

## Respiratory Protection Plan

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### **PURPOSE**

The purpose of the Loyola University Chicago Respiratory Protection Program is to protect employees from inhalation hazards where effective engineering controls have not adequately reduced the risk or level of exposure. This will be done by establishing and maintaining a program that will ensure compliance with all applicable federal and state regulations concerning the selection, use and maintenance of respirators.

### **POLICY**

It is the policy of Loyola University - Chicago to provide employees with a safe and healthful working environment. To this end, Loyola University has developed this Respiratory Protection Program (RPP) in accordance with the U.S. Occupational Safety and Health Administration (OSHA) standard 29 CFR 1910.134. This program addresses the control of employee exposures to airborne contaminants. OSHA has established permissible exposure limits (PELS) for chemicals. Employees cannot be exposed in excess of these levels without proper respiratory protection. As a matter of prevention, all attempts must first be made to reduce exposure to acceptable levels through the use of administrative and engineering controls.

#### **1.0 Introduction**

##### **1.1 Administrative and Engineering Controls:**

Administrative controls include the following:

- Written respiratory protection plan
- Employee training
- Medical surveillance
- Recordkeeping
- Written standard operating procedures (SOPS)

Engineering controls include the following:

- Putting SOPs into practice
- Using good work practices
- Selection and use of appropriate equipment and supplies
- Substitution with a less toxic material
- Change in process to minimize contact with hazardous chemicals
- Isolation or enclosure of a process or work operation
- Wet methods to reduce the generation of dust, when applicable
- General dilution ventilation
- Local exhaust, including the use of chemical fume hoods or other types of specialized ventilation systems
- Good housekeeping practices

Respirators and other personal protective equipment may be used where engineering controls are not feasible or cannot reduce exposure to acceptable levels, or while engineering controls are being installed. The need for a respirator is dependent upon the type of operations and the nature and quantity of the materials in use and must be assessed on a case by case basis. Only Loyola University Chicago furnished respirators shall be used, and only for the purpose they are intended and in a manner complying with Loyola University policy and applicable regulations. Loyola University shall provide respirators, training and medical evaluations at no cost to the employee. This program does not apply to contractors as they are responsible for providing their own respiratory protection programs and respiratory protective equipment.

## **1.2 Objectives:**

The objectives of the RPP include:

- To ensure that respiratory protective equipment is utilized only when effective administrative and/or engineering controls are not feasible; or while they are being implemented.
- To ensure that the correct type of respiratory protective equipment is selected for each application.
- To ensure that respiratory protective equipment is properly maintained.
- To ensure that respiratory protective equipment properly fits the user.
- To ensure that users of respiratory protective equipment are adequately trained in the care, use and limitation of the device.
- To ensure that regulatory documentation is established and maintained in a logical and accessible manner.

## **2.0 RESPONSIBILITIES**

### **2.1 Loyola University Chicago:**

As stated in the OSHA General Duty Clause, every employer is responsible for providing its employees with a safe and healthful work environment. The employer is specifically responsible for the establishment and maintenance of a respiratory protection program in accordance with 29 CFR 1910.134 when respirators are necessary to protect the health of the employee. Loyola University Chicago is responsible for establishing policies and procedures that meet the requirements of OSHA's Standards and for enforcing those policies and procedures to ensure a safe working environment for its employees.

### **2.2 Safety Office:**

The Safety office of the Facilities Management Division is responsible for establishing and maintaining a respiratory protection program consistent with the goal of protecting Loyola University Chicago personnel. Safety will implement a Respiratory Protection Program which is designed and organized to ensure respirators are properly selected, used, and maintained by personnel, and to meet federal regulatory standards (29 CFR 1910.134) and industry accepted standards (ANSI Z88.2). The Safety Office is also responsible for evaluating those tasks for which respiratory protection is thought to be necessary, determining the degree of hazard posed by the potential exposure, determining whether engineering or administrative controls are feasible, and will specify which respiratory protection device is to be used at each task.

In addition, the Safety Office is responsible for training personnel in the selection and use of respiratory protective devices, conduct qualitative and quantitative fit testing, and issue necessary protective devices. This training may be conducted by a knowledgeable outside party.

### **2.3 Safety Officer:**

The Campus Safety Officer acts as Program Administrator for the Respiratory Protection Program. This person shall see that all responsibilities of the EHS are carried out. The Campus Safety Officer is also head of the evaluation and review panel for the Program.

The Campus Safety Officer is responsible for the development, implementation, and administration of the RPP. These responsibilities include:

- Reviewing and updating the respiratory protection written program.
- Conducting exposure and health hazard evaluations of the Loyola University work environment.
- Approving respiratory protection equipment for Loyola University employees.
- Providing instruction to personnel on the proper use, maintenance and storage of respirators.
- Providing a fit-testing program for respirator wearers.

- Maintaining fit-testing and training records.
- Evaluating the overall effectiveness of the Respiratory Protection Program.

#### **2.4 Human Resources (HR):**

The Department of Human Resources (HR) is responsible for monitoring medical evaluations and job descriptions of all personnel who may be required to wear respiratory protective equipment in the completion of their assigned tasks. HR will report changes in employee health status to the Safety Office only as it pertains to respirator use and without divulging any confidential information. The HR Director is responsible for determining reasonable accommodations, workers compensation, disability and collective bargaining issues as relates to employee relations.

#### **2.5 Supervisor:**

Supervisors are to be cognizant of the RPP requirements. They are responsible for the health and safety of their subordinates and themselves. These responsibilities include the following:

- Ensure each employee under his or her supervision using a respirator has received an annual medical evaluation and appropriate training in its use.
- Ensure the availability of appropriate respirators and accessories, provide adequate storage facilities, and encourage proper respirator equipment maintenance.
- Be aware of tasks requiring the use of respiratory protection, and ensure all employees engaged in such work use the appropriate respirators at all times.
- Survey work area conditions and degree of employee exposure or stress. When there is a change in work areas conditions or degree of employee exposure or stress that may affect respirator effectiveness, the supervisor shall reevaluate the continued effectiveness of the respirator.
- Aid in the identification of potentials hazard evaluation.

Each supervisor shall be a member of the evaluation and review panel for the Program. S/He shall identify and notify Safety Office of tasks/procedures which may require exposure/health assessments to determine if individuals need to use respiratory protection.

#### **2.6 Respirator Wearers:**

It is the responsibility of each respirator wearer to comply with all aspects of the RPP. Such responsibilities include, but are not limited to the following:

- Wear his/her respirator when and where required and in the manner trained.
- Report any malfunctions of the respirator to his/her supervisor immediately.
- Guard against mechanical damage to the respirator, clean the respirator as instructed, and store the respirator in a clean, sanitary location.
- Notify Safety of health or other changes that might affect the safe use of a respirator.
- Aid in the identification of potential respiratory hazards.

#### **2.7 Others:**

Contractors are required to develop and implement a respiratory protection program for their employees who must enter into or work in areas where exposure to hazardous materials can not be controlled or avoided. This program must meet OSHA regulations as well as Loyola University Chicago Respiratory Protection Program requirements. Such programs shall be submitted to Loyola University for review prior to use of respirators by Contractor at Loyola University Chicago facilities.

Personnel, such as employees, inspectors, and visitors, who must enter an area where the use of respiratory protective equipment is required, regardless of length of time in the area, shall be provided with and use appropriate equipment, including instructions regarding use and limitations. Personnel shall be fit-tested and medically qualified to wear the respirator being issued prior to entry to the site.

Health, safety, medical and industrial hygiene consultants shall be utilized to support the Respiratory Protection Program as needed. Consultants may be utilized to provide independent data collection, assist in training programs and to assist in compliance audits.

### **3.0 EXPOSURE AND HEALTH ASSESSMENTS**

#### **3.1 Assessment of Work Areas:**

Before the selection and assignment of a respirator, an industrial hygienist, or a competent person under the supervision of an industrial hygienist, shall perform a hazard evaluation of the task that may require respiratory protection. The evaluation shall include the nature of the hazard, expected or actual levels of exposure, and the length of time the respiratory protection is required.

Whenever possible, air contaminants shall be controlled by accepted engineering control measures (e.g., enclosure, ventilation, wet methods, and substitution of less toxic materials). When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators shall be used.

Products or jobs which may indicate or which do require the use of respiratory protection are listed in Appendix E - Applicability of Respiratory Protection

Any task or product may be re-evaluated any time there is a change in the nature of the job or product. Employee complaint will also trigger a review of a task or product. A review of the real and/or potential exposures is made at least annually to determine if respiratory protection continues to be required.

#### **3.2 Medical Evaluation:**

Medical surveillance of employees is instituted to ensure that employees are capable of safely working with respiratory protection without health risk and to monitor the continued health of the employee.

Employees who require medical surveillance include the following:

- Those exposed at or above the OSHA PEL
- Those required to wear a respirator for 30 days or more during a year
- Those issued a negative pressure respirator

For the above affected employees, examinations will take place on the following occasions:

- Pre-placement
- Annual physical re-examination
- Termination (exit exam)
- Upon implementation of the RPP

Employees may make a written request for termination medical exams thirty (30) days prior to or following the date of termination of employment.

Examinations shall be scheduled on company time during normal working hours. Physicals shall be provided at no cost and without loss of pay to the employee.

Examinations shall be conducted by an Occupational Health Department contracted by the university. This department serves as the physician or licensed health care professional (PLHCP) with the ability to comply with OSHA standards regarding respiratory examinations.

Specific medical tests and procedures will be determined by the Occupational Health Physician and will be in accordance with OSHA medical surveillance requirements and/or NIOSH recommendations. The Medical Questionnaires required by OSHA are found in Appendix C to 1910.134: OSHA Respirator Medical Evaluation Questionnaire (Mandatory).

Chest x-rays shall be interpreted by a "B Reader" who has passed a proficiency test administered by the National Institute of Occupational Safety and Health (NIOSH).

The PLHCP shall make initial and subsequent annual determinations as to whether or not an employee can wear the required respirator without physical or psychological risk. Based on the overall health of the individual and special medical tests (pulmonary function studies, EKG, etc.) as appropriate, the examining physician determines whether or not the individual will be restricted from wearing respiratory protective equipment.

If a medical restriction is applied, the employee, his/her supervisor, and Safety Officer are formally notified of the restriction by the Occupational Health Center in consultation with the Department of Human Resources.

The PLHCP shall provide a report to Loyola University Chicago and it shall be placed in the employee's file within thirty (30) days of receipt of the report. The PLHCP must not reveal in the written opinion given to the employer specific findings or diagnoses unrelated to occupational exposure to asbestos or the ability to wear respiratory protection.

