



1.0 INTRODUCTION

Prevention of overexposure to airborne contaminants that may cause occupational diseases is a major element in the overall goal of Harvard University to provide its employees with a safe and healthful workplace. Where feasible, the primary strategies used by Harvard to provide effective control of these airborne contaminants consist of accepted engineering control measures. These include enclosure or confinement of the operation, general and local ventilation and substitution of less toxic materials.

When effective engineering controls are not feasible, or while they are being instituted, appropriate respiratory protection will be provided to Harvard employees when such equipment is necessary to protect the health of the employee. Harvard University employees, during their regular course of duty, may be required to enter environments where atmospheric contaminants are present. Based on the potential for respiratory hazards, this comprehensive *Respiratory Protection Program* has been developed to protect *Harvard University* employees who may be required to wear respirators during the course of their work.

This program should not be considered final or absolute. As operating conditions change or as employees develop greater experience, modifications may be necessary to facilitate smooth and efficient operations. This program will be reviewed annually by the *EH&S Manager of Industrial Hygiene* who will serve as the Program Administrator. Appropriate modifications will be incorporated into the written plan and training program as required. A summary of this program and applicable requirements are included as *Appendix A*– [Harvard University Respiratory Protection Fact Sheet](#).

1.1 PURPOSE

It is essential that established procedures exist to ensure that employee assignments are free from any hazardous exposure which promote safe, efficient, and productive performance. The primary purpose of this program is to manage the process of respiratory hazard identification, evaluation, and control methods.

This program is also intended to fulfill the regulatory compliance requirements of the Federal Occupational Safety and Health Administration (OSHA) described in **Section 1.3**

1.2 APPLICABILITY

This program is applicable to all Harvard employees, to all work conducted under the authority of Harvard, and to all equipment and property managed by Harvard. For Harvard contractors, it is applicable through contract clauses in conformance with the Harvard University Contractor Management Program.

1.3 REGULATORY REQUIREMENTS

The Federal Occupational Safety and Health Administration (OSHA) has established specialized

safety requirements for the use of respiratory protection.

This program incorporates the requirements of:

- [OSHA 29 CFR 1910.134](#) *General Industry Standard for Respiratory Protection*
- *OSHA 29 CFR 1926.103 Construction Industry Standard for Respiratory Protection*, and
- *ANSI Z88.6-1990 American National Standard for Respiratory Protection Devices.*

The major provisions of the standards include requirements for the following:

- A written plan detailing how the program will be administered;
- A complete assessment and knowledge of respiratory hazards that will be encountered in the workplace;
- Procedures and equipment to control respiratory hazards, including the use of engineering controls and work practices designed to limit or reduce employee exposures to such hazards;
- Guidelines for the proper selection of appropriate respiratory protective equipment;
- An employee training program covering hazard recognition, the dangers associated with respiratory hazards, proper care and use of respiratory protective equipment;
- Inspection, maintenance and repair of respiratory protective equipment;
- Medical surveillance of employees.

General Industry guidance to respiratory protection can be found on OSHA Web Page at the following address:

<http://www.osha-slc.gov/SLTC/respiratoryprotection/index.html>

The Occupational Safety and Health Administration (OSHA) has established regulations which require Harvard to limit employee exposure to specific air contaminants. One of these regulations, 29 CFR 1910.1000, Air Contaminants, lists substances and the corresponding OSHA limits for employee exposure to airborne concentrations during various time periods.

Note: Airborne Contaminants regulated by OSHA can be found at the following web address:

http://www.osha-slc.gov/OshStd_data/1910_1000_TABLE_Z-1.html

Additionally, OSHA has established substance-specific standards that contain more comprehensive requirements, including requirements to conduct mandatory initial exposure monitoring (air sampling) to evaluate airborne concentrations to which Harvard employees may be exposed. Links to more specific respiratory protection requirements may be contained within substance-specific or operation-specific regulations at:

http://www.osha-slc.gov/OshStd_toc/OSHA_Std_toc_1910_SUBPART_Z.html

[Appendix C](#) contains definitions, which will aid in the understanding of the terms used in the standards and in this written program.

1.4 DISCIPLINARY ACTION

The responsibilities and procedures outlined in this program are necessary to protect employees when working in hazardous areas. In developing this program, Harvard University strives to limit employee burden, discomfort, and inconvenience as much as possible without compromising employee safety or compliance. It is expected that this program will be regarded as an essential safety measure and that employees will not have difficulty in adhering to these terms.

In the event that University employees fail to meet the responsibilities and adhere to the terms of this program, disciplinary action may result. Department Management will determine the terms and extent of such action.

2.0 ROLES AND RESPONSIBILITIES

In order for the Respiratory Protection Program to be effective, all affected individuals must clearly understand and take an active role in meeting their responsibilities. Due to the potential hazards associated with such work, the specific responsibilities outlined in this program must be followed.

In addition to the duties and responsibilities of employees and supervisors outlined in the following sections, other groups at Harvard University will play an important role in supporting the successful implementation and maintenance of this program.

The Environmental, Health, and Safety Department will provide expert technical guidance to support safe use of respiratory protection, and will participate in the annual program review process and training.

In addition, Department Managers will provide management commitment and support for successful implementation and maintenance of this program.

