

**PURDUE UNIVERSITY**  
**Respiratory Protection Program**  
**Revised March 1998**

APPROVALS:

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Director, Radiological and Environmental Management

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Vice President, Physical Facilities

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## **RESPIRATORY PROTECTION PROGRAM**

### **1.0 PURPOSE**

The purpose of this program is to ensure effective implementation, operation and Record-keeping of a University respiratory protection program in compliance with 29 CFR 1910.134 and 1910.139.

### **2.0 SCOPE**

The provisions of the Respiratory Protection Program apply to all personnel at Purdue University's West Lafayette Campus, Regional Campuses, University research farms and agricultural centers, and related facilities and operations.

### **3.0 APPLICATION**

In the control of those occupational diseases and injuries caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors, the primary objective shall be to prevent atmospheric contamination. This shall be accomplished, as far as feasible, by accepted engineering control measures. (i.e., 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 shall be used.

### **4.0 POLICY**

- A. Respirators shall be provided by the University when such equipment is necessary to protect the health of the employee. The University shall provide respirators which are applicable and suitable for the purpose intended.
- B. The Respiratory Protection Program (RPP) administrator of the Department of Radiological Environmental Management shall be responsible for the establishment and maintenance of a respiratory protection program.
- C. The Department of Radiological and Environmental Management shall have the authority to require the use of respiratory protective equipment and to prohibit the use of such equipment.
- D. Only respiratory protective equipment approved by the Department of Radiological and Environmental Management shall be purchased or utilized.
- E. Only employees authorized by the Department of Radiological and Environmental Management shall use respiratory protective equipment.
- F. Negative pressure respirators and demand respirators shall not be worn when conditions prevent a good face seal. Such conditions may be a growth of beard, side burns, a skull

cap that projects under the face-piece or temple piece of glasses. Any employee who has facial hair which intrudes into the area where the respirator seals against the face, shall not be fitted with a negative pressure demand respirator. Additionally, any employee who is not clean-shaven shall not be allowed to wear a negative pressure or demand respirator, even though he has previously obtained a satisfactory fit with a particular device.

- G Respirators shall be provided to employees at no cost.\*
- H. Departments shall bear the cost of respiratory protective equipment, the cost of miscellaneous supplies and expenses, and the cost of medical evaluations required by the Respiratory Program.
- I. Medical evaluations shall be conducted by the Purdue University Occupational Medicine Physician or a licensed physician acceptable to the RPP administrator of the Department of Radiological and Environmental Management.
- J. The supervising department shall notify the Department of Radiological and Environmental Management prior to assigning an employee to a task that could require the use of a respiratory protective device.
- K. Employees shall utilize and maintain respiratory protective equipment in accordance with procedures established by the Department of Radiological and Environmental Management.
- L. The supervising department shall ensure employees comply with the provisions of the Respiratory Protection Program.
- M. Exceptions to this policy and the Respiratory Protection Program shall require the approval of the RPP administrator of the Department of Radiological and Environmental Management.
- N. Copies of the Respiratory Protection Program shall be made available, upon request, to affected employees by Radiological and Environmental Management.
- O. Where employees use respirators (dust masks only) and exposure levels are below established limits, they may do so in accordance with Appendix VIII.

For more information regarding this Policy and the Respiratory Protection Program, contact the Department of Radiological and Environmental Management at 49227.

\*As used in this Policy, the term employee includes students when exposed to hazardous materials under the same conditions as employees. Students may be required to purchase respiratory equipment for laboratory courses.

## 5.0 DEFINITIONS

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

**“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 into the face-piece only when a negative pressure is created inside the face-piece by inhalation.

**“Emergency situations”** means any occurrence such as, but not limited to, equipment rupture of containers, or failure of control equipment that may or does result in an uncontrolled significant release of an airborne contaminant.

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

**“End-of-service-life indicator”** means a system that warns the respirator user of the approach of the end of adequate respiratory protection, for example, the sorbent is approaching saturation or is no longer effective.

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

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

**“Filtering face-piece (dust mask)”** means a negative pressure particulate respirator with a filter as an integral part of the face-piece or with the entire face-piece composed of the filtering media.

**“Fit factor”** means a quantitative estimate of the fit of a particular respirator to a specific individual, and typically estimates the ratio of the concentration.

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

**“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-disperse particles of 0.3 micrometers in diameter. The equivalent NIOSH 42 CFR part 84 particulate filters are the N100, R100 and P100 filters.

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

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

**“Interior structural fire-fighting”** means the physical activity of fire suppression, rescue or both, inside of buildings or enclosed structures which are involved in a fire situation beyond the incipient stage. (See 29 CFR 1910.155)

**“Loose-fitting face-piece”** means a respiratory inlet covering that is designed to form a partial seal with face.

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

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

**“Physician or other licensed health care professional (PLHCP)”** means an individual whose legally permitted scope of practice (i.e. license, registration, or certification) allows him or her to independently provide, or be delegated the responsibility to provide some or all of the health care services required by section.

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

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

**“Pressure demand respirator”** means a positive pressure atmosphere-supplying

respirator that admits breathing air to the face-piece when the positive pressure is reduced inside the face-piece by inhalation.

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

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

**“Respirator inlet covering”** means that portion of a respirator that forms the protective barrier between the user’s respiratory tract and an air-purifying device or breathing air source, or both. It may be a face-piece, helmet, hood, suit or a mouthpiece respirator with nose clamp.

**“Respiratory protection program administrator (RPP administrator)”** means an individual designated by the director of the Radiological and Environmental Management to establish, manage and update as needed the respiratory protection program.

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

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

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

**“Tight-fitting face-piece”** means a respirator inlet covering that forms a complete seal with the face.

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

## **6.0 DEFINITION OF RESPONSIBILITIES**

A. The supervisor shall:

1. Contact the Department of Radiological and Environmental Management when they suspect a respirator may be required for a job.
2. Attend training on proper selection, storage, use and maintenance of respiratory protective equipment when employees they supervise are required to use such equipment, as defined in section 14.0.
3. Assure employees are scheduled and receive medical exams, when

required. (See section 8.0)

4. Assure employees attend training on the proper storage, use, and care of respiratory protective equipment. (See section 6.0, 9.0, 10.0 11.0 and 13.0, if applicable).
5. Supply employees with respiratory equipment specified by the Department of Radiological and Environmental Management. (See section 6.0)
6. Supply necessary parts and equipment to clean and maintain the respirator. (See section 10.0 (E,F&G))
7. Assure employees clean and maintain respiratory protective equipment properly. (See section 10.0)
8. Assure emergency use respiratory protective equipment is kept in supervised work areas and is inspected on a monthly basis. A log of this inspection shall be maintained. (See section 11.0 (C) (3))

B. The employee shall:

1. Attend training on the storage, use and care of respiratory protective equipment. (See sections 9.0, 10.0, 11.0 and 12.0)
2. Be clean-shaven in areas where facial hair may prevent a good face seal, when required to use negative pressure respiratory protective equipment. (See section 4.0(F))
3. Store, use and maintain respirators in accordance with instructions given. (See section 6.0, 9.0, 10.0, 11.0 and 12.0)
4. Report to supervisor any operations or jobs for which they suspect respiratory protective equipment may be needed.