A copy of the report shall be made available to the employee.

#### **4.0 SELECTION AND USE OF RESPIRATORS**

##### **4.1 Respirator Use:**

Only authorized personnel may utilize respiratory protection, perform tasks or be in restricted areas which require respiratory protection. Respiratory protection is authorized and issued for the following personnel:

- Workers in areas known to have contaminant levels requiring the use of respiratory protection or in which contaminant levels requiring the use of respiratory protection may be created without warning (e.g., emergency purposes such as hazardous material spill responses).
- Workers performing operations documented to be hazardous to health and personnel unavoidably required to be in the immediate vicinity where similar levels of contaminants are generated.
- Workers in suspect areas or performing operations suspected of being hazardous to health but for which adequate sampling data has not been obtained.

##### **4.2 Respirator Approval:**

All respirators shall be approved and certified by the National Institute for Occupational Safety and Health (NIOSH) under NIOSH 42 CFR Part 84.

##### **4.3 Respirator Selection:**

Respiratory protective devices will be selected by the Campus Safety Officer, in accordance with OSHA 29 CFR 1910.134 with guidance from NIOSH Respirator Selection Decision Logic, NIOSH Certified Equipment List, and/or American National Standards Institute (ANSI) "Practices for Respiratory Protection" Z88.2.

Selection of the proper respirator(s) to be used in any work area or operation at Loyola University Chicago is made only after a determination has been made as to the real and/or potential exposure of employees to harmful concentrations of contaminants in the workplace atmosphere. This evaluation will be performed prior to the start of any routine or non-routine tasks requiring respirators.

Air-purifying respirators shall not be used in oxygen-deficient atmospheres or for hazardous chemicals without adequate warning properties, except when written approval is given by an industrial hygienist. Only full face-piece respirators shall be used in contaminant concentrations that produce eye irritation.

When appropriate, employees may choose to use a Powered Air-Purifying Respirator (PAPR) in lieu of a negative pressure respirator. Any respirator wearer, who requests one, shall be provided with a PAPR by Loyola University at its own expense. Purchase and use of a PAPR is subject to the approval of the Safety Officer.

Disposable dust/mist respirators may be used for nuisance particulate levels. Use of these respirators does not require a medical spirometry test or fit-test but does require training and compliance with all other aspects of the Respiratory Protection Program and the written approval of an industrial hygienist.

At no time may "dust masks" be used for asbestos and lead paint operations.

Assigned protection factors, current with OSHA guidelines and the professional judgment of an industrial hygienist (whichever is more conservative), shall be used for determining the appropriate respirator.

The following items will be considered in the selection of respirators:

- Nature of the contaminant, including skin or eye irritant, skin absorption, concentration and health effects;
- Effectiveness of the device against the substance of concern (protection factor);
- Estimated maximum concentration of the substance in the work area;
- Known limitations of the respiratory protective device;
- General environment (open shop or confined space, etc.);
- Nature of the task;
- Comfort, fit, and worker acceptance; and
- Other contaminants in the environment or potential for oxygen deficiency.

Acceptable respirators for select hazards (dependent on expected level of exposure):

<i>Hazard</i>	<i><u>Respirator</u> Type</i>
Asbestos	HM APR with P1 00 filters FF APR with P1 00 filters FF Powered <u>APR (PAPR) with</u> P1 00 filters
Epoxy- or Oil-Based Paints	HM APR with organic vapor cartridges FF Powered <u>APR (PAPR) with organic vapor</u> cartridges
Lead-Based Paint Removal	HM APR with P1 00 filters FF APR with P1 00 filters FF Powered <u>APR (PAPR) with</u> P1 00 filters
Use of Pesticides, Herbicides, and Rodenticides	FF APR with combination particulate and pesticide cartridges FF Powered APR (PAPR) with combination particulate and pesticide cartridges
Use of Formaldehyde	FF APR with organic vapor or specific formaldehyde cartridges FF Powered APR (PAPR) with organic vapor or specific formaldehyde cartridges <u>Type C SAR operated in pressure demand mode</u>

Supervisors shall contact the Safety Officer prior to non-routine work which may expose workers to hazardous substances or oxygen-deficient atmospheres. Examples of work which may require the use of respirators includes, but are not limited to:

- Any work involving the disturbance of asbestos-containing or presumed asbestos containing materials

- Abrasive blasting
- Cutting or melting lead or stripping lead-based paints from surfaces
- Welding or burning
- Painting, especially with epoxy or organic solvent coatings
- Using solvents, thinners or degreasers
- Any work which generates large amounts of dust
- Working in a confined space. This work requires specialized training.
- Using formaldehyde to decontaminate a space
- Bio-aerosols

A review of the real and/or potential exposures is made at least annually to determine if respiratory protection continues to be required, and if so, whether the previously chosen respirators still provide adequate protection.

#### **4.4 Types of Respirators:**

These procedures do not apply to the medical use of surgical masks. The use of surgical masks for protection of the worker against harmful levels of chemicals is not allowed by OSHA regulations. Surgical masks do not provide protection against air contaminants. They are never to be used in place of an air-purifying respirator. They are for medical use only.

Paper dust masks are illegal for work involving asbestos-containing or presumed asbestos-containing materials and for lead-based paint operations.

##### **A. Air-Purifying Respirators (APRS)**

These respirators remove air contaminants by filtering, absorbing, adsorbing, or chemical reaction with the contaminants as they pass through the respirator canister or cartridge. This respirator is to be used only where adequate oxygen (19.5 to 23.5 percent by volume) is available. They are not to be used in atmospheres approaching its IDLH level (immediately dangerous to life and health). APRs shall never be used when dealing with unknown materials and/or concentrations.

Air-purifying respirators can be classified as follows:

1. Particulate removing respirators, which filter out dusts, fibers, fumes and mists. These respirators may be single-use disposable respirators or respirators with replaceable filters.
2. Gas and vapor-removing respirators, which remove specific individual contaminants or a combination of contaminants by absorption, adsorption or by chemical reaction. Gas masks and chemical-cartridge respirators are examples of gas- and vapor-removing respirators.
3. Combination particulate/gas- and vapor-removing respirators, which combine the respirator characteristics of both kinds of air-purifying respirators.

##### **B. Supplied-Air Respirators (SA or SAR)**

These respirators provide breathing air independent of the environment. Such respirators are to be used when the contaminant has insufficient odor, taste or irritating warning properties, or when the contaminant is of such high concentration or toxicity that an air-purifying respirator is inadequate. It is Loyola University Chicago policy to use only full-face masks when using SA respirators. All SA respirators shall be supplied with Grade D breathing air in accordance with Compressed Gas Association (CGA) Commodity Specification G-7.1.

- Oxygen 19.5% - 23.5%
- Hydrocarbon <5Mg/M3
- Carbon monoxide  $\leq 10$  ppm
- Carbon dioxide <1,000 ppm
- Odor None

Supplied-air respirators, also called air-line respirators, are classified as follows:

### 1. Demand

This respirator supplies air to the user on demand (inhalation) which creates negative pressure within the face-piece. Leakage into the face-piece may occur if there is a poor seal between the respirator and the user's face.

### 2. Pressure-Demand

This respirator maintains continuous positive pressure within the face-piece, thus preventing leakage into the face-piece.

### 3. Continuous Flow

This respirator maintains a continuous flow of air to the face-piece and prevents leakage into the face-piece.

## C. Self-Contained Breathing Apparatus (SCBA)

This respiratory protective device is a specialized supplied air system. Generally, the tanks provide a twenty (20) minute air supply. The breathing air supplied to the user is carried on the user's back. This type of respirator allows the user complete independence from fixed source of air and offers the greatest degree of protection but is also the most complex. Training and practice in its use and maintenance is essential. This type of device will be used in emergency situations only.

All SCBA respirators shall be supplied with Grade D breathing air in accordance with Compressed Gas Association (CGA) Commodity Specification G-7. 1.

- Oxygen 19.5% - 23.5%
- Hydrocarbon <5Mg/M3
- Carbon monoxide ≤10 ppm
- Carbon dioxide <1,000 ppm
- Odor None

## D. Escape Bottle

This respiratory protective device is a backup air supply worn when using a SA respirator in an IDLH atmosphere or when entering a confined space. This respiratory protective device is a mini-SCBA with only 5-15 minutes of breathing air. It is commonly called a "5-minute air" bottle. Work is not to be conducted using escape only SCBAS. These shall be used as backup for escape purposes only.

### 4.5 Identification of Respirator Cartridges and Gas Mask Canisters:

Respirator cartridges and canisters are designed to protect against specific individual or a combination of potentially hazardous atmospheric contaminants, and are specifically labeled and color coded to indicate the type and nature of protection they provide. Respirator wearers and supervisors shall be aware of the labeling and color coding of the filters and cartridges in order to prevent use of the wrong cartridge. The primary identifier of the contaminants against which a cartridge protects is its written description. Secondarily, cartridges may be color-coded to ease field identification.

*Note: OSHA 29 CFR 1910.134 (1998) no longer has the table with color-coding. Refer to previous final rule and manufacturer information.*

The NIOSH approval label on the respirator will also specify the maximum concentration of contaminant(s) for which the cartridge or canister is approved. For example, a label may read:

*'Do Not Wear in Atmospheres Immediately Dangerous to Life. Must Be Used in Areas Containing at Least 20 Percent Oxygen. Do Not Wear in Atmospheres Containing More Than One-Tenth Percent Organic Vapors by Volume. Refer to Complete Label on Respirator or Cartridge Container for Assembly, Maintenance, and Use.'*

#### **4.6 Prohibited Materials:**

Chemical cartridges cannot be used to protect against the following contaminants:

Acrolein	Hydrogen sulfide	Nitroglycerin
Aniline	Methanol	Nitromethane
Arsine	Methyl chloride	Ozone
Bromine	Vinyl chloride	Phosgene
Carbon monoxide	Methylene bisphenyl	Phosphine
Dimethylaniline	isocyanate	Phosphorus trichloride
Dimethyl sulfate	Nickel carbonyl	Stibine
Hydrogen cyanide	Nitrobenzene	Sulfur chloride
Hydrogen fluoride	Nitrogen oxides	Toluene diisocyanate (TDI)
Hydrogen selenide		

#### **4.7 Warning Signs of Respirator Failure:**

##### **A. Particulate Air-Purifying**

When breathing difficulty is encountered with a filter respirator (due to partial clogging with increased resistance), the filter(s) must be replaced. Disposable filter respirators must be discarded and properly disposed.

