified intervals is accomplished. EHS will send reminders to employees and/or their supervisors for regular annual fit-testing.

EHS, or designated and qualified representatives of EHS, conduct respirator fit testing to determine the specific model and size of the prescribed type of tight-fitting respirator needed by the employee to accomplish a tight face-to-respirator seal. Employees required to wear a tight-fitting respirator must not have any condition, such as facial hair, that affects the face-to- respirator seal or the correct functioning of the valves. Fit testing will not be performed for those employees with conditions that interfere with the fit or function of the respirator. At the time of fit testing, the employee will be provided an appropriate selection of face pieces and sizes to choose from. EHS will conduct the fit-testing in accordance with protocols established by OSHA in 29 CFR 1910.134.

2.6 Training

Employees who are required to wear a respirator must receive training prior to initial use of RPE and at least annually thereafter. Supervisors and employees are responsible to ensure that training at the specified intervals is accomplished. EHS will send reminders to employees and/or their supervisors of regular annual refresher training. EHS or a designated and qualified representative of EHS will provide training. Training and fit-testing are generally conducted concurrently.

Refresher training is also required under the following circumstances:

- Changes in the workplace or the type of respirator render previous training obsolete.
- Inadequacies in the employee's knowledge or use of the respirator indicate that the employee has not retained the requisite understanding or skill for use of RPE.
- A situation arises in which retraining appears necessary to ensure safe respirator use.

Successful completion of training requires the user to demonstrate knowledge of:

- Why the respirator is necessary and how improper fit, usage, or maintenance can compromise the protective effect of the respirator;
- The limitations and capabilities of the respirator;
- How to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions;
- How to inspect, put on and remove, use, and check the seals of the respirator;
- Procedures for maintenance and storage of the respirator;

- Medical signs and symptoms that may limit or prevent the effective use of respirators.

Following successful completion of training and fit-testing, employees and their supervisors will be provided with written information (***Respirator Training and Fit Test Record***) that describes the type, style, and size of respirator to which the employee has been trained and fit-tested. EHS will also maintain this record. The fit-test and training is valid ONLY for the respirator described. Fit-testing and training (and possibly medical qualification) must be repeated if changes are anticipated for the prescribed respirator.

Conditions of use (i.e., contaminants and approximate concentrations; relative physical exertion; etc.) will also be documented. EHS must be notified of anticipated changes to conditions of use to re-assess the suitability of the specified respirator. Changes to conditions of use may also necessitate repeat training, fit-testing, and medical qualification

In the case of voluntary use of respirators, EHS provides employees with a copy of Appendix D of 29 CFR 1910.134 or the equivalent EHS SOP, ***Voluntary Use of Respiratory Protection Equipment***, following the EHS assessment. This is the extent of training for voluntary use.

2.7 Use of Respirators

Procedures for routine use of RPE will depend on the type of RPE being used. Refer to the supplemental EHS SOPs and instructions provided by the manufacturer for specific types of respirators. General considerations for use of RPE and notable specific considerations are provided below.

2.7.1 General Considerations for Routine Use of All Respirators

All respirators required to be worn at UNL must be NIOSH certified. When respirators are being used in a clinical setting for the purpose of disease control or prevention (medical purposes), they are also subject to FDA approval. In these limited circumstances, dual NIOSH and FDA approval of the respirator is required.

Any respirator that is not NIOSH certified, a respirator that has been modified in any way, or a respirator that is in disrepair must not be used, whether use is required or voluntary. In addition, there shall be no condition that interferes with the protection provided by the RPE being used. Examples of such conditions are provided in the supplemental EHS SOPs and the manufacturer's instructions pertaining to specific equipment.

Users of tight-fitting RPE are required to conduct user seal checks each time that a respirator is donned. Whenever an employee has reason to believe that their RPE is not providing adequate protection, the employee should stop the operation, leave the area, and attempt to resolve the problem. Unresolved problems should be reported to the supervisor and EHS. Employees experiencing signs and/or symptoms of exposure should seek medical attention.

2.7.2 Specific Considerations For Use Of Supplied Air Respirators

The quality of the air provided to supplied air RPE must conform to OSHA requirements. The EHS SOP, ***Use and Maintenance of Supplied Air Respirator***, contains details regarding these requirements.

2.7.3 Respiratory Protection Equipment For Emergency Use, Firefighting, and/or IDLH Atmospheres

Currently, there is no use of respiratory protection equipment at UNL for these purposes. Should departments at UNL obtain RPE for use in the event of an emergency where there is a potential for an IDLH atmosphere, they must report to EHS so that specific written procedures for the use, inspection, and maintenance of the equipment can be developed and implemented. Consultation with EHS must occur before RPE for these purposes can be made available to any employee.