C. The Physician or Other Licensed Health Care Professional (PLHCP) shall:

1. Establish medical and physical criteria for users of respiratory protective equipment as outlined in section 8.0 and may opt to use the OSHA medical questionnaire (Appendix X).
2. Provide the Department of Radiological and Environmental Management with written results verifying medically fit to use a negative pressure respirator and/or restrictions of use.(See section 8.0 (A))

D. The Department of Radiological and Environmental Management shall:

1. Make periodic surveys of operations and equipment at the University to assure adequate protection of employees is being provided.
2. Review operations for which respiratory protective equipment may be required.
3. Specify appropriate equipment. Only National Institute for Occupational Safety and Health (NIOSH) approved equipment will be specified when it is available. The job situation, exposures involved, exposure levels, and respiratory protection factors will be

taken into consideration when specifying a respirator. An inventory of all jobs for which respirators are required shall be maintained at the office.

4. Provide or arrange for training on the proper storage, use and care of respiratory protective equipment.
  5. Inform employees about the reasons why respiratory protective equipment is required.
  6. Maintain a list of employees medically approved for use of respiratory protective equipment.
  7. Generate a written Respiratory Protection Program and update as needed.
  8. Provide a copy of "Information for Employees Using Respirators When Not Required Under the Standard" when dust masks are voluntarily used by employees.
  9. Provide to the PLHCP a copy of appropriate section of the OSHA Standard and information on respirator users. (See section 8.0)
- E. Job postings will indicate when respiratory protective equipment is to be used and that potential employees will be medically screened to assure their medical fitness to use such equipment. During interviews, hiring supervisors will confirm that the applicant is aware of this requirement.

## **7.0 SELECTION OF RESPIRATORS**

- A. Departments shall provide respirators at no cost to the employee.
- B. Unless an exception is granted by the RPP administrator of the Department of Radiological and Environmental Management, all respirators shall be obtained through, or with the approval of, the Department of Radiological and Environmental Management.
- C. Where respirators are required to be used, a selection of respirators from a sufficient assortment of models and sizes will be used to ensure an acceptable and correct fit.
- D. In addition, the Department of Radiological and Environmental Management shall evaluate the following information for each work situation:
  1. The nature of the hazard;
  2. The physical and chemical properties of the air contaminant;
  3. Warning properties of the hazardous chemical;
  4. The adverse health effects of the respiratory hazard;
  5. The relevant hazardous exposure level;
  6. The results of workplace sampling of airborne concentrations of contaminants;
  7. The nature of the work operation or process;
  8. The period of time in which respiratory protection will be worn by employees during the work shift;
  9. The work activities of the employees and the potential stress of these work

- conditions on employees wearing the respirators;
10. Fit-test results; and,
  11. The physical characteristics, functional capabilities, and limitations of the various types of respirators.
- E. Appropriate respirators shall be selected from among those approved and certified by (NIOSH) under the provisions of 30 CFR Part 11 or 42 CFR Part 84 when they exist.
- F. The types of respirators available for selection shall be in accordance with Table I and Table II. The tables specify an "Assigned Protection Factor" (APF) for each type of respirator. This figure multiplied by the hazardous exposure level for the chemical will yield the maximum use concentration (MUC) for the equipment (i.e., the maximum concentration for which that type of equipment can be used). The MUC cannot exceed the use limitations specified on the NIOSH approval label for the cartridge, canister or filter.
- G. Air-purifying respirators shall not be used for hazardous chemical gases or vapors with poor or inadequate warning properties unless either:
1. Their use is permitted under the provisions of an OSHA substance specific standard, or
  2. The odor or irritation threshold is not in excess of three times the hazardous exposure level, there is no associated ceiling limit, and available information indicates that an undetected exposure between one and three times the hazardous exposure level would not cause serious or irreversible health effects. In addition, in order to use an air-purifying respirator for hazardous chemicals with poor or inadequate warning properties, the respirator must have an end of service life indicator (ESLI) approved by NIOSH for use with the specific chemical, or a change schedule must be implemented to assure that air-purifying cartridges, canisters and/or filters are replaced before 80% of their useful service life has expired, based upon documented service life data, airborne concentration of the chemical, and duration of exposure. See Appendix IX cartridge change-out schedule determination.
- H. Either an air-purifying respirator or atmosphere-supplying respirator may be used where an atmosphere has a measured oxygen content of 19.5% by volume or independent of altitude has a partial pressure of oxygen of 100 mm hg or greater.
- I. Where an oxygen-deficient atmosphere exists, appropriate respirators shall be selected as follows:

An atmosphere-supplying respirator shall be used for oxygen-deficient atmospheres with a measured oxygen content level which is less than 19.5% by volume or the partial pressure of oxygen is less than 100 mm hg.

## Respirator Selection

Table I: Air Purifying Respirators<sup>1</sup>

<u>Factor</u>	<u>Assigned Protection</u>
Half Mask or Quarter Facepiece <sup>2</sup>	10
Full Facepiece <sup>3</sup>	50
Disposable, Dust/ Mist	5
Powered Air-Purifying	
Tight fitting full face-piece	250
Tight fitting half mask <sup>2</sup>	50
Loose fitting hood or helmet	25

- Note: 1. Air-purifying respirators may not be used in oxygen-deficient or IDLH atmospheres.
2. Only full face-piece respirators are to be used in contaminant concentrations which produce eye irritation.
3. An APF of 50 is permitted only when QNFT is performed; when QLFT is performed, an APF of 10 is permitted.

**Table II: Atmosphere-Supplying Respirators**

<u>Factor</u>	<u>Assigned Protection Factor</u>
Supplied-Air Respirator (SAR) <sup>1</sup>	N/A
Negative Pressure (demand)	
half mask	10
full face-piece	50
Continuous Flow	
hood or helmet	25
half mask	50
full face-piece	250
Pressure Demand	
half mask	1000
full face-piece	1000
Combination Full Face-piece	
Pressure Demand SAR with Auxiliary Self-Contained Air Supply	greater than 1000, and IDLH, or unknown concentrations
Self-Contained Breathing Apparatus (SCBA) <sup>2</sup>	
demand	50
pressure demand	greater than 1000, and IDLH, or unknown concentrations
positive pressure	greater than 1000, and IDLH, or unknown concentrations

Note: 1. Any atmosphere-supplying respirator may be used in an oxygen-deficient atmosphere where the oxygen content is above the oxygen-deficient IDLH limits.

2. Only a full face-piece pressure demand SCBA or combination full face-piece pressure demand SAR with auxiliary self-contained air supply may be used in unknown IDLH or oxygen-deficient IDLH atmospheres.

## **8.0 MEDICAL EVALUATION**

- A. The Department of Radiological and Environmental Management shall obtain from a licensed physician a written opinion which states whether the employee's health is at increased risk of material impairment from respirator use and any limitations upon the use of respirators for each employee required to wear a respirator:
1. Who is referred for medical evaluation by the RPP administrator of the Department of Radiological and Environmental Management, or
  2. As required by a substance specific standard.