##### **B. Gas or Vapor Air-Purifying**

If, when using a gas or vapor respirator (chemical cartridge or canister), any of the warning properties occur (e.g., odor, taste, eye irritation, or respiratory irritation), promptly leave the area and check the following:

- Proper face seal
- Damaged or missing respirator parts
- Saturated or inappropriate cartridge or canister

If no discrepancies are observed, replace the cartridge or canister. If any of the warning properties appear again, the concentration of the contaminants may have exceeded the cartridge or canister design specification. When this occurs a supplied air respirator or SCBA is required.

##### **C. Service Life of Air-Purifying Respirator Canisters and Cartridges**

Refer to NIOSH respirator Users' Notice "Differences and Limitations between Part 11 Particulate Respirators and Part 84 Particulate Respirators" found in Appendix I of this RPP for further discussion relating specifically to negative pressure, air-purifying particulate respirators.

The canisters or cartridges of air-purifying respirators are intended to be used until filter resistance precludes further use, or the chemical sorbent is expended as signified by a specific warning property (e.g., odor, taste, irritation, etc.). New canisters, cartridges or filters shall always be provided when a respirator is reissued. When in doubt about the previous use of the respirator, obtain a replacement canister or cartridge.

Check manufacturer information on the shelf life of chemical cartridges. Even when stored sealed in the original wrap, these cartridges may have an "expiration" date. Do not remove the wrap until the canister or cartridge is to be installed on the respirator assembly and used. For chemical cartridges, the date put into service is to be written on the cartridge. Check manufacturer information on the service life of the type of cartridge.

Note: If the seal is broken on the cartridge, it is put into service. Even if it is not used in a contaminated atmosphere, it begins its service life once the seal is broken.

##### **D. Supplied Air Respirator**

When using an airline respirator, leave the area immediately if the compressor failure alarm is activated or if an air pressure drop is sensed. When using an SCBA, leave the area immediately if the air pressure alarm is activated.

Warning alarms for carbon monoxide (CO) must be set at or below 10ppm. Leave the area immediately if the CO alarm is activated.

Workers in supplied air are to notify their co-workers and leave the area immediately if they detect an odor or oil in the breathing air. Likewise actions are to be taken if a worker develops headache, feels faint, light-headed or disoriented. These symptoms may indicate CO-poisoning.

## **5.0 RESPIRATOR TRAINING**

### **5.1 Required Training:**

Respirator users and their supervisors will receive training on the contents of the Loyola University Chicago Respiratory Protection Program and their responsibilities under it. They will be trained on the proper selection and use, as well as the limitations of the respirator. Training also covers how to ensure a proper fit before use and how to determine when a respirator is no longer providing the protection intended.

The Safety Officer will ensure that respirator wearers are trained in the use, maintenance, capabilities, and limitations of respirators initially upon assignment to tasks requiring respirators and annually thereafter or more often as necessary. Refresher training shall be conducted to reinforce proper work practices and update workers on any changes in respirator technology and regulations.

Training will be given only upon successful completion of the medical evaluation. Loyola University shall provide training at no cost to the employee. This training may be conducted by a knowledgeable outside party.

Specialized training is required for use of any supplied-air or self-contained breathing apparatus. Additionally, supervisors of users of these respirators shall be knowledgeable in the proper maintenance and use of the breathing air supply system.

The training program will include the following:

1. Nature and degree of respiratory hazard(s) to which employee may be exposed, including identification of PELs
2. Respirator selection, based on the hazard and respirator capabilities and limitations
3. Inspection, donning and use procedures
4. Air dry in a clean area in such a way as to prevent distortion.
5. Clean other respirator parts as recommended by the manufacturer.
6. Inspect valves, head straps, and other parts to ensure proper working condition.
7. Reassemble respirator and replace any defective parts.
8. Place in a clean, dry plastic bag or other suitable container for storage after each cleaning and disinfecting.

Written records shall be kept for the duration of employment and shall include names, training dates, and subject areas covered.

Training will be properly documented and will include the type and model of respirator for which the individual has been trained and fit-tested.

## **6.0 RESPIRATOR FIT-TESTING**

### **6.1 Fit-Testing Required:**

A fit-test shall be used to determine the ability of each individual respirator wearer to obtain a satisfactory fit with a specific air-purifying respirator. Either quantitative or qualitative fit-tests will be performed. Personnel must successfully pass the fit-test before being issued a respirator.

*Note: OSHA 29 CFR 1910.134 (1998) requires fit-testing for tight-fitting negative and positive pressure APRs and for tight-fitting SA respirators. Fit-testing is to be conducted in negative-pressure mode. This additional requirement ensures an adequate seal for escape purposes in the event of a system failure.*

No Loyola University employee is permitted to wear a tight-fitting respirator in a work situation until he or she has demonstrated that an acceptable fit can be obtained. Respirator fitting is conducted initially upon assignment to a task requiring use of respirator training.

Loyola University Chicago shall provide a medical evaluation to determine the employee's ability to use a respirator before the employee is fit-tested. The employee shall be fit-tested prior to the first use of the respirator and annually thereafter. Fit testing will also be required if there is a 10 pound change in weight for the wearer, dental changes, facial scarring, cosmetic surgery, or any other condition that may effect the seal.

*Note: OSHA 29 CFR 1910.134 (1998) amends fit-testing requirements for asbestos, lead, 13-carcinogens, vinyl chloride, inorganic arsenic, cadmium, benzene and acrylonitrile. All contaminants have been standardized to require fit-testing on an annual basis only.*

Fit-testing will be conducted in accordance with Appendix A to 29 CFR 1910.134: Fit Testing Procedures (Mandatory). Fit-testing shall be conducted by a qualified fit-tester familiar with proper fit-testing protocol and applicable regulations. Successful completion of a respirator fit-test will determine the manufacturer, type, model, and size of respirator for use by each individual respirator wearer. No other face-piece shall be used by that employee. Persons failing fit-testing will be provided with a different mask and retested, if the person fails all available masks, s/he cannot be assigned any duty which requires respiratory protection until appropriate respiratory protection can be found.

Fit-test documentation shall be maintained for the duration of employment.

## **6.2 Fit Checking:**

Each time a respirator is donned, the user will perform positive and negative pressure fit checks to verify that the respirator creates an adequate seal before entering the contaminated area. These checks do not substitute for fit-testing. Respirator users must be properly trained in the performance of these checks and understand their limitations.

Fit checks shall be performed in accordance with Appendix B-1 to 29 CFR 1910.134: User Seal Check Procedures (Mandatory) or the manufacturer's recommended user seal check procedures.

### **A. Positive Pressure Check**

**Applicability/Limitations:** This test cannot be carried out on all respirators; however, respirators equipped with exhalation valves can be tested.

**Procedure:** Close off the exhalation valve or the breathing tube with the palm of the hand. Exhale gently. If the respirator has been properly positioned, slight positive pressure will build up inside the face-piece without detection of any outward air leak between the sealing surface of the face-piece and the face.

### **B. Negative Pressure Check**

**Applicability/Limitations:** This test cannot be carried out on all respirators; however, it can be used on face pieces of air-purifying respirators equipped with tight-fitting respirator inlet covers and on supplied-air respirators equipped with breathing tubes which can be squeezed or blocked at the inlet to prevent the passage of air.

**Procedure:** Close off the inlet opening of the respirator's canister(s), cartridge(s), or filter(s) with the palm of the hand, or squeeze the breathing air tube or block its inlet so that it will not allow the passage of air. Inhale gently and hold for at least 10 seconds. If the face-piece collapses slightly and no inward leakage of air into the face-piece is detected, it can be reasonably assumed that the respirator has been properly positioned and the exhalation valve and face-piece are not leaking.

### **6.3 Qualitative Fit-Testing:**

Federal regulations (29 CFR 1910.134) require qualitative fit tests of respirators and describe step-by-step procedures in its Appendix A. This test checks the subject's response to a chemical introduced outside the respirator face-piece. This response is either voluntary or involuntary depending on the test chemical used. Protocol varies only slightly according to test chemical.

#### **A. Isoamyl Acetate (odorous vapor)**

The odorous vapor test is a voluntary response test. It relies on the subject's ability to detect an odorous chemical while wearing the respirator. Air purifying respirators must be equipped with an organic cartridge or canister for this test. Isoamyl acetate (banana oil) is the test chemical.

This test is limited by the wide variation of odor thresholds among individuals and the possibility of olfactory fatigue. Since it is a voluntary response test it depends upon an honest response. If the test subject cannot detect the isoamyl acetate, another acceptable test contaminant must be used.

#### **B. Saccharin Solution Aerosol**

The saccharin test is a voluntary response test. It relies on the subject's ability to detect the sweet taste of the chemical while wearing the respirator. Air purifying respirators must be equipped with high efficiency particulate air (HEPA) particulate filters (100% efficiency rating under NIOSH 42 CFR 84) for this test.

This test is limited by the wide variation of odor thresholds among individuals. Since it is a voluntary response test it depends upon an honest response. If the test subject cannot detect the saccharin solution, another acceptable test contaminant must be used.

#### **C. BitreXTM (Denatonium benzoate)**

The BitreXTM test is a voluntary response test. It relies on the subject's ability to detect the bitter taste of the chemical while wearing the respirator. Air purifying respirators must be equipped with HEPA particulate filters (100% efficiency rating under NIOSH 42 CFR 84) for this test.

This test is limited by the wide variation of odor thresholds among individuals. Since it is a voluntary response test it depends upon an honest response. If the test subject cannot detect the bitter solution, another acceptable test contaminant must be used.

#### **D. Stannic chloride (irritant Smoke)**

The irritant smoke test is an involuntary response test. Air-purifying respirators must be equipped with a HEPA particulate filters (100% efficiency rating under NIOSH 42 CFR 84) filter for this test. An irritant smoke, usually either stannic chloride or titanium tetrachloride, is directed from a smoke tube toward the respirator.

The irritant smoke is an irritant to the eyes, skin, and mucous membranes. It should not be introduced directly onto the skin. The test subject must keep his or her eyes closed during the testing if a full face-piece mask is not used.

Most test subjects will react to breakthrough of irritant smoke, however, after successful fit-testing, the subjects must waft the smoke to prove that they would have reacted to any leakage in their respirator. If the test subject does not react to the irritant smoke, another acceptable test contaminant must be used.

### **6.4 Quantitative Fit-Testing:**

Quantitative fit testing uses measuring instrumentation to determine the effectiveness of a respirator seal. Fit factors are determined by comparing the particle concentration outside the respirator with the concentration inside the respirator face-piece.