2.1 MANAGEMENT AND SUPERVISOR'S RESPONSIBILITIES

Management and supervisor's responsibilities are outlined below:

- Ensuring that employees and contractors abide by the terms and conditions of this program.
- Determining any necessary disciplinary action for violations of this program.
- Providing management commitment and support for successful implementation and maintenance of this program.
- Identifying, with the assistance of EH&S, those employees under their supervision who may need respiratory protection equipment and scheduling them for fitting and training in the proper use and maintenance of the equipment.

- Requesting assistance from EH&S in evaluating new operations that may present health and safety hazards.
- Coordinating with EH&S in obtaining approval from the University Health Services (UHS) - Occupational Health Physician before assigning known or suspected medically restricted employees to jobs requiring the use of respirators.
- Enforcing the use of respiratory protection equipment and other requirements when applicable
- Ensuring that respirator users have received an annual training and medical examinations.
- Ensuring respirator users use and operate their respirators under the respiratory protection procedures as described in this program.
- Applying engineering controls when feasible.
- Referring to the *Supervisor's Management Checklist* in [Appendix D](#) on a regular basis to ensure compliance with this program.

2.2 EMPLOYEE RESPONSIBILITIES

The responsibilities of employees qualified to wear respirators include:

- Following the requirements of this program.
- Attending required annual respiratory protection training classes and obtaining an annual medical clearance from an Occupational Health Physician to wear a respirator.
- Completing an annual fit test with Harvard EH&S personnel.
- Informing their supervisor of any change in operations, tasks, or hazards present.
- Utilizing the issued respiratory protection equipment in accordance with instruction and training provided by EH&S personnel. This includes maintaining the respirator in a clean “ ready to use” condition
- Restricting the use of an assigned respirator to his or her exclusive use
- Informing his/her supervisor or Occupational Health Physician of any personal health problems that could be aggravated by the use of respiratory equipment
- Guarding against damage to equipment and ensuring respirators are not disassembled, modified, or otherwise altered in any way other than by the changing of respirator cartridges or filters.
- Reporting any observed or suspected malfunctioning respirator to their supervisor or EH&S personnel.
- Using only those brands and types of respiratory protection equipment for which they have been trained and fit tested.

2.3 PROGRAM ADMINISTRATOR RESPONSIBILITIES

The *Program Administrator's* responsibilities include (but are not limited to):

- Overseeing the Respiratory Protection Program throughout Harvard University and conducting required evaluations of program effectiveness. At a minimum, evaluating the *Respiratory Protection Program* on an annual basis and updating as procedures change.
- Preparing written respirator testing and selection procedures in accordance with applicable standards and the requirements of this program.
- Keeping the University and affected personnel informed of any actions proposed or taken regarding the Respiratory Protection Program.
- Maintaining files that document measures taken to assure respiratory protection, including a current version of the Respiratory Protection Program and records of fit testing, training, and certifications issued.
- Performing and coordinating an annual review of jobs with respirator use with appropriate Managers and Supervisors.
- Reviewing respirator usage on a continual basis to ensure they are applicable and suitable for the purpose intended.
- Performing field audits and reporting back to Management.
- Developing and providing Initial and Refresher Respiratory Protection Training to Employees, Supervisors and Managers.
- Provide safety expertise and regulatory guidance to Employees, Supervisors and Managers as required.
- Recommending Respiratory Protection Equipment Requirements and PPE to supervisors and assisting in the Procurement of appropriate respiratory protective equipment.
- Authorizing the use, procurement, and issuance of respirators after review of work conditions.
- Providing regularly scheduled respirator fit testing and coordinating training to new and continuing employees.

2.4 DEPARTMENT OF ENVIRONMENTAL HEALTH AND SAFETY RESPONSIBILITIES

The Department of Environmental Health and Safety responsibilities include, but are not limited to:

- Providing regulatory guidance to Harvard University regarding OSHA Respiratory Protection Standards.
- Providing technical guidance on selection of appropriate respiratory protection

equipment.

- Providing technical expertise and assistance in air monitoring or industrial hygiene sampling as required.
- Participating in the annual review of the Respiratory Protection Program.
- Maintaining training records as part of the Web Training Database System.
- Training of Harvard University personnel.

2.5 CONTRACTORS

University contractors shall maintain a written respirator program that meets the requirements of 29 CFR 1910.134. Contractors shall be responsible for administering and maintaining their own Respiratory Protection Program in accordance with 29 CFR 1910.134.

[Appendix F](#) is a checklist to be used by Harvard contract managers to ensure compliance with the contractor requirements of the Respiratory Protection Program.

3.0 TYPES OF RESPIRATORY PROTECTION

Respirators are designed to protect only against specific types of substances, in certain concentrations, and must be matched to the user, job, and contaminant. This section program will discuss two categories of respirators including:

3.1 AIR-PURIFYING RESPIRATORS (APRS)

- Particulate removing
- Vapor/Gas removing
- Combination

3.2 SUPPLIED AIR RESPIRATORS (SARS)

- Self-Contained Breathing Apparatus (SCBA)
- Supplied Air Respirator (Air-line)

3.3 AIR-PURIFYING RESPIRATORS

Air-purifying respirators (APRs) remove contaminants from the atmosphere; they must be used only in atmospheres with sufficient oxygen ($> 19.5\%$ AND $< 23.5\%$) and within specified hazard concentration limitations of the specific device.