In requesting the written medical opinion, the Department of Radiological and Environmental Management shall provide the licensed physician with information concerning:

1. The type of respiratory protection to be used including its weight;
  2. A description of the work effort required;
  3. Duration and frequency of usage;
  4. The type of work performed, including any special responsibilities that affect the safety of others, such as fire-fighting or rescue work;
  5. Any special environmental conditions, such as heat and humidity or confined space entry; and,
  6. Additional requirements for protective clothing and equipment.
- B. Additional medical evaluations shall be provided for respirator users if:
1. An employee reports medical signs or symptoms that are related to the ability to use a respirator or;
  2. The PLHCP, supervisor or RPP administrator request the employee be re-evaluated.
- C. Minimal medical evaluation procedures are outlined in Appendix I.
- D. In the case of new employees, the Department of Radiological and Environmental Management may accept an already existing medical examination or written opinion from a physician stating whether the employee has any detected medical condition which would place the employee's health at increased risk of material impairment from respirator use and any recommended limitations upon the use of respirators, provided it was conducted within a year of the date of employment.
- E. The Department of Radiological and Environmental Management shall have the employee's medical status reviewed by, or under the supervision of, the PLHCP annually and at any time the employee reports difficulty breathing while being fitted for, or while using a respirator. The Department of Radiological and Environmental Management shall have the responsible licensed physician provide a written opinion

resulting from the review as required under 8.0 (A).

## **9.0 FIT-TESTING PROCEDURES**

- A. The Department of Radiological and Environmental Management shall ensure that the respirator selected fits the employee well enough to provide the protection required in the work area in which it will be worn.
- B. The Department of Radiological and Environmental Management shall ensure that an employee is fitted prior to initial use of the respirator and annually thereafter unless otherwise specified and that fit-testing shall be done using the same model, style and size respirator to be used by the employee in the work area.
- C. The Department of Radiological and Environmental Management shall fit-test employees required to wear tight-fitting, air-purifying respirators and tight-fitting atmosphere-supplying respirators as specified in section 8.0(A). The fit-test shall be administered using an OSHA-accepted protocol.
- D. The employee shall be re-fitted when visual observations are noted regarding an employee's condition which could affect respirator fit. Conditions to look for include facial scarring, dental change, cosmetic surgery, or an obvious change in body weight.
- E. The employee, once successfully fitted, shall be given the opportunity to wear the respirator for a period of two weeks. If the respirator becomes increasingly uncomfortable at any time, the employee shall be given the opportunity to select a different respirator face-piece and be re-fitted.
- F. Where positive pressure tight fitting face-piece is used, fit testing shall be done by temporarily converting the respirator's actual face-piece into a negative pressure respirator or by using an identical negative pressure air-purifying respirator face-piece with the same sealing surfaces as a surrogate.

## **10.0 USE OF RESPIRATORS**

- A. Procedures for the use of respirators in atmospheres where oxygen-deficiency, or the concentrations of a hazardous chemical are unknown, and/or potentially immediately dangerous to the life or health (IDLH), or interior structural fire-fighting:
  - 1. The employees shall wear pressure demand or positive pressure self-contained breathing apparatus (SCBA) or combination full face-piece pressure demand supplied-air respirator with auxiliary self-contained air supply
  - 2. When an employee wears a respirator in IDLH atmospheres or unknown or

potentially IDLH atmospheres where the employee could be overcome if the respiratory protection fails, the supervising department shall ensure that at least one additional person located outside the IDLH atmosphere is in communication with the employee in the IDLH atmosphere and able to provide effective emergency assistance; and,

3. When an employee enters IDLH atmospheres, the supervising department shall ensure that he is equipped with retrieval equipment for lifting or removing them from the hazardous area, or shall ensure that equivalent provisions for rescue have been made.
4. Visual, voice or signal line communication shall be maintained between the employee(s) in the IDLH atmosphere and employee(s) located outside the IDLH atmosphere.
5. The emergency assistance personnel present shall be trained and equipped with a positive pressure or pressure demand self-contained breathing apparatus.
6. Only employee(s) authorized by Purdue Fire Department shall provide assistance in IDLH situations.

B. Procedures for Structural Fire Fighting:

1. At least two employees shall enter the IDLH atmosphere and remain in visual or voice contact with one another at all times.
2. All employees involved in interior structural fire-fighting shall use SCBA's.

Note: Nothing in this section is meant to preclude firefighters from performing emergency rescue activities before an entire team has assembled.

- C. The supervising department shall not permit negative pressure, pressure demand, or positive pressure respirators which depend for effective performance on a tight face-piece-to-face seal to be worn by employees with conditions that prevent such a fit. Examples of these conditions include facial hair that interferes with the face-piece seal, absence of normally worn dentures, facial scars, temple pieces of glasses or headgear that projects under the face-piece seal.
- D. If an employee must wear corrective glasses or goggles, the supervising department shall ensure that provisions are made to avoid interference with the seal of the facepiece to the face of the wearer.
- E. The supervising department shall permit employees to leave the respirator use area to wash their faces and respirator face-pieces as necessary to prevent skin irritation associated with respirator use.
- F. The supervising department shall permit employees to leave the respirator use area to change the filter elements or replace air-purifying respirators whenever they detect the

warning properties of the contaminant, reach a predetermined end-of-service for the filter elements or whenever they detect a change in breathing resistance or chemical breakthrough occurs.

- G. The supervising department shall ensure that respirators are immediately repaired, or discarded and replaced, when they are no longer in proper original working condition.
- H. The supervising department shall ensure that disposable respirators which cannot be cleaned and sanitized are discarded at the end of the task or work shift, whichever comes first. A disposable respirator which can not be cleaned and sanitized shall be disposed of after its useful service life has been reached.
- I. The supervising department shall ensure that the employee performs a user seal check upon donning the respirator prior to entering the work area. The user seal check must be performed in accordance with the procedure in Appendix II (8)(a)(1&2) on all respirators on which such check is possible.
- J. The supervising department shall ensure that each self-contained breathing apparatus used in IDLH atmospheres, or for emergency entry or fire-fighting, is certified for a minimum service life of thirty minutes. This requirement does not apply to combination supplied-air respirators with auxiliary air supply or to emergency escape SCBA's.

## **11.0 MAINTENANCE AND CARE OF RESPIRATORS**

### **A. Cleaning and Disinfecting**

The supervising department shall ensure that respirators are cleaned and disinfected as follows: (The supervising department may use cleaning procedures recommended by the respirator manufacturer or cleaning procedures such as those recommended in Appendix VI.)

1. Routinely used respirators issued for the exclusive use of an employee shall be cleaned and disinfected after each day's use;
2. Routinely used respirators issued to more than one employee shall be cleaned and disinfected after each use;
3. Respirators maintained for emergency use shall be cleaned and disinfected after each use.
4. Respirators used in fit testing and training shall be cleaned and disinfected after each use.

### **B. Storage**

The supervising department shall store respirators as follows:

1. All respirators shall be stored in a manner that protects them from damage, face-piece distortion, dust, sunlight, extreme temperatures, excessive moisture, or damaging chemicals;
2. Emergency respirators shall be kept accessible to the work area. In locations where weathering, contamination or deterioration of the respirator could occur, respirators shall be stored in compartments built to protect them. Such compartments shall be clearly marked as containing emergency respirators and shall be used in accordance with any applicable manufacturer instructions;
3. Non-emergency respirators shall be stored in plastic bags or otherwise protected from contamination or damage; and,
4. Respirators shall be packed or stored to prevent deformation of the face-piece or exhalation valve.