Air purifying respirators must be equipped with HEPA particulate filters (P100 series filters under NIOSH 42 CFR 84) for this test.

An acceptable fit is achieved with a minimum fit factor greater than or equal to 1.00 for both half-mask and full-face un-powered APRS.

### **6.5 Special Problems:**

#### **A. Facial Hair**

No attempt shall be made to fit a respirator on an employee who has facial hair which comes between the sealing periphery of the face-piece and the face, or if facial hair interferes with normal functioning of the exhalation valve of the respirator.

#### **B. Glasses and Eye/Face Protective Devices**

Proper fitting of a respiratory protective device face-piece for individuals wearing corrective eyeglasses or goggles may not be established if temple bars or straps extend through the sealing edge of the face-piece. If an employee must wear corrective lenses with a half-mask respirator, the worker must have corrective lenses fitted into protective eyewear which does not interfere with the respirator seal. If an employee must wear corrective lenses with a full-face respirator, the worker must have corrective lenses mounted to the interior of the face-piece.

#### **C. Corrective Contact Lenses**

Contact lenses will not be worn while wearing any respirator. If an employee must wear corrective lenses with a half-mask respirator, the worker must have corrective lenses fitted into protective eyewear which does not interfere with the respirator seal. If an employee must wear corrective lenses with a full-face respirator, the worker must have corrective lenses mounted to the interior of the face-piece.

### **6.6 Respirator User Cards:**

Respirator User Cards will be issued by the Safety Officer to employees who have been medically evaluated, trained and fit-tested for respirator use. A Respirator User Card will include:

1. Name and identification number of the worker
2. Type of fit-test performed
3. Pass/fail results for qualitative or fit factor and strip chart results for quantitative fit tests
2. The statement: "(name) has been medically evaluated, trained, and fitted to use the respirator indicated"
3. The type, model, and size of respirator that the cardholder was issued
4. Expiration date of card

### **6.7 Recordkeeping:**

Information shall include the name of test subject, date of testing, name of fit-tester, test chemical and respirator selected. The respirator information shall indicate the manufacturer, model, size and approval number. Quantitative fit-testing records shall additionally include the protection factor obtained for the respirator. A summary of test results shall be maintained for the duration of employment.

## **7.0 MAINTENANCE AND ISSUANCE OF RESPIRATORS**

### **7.1 Maintenance and Inspection:**

The maintenance of respiratory protective devices involves a thorough visual inspection for cleanliness and defects (i.e., cracking rubber, deterioration of straps, defective exhalation and inhalation valves, broken or cracked lenses, etc.). Worn or deteriorated parts will be replaced prior to reissue. No respirator with a known defect is reissued for use. No attempt is made to replace components, make adjustments or make repairs on any respirator beyond those recommended by the manufacturer. Under no circumstances will parts be substituted as such substitutions will

invalidate the approval of the respirator. Any repair to reducing or admission valves, regulators, or alarms will be conducted by either the manufacturer or a qualified trained technician. All Supervisors are to be knowledgeable in the specific manufacturer recommendations for respirators used by Loyola University respirator users. Only a Supervisor may replace any part of a respirator.

Respirator users are responsible for regular inspection of their respirators. Respirators are to be inspected by user prior to donning, each time the respirator is donned. It is the responsibility of the Supervisors to see that all respirators are kept in good working order. Scheduled inspections of respirators are to be conducted monthly by Supervisors to ensure that they are in good condition and that proper work practices are being followed. Unannounced inspections are to be conducted at least twice annually.

### **7.2 Cleaning of Respirators:**

All respirators in routine use shall be cleaned and sanitized on a periodic basis. Respirators used non-routinely shall be cleaned and sanitized after each use and filters and cartridges replaced. Routinely used respirators are maintained individually by the respirator wearer. Replacement cartridges and filters are obtained by contacting EHS.

Cleaning and disinfecting respirators must be done frequently to ensure that skin penetrating and dermatitis-causing contaminants are removed from the respirator surface. Respirators maintained for emergency use or those used by more than one person must be cleaned after each use by the user.

Cleaning shall be conducted in accordance with Appendix B-2 to OSHA 29 CFR 1910.134: Respirator Cleaning Procedures (Mandatory) or manufacturer recommendations.

The following procedure is a general recommendation for cleaning and disinfecting respirators. Manufacturer recommendations are to be followed when available.

1. Remove and properly dispose of all used filters, cartridges, or canisters.
2. Wash face-piece and breathing tube in a cleaner-disinfectant solution. A hand brush may be used to remove dirt. Solvents which can affect rubber and other parts shall not be used.
3. Rinse completely in clean, warm water.
4. Air dry in a clean area in such a way as to prevent distortion.
5. Clean other respirator parts as recommended by the manufacturer.
6. Inspect valves, head straps, and other parts to ensure proper working condition.
7. Reassemble respirator and replace any defective parts.
8. Place in a clean, dry plastic bag or other suitable container for storage after each cleaning and disinfecting.

### **7.3 Issuance of Respirators:**

Respiratory protective equipment shall not be ordered, purchased, or issued to personnel unless the respirator wearer has received written medical clearance, proper respirator training and achieved a successful fit-test. New employees, who require respiratory protective equipment, must be placed into the Respiratory Protection Program before being issued equipment.

### **7.4 Storage:**

After inspection, cleaning, and any necessary minor repairs, store respirators to protect against sunlight, heat, extreme cold, excessive moisture, damaging chemicals or other contaminants. Respirators shall be packed or stored so that the face-piece and exhalation valves will rest in a normal position and not be crushed. Routinely used respirators, such as half-mask or full-face air-purifying respirators, shall be placed in sealable plastic bags. Respirators will be stored in areas designated by the Campus Safety Officer.

Emergency use respirators shall be stored at appropriate work areas or stations in a sturdy compartment that is quickly accessible at all times and clearly marked.

**7.5 Recordkeeping:**

Sample respirator cleaning and inspection forms are listed in the appendix and are attached to this document. Respirator cleaning and inspection records shall be maintained indefinitely.

**8.0 PROGRAM SURVEILLANCE**

**8.1 Annual Program Review:**

In accordance with ANSI Z88.2, "an appraisal of the effectiveness of the respirator program shall be carried out at least annually. Action shall be taken to correct defects found in the program."

The evaluation of the Respiratory Protection Program will include addressing:

- Wearer acceptance of respirators
- Respirator program effectiveness
- Appraisal of protection provided by the respirator
- Compliance with regulatory requirements

Respirator users and their immediate supervisors shall be interviewed. The interviews will be used in evaluation of the RPP. Evidence of excessive exposure of respirator wearers to respiratory hazards will be followed up by investigation to determine why inadequate respiratory protection was provided. The findings of the Respiratory Protection Program evaluation will be documented, and this documentation will list plans to correct faults in the program and set target dates for the implementation of the plans.

Members of the Program Evaluation and Review Panel shall include the Safety Officer, Chief Engineer, Maintenance Supervisor, Grounds Supervisor and other supervisors of respirator users.

**9.0 RECORDKEEPING**

The following records shall be developed and maintained for the Loyola University Chicago Respiratory Protection Program:

<i>Records</i>	<i>Location</i>	<i>Maintain</i>
Respirator Program Manual, Standard Operating Procedures	F.O.M. Office	Continuously with annual evaluations
Program Review and Evaluations	F.O.M. Office	Indefinitely
Hazard Evaluations (Air sampling results, surveys, respirator selection records)	F.O.M. Office	Continuously with annual evaluations
Medical Evaluations	Occupational Health Service Provider	Duration of employment plus 30 years from termination
Medical Clearance for Respirator Use	F.O.M. Office	Duration of employment plus 30 years from termination
Training Records	F.O.M. Office	Duration of employment
Fit-Test Records	F.O.M. Office	Duration of Employment

Respirator Inspection and Maintenance	F.O.M. Office	Indefinitely
Program Review and Evaluations	F.O.M. Office	Indefinitely
<b><i>End of Program</i></b>		

## **REFERENCES**

### **U.S. Department of Labor OSHA Standards for General Industry:**

OSHA has established the following standards for Respiratory Protection

29 CFR 1910.134 (a), (b), (c), (d), (e), (f), (g), (h), (i), (j), and (k)

### **Appendices:**

Appendix A: Fit Testing Procedures (Mandatory)

Appendix B-1: User Seal Check Procedures (Mandatory)

Appendix B-2: Respirator Cleaning Procedures (Mandatory)

Appendix C: OSHA Respirator Medical Evaluation Questionnaire (Mandatory)

Appendix D: Information for Employees Using Respirators When Not Required Under the Standard (Mandatory)

### **Attachments:**

Medical Clearance to Wear a Respirator

Fit Test Worksheets

Respirator Training Record

Respirator Cleaning/Inspection Forms

Respirator Program Evaluation Checklist

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

### ***Part I. OSHA-Accepted Fit Test Protocols***

#### **A. Fit Testing Procedures -- General Requirements**

The employer shall conduct fit testing using the following procedures. The requirements in this appendix apply to all OSHA-accepted fit test methods, both QLFT and QNFT.

1. The test subject shall be allowed to pick the most acceptable respirator from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.
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 an acceptable 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, because it is only a review.
3. The test subject shall be informed that he/she is being asked to select the respirator that provides the most acceptable 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 chosen face-piece up to the face and eliminate those that obviously do not give an acceptable fit.
5. The more acceptable face-pieces are noted in case the one selected proves unacceptable; 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 the following item A.6. 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 a review of 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 a user seal check, either the negative and positive pressure seal checks described in Appendix B-1 of this section or those recommended by the respirator manufacturer which provide equivalent protection to the procedures in Appendix B-1. Before conducting the negative and positive pressure checks, 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 retested if the test subject fails the user seal 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, mustache or sideburns which cross the respirator sealing surface. Any type of apparel which interferes with a satisfactory fit shall be altered or removed.

10. If a test subject exhibits difficulty in breathing during the tests, she or he shall be referred to a physician or other licensed health care professional, as appropriate, to determine whether the test subject can wear a respirator while performing her or his duties.

11. If the employee finds the fit of the respirator unacceptable, the test subject shall be given the opportunity to select a different respirator and to be retested.

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. The description of the process shall include a description of the test exercises that the subject will be performing. The respirator to be tested shall be worn for at least 5 minutes before the start of the fit test.