3.3.1



GENERAL LIMITATIONS OF AIR

PURIFYING RESPIRATORS

Air-purifying respirators may not be used for protection in the following circumstances:

- Air-purifying respirators do not provide effective protection against certain gaseous materials. **Section 3.1.1.2** discusses specific limitations of APRs in a gas/vapor contaminated environment.
- The maximum contaminant concentration against which an air-purifying respirator will protect is determined by the design efficiency and capacity of the cartridge, canister, or filter and the face-piece-to-face seal on the user. For gases and vapors, the maximum concentration for which the air-purifying element is designed is specified by the manufacturer or is listed on labels of cartridges and canisters. For assistance in determining maximum contaminant concentrations, contact the *Department of Environmental Health and Safety*
- Air-purifying respirators will not provide the maximum design protection specified unless the face piece is carefully fitted to the wearer's face to prevent inward leakage. The time period over which protection is provided is dependent on canister, cartridge, or filter type; concentration of contaminant; humidity levels in the ambient atmosphere; and the wearer's respiration rate.
- The proper type of canister, cartridge, or filter must be selected for the particular atmosphere and conditions. Air-purifying respirators may cause discomfort due to the noticeable resistance in inhalation.

3.3.2 SPECIFIC LIMITATIONS FOR AIR-PURIFYING PARTICULATE-REMOVING RESPIRATORS.

- Use for protection against nonvolatile particles only. These respirators offer no protection against gases or vapors.
- These respirators are not for use in an atmosphere immediately dangerous to life or health (IDLH).
- Do not use air-purifying particulate-removing respirators in oxygen-deficient atmospheres.

3.3.3 SPECIFIC LIMITATION FOR AIR-PURIFYING GAS/VAPOR-REMOVING RESPIRATORS:

Do not use air-purifying vapor/gas removing respirators with airborne chemicals that have "poor warning properties."

- [Appendix G](#) contains a list of gaseous materials for which air-purifying respirators should not be used.
- Do not use air-purifying vapor/gas-removing respirators in atmospheres with unknown chemicals. Do not use in atmospheres with unusually high concentrations of a known

chemical.

- Do not use air-purifying vapor/gas-removing respirators in oxygen-deficient atmospheres.

3.4 SUPPLIED AIR RESPIRATORS

Atmosphere-supplying or Supplied Air Respirators (SAR) deliver breathing-air through a supply hose connected to the wearer's face piece. The breathing-air can be provided from a stationary source, i.e., by a compressed air tank (SCBA) or a breathing air compressor (air line)

Atmosphere-supplying respirators are required when there is insufficient oxygen (<19.5 percent), when the concentration of contaminant is too high for an air-purifying cartridge to handle, the toxicity of the material is too hazardous for an air-purifying cartridge, or when required by specific Federal Occupational Safety And Health Administration (OSHA) regulations.

3.4.1 GENERAL LIMITATIONS

Except for some air-line suits, no protection is provided against skin irritation by materials such as ammonia and hydrogen chloride, or against absorption through the skin of materials such as hydrogen cyanide and organic phosphate pesticides. Use of atmosphere-supplying respirators in an atmosphere Immediately Dangerous to Life or Health (IDLH) is limited to Self-Contained Breathing Apparatus (SCBA) or to those Supplied Air-line Respirators equipped with an "escape" bottle of air.



Self Contained Breathing Apparatus (SCBA)



Supplied Air Respirator – Stationary Compressed Air Source



5-Minute Escape Bottle to be used with an Air Line Respirator

Note: Oxygen levels exceeding 23.5% (Oxygen Enriched Atmospheres) pose an increased risk of fire and explosion to combustible materials. Respiratory protection devices cannot control hazards of this nature.

3.4.2 SPECIFIC LIMITATIONS FOR SELF-CONTAINED BREATHING APPARATUS (SCBA)

Below are some limitations of SCBAs. For specific limitations, consult the owner's manual of the specific make and model of the breathing apparatus.

- The period over which the device will provide protection is limited by the amount of breathing air in the apparatus, the ambient atmospheric pressure (service life of open-circuit devices is cut in half by a doubling of the atmospheric pressure), and the type of work being performed. Some SCBA devices have a short service life (less than 15 minutes) and are suitable only for escape (self-rescue from an irrespirable atmosphere).
- Other limitations of SCBA devices are their weight or bulk, or both, limited service life, and the training required for their maintenance and safe use.
- All self-contained breathing apparatus to be used in an IDLH environment must be rated for at least 30 minutes and must be used in the pressure-demand mode.

3.4.3 SPECIFIC LIMITATIONS FOR SUPPLIED-AIR RESPIRATORS (AIR-LINE):

- Ordinary air-line respirators (no emergency escape air bottle) are limited to use in atmospheres from which the wearer can escape unharmed without the aid of the respirator (i.e., non-IDLH and non-oxygen deficient atmospheres).
- The wearer is restricted in movement by the hose and must return to the respirable atmosphere by retracing his/her route of entry. The hose is subject to being severed or pinched off.

4.0 SELECTION AND USE

Selection and use of respirators shall be based on the hazards to which the worker is exposed, the work environment, and the characteristics and limitations of the respirator. Respiratory protective equipment shall be used only for the purpose intended, and no modifications of the equipment shall be made.