### C. Inspection

1. The supervising department shall ensure that respirators are inspected as follows:
  - a. All respirators used in non-emergency circumstances shall be inspected before each use and during cleaning after each use;
  - b. All respirators maintained for emergency situations shall be inspected at least monthly and per the manufacturer's recommendations for proper function before and after each use. Emergency escape respirators shall be inspected before being carried into the workplace; and,
  - c. Self-contained breathing apparatus (SCBA) shall be inspected monthly. Air and oxygen cylinders shall be maintained in a fully charged state and recharged when the pressure falls to 90% of the manufacturer's recommended pressure level. The supervising department shall determine that the regulator and warning devices function properly.
2. The supervising department shall ensure that the respirator inspections include the following:
  - a. A check of respirator function, tightness of connections and the condition of the face-piece, head-straps, valves, connecting tube, cartridges, and canisters or filters and,
  - b. A check of rubber or elastomeric parts for pliability and signs of deterioration.

3. The supervising department shall inspect respirators maintained for emergency use and shall certify the date the inspection was performed, the name (or signature) of the person that made the inspection, and a serial number or other means of identifying the inspected respirator. This certification may be in the form of a tag or label attached to the storage compartment for the respirator, electronic file, or kept with the respirator and shall be maintained until replaced by the certification of the next inspection.

#### D. Repairs

The supervising department shall ensure that respirators which fail to pass inspection are removed from service and/or repaired in accordance with the following:

1. Repairs to respirators are to be made only by persons appropriately trained to perform such repairs, using parts designed for the respirator;
2. Manufacturer's recommendations concerning the type and extent of repairs that can be performed shall be followed; and,
3. Reducing or admission valves and regulators shall be returned to the manufacturer or given to an appropriately trained technician for adjustment or repair.

### 12.0 SUPPLIED-AIR QUALITY AND USE

The supervising department shall ensure that compressed air, compressed and liquid oxygen used for respiration is of high purity and in accordance with the following specifications:

- A. Compressed air and liquid oxygen shall meet the requirements of the United States Pharmacopoeia for medical or breathing oxygen, and compressed breathing air shall at least meet the requirements of the specification for Grade D breathing air, as described in Compressed Gas Association Commodity Specification G-7.1-1989 (oxygen content (v/v) of 19.5 - 23.5% (atmospheric air); hydrocarbon (content of 5 milligrams per cubic meter of air or less; carbon monoxide of 10 ppm or less, and carbon dioxide of 1,000 ppm or less) and lack of noticeable odor.
- B. Compressed oxygen shall not be used in atmosphere-supplying respirators or in open circuit self-contained breathing apparatus (SCBA) that have previously used compressed air; and,

- C. Oxygen shall not be used with supplied-air respirators.
- D. Breathing air to respirators shall be provided from cylinders or air compressors:
  - 1. Cylinders shall be tested and maintained as prescribed in the Shipping Container Specification Regulations of the Department of Transportation (49 CFR, Part 178) and the Contents shall meet the requirements for Type 1-Grade D breathing air; and the moisture in the cylinder shall not exceed a dew point of -50 deg. F (-45.6 deg. C) at 1 atmosphere pressure.
  - 2. The compressor for supplying breathing air shall be equipped with the necessary safety and standby devices;
  - 3. Compressors shall be constructed and situated so as to avoid entry of contaminated air into the air-supply system and shall be equipped with suitable in-line air-purifying sorbent bed and a filter to further assure breathing air quality, and to minimize moisture content so that the dew point at line pressure is 10° deg. F (5.56 deg C) below the ambient temperature;
  - 4. In-line air-purifying sorbent beds and filters shall be maintained and replaced and refurbished periodically following the manufactures instructions. A tag or label shall be affixed with the date of the most recent change and the name of the authorized person performing the work.
  - 5. A receiver of sufficient capacity to enable the respirator wearer to escape from a contaminated atmosphere in the event of compressor failure, and alarms to indicate compressor failure and overheating, shall be installed in the compressor system;
  - 6. If an oil-lubricated compressor is used, it shall be equipped with a high temperature or carbon monoxide alarm;
  - 7. For oil-less compressor systems monitoring of the supplied air shall be conducted to ensure carbon monoxide levels do not exceed 10 ppm.
- E. The supervising department shall ensure that breathing air couplings are incompatible with outlets for non-respirable plant air or other gas systems to prevent inadvertent servicing of airline respirators with non-respirable gases or oxygen.
- F. The supervising department shall use breathing gas containers marked in accordance with the NIOSH respirator certification standard, 42 CRF part 84.

### **13.0 IDENTIFICATION OF FILTERS, CARTRIDGES, AND CANISTERS**

- A. All filters, cartridges, and canisters used in the workplace shall be properly labeled and color-coded with the NIOSH approval label before they are placed in service.
- B. The supervising department shall ensure that the existing NIOSH/MSHA approval label on a filter, cartridge, or canister is not removed, obscured or defaced while they are in service in the workplace.

### **14.0 TRAINING**

- A. The Department of Radiological and Environmental Management shall provide a training program for employees required by the employer to wear respirators which includes the following:
  - 1. Why the respirator is necessary and how improper fit, usage, or maintenance can compromise the protection effect of the respirator ;
  - 2. Explanation of the operation, limitations, and capabilities of the selected respirator(s);
  - 3. How to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions;
  - 4. How to inspect, put on and remove, use, and check the seals of the respirator;
  - 5. Explanation of the procedures for maintenance and storage of the respirator;
  - 6. Instruction on how to deal with emergency situations involving the use of respirators or with respirator malfunctions;
  - 7. The contents of the OSHA Standard (29 CFR 1910.134) and of the written respiratory protection program, its location, and availability.
- B. Retraining shall be conducted when:
  - 1. Changes in the workplace or the type of respirator render previous training obsolete;
  - 2. Inadequacies in the employee's knowledge or use of the respirator indicate that the employee has not retained the requisite understanding or skill.
- C. Training activities shall be documented.
- D. The Department of Radiological and Environmental Management shall provide the training prior to requiring the employee to wear a respirator in the workplace and annually thereafter.

### **15.0 RESPIRATORY PROTECTION PROGRAM EVALUATION**

- A. The Department of Radiological and Environmental Management shall review the Respiratory Protection Program periodically and shall conduct frequent random inspections of the workplace to ensure that the provisions of the program are being properly implemented for all affected employees. The review of the program shall include an assessment of each element of the Respiratory Protection Program (RPP).
- B. The Department of Radiological and Environmental Management shall periodically consult employees wearing respirators to assess wearer acceptance and attempt to correct any problems that are revealed during this assessment. Factors to be included in the assessment are whether the respirators being used are:
  - 1. Preventing the occurrence of illness;
  - 2. Properly fitted;
  - 3. Properly selected for the hazards encountered;
  - 4. Being worn when necessary; and,
  - 5. Being maintained properly

## **16.0 RECORDKEEPING AND ACCESS TO RECORDS**

### **A. Medical Evaluation**

The University shall establish and maintain an accurate record for each employee subject to medical evaluation required by the RPP, in accordance with 29 CFR 1910.20, Access to Employee Exposure and Medical Records.

- 1. This record shall include:
  - (a) The name, social security number and description of the duties of the employee;
  - (b) The University's copy of the physician's written opinion on the initial, periodic and special examinations, including results of the medical examination and opinions and recommendations;
  - (c) A copy of the information provided to the physician, as required by the Respiratory Protection Program;
  - (d) A copy of the fit testing results conducted on the employee.
- 2. The University shall maintain this record in accordance with 29 CFR 1910.20.