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

14. Test Exercises. (a) The following test exercises are to be performed for all fit testing methods prescribed in this appendix, except for the CNP method. A separate fit testing exercise regimen is contained in the CNP protocol. The test subject shall perform exercises, in the test environment, in the following manner:

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

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

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

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

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

### ***Rainbow Passage***

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

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

(7) Bending over. The test subject shall bend at the waist as if he/she were to touch his/her toes. Jogging in place shall be substituted for this exercise in those test environments such as shroud type QNFT or QLFT units that do not permit bending over at the waist. (8) Normal breathing. Same as exercise (1).

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

## ***B. Qualitative Fit Test (QLFT) Protocols***

### 1. General

- (a) The employer shall ensure that persons administering QLFT are able to prepare test solutions, calibrate equipment and perform tests properly, recognize invalid tests, and ensure that test equipment is in proper working order.
- (b) The employer shall ensure that QLFT equipment is kept clean and well maintained so as to operate within the parameters for which it was designed.

### 2. Isoamyl Acetate Protocol

**Note:** This protocol is not appropriate to use for the fit testing of particulate respirators. If used to fit test particulate respirators, the respirator must be equipped with an organic vapor filter.

#### (a) Odor Threshold Screening

Odor threshold screening, performed without wearing a respirator, is intended to determine if the individual tested can detect the odor of isoamyl acetate at low levels.

- (1) Three 1 liter glass jars with metal lids are required.
- (2) Odor-free water (e.g., distilled or spring water) at approximately 25 deg. C (77 deg. F) shall be used for the solutions.
- (3) The isoamyl acetate (IAA) (also known as isopentyl acetate) stock solution is prepared by adding 1 ml of pure IAA to 800 ml of odor-free water in a 1 liter jar, closing the lid 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 to prevent the odor of IAA from becoming evident in the general room air where testing takes place.
- (5) The odor test solution is prepared in a second jar by placing 0.4 ml of the stock solution into 500 ml 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 jar lids shall be labeled (e.g., 1 and 2) for jar identification. Labels shall be placed on the lids so that they can be peeled off periodically 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.

#### (b) Isoamyl Acetate Fit Test

- (1) The fit test chamber shall be 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. If no drum liner is available, a similar chamber shall be constructed using plastic sheeting. 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.
- (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 ml of pure IAA. The test subject shall hang the wet towel on the hook at the top of the chamber. An IAA test swab or ampule may be substituted for the IAA wetted paper towel provided it has been demonstrated that the alternative IAA source will generate an IAA test atmosphere with a concentration equivalent to that generated by the paper towel method.
- (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 test 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 is failed. The subject shall quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.
- (8) If the test is failed, the subject shall return to the selection room and remove the respirator. The test subject shall repeat the odor sensitivity test, select and put on another respirator, return to the test area and again begin the fit test procedure described in (b) (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 at least 5 minutes before retesting. Odor sensitivity will usually have returned by this time.
- (9) If the subject passes the test, the efficiency of the test procedure shall be demonstrated by having the subject break the respirator 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, so that there is no significant IAA concentration buildup in the chamber during subsequent tests. The used towels shall be kept in a self-sealing plastic bag to keep the test area from being contaminated.

### 3. Saccharin Solution Aerosol Protocol

The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.

(a) Taste threshold screening. The saccharin taste threshold screening, performed without wearing a respirator, is intended to determine whether the individual being tested can detect the taste of saccharin.

- (1) During threshold screening as well as during fit testing, subjects shall wear an enclosure about the head and shoulders that is approximately 12 inches in diameter by 14 inches tall with at least the front portion clear and that allows free movements of the head when a respirator is worn. An enclosure substantially similar to the 3M hood assembly, parts # FT 14 and # FT 15 combined, is adequate.
- (2) The test enclosure shall have a 3/4-inch (1.9 cm) hole in front of the test subject's nose and mouth area to accommodate the nebulizer nozzle.
- (3) The test subject shall don the test enclosure. Throughout the threshold screening test, the test subject shall breathe through his/her slightly open mouth with tongue extended. The subject is instructed to report when he/she detects a sweet taste.

- (4) Using a DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent, the test conductor shall spray the threshold check solution into the enclosure. The nozzle is directed away from the nose and mouth of the person. This nebulizer shall be clearly marked to distinguish it from the fit test solution nebulizer.
  - (5) The threshold check solution is prepared by dissolving 0.83 gram of sodium saccharin USP in 100 ml of warm water. It can be prepared by putting 1 ml of the fit test solution (see (b)(5) below) in 100 ml of distilled water.
  - (6) To produce the aerosol, the nebulizer bulb is firmly squeezed so that it collapses completely, then released and allowed to fully expand.
  - (7) Ten squeezes are repeated rapidly and then the test subject is asked whether the saccharin can be tasted. If the test subject reports tasting the sweet taste during the ten squeezes, the screening test is completed. The taste threshold is noted as ten regardless of the number of squeezes actually completed.
  - (8) If the first response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whether the saccharin is tasted. If the test subject reports tasting the sweet taste during the second ten squeezes, the screening test is completed. The taste threshold is noted as twenty regardless of the number of squeezes actually completed.
  - (9) If the second response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whether the saccharin is tasted. If the test subject reports tasting the sweet taste during the third set of ten squeezes, the screening test is completed. The taste threshold is noted as thirty regardless of the number of squeezes actually completed.
  - (10) The test conductor will take note of the number of squeezes required to solicit a taste response.
  - (11) If the saccharin is not tasted after 30 squeezes (step 10), the test subject is unable to taste saccharin and may not perform the saccharin fit test.
- Note to paragraph 3. (a):** If the test subject eats or drinks something sweet before the screening test, he/she may be unable to taste the weak saccharin solution.
- (12) If a taste response is elicited, the test subject shall be asked to take note of the taste for reference in the fit test.
  - (13) Correct use of the nebulizer means that approximately 1 ml of liquid is used at a time in the nebulizer body.
  - (14) The nebulizer shall be thoroughly rinsed in water, shaken dry, and refilled at least each morning and afternoon or at least every four hours.
- (b) Saccharin solution aerosol fit test procedure.
- (1) The test subject may not eat, drink (except plain water), smoke, or chew gum for 15 minutes before the test.
  - (2) The fit test uses the same enclosure described in 3. (a) above.
  - (3) The test subject shall don the enclosure while wearing the respirator selected in section I. A. of this appendix. The respirator shall be properly adjusted and equipped with a particulate filter(s).
  - (4) A second DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent is used to spray the fit test solution into the enclosure. This nebulizer shall be clearly marked to distinguish it from the screening test solution nebulizer.
  - (5) The fit test solution is prepared by adding 83 grams of sodium saccharin to 100 ml of warm water.
  - (6) As before, the test subject shall breathe through the slightly open mouth with tongue extended, and report if he/she tastes the sweet taste of saccharin.
  - (7) The nebulizer is inserted into the hole in the front of the enclosure and an initial concentration of saccharin fit test solution is sprayed into the enclosure using the same number of squeezes (either 10, 20 or 30 squeezes) based on the number of squeezes required to elicit a taste response as noted during the screening test. A minimum of 10 squeezes is required.

(8) After generating the aerosol, the test subject shall be instructed to perform the exercises in section I. A. 14. of this appendix.

(9) Every 30 seconds the aerosol concentration shall be replenished using one half the original number of squeezes used initially (e.g., 5, 10 or 15).

(10) The test subject shall indicate to the test conductor if at any time during the fit test the taste of saccharin is detected. If the test subject does not report tasting the saccharin, the test is passed.

(11) If the taste of saccharin is detected, the fit is deemed unsatisfactory and the test is failed. A different respirator shall be tried and the entire test procedure is repeated (taste threshold screening and fit testing).

(12) Since the nebulizer has a tendency to clog during use, the test operator must make periodic checks of the nebulizer to ensure that it is not clogged. If clogging is found at the end of the test session, the test is invalid.

#### 4. Bitrex™ (Denatonium Benzoate) Solution Aerosol Qualitative Fit Test Protocol

The Bitrex™ (Denatonium benzoate) solution aerosol QLFT protocol uses the published saccharin test protocol because that protocol is widely accepted. Bitrex is routinely used as a taste aversion agent in household liquids which children should not be drinking and is endorsed by the American Medical Association, the National Safety Council, and the American Association of Poison Control Centers. The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.

##### (a) Taste Threshold Screening.

The Bitrex taste threshold screening, performed without wearing a respirator, is intended to determine whether the individual being tested can detect the taste of Bitrex.

(1) During threshold screening as well as during fit testing, subjects shall wear an enclosure about the head and shoulders that is approximately 12 inches (30.5 cm) in diameter by 14 inches (35.6 cm) tall. The front portion of the enclosure shall be clear from the respirator and allow free movement of the head when a respirator is worn. An enclosure substantially similar to the 3M hood assembly, parts # FT 14 and # FT 15 combined, is adequate.

(2) The test enclosure shall have a  $\frac{3}{4}$  inch (1.9 cm) hole in front of the test subject's nose and mouth area to accommodate the nebulizer nozzle.

(3) The test subject shall don the test enclosure. Throughout the threshold screening test, the test subject shall breathe through his or her slightly open mouth with tongue extended. The subject is instructed to report when he/she detects a bitter taste

(4) Using a DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent, the test conductor shall spray the Threshold Check Solution into the enclosure. This Nebulizer shall be clearly marked to distinguish it from the fit test solution nebulizer.

(5) The Threshold Check Solution is prepared by adding 13.5 milligrams of Bitrex to 100 ml of 5% salt (NaCl) solution in distilled water.

(6) To produce the aerosol, the nebulizer bulb is firmly squeezed so that the bulb collapses completely, and is then released and allowed to fully expand.

(7) An initial ten squeezes are repeated rapidly and then the test subject is asked whether the Bitrex can be tasted. If the test subject reports tasting the bitter taste during the ten squeezes, the screening test is completed. The taste threshold is noted as ten regardless of the number of squeezes actually completed.

(8) If the first response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whether the Bitrex is tasted. If the test subject reports tasting the bitter taste during the second ten squeezes, the screening test is completed. The taste threshold is noted as twenty regardless of the number of squeezes actually completed.

(9) If the second response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whether the Bitrex is tasted. If the test subject reports tasting the bitter taste during the third set of ten squeezes, the

screening test is completed. The taste threshold is noted as thirty regardless of the number of squeezes actually completed.

(10) The test conductor will take note of the number of squeezes required to solicit a taste response.

(11) If the Bitrex is not tasted after 30 squeezes (step 10), the test subject is unable to taste Bitrex and may not perform the Bitrex fit test.

(12) If a taste response is elicited, the test subject shall be asked to take note of the taste for reference in the fit test.