For protection against gases and vapors, the following forms of protection may be used:

- An atmosphere-supplying respirator.
- An air-purifying respirator, provided that:
 - The respirator is equipped with an end-of-service-life indicator (ESLI) certified by the National Institute for Occupational Safety and Health (NIOSH) for the contaminant.
 - If there is no ESLI appropriate for conditions in the employer's workplace, the respirator filters and cartridges are replaced after every eight hours of cumulative use.

For protection against particulates, any of the following forms of protection may be used:

- An atmosphere-supplying respirator.
- An air-purifying respirator equipped with a filter certified by NIOSH under 30 CFR Part 11 as a high-efficiency particulate air (HEPA) filter, or an air-purifying respirator equipped with a filter certified for particulates by NIOSH under 42 CFR Part 84.

- For contaminants that consist primarily of particles with mass median aerodynamic diameters (MMAD) of at least two micrometers, an air-purifying respirator equipped with any filter certified for particulates by NIOSH.

The Department of Environmental Health and Safety is available to provide consultation on proper respirator selection.

4.1 NIOSH APPROVALS

All respiratory protective equipment used shall carry the NIOSH approval.

4.2 RESPIRATOR DESIGNATION

The Supervisor shall specify the correct respirator for each applicable job and task with assistance from the *UOS Safety Compliance Officer*. Respiratory protection requirements for all new or revised processes shall be determined during the technical review of such processes.

4.3 FACTORS THAT INFLUENCE RESPIRATOR SELECTION

Nature of the hazard - this factor has several important aspects.

- The physical state of the air contaminant; i.e., dust, fume, mist, gas, or chemical vapor. The physical state determines some limitations of the respirator.
- The relative toxicity of the material; e.g., trichloroethylene is more toxic than 1,1,1-trichloroethane; brazing fumes from cadmium alloys are more toxic than fumes from steel alloys; etc.
- The rate at which the contaminant affects the human body. For example, excessive concentrations of silica dust, although hazardous, will not cause an immediate effect; however, an excessive concentration of chlorine gas can overcome an individual almost instantly, making escape impossible.
- The possibility exists that more than one air contaminant in different physical states may be involved.
- Extent of the hazard - this factor includes the anticipated airborne concentrations and physical area in which the hazard exists.
- Work requirements and conditions - this factor includes proximity to the source of the airborne contamination and physical restriction of the working area.

4.4 PROCEDURE FOR RESPIRATOR SELECTION

Determine hazard classification, i.e., oxygen deficiency or toxic contaminant (gases, particulate, or combination) and type of respiratory protection recommended.

[Appendix I](#) identifies specific airborne hazards and respirator use codes.

Using the tables in *Appendix J* through *N* and the respirator use code determined from Step 2, select the corresponding respirator type.

[Appendix N](#) provides a description of respirator filter classifications established by 42 CFR 84.

<i>Appendix</i>	<i>Description</i>
I	Respirator Selection Guide by Operation Hazard (<i>i.e.</i> painting, asbestos removal, machining, etc.)
J	Respirator Selection Guide by Gas / Vapor Inhalation Hazard
K	Respirator Selection Guide by Dust Inhalation Hazard
M	Respirator Selection Guide by Mist Inhalation Hazard
M	Respirator Selection Guide by Fume Inhalation Hazard

Important Note: These tables are intended to be used as general guides to respirator selection according to hazard classification. Since the actual respirator selection will depend on exposure level and duration to chemical stressors, it is important for the employee to confirm proper respirator selection through his/her supervisor and/or the UOS Safety Compliance Officer before choosing a respirator to wear.

4.5 VOLUNTARY USE OF RESPIRATORY PROTECTION IN NON-HAZARDOUS ATMOSPHERES

OSHA requires that voluntary use of respirators, when not required by the company, must be controlled as strictly as under required circumstances. To prevent violations of the Respiratory Protection Standard, UOS Employees are **not** allowed voluntary use of their own or company supplied respirators of any type in non-hazardous atmospheres.

Exception: Employees whose only use of respirators involves the voluntary use of filtering (non-sealing) face pieces (dust masks).

5.0 USE OF RESPIRATORS

5.1 NORMAL OPERATIONS

- Only respiratory protective equipment that has current approval from NIOSH shall be used.
- Respirators shall be used as issued. No modifications or substitutions to issued equipment shall be permitted. Any modification, no matter how slight, will result in voiding of respirator approval.
- A respirator shall be used only by the person to whom it was issued.

- Personnel who use respiratory protection shall leave the space if they detect the odor of a contaminant or experience difficulty in breathing. Re-entry shall not be undertaken until respirator integrity and fit, adequate air flow, or filter cartridge replacement, as appropriate, have been accomplished. If employees experience physical symptoms, they shall immediately leave the area of the hazardous atmosphere and notify their supervisor.
- Proper use, inspection, fitting, and maintenance of the respirator is the responsibility of the individual to whom the respirator was issued.

5.2 PROCEDURES FOR IDLH ATMOSPHERES

For all IDLH atmospheres, the supervisor shall ensure that:

- One employee or, when needed, more than one employee is located outside the IDLH atmosphere.
- Visual, voice, or signal line communication is maintained between the employee(s) in the IDLH atmosphere and the employee(s) located outside the IDLH atmosphere.
- The employee(s) located outside the IDLH atmosphere are trained and equipped to provide effective emergency rescue.
- Employee(s) located outside the IDLH atmospheres are equipped with:
 - Pressure-demand or other positive pressure SCBAs, or a pressure-demand or other positive-pressure supplied-air respirator with auxiliary SCBA; and either
 - Appropriate retrieval equipment for removing the employee(s) who enter(s) these hazardous atmospheres where retrieval equipment would contribute to the rescue of the employee(s) and would not increase the overall risk resulting from entry, or
 - Equivalent means for rescue where retrieval equipment is not required.