2.7.4 Interim Respirator Use

If use of a respirator is authorized because of non-existent or inadequate engineering controls, and engineering controls are deemed feasible, a plan for establishing necessary engineering controls to control potential exposures must be developed by the department. This plan will generally require consultation with Facilities Management and Planning and EHS. The department must review the status of establishing the engineering controls continuously until they are in place.

2.7.5 Voluntary Use of Respirators

UNL is not responsible for the cost of respirators that are used strictly on a voluntary basis, nor the cost of medical qualification if necessary.

A. Voluntary Use of Filtering Facepieces

If an employee elects to use a filtering facepiece and use is not required by UNL or necessary to maintain exposures below established limits, most provisions of this program do not apply. Voluntary use of a filtering facepiece requires only the following:

- Notifying EHS of intended voluntary use of a filtering facepiece by an employee so that a determination can be made that such use will not in itself create a hazard;
- Dissemination of OSHA required information on voluntary use (29 CFR 1910.134, Appendix D, *Information for Employees Using Respirators When Not Required Under the Standard*). EHS will provide the EHS SOP, ***Voluntary Use of Respiratory Protection Equipment*** or a copy of OSHA's Appendix D to the employee, as appropriate (e.g., after evaluation to confirm that use qualifies as "voluntary;" use will not in itself create a hazard; and use will be restricted to filtering facepieces only).

Required use of filtering facepieces must conform to all requirements of the UNL Respiratory Protection Program.

B. Voluntary Use of Respirators Other Than Filtering Facepieces

An employee may desire to use RPE other than a filtering facepiece when exposures do not require such equipment. In these situations, the requirements described above for voluntary use of filtering facepieces must be observed as well as the following:

- Employees must be medically qualified (Section 2.4)
- Supervisors and employees must assure that procedures specified by the manufacturer for cleaning, storing, and maintaining the respirators are implemented.

C. Special Requirements

There are special respiratory protection requirements listed in specific standards for employees who work with asbestos (29 CFR 1910.1001), cadmium (29 CFR 1910.1027), formaldehyde (29 CFR 1910.1048), lead (29 CFR 1910.1025), and 4,4'-methylene dianiline (29 CFR 1910.1050). The provisions of these specific standards and the requirements of this program apply when employees use RPE for protection while working with these substances.

EHS will provide guidance on these special requirements when the need is established based on EHS assessment of the operation. Supervisors of employees working with these materials must contact EHS for an assessment of the work area. Note that typical laboratory use (small quantities with local exhaust) of these materials will not generally require the use of RPE. Other uses, including laboratory uses in large quantities or with insufficient or non-existent engineering controls, will require compliance with the UNL's Respiratory Protection Program and applicable OSHA regulations.

2.8 Maintenance and Storage of Respiratory Protection Equipment

2.8.1 Respirator Inspections

The respirator user must inspect their respirator before every use. Supervisors must periodically spot check to determine if respirators are being used properly. EHS will also conduct periodic inspections to assess whether respirators are being properly used and maintained. User inspection procedures are specified by the manufacturer and summarized in EHS SOPs for the particular kind of RPE involved. Defective respirators must be immediately taken out of service and not used until repaired or replaced.

2.8.2 Cartridge Change Schedule (Air Purifying Respirators)

When using cartridge equipped, air-purifying RPE, the cartridges must be equipped with a NIOSH-approved end-of-service life indicator or changed at an interval that will assure protection is maintained for the user. EHS will determine a change-out schedule when completing the Respiratory Protective Equipment Hazard Assessment. Users must adhere to cartridge change schedules, or ensure that the cartridges are not at the end of their service life, if equipped with such an indicator, before each use. A sufficient stock of cartridges and filters must be available to meet the change schedule. Relying on breakthrough of cartridges or clogging of filters to determine when to obtain new filters or cartridges is not permitted in place of a cartridge and filter change schedule. However, if breakthrough occurs, then the cartridges or filters must be replaced

immediately. Users and/or their supervisors must consult EHS to re-evaluate the adequacy of the established change schedule under these circumstances.

2.8.3 Repair

Defective respirators must be discarded or returned to the manufacturer for major repair. No attempts shall be made to modify or repair a respirator by unqualified people. This does not apply to routine maintenance of the equipment to replace cartridges and filters. In addition, it does not apply to defective valves or straps that can be readily removed and replaced. However, all replacement parts must be designed to go with the specific respirator.