(13) Correct use of the nebulizer means that approximately 1 ml of liquid is used at a time in the nebulizer body.

(14) The nebulizer shall be thoroughly rinsed in water, shaken to dry, and refilled at least each morning and afternoon or at least every four hours.

(b) Bitrex Solution Aerosol Fit Test Procedure.

(1) The test subject may not eat, drink (except plain water), smoke, or chew gum for 15 minutes before the test.

(2) The fit test uses the same enclosure as that described in 4. (a) above.

(3) The test subject shall don the enclosure while wearing the respirator selected according to section I. A. of this appendix. The respirator shall be properly adjusted and equipped with any type particulate filter(s).

(4) A second DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent is used to spray the fit test solution into the enclosure. This nebulizer shall be clearly marked to distinguish it from the screening test solution nebulizer.

(5) The fit test solution is prepared by adding 337.5 mg of Bitrex to 200 ml of a 5% salt (NaCl) solution in warm water.

(6) As before, the test subject shall breathe through his or her slightly open mouth with tongue extended, and be instructed to report if he/she tastes the bitter taste of Bitrex.

(7) The nebulizer is inserted into the hole in the front of the enclosure and an initial concentration of the fit test solution is sprayed into the enclosure using the same number of squeezes (either 10, 20 or 30 squeezes) based on the number of squeezes required to elicit a taste response as noted during the screening test.

(8) After generating the aerosol, the test subject shall be instructed to perform the exercises in section I. A. 14. of this appendix.

(9) Every 30 seconds the aerosol concentration shall be replenished using one half the number of squeezes used initially (e.g., 5, 10 or 15).

(10) The test subject shall indicate to the test conductor if at any time during the fit test the taste of Bitrex is detected. If the test subject does not report tasting the Bitrex, the test is passed.

(11) If the taste of Bitrex is detected, the fit is deemed unsatisfactory and the test is failed. A different respirator shall be tried and the entire test procedure is repeated (taste threshold screening and fit testing).

## 5. Irritant Smoke (Stannic Chloride) Protocol

This qualitative fit test uses a person's response to the irritating chemicals released in the "smoke" produced by a stannic chloride ventilation smoke tube to detect leakage into the respirator.

(a) General Requirements and Precautions

(1) The respirator to be tested shall be equipped with high efficiency particulate air (HEPA) or P100 series filter(s).

(2) Only stannic chloride smoke tubes shall be used for this protocol.

(3) No form of test enclosure or hood for the test subject shall be used.

(4) The smoke can be irritating to the eyes, lungs, and nasal passages. The test conductor shall take precautions to minimize the test subject's exposure to irritant smoke. Sensitivity varies, and certain individuals may respond to a greater degree to irritant smoke. Care shall be taken when performing the sensitivity screening checks that determine whether the test subject can detect irritant smoke to use only the minimum amount of smoke necessary to elicit a response from the test subject.

(5) The fit test shall be performed in an area with adequate ventilation to prevent exposure of the person conducting the fit test or the build-up of irritant smoke in the general atmosphere.

#### (b) Sensitivity Screening Check

The person to be tested must demonstrate his or her ability to detect a weak concentration of the irritant smoke.

(1) The test operator shall break both ends of a ventilation smoke tube containing stannic chloride, and attach one end of the smoke tube to a low flow air pump set to deliver 200 milliliters per minute, or an aspirator squeeze bulb. The test operator shall cover the other end of the smoke tube with a short piece of tubing to prevent potential injury from the jagged end of the smoke tube.

(2) The test operator shall advise the test subject that the smoke can be irritating to the eyes, lungs, and nasal passages and instruct the subject to keep his/her eyes closed while the test is performed.

(3) 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 irritating properties and to determine if he/she can detect the irritating properties of the smoke. The test operator shall carefully direct a small amount of the irritant smoke in the test subject's direction to determine that he/she can detect it.

#### (c) Irritant Smoke Fit Test Procedure

(1) The person being fit tested shall don the respirator without assistance, and perform the required user seal check(s).

(2) The test subject shall be instructed to keep his/her eyes closed.

(3) The test operator shall direct the stream of irritant smoke from the smoke tube toward the faceseal area of the test subject, using the low flow pump or the squeeze bulb. The test operator shall begin at least 12 inches from the facepiece and move the smoke stream around the whole perimeter of the mask. The operator shall gradually make two more passes around the perimeter of the mask, moving to within six inches of the respirator.

(4) If the person being tested has not had an involuntary response and/or detected the irritant smoke, proceed with the test exercises.

(5) The exercises identified in section I.A. 14. of this appendix shall be performed by the test subject while the respirator seal is being continually challenged by the smoke, directed around the perimeter of the respirator at a distance of six inches.

(6) If the person being fit tested reports detecting the irritant smoke at any time, the test is failed. The person being retested must repeat the entire sensitivity check and fit test procedure.

(7) Each test subject passing the irritant smoke test without evidence of a response (involuntary cough, irritation) shall be given a second sensitivity screening check, with the smoke from the same smoke tube used during the fit test, once the respirator has been removed, to determine whether he/she still reacts to the smoke. Failure to evoke a response shall void the fit test.

(8) If a response is produced during this second sensitivity check, then the fit test is passed.

#### C. Quantitative Fit Test (QNFT) Protocols

The following quantitative fit testing procedures have been demonstrated to be acceptable: Quantitative fit testing using a non-hazardous test aerosol (such as corn oil, polyethylene glycol 400 [PEG 400], di-2-ethyl hexyl sebacate [DEHS], or sodium chloride) generated in a test chamber, and employing instrumentation to quantify the fit of the respirator; Quantitative fit testing using ambient aerosol as the test agent and appropriate instrumentation

(condensation nuclei counter) to quantify the respirator fit; Quantitative fit testing using controlled negative pressure and appropriate instrumentation to measure the volumetric leak rate of a face-piece to quantify the respirator fit.

## 1. General

(a) The employer shall ensure that persons administering QNFT are able to calibrate equipment and perform tests properly, recognize invalid tests, calculate fit factors properly and ensure that test equipment is in proper working order.

(b) The employer shall ensure that QNFT equipment is kept clean, and is maintained and calibrated according to the manufacturer's instructions so as to operate at the parameters for which it was designed.

## 2. Generated Aerosol Quantitative Fit Testing Protocol

### (a) Apparatus.

(1) Instrumentation. Aerosol generation, dilution, and measurement systems using particulates (corn oil, polyethylene glycol 400 [PEG 400], di-2-ethyl hexyl sebacate [DEHS] or sodium chloride) as test aerosols shall be used for quantitative fit testing.

(2) Test chamber. The test chamber shall be large enough to permit all test subjects to perform freely all required exercises without disturbing the test agent concentration or the measurement apparatus. The test chamber shall be equipped and constructed so that the test agent is effectively isolated from the ambient air, yet uniform in concentration throughout the chamber.

(3) When testing air-purifying respirators, the normal filter or cartridge element shall be replaced with a high efficiency particulate air (HEPA) or P100 series filter supplied by the same manufacturer.

(4) The sampling instrument shall be selected so that a computer record or strip chart record may be made of the test showing the rise and fall of the test agent concentration with each inspiration and expiration at fit factors of at least 2,000. Integrators or computers that integrate the amount of test agent penetration leakage into the respirator for each exercise may be used provided a record of the readings is made.

(5) The combination of substitute air-purifying elements, test agent and test agent concentration shall be such that the test subject is not exposed in excess of an established exposure limit for the test agent at any time during the testing process, based upon the length of the exposure and the exposure limit duration.

(6) The sampling port on the test specimen respirator shall be placed and constructed so that no leakage occurs around the port (e.g., where the respirator is probed), a free air flow is allowed into the sampling line at all times, and there is no interference with the fit or performance of the respirator. The in-mask sampling device (probe) shall be designed and used so that the air sample is drawn from the breathing zone of the test subject, midway between the nose and mouth and with the probe extending into the face-piece cavity at least 1/4 inch.

(7) The test setup shall permit the person administering the test to observe the test subject inside the chamber during the test.

(8) The equipment generating the test atmosphere shall maintain the concentration of test agent constant to within a 10 percent variation for the duration of the test.

(9) The time lag (interval between an event and the recording of the event on the strip chart or computer or integrator) shall be kept to a minimum. There shall be a clear association between the occurrence of an event and its being recorded.

(10) The sampling line tubing for the test chamber atmosphere and for the respirator sampling port shall be of equal diameter and of the same material. The length of the two lines shall be equal.

(11) The exhaust flow from the test chamber shall pass through an appropriate filter (i.e., high efficiency particulate filter) before release.

(12) When sodium chloride aerosol is used, the relative humidity inside the test chamber shall not exceed 50 percent.

(13) The limitations of instrument detection shall be taken into account when determining the fit factor.

(14) Test respirators shall be maintained in proper working order and be inspected regularly for deficiencies such as cracks or missing valves and gaskets.

(b) Procedural Requirements.

(1) When performing the initial user seal check using a positive or negative pressure check, the sampling line shall be crimped closed in order to avoid air pressure leakage during either of these pressure checks.

(2) The use of an abbreviated screening QLFT test is optional. Such a test may be utilized in order to quickly identify poor fitting respirators that passed the positive and/or negative pressure test and reduce the amount of QNFT time. The use of the CNC QNFT instrument in the count mode is another optional method to obtain a quick estimate of fit and eliminate poor fitting respirators before going on to perform a full QNFT.

(3) A reasonably stable test agent concentration shall be measured in the test chamber prior to testing. For canopy or shower curtain types of test units, the determination of the test agent's stability may be established after the test subject has entered the test environment.

(4) Immediately after the subject enters the test chamber, the test agent concentration inside the respirator shall be measured to ensure that the peak penetration does not exceed 5 percent for a half mask or 1 percent for a full face-piece respirator.

(5) A stable test agent concentration shall be obtained prior to the actual start of testing.

(6) Respirator restraining straps shall not be over-tightened for testing. The straps shall be adjusted by the wearer without assistance from other persons to give a reasonably comfortable fit typical of normal use. The respirator shall not be adjusted once the fit test exercises begin.

(7) The test shall be terminated whenever any single peak penetration exceeds 5 percent for half masks and 1 percent for full face-piece respirators. The test subject shall be refitted and retested.

(8) Calculation of fit factors.

(i) The fit factor shall be determined for the quantitative fit test by taking the ratio of the average chamber concentration to the concentration measured inside the respirator for each test exercise except the grimace exercise.