5.3 WORK IN PROXIMITY TO UNPROTECTED PERSONNEL

Whenever work operations result in the establishment of a respirator-required area that is near an area occupied by unprotected personnel, employees whose tasks do not require them to wear respirators normally shall not be required to wear them unless their exposures may exceed the permissible exposure limits (PEL) and adequate ventilation cannot be provided. In such instances, work that requires respirators must be performed at a time when a minimum number of other employees are affected.

5.4 CONCURRENT WORK REQUIRING RESPIRATORY PROTECTION

Two or more different jobs that both require respiratory protection may be worked simultaneously, provided that the level and type of respiratory protection worn is adequate for all the airborne contaminants and the concurrent work does not create additional hazards.

5.5 ASSISTING TRADES AND SUPERVISORS

Employees required to support, assist, or supervise a respirator-requiring job shall also wear the proper respiratory protection. Trades that support or assist respirator-requiring work shall have personnel qualified for respirator use for those individuals who need to access locations where respirators are required.

5.6 POSTING/GUARDING ACCESS TO CONTROLLED AREAS

Unless the area in which respiratory protection is required is limited to the space occupied by the employee who is performing the work, posting or guarding access shall be established and controlled.

5.7 PROHIBITED USES

Air-purifying respirators shall not be used for the accomplishment of work in the following environments:

- Untested confined spaces
- Oxygen-deficient atmospheres.
- Atmosphere immediately dangerous to life or health (IDLH).

Access to life-threatening areas is limited to emergency situations. Such areas must be tested and ventilated to safe conditions prior to accomplishment of routine work.

5.8 SURVEILLANCE OF WORK AREA

Supervisors who assign personnel to operations that require the use of respiratory protection shall, when possible, observe the operation to ensure that conditions have not changed. They should also assure compliance with this or other applicable instructions.

5.9 CHANGING CARTRIDGES

Cartridges or canisters should be replaced after eight hours of use or more often if necessary.

All filters and pre-filters should be replaced after no more than eight hours of cumulative use

Type R filters (rated under 42 CFR 84) must be changed at the end of each shift where exposure includes airborne oil mists.

Particulate filters, including paint-mist pre-filters, should be changed if breathing becomes more difficult.

Cartridges and canisters should be changed whenever the wearer can smell or taste the airborne contaminant. If the wearer detects an odor or taste of gas in the inspired air, or feels eye or throat irritation, he/she should leave the hazardous area immediately and go to a clean area to change out the cartridges.

5.10 PERSONAL PROTECTIVE EQUIPMENT

Many operations that require respirators also require other personal protective clothing and gear. These requirements are delineated by the Harvard University Personal Protective Equipment Program and shall be complied with in all instances.

5.11 POWERED AIR-PURIFYING RESPIRATOR (PAPR)

The use of powered air-purifying respirators (PAPRs) in lieu of supplied air respirators or respirators with a lower protection factor may be allowed and/or required under special circumstances as determined by the *UOS Safety Compliance Officer*.

Powered air-purifying respirators may be a half-mask, full-face, or hood type, depending on the type of hazard and working conditions.

6.0 RESPIRATOR USER'S INSPECTION GUIDE

6.1 GENERAL

All respirators shall be inspected for obvious defects by the user prior to use.

Emergency respirators (e.g., SCBA) shall be inspected monthly and after each use. [Appendix O](#) contains a log that shall be completed monthly by the department responsible for the routine maintenance of the unit.

6.2 AIR-PURIFYING (HALF-MASK OR FULL-FACE) RESPIRATORS

Respirators shall be free of the following defects, as applicable:

- Excessive dirt
- Cracks, tears, or deterioration
- Distortion
- Inflexibility
- Cracked or badly scratched lenses
- Incorrectly mounted lenses
- Poorly seated or torn inhalation and/or exhalation check valves or diaphragms
- Deterioration; if the device has a corrugated breathing tube, examine it for deterioration by stretching the tube and looking for cracks

Straps shall be free of the following defects, as applicable:

- Breaks, tears, or cuts
- Loss of elasticity

- Broken buckles
- Worn serration or missing tabs or a head harness that may permit slippage.

6.3 AIR-SUPPLIED (HALF-MASK OR FULL-FACE) RESPIRATORS

Inspect face piece and straps as outlined in *Section 6.2*.

If the device has a corrugated breathing tube, examine it for deterioration by stretching the tube and looking for cracks.

Also examine the respirator system components for accumulation of dirt, grit, oil, tears, breaks, etc.

Note: [Appendix O](#) contains a log which should be completed monthly for Supplied Air (SCBA) Respirators.

7.0 PHYSICAL AND MEDICAL QUALIFICATIONS

Using a respirator may place a physiological burden on an employee that varies with the type of respirator worn, the job and workplace conditions in which the respirator is used, and the medical status of the employee. It is a requirement that a medical evaluation be given to determine the employee's ability to use a respirator, before the employee is fit tested or required to use the respirator in the workplace.