## B. Transfer of Records

The University shall comply with the requirements involving transfer of records set forth in 29 CFR 1910.20. If the University ceases to do business and there is no successor employer to receive and retain the records for the prescribed period, the University shall notify the Director of the Regional OSHA office at least 90 days prior to disposal, and transmit them to the Director of the Regional OSHA office within that period.

## **Appendix I**

### **MEDICAL EVALUATION PROCEDURES**

This appendix contains recommended elements that should be taken into account during the performance of the required medical evaluation for respirator use. These elements should be evaluated in taking the medical history and evaluation, and the extent of testing performed is left for the responsible physician to determine. This recommended list of elements to be covered is not meant to limit the physician to the testing procedures recommended, since the examining physician is free to perform additional tests, if necessary, to determine an individual's ability to wear a respirator.

#### A. The medical history should include:

1. Previously diagnosed diseases, emphasizing cardiovascular or respiratory diseases;
2. Problems associated with breathing during normal work activities;
3. Past problems with respirator use;
4. Past and current usage of medication;
5. Any known physical conditions which may interfere with respirator use;
6. Previous occupations; and,

7. Use of medications whose side effects might impact upon cardiopulmonary fitness.

B. The medical examination should assess:

1. Hearing ability (sufficient to assure communication and response to instructions and alarm systems);
2. Pulmonary function testing including spirometry for FEV<sub>1</sub> and FVC\* (present degree of restrictive or obstructive disease or perfusion disorders);
3. Cardiovascular system (evidence of symptomatic coronary artery disease, significant arrhythmias, occurrence of frequent premature ventricular contractions (PVCs) with elevated pulse rates or uncontrolled hypertension symptoms);
4. Endocrine system (conditions which may result in sudden loss of consciousness or response capability);
5. Neurological system (inability to perform coordinated movements and conditions affecting response and consciousness);
6. Psychological condition (signs of claustrophobia; severe anxiety);
7. Miscellaneous conditions specific to the work situation (skin conditions where occlusive materials may result in symptoms or aggravation of a pre-existing dermatitis); and,
8. Exercise stress ( employees who use a self-contained breathing apparatus (SCBA) or re-breather type respirator under strenuous work conditions or in emergencies, particularly in fire and rescue operations).

\* In interpreting spirometry, if the FVC is less than 65 percent or the FEV<sub>1</sub>/FVC is less than 60 percent, restriction from respirator use should be considered.

## **Appendix II**

### **FIT-TEST PROTOCOLS**

A. The Department of Radiological and Environmental Management shall include the following provisions in the fit-test procedures. These procedures apply to both the Qualitative Fit-Test (QLFT) and the Quantitative Fit-Test (QNFT):

1. The test subject shall be allowed to pick the most comfortable respirator from a suitable selection, including respirators of various sizes from different manufacturers.
2. Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension and how to determine a comfortable fit. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator. This instruction may not constitute the subject's formal training on respirator use, as it is only a review.
3. The test subject shall be informed that he/she is being asked to select the respirator which provides the most comfortable fit. Each respirator represents a different size and shape, and if fitted and used properly, will provide adequate protection.
4. The test subject shall be instructed to hold each face-piece up to the face and eliminate

- those which obviously do not give a comfortable fit.
5. The more comfortable face-pieces are noted; the most comfortable mask is donned and worn at least five minutes to assess comfort. Assistance in assessing comfort can be given by discussing the points in item 6 below. If the test subject is not familiar with using a particular respirator, the test subject shall be directed to don the mask several times and to adjust the straps each time to become adept at setting proper tension on the straps.
  6. Assessment of comfort shall include reviewing the following points with the test subject and allowing the test subject adequate time to determine the comfort of the respirator.
    - a. Position of the mask on the nose;
    - b. Room for eye protection;
    - c. Room to talk;
    - d. Position of mask on face and cheeks;
  7. The following criteria shall be used to help determine the adequacy of the respirator fit:
    - a. Chin properly placed;
    - b. Adequate strap tension, not overly tightened
    - c. Fit across nose bridge;
    - d. Respirator of proper size to span distance from nose to chin;
    - e. Tendency of respirator to slip;
    - f. Self-observation in mirror to evaluate fit and respirator position.
  8. The test subject shall conduct the negative and positive pressure seal checks, as described in ANSI Z88.2-1980 or as follows:

## Appendix II, Continued

### a. Face-piece Seal Tests

- (1) Positive pressure test - Close off the exhalation valve and exhale gently into the face-piece. The face fit is considered satisfactory if a slight positive pressure can be built up inside the face-piece without any evidence of outward leakage of air at the seal. For most respirators, this method of leak testing requires the wearer to first remove the exhalation valve cover before closing off the exhalation valve and then carefully replacing it after the test.
- (2) Negative pressure test - Close off the inlet opening of the canister or cartridge(s) covering with the palm of the hand(s) or by replacing the filter seal(s), inhale gently so that the face-piece collapses slightly, and hold the breath for ten seconds. If the face-piece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is considered satisfactory.

Before conducting the negative or positive pressure test, the subject shall be told to seat the mask on the face by moving the head from side-to-side and up and down slowly while taking in a few slow deep breaths. Another face-piece shall be selected and re-tested if the test subject fails the fit-check tests.

9. The test shall not be conducted if there is any hair growth between the skin and the face-piece sealing surface, such as stubble beard growth, beard, or long sideburns which cross the respirator sealing surface. Any type of apparel which interferes with a satisfactory fit shall be altered or removed.
10. If at any time within the first two weeks of use the respirator becomes uncomfortable, the test subject shall be given the opportunity to select a different face-piece and to be re-tested.
11. The Department of Radiological and Environmental Management shall maintain a record of the fit-test administered to an employee. The record shall contain at least the following information:
  - a. Employee name and social security number;
  - b. Type of respirator;
  - c. Brand, size of respirator;
  - d. Date of test;
  - e. Results of the test;
  - f. Work description;
  - g. Testing device;
  - h. Individual conducting the test;
  - i. Factory calibration date;
  - j. Calculated fit factor from appropriate exercises:

Appendix II, Continued

- (1) For other than asbestos activities, follow Test Exercises 13a-e and i.
- (2) For asbestos activities, follow Test Exercises 13a-i.
- k. Overall fit factor for test.

The record shall be maintained until the next fit-test is administered.

12. Exercise regimen - Prior to the commencement of the fit-test, the test subject shall be given a description of the fit-test and the test subject's responsibilities during the test procedure, and the description of the test exercises that the subject will be performing. The respirator to be tested shall be worn for at least 5 minutes before the start of the fit-test.
13. Test Exercises - The test subject shall perform exercises, in the test environment, in the manner described below:
  - a. **Normal breathing** - In a normal standing position, without talking, the subject shall breathe normally.
  - b. **Deep breathing** - In a normal standing position, the subject shall breathe slowly and deeply, taking caution so as to not hyperventilate.

- c. **Turning head side-to-side** - Standing in place, the subject shall slowly turn his/her head from side-to-side between the extreme positions on each side. The head shall be held at each extreme momentarily so the subject can inhale at each side.
- d. **Moving head up and down** - Standing in place, the subject shall slowly move his/her head up and down. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).
- e. **Talking** - The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor.
- f. **Grimace** - The test subject shall grimace by smiling or frowning.
- g. **Bending over** - The test subject shall bend at the waist as if he/she were to touch his/her toes. Jogging in place shall be substituted for this exercise in those test environments which prohibit bending at the waist.
- h. **Jogging in place** - The test subject shall perform jogging in place for at least 30 seconds.
- i. **Normal breathing**- Repeat same as Exercise a.