(ii) The average test chamber concentration shall be calculated as the arithmetic average of the concentration measured before and after each test (i.e., 7 exercises) or the arithmetic average of the concentration measured before and after each exercise or the true average measured continuously during the respirator sample.

(iii) The concentration of the challenge agent inside the respirator shall be determined by one of the following methods:

**(A)** Average peak penetration method means the method of determining test agent penetration into the respirator utilizing a strip chart recorder, integrator, or computer. The agent penetration is determined by an average of the peak heights on the graph or by computer integration, for each exercise except the grimace exercise. Integrators or computers that calculate the actual test agent penetration into the respirator for each exercise will also be considered to meet the requirements of the average peak penetration method.

**(B)** Maximum peak penetration method means the method of determining test agent penetration in the respirator as determined by strip chart recordings of the test. The highest peak penetration for a given exercise is taken to be representative of average penetration into the respirator for that exercise.

**(C)** Integration by calculation of the area under the individual peak for each exercise except the grimace exercise. This includes computerized integration.

**(D)** The calculation of the overall fit factor using individual exercise fit factors involves first converting the exercise fit factors to penetration values, determining the average, and then converting that result back to a fit factor. This procedure is described in the following equation:

$$\text{Overall Fit Factor} = \frac{\text{Number of exercises}}{1/ff_1 + 1/ff_2 + 1/ff_3 + 1/ff_4 + 1/ff_5 + 1/ff_6 + 1/ff_7 + 1/ff_8}$$

Where  $ff_1$ ,  $ff_2$ ,  $ff_3$ , etc. are the fit factors for exercises 1, 2, 3, etc.

(9) The test subject shall not be permitted to wear a half mask or quarter face-piece respirator unless a minimum fit factor of 100 is obtained, or a full face-piece respirator unless a minimum fit factor of 500 is obtained.

(10) Filters used for quantitative fit testing shall be replaced whenever increased breathing resistance is encountered, or when the test agent has altered the integrity of the filter media.

### 3. Ambient aerosol condensation nuclei counter (CNC) quantitative fit testing protocol.

The ambient aerosol condensation nuclei counter (CNC) quantitative fit testing (Portacount™) protocol quantitatively fit tests respirators with the use of a probe. The probed respirator is only used for quantitative fit tests. A probed respirator has a special sampling device, installed on the respirator, that allows the probe to sample the air from inside the mask. A probed respirator is required for each make, style, model, and size that the employer uses and can be obtained from the respirator manufacturer or distributor. The CNC instrument manufacturer, TSI Inc., also provides probe attachments (TSI sampling adapters) that permit fit testing in an employee's own respirator. A minimum fit factor pass level of at least 100 is necessary for a half-mask respirator and a minimum fit factor pass level of at least 500 is required for a full face-piece negative pressure respirator. The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.

#### (a) Portacount Fit Test Requirements.

(1) Check the respirator to make sure the sampling probe and line are properly attached to the face-piece and that the respirator is fitted with a particulate filter capable of preventing significant penetration by the ambient particles used for the fit test (e.g., NIOSH 42 CFR 84 series 100, series 99, or series 95 particulate filter) per manufacturer's instruction.

(2) Instruct the person to be tested to don the respirator for five minutes before the fit test starts. This purges the ambient particles trapped inside the respirator and permits the wearer to make certain the respirator is comfortable. This individual shall already have been trained on how to wear the respirator properly.

(3) Check the following conditions for the adequacy of the respirator fit: Chin properly placed; Adequate strap tension, not overly tightened; Fit across nose bridge; Respirator of proper size to span distance from nose to chin; Tendency of the respirator to slip; Self-observation in a mirror to evaluate fit and respirator position.

(4) Have the person wearing the respirator do a user seal check. If leakage is detected, determine the cause. If leakage is from a poorly fitting face-piece, try another size of the same model respirator, or another model of respirator.

(5) Follow the manufacturer's instructions for operating the Portacount and proceed with the test.

(6) The test subject shall be instructed to perform the exercises in section I. A. 14. of this appendix.

(7) After the test exercises, the test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried.

#### (b) Portacount Test Instrument.

(1) The Portacount will automatically stop and calculate the overall fit factor for the entire set of exercises. The overall fit factor is what counts. The Pass or Fail message will indicate whether or not the test was successful. If the test was a Pass, the fit test is over.

(2) Since the pass or fail criterion of the Portacount is user programmable, the test operator shall ensure that the pass or fail criterion meet the requirements for minimum respirator performance in this Appendix.

(3) A record of the test needs to be kept on file, assuming the fit test was successful. The record must contain the test subject's name; overall fit factor; make, model, style, and size of respirator used; and date tested.

#### 4. Controlled negative pressure (CNP) quantitative fit testing protocol.

The CNP protocol provides an alternative to aerosol fit test methods. The CNP fit test method technology is based on exhausting air from a temporarily sealed respirator face-piece to generate and then maintain a constant negative pressure inside the face-piece. The rate of air exhaust is controlled so that a constant negative pressure is maintained in the respirator during the fit test. The level of pressure is selected to replicate the mean inspiratory pressure that causes leakage into the respirator under normal use conditions. With pressure held constant, air flow out of the respirator is equal to air flow into the respirator. Therefore, measurement of the exhaust stream that is required to hold the pressure in the temporarily sealed respirator constant yields a direct measure of leakage air flow into the respirator. The CNP fit test method measures leak rates through the face-piece as a method for determining the face-piece fit for negative pressure respirators. The CNP instrument manufacturer Dynatech Nevada also provides attachments (sampling manifolds) that replace the filter cartridges to permit fit testing in an employee's own respirator. To perform the test, the test subject closes his or her mouth and holds his/her breath, after which an air pump removes air from the respirator face-piece at a pre-selected constant pressure. The face-piece fit is expressed as the leak rate through the face-piece, expressed as milliliters per minute. The quality and validity of the CNP fit tests are determined by the degree to which the in-mask pressure tracks the test pressure during the system measurement time of approximately five seconds. Instantaneous feedback in the form of a real-time pressure trace of the in-mask pressure is provided and used to determine test validity and quality. A minimum fit factor pass level of 100 is necessary for a half-mask respirator and a minimum fit factor of at least 500 is required for a full face-piece respirator. The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.

##### (a) CNP Fit Test Requirements.

(1) The instrument shall have a non-adjustable test pressure of 15.0 mm water pressure.

(2) The CNP system defaults selected for test pressure shall be set at -- 15 mm of water (-0.58 inches of water) and the modeled inspiratory flow rate shall be 53.8 liters per minute for performing fit tests.

**(Note:** CNP systems have built-in capability to conduct fit testing that is specific to unique work rate, mask, and gender situations that might apply in a specific workplace. Use of system default values, which were selected to represent respirator wear with medium cartridge resistance at a low-moderate work rate, will allow inter-test comparison of the respirator fit.)

(3) The individual who conducts the CNP fit testing shall be thoroughly trained to perform the test.

(4) The respirator filter or cartridge needs to be replaced with the CNP test manifold. The inhalation valve downstream from the manifold either needs to be temporarily removed or propped open.

(5) The test subject shall be trained to hold his or her breath for at least 20 seconds.

(6) The test subject shall don the test respirator without any assistance from the individual who conducts the CNP fit test.

(7) The QNFT protocol shall be followed according to section I.

C. 1. of this appendix with an exception for the CNP test exercises.

##### (b) CNP Test Exercises.

(1) Normal breathing. In a normal standing position, without talking, the subject shall breathe normally for 1 minute. After the normal breathing exercise, the subject needs to hold head straight ahead and hold his or her breath for 10 seconds during the test measurement.

(2) Deep breathing. In a normal standing position, the subject shall breathe slowly and deeply for 1 minute, being careful not to hyperventilate. After the deep breathing exercise, the subject shall hold his or her head straight ahead and hold his or her breath for 10 seconds during test measurement.

(3) Turning head side to side. Standing in place, the subject shall slowly turn his or her head from side to side between the extreme positions on each side for 1 minute. The head shall be held at each extreme momentarily so the subject can inhale at each side. After the turning head side to side exercise, the subject needs to hold head full left and hold his or her breath for 10 seconds during test measurement. Next, the subject needs to hold head full right and hold his or her breath for 10 seconds during test measurement.

(4) Moving head up and down. Standing in place, the subject shall slowly move his or her head up and down for 1 minute. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling). After the moving head up and down exercise, the subject shall hold his or her head full up and hold his or her breath for 10 seconds during test measurement. Next, the subject shall hold his or her head full down and hold his or her breath for 10 seconds during test measurement.

(5) Talking. The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song for 1 minute. After the talking exercise, the subject shall hold his or her head straight ahead and hold his or her breath for 10 seconds during the test measurement.

(6) Grimace. The test subject shall grimace by smiling or frowning for 15 seconds.

(7) Bending Over. The test subject shall bend at the waist as if he or she were to touch his or her toes for 1 minute. Jogging in place shall be substituted for this exercise in those test environments such as shroud-type QNFT units that prohibit bending at the waist. After the bending over exercise, the subject shall hold his or her head straight ahead and hold his or her breath for 10 seconds during the test measurement.

(8) Normal Breathing. The test subject shall remove and re-don the respirator within a one-minute period. Then, in a normal standing position, without talking, the subject shall breathe normally for 1 minute. After the normal breathing exercise, the subject shall hold his or her head straight ahead and hold his or her breath for 10 seconds during the test measurement. After the test exercises, the test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of a respirator shall be tried.

(c) CNP Test Instrument.

(1) The test instrument shall have an effective audio warning device when the test subject fails to hold his or her breath during the test. The test shall be terminated whenever the test subject failed to hold his or her breath. The test subject may be refitted and retested.

(2) A record of the test shall be kept on file, assuming the fit test was successful. The record must contain the test subject's name; overall fit factor; make, model, style and size of respirator used; and date tested.

## ***Part II. New Fit Test Protocols***

A. Any person may submit to OSHA an application for approval of a new fit test protocol. If the application meets the following criteria, OSHA will initiate a rulemaking proceeding under section 6(b)(7) of the OSH Act to determine whether to list the new protocol as an approved protocol in this Appendix A.

B. The application must include a detailed description of the proposed new fit test protocol. This application must be supported by either:

1. A test report prepared by an independent government research laboratory (e.g., Lawrence Livermore National Laboratory, Los Alamos National Laboratory, the National Institute for Standards and Technology) stating that the laboratory has tested the protocol and had found it to be accurate and reliable; or

2. An article that has been published in a peer-reviewed industrial hygiene journal describing the protocol and explaining how test data support the protocol's accuracy and reliability.