7.1 MEDICAL EVALUATION PROCEDURES

Each UOS employee whose duties require the use of a respirator will be required to complete and submit a Medical Evaluation Questionnaire form to University Health Services before being fitted with a respirator. The Medical Evaluation Questionnaire was developed by the Department of University Health Services under the direct supervision of a physician. Those who are medically denied to wear a respirator cannot participate in this program. Additional referrals and medical surveillance may be required following evaluation of the Medical Evaluation Questionnaire form. UOS Supervisors are responsible for ensuring that medical evaluations are scheduled for employees with UHS, before they are fit tested and required to use a respirator in the workplace.

7.2 FOLLOW-UP MEDICAL EXAMINATION

Harvard University Operations Services Supervisors shall ensure that a follow-up medical examination is provided for an employee whose initial medical examination demonstrates the need for a follow-up medical examination. The follow-up medical examination shall include any medical tests, consultations, or diagnostic procedures that the University Health Services Physician deems necessary to make a final determination.

At a minimum, the UOS shall ensure that additional medical evaluations are provided if:

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

- A Physician informs the department that an employee needs to be reevaluated.
- Information from the respiratory protection program, including observations made during fit testing and program evaluation, indicates a need for employee reevaluation.
- A change occurs in workplace conditions (e.g., physical work effort, protective clothing, temperature) that may result in a substantial increase in the physiological burden placed on an employee.

7.3 ADMINISTRATION OF THE MEDICAL QUESTIONNAIRE AND EXAMINATIONS

The medical questionnaire and examinations shall be administered confidentially during the employee's normal working hours or at a time and place convenient to the employee. The medical questionnaire shall be administered in a manner that ensures that the employee understands its content. The company shall provide the employee with an opportunity to discuss the questionnaire and examination results with the Physician.

7.4 SUPPLEMENTAL INFORMATION FOR THE PHYSICIAN

The following information must be provided to the UHS Physician before the UHS Physician makes a recommendation concerning an employee's ability to use a respirator

- The type and weight of the respirator to be used by the employee
- The duration and frequency of respirator use (including use for rescue and escape)
- The expected physical work effort
- Additional protective clothing and equipment to be worn
- Temperature and humidity extremes that may be encountered

Any supplemental information provided previously to the Physician regarding an employee need not be provided for a subsequent medical evaluation if the information and the Physician remain the same

University Operations Services has provided the University Health Services with a copy of the written respiratory protection program and a copy of the OSHA Standard 1910.134

7.5 MEDICAL DETERMINATION

In determining the employee's ability to use a respirator, Harvard University Operations Services shall obtain a written recommendation regarding the employee's ability to use the respirator from the Physician. The recommendation shall provide only the following information:

- Any limitations on respirator use related to the medical condition of the employee, or relating to the workplace conditions in which the respirator will be used, including whether or not the employee is medically able to use the respirator.
- The need, if any, for follow-up medical evaluations.

- A statement that the Physician has provided the employee with a copy of the Physician's written recommendation.
- If the respirator is a negative pressure respirator and the Physician finds a medical condition that may place.

8.0 RESPIRATOR FITTING/TESTING PROCEDURES

8.1 GENERAL

A respirator cannot provide optimum levels of protection unless an air-tight seal is obtained between the respirator and the user's face. Accordingly:

- A respirator shall not be worn if facial hair comes between the sealing periphery of the face piece and the face, or if facial hair interferes with valve functions.
- Because half-mask respirators are manufactured in small, medium, and large sizes to fit various sized and shaped faces, and since the wearer is required to have a properly fitting respirator, it is imperative that supervisors make arrangements to obtain the specific model and size respirator certified for each employee who must use one.
- If spectacles, goggles, face shield, or welding helmet must be worn with a face piece, it shall be worn so as not to interfere with the seal of the face piece to the face.

8.2 RESPIRATOR FACE PIECE FIT-TEST REQUIREMENTS

The respirator cannot provide proper respiratory protection unless it seals airtight with the face of the wearer and thereby excludes the entire contaminated atmosphere. To do this, the respirator must be properly fitted to the individual.

Qualitative tests using irritant smoke or other agent approved by the UOS Safety Compliance Officer shall be conducted and documented on all persons who will wear a negative, positive and air-purifying respirator at least annually. The UOS Safety Compliance Officer will offer and coordinate an annual fit-test for all affected individuals listed in [Appendix F](#).

The results of the qualitative fit test will be used to select specific types, makes, and models of respirators for use by the individual. [Appendix P](#) contains the documentation used by the fit tester.

The procedure contained in [Appendix Q](#), *Irritant Smoke Fit-Testing Procedure*, shall be used to fit-test respirators with irritant smoke.

8.3 FIT CHECKING

The face-piece seal of any respirator shall be checked by the wearer each time the respirator is donned. To check the seal, complete the following negative- and positive-pressure tests.

8.3.1 NEGATIVE-PRESSURE TEST:

Close off the air inlet for the canister, cartridge(s), filter(s), or hose(s) by covering with the

palms, being careful not to dislodge the face piece.

Inhale gently so that the face piece collapses slightly, and

Hold breath for ten seconds.

If the face piece remains slightly collapsed and no inward leakage is detected, the respirator fit is adequate.

8.3.2 POSITIVE-PRESSURE TEST:

Close off the opening of the exhalation valve by covering with the palm, being careful not to dislodge the face piece.