2.8.4 Cleaning

Employees are responsible for cleaning their non-disposable respirators using procedures provided by the manufacturer. Supervisors must assure facilities and supplies are available to the employee for cleaning their equipment. At a minimum, respirators shall be cleaned after each use. More frequent cleaning may be necessary if the respirator becomes dirty during use. Single use respirators must not be reused.

2.8.5 Storage

Respirators must be cleaned prior to storage. RPE must be stored in a tight-sealing container such as a plastic bag or plastic container, and kept in an appropriate location to protect them from damage, excessive moisture, extreme temperatures, sunlight, and dust. The storage area should be located away from chemical use or storage areas or other atmospheric contaminants. In addition, the respirator should be stored in a way that will not cause the face piece to become deformed.

2.9 Recordkeeping

Several types of records are generated when implementing the requirements of this program. Some records may be maintained by more than one party. This is because each party is maintaining the records for different purposes. The table below summarizes the records that are generated through implementation of this program and minimum retention requirements of each.

Type Of Record	Reference Section of This Program	Record Is Generated by	Record Is Retained by	Required Time For Record Retention (Years)
Hazard Assessment Forms	2.2 & 2.3	EHS	Medical provider EHS	30 As long as the assessment remains valid
Respirator Medical Evaluation Questionnaire	2.4	Employee	Medical provider	30

Written medical authorization or denial to wear RPE (Medical Surveillance Form)	2.4	Medical provider	Medical professional EHS	30 As long as the authorization remains valid; or 1 year following discontinuation of RPE use
Respirator Training and Fit Test Record	2.5 & 2.6	EHS	EHS	1
Record of annual refresher training	2.6	EHS	EHS	1

2.10 Program Evaluations

EHS conducts program evaluations to determine the effectiveness of the program. Problems identified will be promptly corrected, and changes made to the written program as appropriate. Elements of the EHS program evaluation include:

- EHS re-evaluation of exposure assessments at the time of refresher training of participants in the program
- EHS initiated consultation with program participants, conducted at the time of annual refresher training.

3 Responsibilities

The following responsibilities are assigned under the UNL Respiratory Protection Plan:

3.1 Department Heads/Chairs

- Implement engineering controls, whenever feasible, to reduce or eliminate excessive exposures to respiratory hazards. When engineering controls are determined feasible, but are not yet in place, develop a schedule and secure funding for implementation of those controls and review project status continually until the engineering controls are in place.
- Assure supervisors are provided with administrative support needed to comply with the requirements of this program.
- Enforce requirements of this program within their reporting units.

3.2 Supervisors

- Identify operations where employees may require the use of respiratory protection and report these areas to EHS for evaluation. Report to EHS any changes in existing operations that may impact the adequacy of the currently assigned RPE.
- Notify EHS of any anticipated use of SCBAs or respirators used for IDLH or interior structural fire-fighting purposes. The current UNL Respiratory Protection program does not provide for these types of uses since none currently exist.

- Report operations involving UNL employees working with asbestos, formaldehyde, cadmium, lead, and 4,4'-methylene dianiline to EHS for an assessment, unless use is strictly in laboratory quantities and with local ventilation.
- Ensure employees are medically qualified for use of respiratory protective equipment, as required in Section 2.4.
- Ensure employees are fit-testing at the required intervals.
- Ensure employees receive training required for use of RPE at the specified intervals.
- Provide employees with the RPE specified by EHS.
- Provide the facilities and supplies necessary to properly clean, maintain, and store RPE.
- Periodically check and continually enforce the proper cleaning, maintenance, and storage of RPE.
- Implement appropriate disciplinary procedures in accordance with UNL Human Resource Policies for employees who do not comply with the requirements of this program.
- Maintain records prescribed by this program as described in Section 2.9.

3.3 Employees

- Identify operations that may require the use of respiratory protection and report these areas to the supervisor and EHS for evaluation. Report to the supervisor and EHS any changes in existing operations that may impact the adequacy of the currently assigned RPE.
- Comply with the requirements of this program and work area specific policies and procedures for use of RPE.
- Use and maintain respirators in accordance with training received, manufacturer's instructions, and work area specific procedures.
- Report suspected and known exposures and unresolved RPE problems to the supervisor and EHS. Do not use defective RPE.
- Report any medical problems or other changes in physical condition that could affect their ability to safely use a respirator to the supervisor. When required to use tight-fitting respirators, report any changes in physical condition such as loss or gain of weight that may affect the seal of the respirator.
- When required to use tight-fitting respirators, remove facial hair to ensure a proper seal between the face and respirator and proper valve function.