## Appendix III

### ISOAMYL ACETATE PROTOCOL - QUALITATIVE FIT-TEST

#### A. Odor Threshold Screening

The odor threshold screening test, performed without wearing a respirator, is intended to determine if the individual tested can detect the odor of iso-amyl acetate.

1. Three 1-liter glass jars with metal lids are required.
2. Odor-free water (e.g. distilled or spring water) at approximately 25° C shall be used for the solutions.
3. The iso-amyl acetate (IAA), also known as iso-pentyl acetate stock solution, is prepared by adding 1 cc of pure IAA to 800 cc of odor free water in a 1-liter jar and shaking for 30 seconds. A new solution shall be prepared at least weekly.
4. The screening test shall be conducted in a room separate from the room used for actual fit-testing. The two rooms shall be well ventilated but shall not be connected to the same recirculating ventilation system.
5. The odor test solution is prepared in a second jar by placing 0.4 cc of the stock solution into 500 cc of odor-free water using a clean dropper or pipette. The solution shall be shaken for 30 seconds and allowed to stand for two to three minutes so that the IAA concentration above the liquid may reach equilibrium. This solution shall be used for only one day.
6. A test blank shall be prepared in a third jar by adding 500 cc of odor-free water.
7. The odor test and test blank jars shall be labeled 1 and 2 for jar identification. Labels shall be placed on the lids so they can be periodically peeled, dried off and switched to maintain the integrity of the test.
8. The following instruction shall be typed on a card and placed on the table in front of the two test jars (i.e., 1 and 2): "The Purpose of this test is to determine if you can smell banana oil at a low concentration. The two bottles in front of you contain water. One of these bottles also contains a small amount of banana oil. Be sure the covers are on tight, then shake each bottle for two seconds. Unscrew the lid of each bottle, one at a time, and sniff at the mouth of the bottle. Indicate to the test conductor which bottle contains banana oil."
9. The mixtures used in the IAA odor detection test shall be prepared in an area separate from where the test is performed, in order to prevent olfactory fatigue in the subject.
10. If the test subject is unable to correctly identify the jar containing the odor test solution, the IAA qualitative fit-test shall not be performed.
11. If the test subject correctly identifies the jar containing the odor test solution, the test subject may proceed to respirator selection and fit-testing.

## Appendix III, Continued.

### B. Iso-amyl Acetate Fit-Test

1. The fit-test chamber shall be similar to a clear 55-gallon drum liner suspended inverted over a 2-foot diameter frame so that the top of the chamber is about 6 inches above the test subject's head. The inside top center of the chamber shall have a small hook attached.
2. Each respirator used for the fitting and fit-testing shall be equipped with organic vapor cartridges or offer protection against organic vapors. The cartridges or masks shall be changed at least weekly.
3. After selecting, donning, and properly adjusting a respirator, the test subject shall wear it to the fit-testing room. This room shall be separate from the room used for odor threshold screening and respirator selection, and shall be well ventilated, as by an exhaust fan or lab hood, to prevent general room contamination.
4. A copy of the test exercises and any prepared text from which the subject is to read shall be taped to the inside of the test chamber.
5. Upon entering the test chamber, the test subject shall be given a 6-inch by 5-inch piece of paper towel, or other porous, absorbent, single-ply material, folded in half and wetted with 0.75 cc of pure IAA. The test subject shall hang the wet towel on the hook at the top of the chamber.
6. Allow two minutes for the IAA test concentration to stabilize before starting the fit-test exercises. This would be an appropriate time to talk with the test subject to explain the fit-test, the importance of his/her cooperation, and the purpose for the head exercises; or to demonstrate some of the exercises.
7. If at any time during the test, the subject detects the banana-like odor of IAA, the test has failed. The subject shall quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.
8. If the test has failed, the subject shall return to the selection room and remove the respirator, repeat the odor sensitivity test, select and put on another respirator, return to the test chamber, and again begin the procedure described in (1) through (7) above. The process continues until a respirator that fits well has been found. Should the odor sensitivity test be failed, the subject shall wait about 5 minutes before re-testing. Odor sensitivity will usually have returned by this time.
9. When a respirator is found that passes the test, its efficiency shall be demonstrated for the subject by having the subject break the face seal and take a breath before exiting the chamber.
10. When the test subject leaves the chamber, the subject shall remove the saturated towel and return it to the person conducting the test. to keep the test area from becoming contaminated. The used towels shall be kept in a self-sealing bag so there is no significant IAA concentration build-up in the test chamber during subsequent tests.

## Appendix IV

### IRRITANT FUME PROTOCOL - QUALITATIVE FIT-TEST

- A. The respirator to be tested shall be equipped with high-efficiency particulate air (HEPA) filters.
- B. The test subject shall be allowed to smell a weak concentration of the irritant smoke before the respirator is donned to become familiar with its characteristic odor.
- C. Break both ends of a ventilation smoke tube containing stannic oxychloride, such as the MSA part No. 5645, or equivalent. Attach one end of the smoke tube to a low flow air pump set to deliver 200 milliliters per minute.
- D. Advise the test subject that the smoke can be irritating to the eyes and instruct the subject to keep his/her eyes closed while the test is performed.
- E. The test conductor shall direct the stream of irritant smoke from the smoke tube towards the face seal area of the test subject. He/she shall begin at least 12 inches from the face-piece and gradually move to within one inch, moving around the whole perimeter of the mask.
- F. The exercises identified in Appendix II, A. (13) shall be performed by the test subject while the respirator seal is being challenged by the smoke.
- G. Each test subject passing the smoke test without evidence of a response shall be given a sensitivity check of the smoke from the same tube once the respirator has been removed to determine whether he/she reacts to the smoke. Failure to evoke a response shall void the fit-test.
- H. The fit-test shall be performed in a location with exhaust ventilation sufficient to prevent general contamination of the testing area by the test agent.

## Appendix V

### SACCHARIN PROTOCOL (USE OF 3M FIT-10 KIT) - QUALITATIVE FIT-TEST

#### A. Preparation

1. Attach hood to collar by placing draw string between flanges on collar. Tighten draw-string and tie with square knot or bow.
2. Pour a small amount (approximately one teaspoonful) of the Sensitivity Test Solution into the nebulizer labeled “#1 Sensitivity Test Solution.”
3. Pour the same amount of Fit Test Solution into the second nebulizer labeled “#2 Fit Test Solution.”

#### B. Sensitivity Test

This test is done to assure that the person being fit tested can detect the taste of the test solution at very low levels. The sensitivity Test Solution is a very dilute version of the Fit Test Solution.

The test subject should not eat, drink, or chew gum for 15 minutes before the test.

1. Have the test subject put on the hood and collar assembly without a respirator.
2. Position the hood assembly forward so that there is about six inches between the subject's face and the hood window.
3. Instruct the test subject to breathe through his mouth.
4. Using Nebulizer #1 with the Sensitivity Test Solution, inject the aerosol into the hood through the hole in the hood window. Inject ten squeezes of the bulb, fully collapsing and allowing the bulb to expand fully on each squeeze.
5. Ask the test subject if he can detect the sweet taste of the solution. If tasted, note the number of squeezes and proceed to the Fit Test.
6. If not tasted, inject an addition ten squeezes of the aerosol into the hood. Repeat with ten more squeezes required to produce a taste response.
7. If 30 squeezes are inadequate, the test is ended and another type fit test must be used.
8. Remove the test hood, and give the subject a few minutes to clear the taste from his mouth.