Exhale gently into the face piece.

If slight positive pressure can be built up inside the face piece without leaking, the respirator fit is considered satisfactory.

9.0 RESPIRATOR INSPECTION, CLEANING, MAINTENANCE, AND STORAGE

9.1 GENERAL

Reusable rubber face piece respirators shall be inspected and cleaned after each use to prevent spread of germs, contamination by chemicals and dusts, and to maintain rubber parts in good repair. Spare parts for reusable respirators must be procured from the respirator supplier.

9.2 CLEANING PROCEDURES

Respirators may not be cleaned with solvents or paint removers, because damage to rubber or plastic pieces may result. Respirators shall be cleaned in accordance with the respirator manufacturer's instructions or by the following method:

1. Remove filters, cartridges, or canisters. Disassemble face pieces by removing speaking diaphragms, demand and pressure-demand valve assemblies, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.
2. Wash components in warm (43° C [110° F] maximum) water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.
3. Rinse components thoroughly in clean, warm (43° C [110° F] maximum), preferably running water. Drain.
4. When the cleaner used does not contain a disinfecting agent, respirator components should be immersed for two minutes in one of the following:
 - Hypochlorite solution (50 ppm of chlorine) made by adding approximately one milliliter of laundry bleach to one liter of water at 43° C (110° F) maximum; or,
 - Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 milliliters

of tincture of iodine (6-8 grams ammonium and/or potassium iodide/100 cc of 45-percent alcohol) to one liter of water at 43° C (110° F) maximum; or,

- Other commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer.
5. Rinse components thoroughly in clean, warm (43° C [110° F] maximum), preferably running water. Drain. The importance of thorough rinsing cannot be overemphasized. Detergents or disinfectants that dry on face pieces may result in dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.
 6. Components should be hand-dried with a clean, lint-free cloth or air-dried.
 7. Test the respirator to ensure that all components work properly.
 8. For self-contained breathing apparatus (SCBA), disassemble and hand-clean the pressure-demand and exhalation valve as appropriate, exercising care to avoid damaging the rubber diaphragm.
 9. Visually inspect face pieces and all parts for deterioration, distortion, or other faults that might affect the performance of the respirator. Discard faulty items, replacing only with parts specifically designed for the particular respirator.
 10. Place respirator in a clean, zip-lock bag, or container for storage after it has completely dried.

9.3 PESTICIDE CONTAMINATION

For decontamination against pesticide residues, wash with alkaline soap and rinse with 50-percent ethyl or isopropyl alcohol.

9.4 RESPIRATOR STORAGE

Cleaned respirators shall be stored to protect against dust, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals. The storage area shall be clean and sanitary.

Respirators shall be packed or stored so that the face piece and exhalation valve will rest in a normal position and function will not be impaired because the face piece sat in an abnormal position.

Storage of issued respirators - Respirators issued to individuals shall be stored in a clean plastic bag, carton, or carrying case, as appropriate.

9.5 EMERGENCY-USE RESPIRATORS

Emergency escape-only respirators shall be inspected before being carried into the workplace for use.

Self-contained breathing apparatus shall be inspected monthly. Air and oxygen cylinders shall be maintained in a fully charged state and shall be recharged when the pressure falls to 90 percent of the manufacturer's recommended pressure level. The inspection must:

- Establish that the regulator and warning devices function properly.
- Check the respirator function, tightness of connections, and the condition of the various parts including, but not limited to, the face piece, head straps, valves, and connecting tube; and
- Check the elastomeric parts for pliability and signs of deterioration.

For respirators maintained for emergency use, the maintaining organization shall:

- Certify the respirator by documenting the date the inspection was performed, the name (or signature) of the person who made the inspection, the findings, required remedial action, and a serial number or other means of identifying the inspected respirator.
- Provide this information on a tag or label that is attached to the storage compartment for the respirator, is kept with the respirator, or is included in inspection reports stored as paper or electronic files. This information shall be maintained until replaced following a subsequent certification.

10.0 BREATHING-AIR QUALITY AND SUPPLIED AIR SYSTEMS

10.1 AIR QUALITY FOR SUPPLIED AIR SYSTEMS

Compressed air for breathing purposes shall be of at least Grade D quality. Grade D air contains:

- Oxygen content: 19.5-23.5 percent.
- Less than 10 ppm carbon monoxide.
- Less than 1000 ppm carbon dioxide.
- Less than 5 mg/m³ total hydrocarbons.
- No objectionable odors.

10.2 TEMPERATURE CONSIDERATIONS

Compressed air that is to be used at temperatures below freezing should have excess water vapor removed so as to attain a dew point below the minimum temperature anticipated. Compressed air, as it passes through regulators and valves from a high pressure to a low pressure, expands and cools down, resulting in a temperature lower than the surrounding temperature.

10.3 BREATHING-AIR COMPRESSORS

Breathing-air compressors must be located where contaminated air cannot enter the system. If the compressor is oil-lubricated, it shall be equipped with both a high-temperature and carbon monoxide alarm. The high-temperature alarm will be set at the temperature specified in the manufacturer's literature. The carbon monoxide alarm will be set at 10 ppm. Compressors used for breathing air must be specifically designed and certified for the purpose.