3.4 Environmental Health and Safety (EHS)

- Administer the Respiratory Protection Program.
- Provide technical information to management, supervisors, and employees regarding respiratory protection.
- Evaluate work processes for respiratory hazards.

- Perform or arrange for assessments of work areas with respiratory hazards and specify appropriate RPE for use in those areas. Confirm/re-evaluate upon reports of changed conditions and at the time of annual refresher training.
- Train and fit test employees required to use of RPE at the required intervals.
- Conduct routine program evaluations to determine the effectiveness of the program and revise the program as necessary.
- Maintain records as described in Section 2.9.

3.5 Medical Professional

- Conduct medical evaluations described in this program document only if properly licensed.
- Conduct medical evaluations that meet the requirements of 29 CFR 1910.134 and this program.
- Provide written notification to the employee and EHS regarding the employee's capability for/limitations of respirator use, as well as recommendations for medical re-evaluation as appropriate.
- Maintain records of the medical evaluation and associated documents.

Appendix A

GLOSSARY OF TERMS

Assigned Protection Factor means the protection provided by a respirator. This factor is defined as the ratio of the concentration of contaminant outside a respirator to that inside the equipment. For example, if a half-mask respirator has a protection factor of 10 it may be used to protect against air contaminants up to 10 times the permissible exposure limit.

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 units (SCBA).

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 the occurrence such as, but not limited to, equipment failure, rupture of cylinders, or failure of control equipment that may or does result in an uncontrolled significant release of an airborne contaminant. Emergency situation also includes any situation where a respirator is worn to perform an emergency response function.

Doff means the act of taking off a respirator.

Don means the act of putting on a respirator.

End-Of-Service-Life Indicator (ESLI) means system that warns the respirator user of the approach of the end of adequate respiratory protection.

Escape-Only Respirator means a respirator that is used only for an 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 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 Test means evaluation of the fit of a respirator on an employee.

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 mono-dispersed particles of 0.3 micrometers in diameter. The NIOSH equivalent particulate filters are designated as 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.

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 concentration of an air contaminant that a certain respirator is able to protect against.

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 oxygen content below 19.5% by volume.

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 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 test to assess the adequacy of respirator fit that relies on the individual's response to a test agent.

Quantitative Fit Test (QNFT) means an assessment of the adequacy of respirator fit by numerically measuring the amount of leakage in the respirator.

RPE means respiratory protection equipment.

Respiratory Inlet Covering means a 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 user carries the breathing air source.

Service Life means the period of time that a respirator, filter, 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 Face Piece 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 sealed to the face.

Appendix B
TYPES OF RESPIRATORY PROTECTIVE EQUIPMENT

Filtering Facepieces
Filtering facepieces are disposable. They are designed to provide protection against particulates only; they do not provide protection against gases, vapors, or mists. Filtering facepieces do not supply oxygen and therefore cannot be used in atmospheres that are oxygen deficient (less than 19.5%). They are not suitable for emergency use. The OSHA Assigned Protection Factor is 10, meaning that, when used properly, they will protect the user in atmospheres where the contaminant concentration does not exceed 10 times the applicable exposure limit.

Reusable Air-Purifying Respirators
Reusable air purifying respirators rely on cartridges (gases or vapors) or filters (particulates) to purify the air. Sometimes cartridges and filters are used in combination to protect against both gases or vapors and particulates. Air purifying respirators do not supply oxygen and therefore cannot be used in atmospheres that are oxygen deficient (less than 19.5%). These respirators do not provide sufficient protection for atmospheres immediately dangerous to life and health. They are not suitable for emergency use.

Often air-purifying respirators are designed to be tight-fitting, in either a half-mask or full-face style.

- ***Half Mask Air-Purifying Respirators***
  A half mask covers the mouth, nose and chin. The face to facepiece seal is important for use of this type of respirator. The OSHA Assigned Protection Factor is 10, meaning that, when used properly, they will protect the user in atmospheres where the contaminant concentration does not exceed 10 times the applicable exposure limit.

- ***Full-Face Mask Air Purifying Respirators***
  A full facemask covers the entire face and works in the same manner as a half mask air-purifying respirator. The advantage of this type of respirator is that it provides eye protection and is good for exposure to contaminants that may irritate the eyes, or for work situations involving other eye hazards. The face to facepiece seal is important for use of this type of respirator. Full-face mask respirators provide a higher level of protection than half-mask because their shape allows a better mask-to-face seal. The OSHA Assigned Protection Factor is 50, meaning that, when used properly, they will protect the user in atmospheres where the contaminant concentration does not exceed 50 times the applicable exposure limit.