#### C. Fit Test

1. Have the test subject put on and fit check the respirator per the instructions provided with the respirator.
2. Have the subject put on and position the test hood as before, and breathe through his mouth.
3. Using Nebulizer #2 with the Fit Test Solution, inject the fit test aerosol using the same number of squeezes as required in the Sensitivity Test.
4. To maintain an adequate concentration of aerosol during this test, one-half the number of squeezes used in Step 3 is injected every 30 seconds.

## Appendix V, Continued

5. After the initial aerosol is injected, ask the test subject to perform the following test exercises for 60 seconds each:
  - a. **Normal breathing** - In a normal standing position, without talking, the subject shall breathe normally.
  - b. **Deep breathing** - In a normal standing position, the subject shall breathe slowly and deeply, taking caution so as to not hyperventilate.
  - c. **Turning head side-to-side** - Standing in place, the subject shall slowly turn his/her head from side-to-side between the extreme positions on each side. The head shall be held at each extreme momentarily so the subject can inhale at each side.
  - d. **Moving head up and down**- Standing in place, the subject shall slowly move his/her head up and down. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).
  - e. **Talking** - The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor.
  - f. **Grimace** - The test subject shall grimace by smiling or frowning.
  - g. **Bending over** - The test subject shall bend at the waist as if he/she were to touch his/her toes. Jogging in place shall be substituted for this exercise in those test environments which prohibit bending at the waist.
  - h. **Jogging in place** - The test subject shall perform jogging in place for at least 30 seconds.
  - i. **Normal breathing** - Repeat same as Exercise a.
6. The test is terminated at any time the sweet taste of the aerosol is detected by the subject, because this indicates an inadequate fit. (Before re-testing, wait 15 minutes and perform the sensitivity test again.)
7. If the entire test is completed without the subject detecting the sweet taste of the aerosol, the test is successful and the respirator fit is deemed adequate.

## Appendix VI

### **RECOMMENDED PROCEDURES FOR CLEANING RESPIRATORS**

- A. 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.
- B. Wash components in 50° C (122° F) 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.
- C. Rinse components thoroughly in clean, warm (50° C maximum), preferably running water. Drain.
- D. When the cleaner used does not contain a disinfecting agent, respirator components should be immersed for two minutes in one of the following:
  - 1. Hypo-chloride solution (50 ppm of chlorine) made by adding approximately one milliliter of laundry bleach to one liter of water at 50° C; or,
  - 2. 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% alcohol) to one liter of water at 50° C; or,
  - 3. Other commercially available cleansers of equivalent disinfectant quality when used as directed unless their use is recommended against by the respirator manufacturer.
- E. Rinse components thoroughly in clean, warm (50° C 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.
- F. Components should be hand-dried with a clean lint-free cloth or air-dried (preferred).
- G. Reassemble face-piece, replacing filters, cartridges, and canisters where necessary.
- H. Test the respirator to ensure that all components work properly.

## Appendix VII

### Quantitative Fit Testing Protocol Using the Portacount™ Ambient Aerosol Condensation Nuclei Counter (CNC).

#### A. Preparation

1. The minimum ambient particle count to complete the test shall be at least 2000 particles per cubic centimeter (part/cm<sup>3</sup>). If levels of less than this are present a lit candle or aerosol generator shall be used to increase the ambient concentration.
2. Following an established ambient of ambient concentration of  $\geq 2000$  Part/cm<sup>3</sup> attach the in-line HEPA filter to clear colored sampling line designed to attach to the probe on the respirator. Place the fit testing unit in the “particle count mode” and leave the HEPA filter in line until a particle concentration of 0.00 Part/cm<sup>3</sup>.
3. The respirator used for fit testing shall be equipped with a sampling probe or an attachable adapter containing a sampling probe that will not compromise the integrity of the seal during fit testing.

#### B. Fit Test

1. After the respirator has been properly donned, adjusted, adequately passed positive and/or negative seal checks, place the fit testing unit in “fit test mode”.
  - a. For half-mask negative pressure respirators the pass/fail level shall be set at 100.
  - b. For full-face negative pressure respirators the pass/fail level shall be set at 500.
2. The test will consist of the following test exercises for 60 seconds each (with the exception of Grimace which will be conducted for 15 seconds):
  - a. **Normal breathing** - In a normal standing position, without talking, the subject shall breathe normally.
  - b. **Deep breathing** - In a normal standing position, the subject shall breathe slowly and deeply, taking caution so as to not hyperventilate.
  - c. **Turning head side-to-side** - Standing in place, the subject shall slowly turn his/her head from side-to-side between the extreme positions on each side. The head shall be held at each extreme momentarily so the subject can inhale at each side.
  - d. **Moving head up and down**- Standing in place, the subject shall slowly move his/her head up and down. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).

e. **Talking** - The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor.

f. **Grimace** - The test subject shall grimace by smiling or frowning.

Appendix VII, Continued

g. **Bending over** - The test subject shall bend at the waist as if he/she were to touch his/her toes. Jogging in place shall be substituted for this exercise in those test environments which prohibit bending at the waist.

h. **Jogging in place** - The test subject shall perform jogging in place for at least 30 seconds.

i. **Normal breathing** - Repeat same as Exercise a.

3. The test shall be considered valid if the overall calculated fit factor is at least 100 and 500 for half-mask and full-face respectively.

## Appendix VIII

### **Information for Employees Using Respirators When Not Required Under the Standard**

Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for workers. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the worker. Sometimes, workers may wear respirators to avoid exposures to hazards, even if the amount of hazardous substance does not exceed the limits set by OSHA standards. If your voluntary use, or if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not present a hazard.

You should do the following.

1. Read and heed all instructions provided by the manufacturer on use, maintenance, cleaning and care, and warnings regarding the respirators limitations.
2. Choose respirators certified for use to protect against the contaminant of concern. NIOSH, the National Institute for Occupational Safety and Health of the U. S. Department of Health and Human Services, certifies respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is designed for and how much it will protect you.
3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke.
4. Keep track of your respirator so that you do not mistakenly use someone else's respirator.

## Appendix IX

### Change-out Schedule for Gas and Vapor Respirator Cartridges

For a cartridge/canister air purifying respirator a change-out schedule must be used to ensure that the user replaces respirator cartridges before the end of their service life. The regulation prohibits the use of warning properties as the sole basis for determining change schedules. Below is a list of specific chemicals and the regulatory change out requirements:

Acrylonitrile ----- end-of-service or end of shift (whichever occurs first)

Benzene ----- end-of-service life or beginning of shift (whichever occurs first)

Butadiene ----- every 1, 2 or 4 hours dependent on concentration and at the beginning of each shift

Half mask respirator with organic vapor cartridges	
<u>Concentration</u>	<u>Use duration</u>
5 ppm	4 hours
10 ppm	2 hours
25 ppm	1 hour

Formaldehyde ----- every 3 hours or the end of shift

Vinyl Chloride ----- end-of-service life or end of shift which ever occurs first

Methylene Chloride ----- for emergency escape only and must be replaced after use

#### **Alternative methods for establishing service life of cartridges:**

*Manufactures Objective Data*-Information verbally or written that is make and model specific.