10.4 BREATHING-AIR TESTING

Breathing-air quality shall be laboratory tested and certified at least quarterly. Supervisors of those activities capable of producing their own breathing air are responsible for such testing and record keeping. The air from non-oil-lubricated, low-pressure air pumps designed specifically to provide respirator breathing-air does not need to be tested.

10.5 BREATHING-AIR HOSES

Only hoses designed for breathing-air shall be used and they shall have NIOSH approval and be compatible with the respirator being used.

Air-line hoses shall be protected from damage. Hoses shall be arranged to prevent tripping and allow ready access/exit.

Air-lines used for supplying breathing air shall be tagged or labeled as "Breathing-Air Supply Line." Breathing-air-lines shall be labeled by the owning organization.

All breathing-air-line couplings shall be incompatible with outlets for other gas systems.

When not in use, ends of breathing-air system shall be capped or sealed.

The total hose length shall be limited to a maximum of 300 feet.

All equipment used from the respirator face piece to the breathing-air pump must be from the same manufacturer.

11.0 TRAINING REQUIREMENTS

All personnel who will use or issue respirators and their supervisors shall receive appropriate respirator training annually. Training for all affected UOS personnel will be provided by the *UOS Safety Compliance Officer*.

In addition, whenever procedures are modified, duties change, or a review of the procedure identifies program deviations or inadequacies, all affected employees will be informed of any changes which will impact their duties as covered under this program. A [training schedule](#) can be found on the EH&S web site.

11.1 TRAINING CONTENT

Employees and their supervisors must receive training so that they acquire and demonstrate the knowledge, understanding and skills necessary to perform each of the specific duties outlined in this program.

Local Department Managers shall retain training records for their employees for a period of at least 3 years. Employee training records will also be maintained in [the EH&S Training Database](#).

11.2 RESPIRATOR AUTHORIZATION CARD

Each person who satisfactorily completes the respirator physical examination, training, and fit-

testing shall be issued a [Respirator Authorization Card](#).

The expiration date on the card shall be one year from the earliest date of:

- Respirator physical examination,
- Respirator training; or
- Respirator fit-testing.

The [Respirator Authorization Card](#) shows the respirators for which the person was satisfactorily fit-tested and shall be carried on the individual while using a respirator.

12.0 RESPIRATOR AND EQUIPMENT ISSUE

Respirators and filter cartridges are issued by Supervisors to users who have completed the required training, fit testing and medical surveillance and upon the presentation of a completed and signed Respirator Authorization Card. Due to the many requirements associated with this program, respirators and related equipment will not be stocked in the *175 North Harvard Street Main Stockroom*. Supervisors should contact the *UOS Safety Compliance Officer* for guidance on proper equipment selection and purchases.

13.0 LOSS OF QUALIFICATION

Employees may lose their respirator use qualification and/or respirator at any time for any of the following reasons:

- Expiration of qualification (medical clearance or training).
- Determination by a medical officer that the employee is not physically qualified for respirator use.
- Lack of knowledge or willful neglect of requirements, as demonstrated by failing the training exam or by serious violations of this program, such as:
 - Use of the wrong type of respirator.
 - Failure to wear a respirator where required.
 - Removal of a respirator in a respirator area.
 - Tampering with a respirator.
 - Entry into an untested, oxygen-deficient, or life-hazardous space unprotected.
 - Wearing the respirator with facial hair that prohibits proper sealing or interferes with proper internal valve operation.

14.0 MANAGEMENT TOOLS

University Operations Services (UOS) utilizes a computer based work order system known as the

Avantis System. Work orders are created by “Planners”, who in most cases are also Supervisors. **Avantis** allows Planners and Supervisors to link Standard Procedures and Safety Instructions to work orders based on the tasks to be completed. Relevant safety requirements would then print on work orders to alert workers to the hazards and procedures associated with the tasks.

UOS Respiratory Protection and Safety Procedures, which focus on employee roles and responsibilities within this program, have been created on the **Avantis System**. Work planners should identify and link this procedure to all work orders involving respiratory protection.

15.0 PROGRAM EVALUATION

In order to ensure that this Respiratory Protection Program continues to be effective, the program will be reviewed annually. The Engineering & Utilities Department, Facilities Maintenance Organization, and Environmental, Health, and Safety Department, will all participate in the review process.

The *UOS Safety Compliance Officer (SCO)* will act as the program coordinator. The responsible Supervisor will review all work involving respiratory protection with the SCO as part of this annual review. Conditions that might warrant a review of the program on a more frequent basis would include:

- Unauthorized use of respirators
- Identification of a hazard not covered by this program
- An injury or near miss resulting from respirator use or mis-use.
- A change in the use/configuration of equipment.
- Employee safety committee or contractor concern.

Following completion of any review, the program will be revised/updated in order to correct any identified deficiencies before further respirator use is authorized. Any changes in the program will be communicated to all affected employees.

16.0 AUTHORITY AND REFERENCES

29 CFR 1910.134 U.S. Dept. of Labor, Occupational Safety and Health, General Industry Requirements for Respiratory Protection.

29 CFR 1926.103 U.S. Dept. of Labor, Occupational Safety and Health, Construction Industry Requirements for Respiratory Protection

29 CFR 1910.1001 - 1045 U.S. Dept. of Labor, Occupational Safety and Health, Chemical Specific Regulations

American National Standards Institute (ANSI) Standard Z88.2-1992, Practices for Respiratory Protection

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