Some air purifying respirators are equipped with a re-chargeable, battery-powered unit that forces air through the cartridges or filters, rather than relying solely on the users lung capacity for air movement. These types of air purifying respirators are called Powered Air Purifying Respirators (PAPRs).

- ***Powered Air Purifying Respirators (PAPR)***
  PAPRs are available in tight-fitting and loose-fitting styles. Some people who are not able to wear other types of air-purifying respirators can use PAPRs since they present minimal breathing resistance. Loose-fitting PAPRs can be worn by employees with a beard or other physical condition that prevents them from obtaining a proper seal for negative pressure air-purifying respirators. The OSHA Assigned Protection Factor varies from 25-1,000 depending upon the style (e.g., loose-fitting or tight-fitting).

There are many types of cartridges and filters, and the type of cartridge, filter, or combination selected will depend on the contaminants of concern. Cartridges are color-coded based on the type of contaminant(s) for which they offer protection. Cartridges and filters must be equipped with NIOSH approved end-of-service life indicators, or a change schedule must be established and followed. Cartridge change must not rely on breakthrough as an indication. The table below provides color code information.

CARTRIDGE COLOR CODE

COLOR	TYPE OF PROTECTION
Black	Organic vapor cartridge
White	Acid gas cartridge
Yellow	Organic vapor and acid gas cartridge
Green	Ammonia and methyl amine cartridge
Olive Green	Organic vapor and formaldehyde cartridge
Purple (Magenta)	Dust, fumes, mists, asbestos, radionuclides, and highly toxic particulates (P100) filter
Black/Purple	Organic vapor and P100 combination
White/Purple	Acid gas and P100 combination
Yellow/Purple	Organic vapor/acid gas and P100 combination
Green/Purple	Ammonia/Methyl amine and P100 combination
Olive Green/Purple	Organic vapor/formaldehyde and P100 combination
Pre-filters	Use with dusts, fumes, mists, pesticides, and paints.

AIR PURIFYING RESPIRATOR FILTER INFORMATION

FILTER TYPE	USE
N	Not Resistant to Oil
R	Somewhat Resistant to Oil
P	Strongly Resistant to Oil
100	At least 99.97% efficient in removing monodispersed particles of 0.3 micrometers in diameter.
99	At least 99% efficient in removing monodispersed particles of 0.3 micrometers in diameter

95	At least 95% efficient in removing monodispersed particles of 0.3 micrometers in diameter.

Supplied Air Respirators (SAR)

With supplied air respirators, respirable air is provided to the user via an air compressor or compressed air cylinder through a small-diameter hose that attaches to a facepiece, hood, helmet, or suit. These respirators must be supplemented with escape respirator when used in atmospheres that are deficient in oxygen or immediately dangerous to life and health (IDLH). There are three types of supplied-air respirators.

- ***Demand***
  A demand SAR supplies air to the user when inhalation occurs and creates a negative pressure within the facepiece. Leakage may occur into the facepiece if there is a poor seal between the respirator and the wearer's face; thereby compromising the effectiveness of the respirator. Inhalation by the user activates the flow of air into the mask.

- **Pressure Demand**
  A small amount of air flow is maintained through the facepiece at all times, and is increased when the user inhales. This creates a positive pressure in the facemask, which is intended to prevent infiltration of contaminants.

- **Continuous Flow**
  A constant air flow is maintained in the facepiece at all times, rather than just on demand. The positive pressure in the facepiece is intended to prevent infiltration of contaminants.

Self-Contained Breathing Apparatus (SCBA)

SCBA units provide the wearer with a clean supply of air from tanks that are carried on the back. These units may be used in IDLH atmospheres, oxygen deficient atmospheres, and for other emergencies where respiratory hazards may exist. A SCBA tank typically has a capacity to provide air to the user for 30 to 45 minutes; however, stress and heavy exertion by the wearer increases respirations and reduces this time. There are two types of SCBA, demand and pressure demand. Both operate in a similar fashion to that described above for supplied air respirators.

Escape-only Respirators

Escape-only respirators generally consist of an oxygen source such as a small air tank or oxygen generating canister and a hood that fits over the head. They are capable of providing oxygen for a short period of time and are intended to allow the user to **leave** an area that was previously not IDLH, but the atmosphere has become IDLH. *Users may not enter an IDLH atmosphere using an escape-only respirator.*