*Experimental Methods*-Calculated breakthrough based on laboratory tests using worst case workplace conditions.

*Mathematical Predictive Methods*-Mathematical calculations based on manufactures information and known work place conditions.

Appendix IX, Continued

**For other chemicals not specifically regulatory addressed use the general guidance as outlined below in combination with any of the alternative methods listed:**

\*If a chemical's boiling point is  $> 70$  C and the concentration is less than 200 ppm a service life of 8 hours is expected at a normal work rate.

\*Service life is inversely proportional to work rate.

\*Humidity  $> 85\%$  will reduce service life by 50%.

## Appendix X

### OSHA Respirator Medical Evaluation Questionnaire

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

To the employee:

Can you read (circle one): Yes/No

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

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

1. Today's date: \_\_\_\_\_

2. Your name: \_\_\_\_\_

3. Your age (to nearest year): \_\_\_\_\_

4. Sex (circle one): Male/Female

5. Your height: \_\_\_\_\_ ft. \_\_\_\_\_ in.

6. Your weight: \_\_\_\_\_ lbs.

7. Your job title: \_\_\_\_\_

8. A phone number where you can be reached by the health care professional who reviews this questionnaire (include the Area Code): \_\_\_\_\_

9. The best time to phone you at this number: \_\_\_\_\_

10. Has your employer told you how to contact the health care professional who will review this questionnaire (circle one): Yes/No

11. Check the type of respirator you will use (you can check more than one category):

a. \_\_\_\_\_ N, R, or P disposable respirator (filter-mask, non-cartridge type only).

b. \_\_\_\_\_ Other type (for example, half- or full-face-piece type, powered-air purifying, supplied-air, self-contained breathing apparatus).

12. Have you worn a respirator (circle one): Yes/No

If "yes," what type(s): \_\_\_\_\_

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

1. Do you currently smoke tobacco, or have you smoked tobacco in the last month: Yes/No

2. Have you ever had any of the following conditions?

a. Seizures (fits): Yes/No

b. Diabetes (sugar disease): Yes/No

c. Allergic reactions that interfere with your breathing: Yes/No

d. Claustrophobia (fear of closed-in places): Yes/No

e. Trouble smelling odors: Yes/No

3. Have you ever had any of the following pulmonary or lung problems?

a. Asbestosis: Yes/No

b. Asthma: Yes/No

c. Chronic bronchitis: Yes/No

d. Emphysema: Yes/No

e. Pneumonia: Yes/No

f. Tuberculosis: Yes/No

g. Silicosis: Yes/No

h. Pneumothorax (collapsed lung): Yes/No

i. Lung cancer: Yes/No

j. Broken ribs: Yes/No

k. Any chest injuries or surgeries: Yes/No

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

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

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

10. Have you ever lost vision in either eye (temporarily or permanently): Yes/No
11. Do you currently have any of the following vision problems?
- a. Wear contact lenses: Yes/No
  - b. Wear glasses: Yes/No
  - c. Color blind: Yes/No
  - e. Any other eye or vision problem: Yes/No
12. Have you ever had an injury to your ears, including a broken eardrum: Yes/No
13. Do you currently have any of the following hearing problems?
- a. Difficulty hearing: Yes/No
  - b. Wear a hearing aid: Yes/No
  - c. Any other hearing or ear problem: Yes/No
14. Have you ever had a back injury: Yes/No
15. Do you currently have any of the following muscle skeletal problems?
- a. Weakness in any of your arms, hands, legs, or feet: Yes/No
  - b. Back pain: Yes/No
  - c. Difficulty fully moving your arms and legs: Yes/No
  - d. Pain or stiffness when you lean forward or backward at the waist: Yes/No
  - e. Difficulty fully moving your head up or down: Yes/No
  - f. Difficulty fully moving your head side to side: Yes/No
  - g. Difficulty bending at your knees: Yes/No
  - h. Difficulty squatting to the ground: Yes/No
  - i. Climbing a flight of stairs or a ladder carrying more than 25 lbs: Yes/No
  - j. Any other muscle or skeletal problem that interferes with using a respirator: Yes/No

Part B Any of the following questions, and other questions not listed, may be added to the questionnaire at the discretion of the health care professional who will review the questionnaire.

1. In your present job, are you working at high altitudes (over 5,000 feet) or in a place that has lower than normal amounts of oxygen: Yes/No  
If "yes," do you have feelings of dizziness, shortness of breath, pounding in your chest, or other symptoms when you're working under these conditions: Yes/No
2. At work or at home, have you ever been exposed to hazardous solvents, hazardous airborne chemicals (e.g., gases, fumes, or dust), or have you come into skin contact with hazardous chemicals: Yes/No

If "yes," name the chemicals if you know them: \_\_\_\_\_

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3. Have you ever worked with any of the materials, or under any of the conditions, listed below:
  - a. Asbestos: Yes/No
  - b. Silica (e.g., in sandblasting): Yes/No
  - c. Tungsten/cobalt (e.g., grinding or welding this material): Yes/No
  - d. Beryllium: Yes/No
  - e. Aluminum: Yes/No
  - f. Coal (for example, mining): Yes/No
  - g. Iron: Yes/No
  - h. Tin: Yes/No
  - i. Dusty environments: Yes/No
  - j. Any other hazardous exposures: Yes/No

If "yes," describe these exposures:

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4. List any second jobs or side businesses you have: \_\_\_\_\_

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5. List your previous occupations: \_\_\_\_\_

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6. List your current and previous hobbies: \_\_\_\_\_

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7. Have you been in the military services? Yes/No

If "yes," were you exposed to biological or chemical agents (either in training or combat): Yes/No

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

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

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

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

a. HEPA Filters: Yes/No

b. Canisters (for example, gas masks): Yes/No

c. Cartridges: Yes/No

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

a. Escape only (no rescue): Yes/No

b. Emergency rescue only: Yes/No

c. Less than 5 hours per week: Yes/No

d. Less than 2 hours per day: Yes/No

e. 2 to 4 hours per day: Yes/No

f. Over 4 hours per day: Yes/No

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

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

If "yes," how long does this period last during the average shift: \_\_\_\_\_ hrs. \_\_\_\_\_ mins.

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

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

If "yes," how long does this period last during the average shift: \_\_\_\_\_ hrs. \_\_\_\_\_ mins.

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

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

If "yes," how long does this period last during the average shift: \_\_\_\_\_ hrs. \_\_\_\_\_ mins.

Examples of heavy work are lifting a heavy load (about 50 lbs.) from the floor to your waist or shoulder; working on a loading dock; shoveling; standing while bricklaying or chipping castings; walking up an 8-degree grade about 2 mph; climbing stairs with a heavy load (about 50 lbs.).

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

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

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

15. Will you be working under humid conditions: Yes/No

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

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

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

Estimated maximum exposure level per shift: \_\_\_\_\_

Duration of exposure per shift: \_\_\_\_\_

Name of the second toxic substance: \_\_\_\_\_

Estimated maximum exposure level per shift: \_\_\_\_\_

Duration of exposure per shift: \_\_\_\_\_

Name of the third toxic substance: \_\_\_\_\_

Estimated maximum exposure level per shift: \_\_\_\_\_

Duration of exposure per shift: \_\_\_\_\_

The name of any other toxic substances that you'll be exposed to while using your respirator:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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

\_\_\_\_\_