C. If OSHA determines that additional information is required before the Agency commences a rulemaking proceeding under this section, OSHA will so notify the applicant and afford the applicant the opportunity to submit the supplemental information. Initiation of a rulemaking proceeding will be deferred until OSHA has received and evaluated the supplemental information. [63 FR 20098, April 23, 1998]

## **Appendix B-1 to § 1910.134: User Seal Check Procedures (Mandatory)**

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

### *I. Face-piece Positive and/or Negative Pressure Checks*

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

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

### *II. Manufacturer's Recommended User Seal Check Procedures*

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

[63 FR 1152, Jan. 8, 1998]

## **Appendix B-2 to § 1910.134: Respirator Cleaning Procedures (Mandatory)**

These procedures are provided for employer use when cleaning respirators. They are general in nature, and the employer as an alternative may use the cleaning recommendations provided by the manufacturer of the respirators used by their employees, provided such procedures are as effective as those listed here in Appendix B- 2. Equivalent effectiveness simply means that the procedures used must accomplish the objectives set forth in Appendix B-2, i.e., must ensure that the respirator is properly cleaned and disinfected in a manner that prevents damage to the respirator and does not cause harm to the user.

### *I. 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 warm (43 deg. C [110 deg. 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.

C. Rinse components thoroughly in clean, warm (43 deg. C [110 deg. F] 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. Hypochlorite solution (50 ppm of chlorine) made by adding approximately one milliliter of laundry bleach to one liter of water at 43 deg. C (110 deg. F); 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 43 deg. C (110 deg. F); or,

3. Other commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer.

E. Rinse components thoroughly in clean, warm (43 deg. C [110 deg. 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.

F. Components should be hand-dried with a clean lint-free cloth or air-dried.

G. Reassemble face-piece, replacing filters, cartridges, and canisters where necessary.

H. Test the respirator to ensure that all components work properly.

[63 FR 1152, Jan. 8, 1998]

## Appendix C to Sec. 1910.134: OSHA Respirator Medical Evaluation Questionnaire (Mandatory)

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): \_\_\_\_\_

\_\_\_\_\_

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

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

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

- a. Seizures (fits): Yes/No
- b. Diabetes (sugar disease): Yes/No
- c. Allergic reactions that interfere with your breathing: Yes/No
- d. Claustrophobia (fear of closed-in places): Yes/No
- e. Trouble smelling odors: Yes/No

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

- a. Asbestosis: Yes/No
- b. Asthma: Yes/No
- c. Chronic bronchitis: Yes/No
- d. Emphysema: Yes/No
- e. Pneumonia: Yes/No
- f. Tuberculosis: Yes/No
- g. Silicosis: Yes/No
- h. Pneumothorax (collapsed lung): Yes/No
- i. Lung cancer: Yes/No
- j. Broken ribs: Yes/No
- k. Any chest injuries or surgeries: Yes/No
- l. Any other lung problem that you've been told about: Yes/No

4. Do you **currently** have any of the following symptoms of pulmonary or lung illness?

- a. Shortness of breath: Yes/No
- b. Shortness of breath when walking fast on level ground or walking up a slight hill or incline: Yes/No
- c. Shortness of breath when walking with other people at an ordinary pace on level ground: Yes/No
- d. Have to stop for breath when walking at your own pace on level ground: Yes/No
- e. Shortness of breath when washing or dressing yourself: Yes/No
- f. Shortness of breath that interferes with your job: Yes/No
- g. Coughing that produces phlegm (thick sputum): Yes/No
- h. Coughing that wakes you early in the morning: Yes/No
- i. Coughing that occurs mostly when you are lying down: Yes/No
- j. Coughing up blood in the last month: Yes/No
- k. Wheezing: Yes/No
- l. Wheezing that interferes with your job: Yes/No
- m. Chest pain when you breathe deeply: Yes/No
- n. Any other symptoms that you think may be related to lung problems: Yes/No

5. Have you **ever had** any of the following cardiovascular or heart problems?

- a. Heart attack: Yes/No
- b. Stroke: Yes/No
- c. Angina: Yes/No
- d. Heart failure: Yes/No
- e. Swelling in your legs or feet (not caused by walking): Yes/No
- f. Heart arrhythmia (heart beating irregularly): Yes/No
- g. High blood pressure: Yes/No
- h. Any other heart problem that you've been told about: Yes/No

6. Have you **ever had** any of the following cardiovascular or heart symptoms?

- a. Frequent pain or tightness in your chest: Yes/No
- b. Pain or tightness in your chest during physical activity: Yes/No
- c. Pain or tightness in your chest that interferes with your job: Yes/No
- d. In the past two years, have you noticed your heart skipping or missing a beat: Yes/No
- e. Heartburn or indigestion that is not related to eating: Yes/ No
- f. Any other symptoms that you think may be related to heart or circulation problems: Yes/No

7. Do you **currently** take medication for any of the following problems?

- a. Breathing or lung problems: Yes/No
- b. Heart trouble: Yes/No
- c. Blood pressure: Yes/No
- d. Seizures (fits): Yes/No

8. If you've used a respirator, have you **ever had** any of the following problems? (If you've never used a respirator, 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 these questions is voluntary.

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

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

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

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

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

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

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

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

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

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

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: \_\_\_\_\_

\_\_\_\_\_

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: \_\_\_\_\_

\_\_\_\_\_

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

\_\_\_\_\_

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

\_\_\_\_\_

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

\_\_\_\_\_

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:

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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):

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

## **Appendix D to Sec. 1910.134 (Mandatory) Information for Employees Using Respirators When Not Required Under the Standard**

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

You should do the following:

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

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

**PHYSICIAN'S CERTIFICATION FOR USE OF A RESPIRATOR**

Name \_\_\_\_\_

I have examined the above-named person and find that s/he is in the proper physical condition to safely withstand the stress associated with the use of a respirator. My examination included questioning of the above-named person. The questioning included, but was not limited to, the identification of exposing chemicals, duration of exposure(s), type(s) of respirator(s) used, and taking a medical history of the individual.

\_\_\_\_\_  
Physician

\_\_\_\_\_  
Date

Use Authorized by \_\_\_\_\_  
(Supervisor or Instructor)



**RECORD OF RESPIRATOR TRAINING**

Employee's Name: \_\_\_\_\_  
Date(s) of Training: \_\_\_\_\_  
Instructor's Name: \_\_\_\_\_  
Respirator(s) Involved in Training:  
Name: \_\_\_\_\_  
Manufacturer: \_\_\_\_\_  
Model Name: \_\_\_\_\_  
Number of Cartridges For Which Trained: \_\_\_\_\_

This is to certify that I have received instruction and/or training on the respirator I will be using and that I understand the following:

**Employee  
Initial Below**

- [        ] The reason for the need of respiratory protection.
  
- [        ] The nature, extent, and effects of respiratory hazards to which I may be exposed while performing my job.
  
- [        ] The explanation of why engineering controls are not being applied or are not adequate and what efforts are being made, if possible, to reduce or eliminate the need for respirators.
  
- [        ] The reason why a particular type of respirator has been selected for a particular respiratory hazard, i.e. the correct respirator to use in different circumstances.
  
- [        ] The explanation for the operation, capabilities, and limitations of the respirator selected.
  
- [        ] The instructions given for selecting, inspecting, putting on, checking the fit of, wearing, and taking off the respirator.
  
- [        ] The instructions for selecting, cleaning, storing, and maintaining the respirator.
  
- [        ] The use, handling, adjustment, and wearing of the respirator including how to put it on, wear it properly, and check its seals.
  
- [        ] The instructions given for recognizing and coping with emergency situations, including emergency procedures such as the "additional man" and "standby man" rules.
  
- [        ] The instructions given for signs of damage and/or indications of malfunction of the respirator.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name of Instructor



### Checklist for Respiratory Protection Programs

#### Respirator Protection Program

Our written respiratory protection program covers the following:

- Procedures for selecting respirators
- Medical evaluations of employees required to wear respirators
- Fit testing procedures
- Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding and maintaining respirators
- Procedures for ensuring adequate air quality for supplied air respirators
- Training in respiratory hazards
- Training in proper use and maintenance of respirators
- Program evaluation procedures
- Procedures for ensuring that workers who voluntarily wear respirators (excluding filtering face pieces) comply with the medical evaluation, and cleaning, storing and maintenance requirements of the standard

University has a designated program administrator who is qualified to administer the program.

University has updated the written program as necessary to account for changes in the workplace affecting respirator use.

University has provided equipment, training and medical evaluations at no cost to employees.

#### Respirator Selection

Respiratory hazards in the workplace have been identified and evaluated.

Employee exposures that have not been, or cannot be, evaluated are considered IDLH.

Respirators are NIOSH certified, and used under the conditions of certification.

Respirators are selected based on the workplace hazards evaluated and workplace and user factors affecting respirator performance and reliability.

A sufficient number of respirator sizes and models are provided to be acceptable and correctly fit the users.

For IDLH atmospheres:

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

For Non-IDLH atmospheres:

- Respirators selected are appropriate for the chemical state and physical form of the contaminant.
- Air-purifying respirators used for protection against gases and vapors are equipped with ESLIs or a change schedule has been implemented.
- Air-purifying respirators used for protection against particulate are equipped with NIOSH-certified HEPA filters or other filters certified by NIOSH for particulate under 42 CFR part 84 (95,97,100-N,R,P)

<b>Medical Evaluation</b>	
All employees have been evaluated to determine their ability to wear a respirator prior to being fit tested for or wearing a respirator for the first time in your workplace.	
A physician or other licensed health care professional (PLHCP) has been identified to perform the medical evaluations.	
The medical evaluations obtain the information requested in Sections 1 and 2, Part A of Appendix C of the standard, 29 CFR 1910.134.	
Employees are provided follow-up medical exams if they answer positively to any of questions 1 through 8 in Section 2, Part A of Appendix C, or if their initial medical evaluation reveals a follow-up exam is needed.	
Medical evaluations are administered confidentially during normal work hours, and in a manner that is understandable to employees.	
Employees are provided the opportunity to discuss the medical evaluation results with the PLHCP.	
The following supplemental information is provided to the PLHCP before they make a decision about respirator use: <ul style="list-style-type: none"> <li><input type="checkbox"/> The type and weight of the respirator to be used by the employee;</li> <li><input type="checkbox"/> The duration and frequency of respirator use (including use for rescue and escape);</li> <li><input type="checkbox"/> The expected physical work effort;</li> <li><input type="checkbox"/> Additional protective clothing and equipment to be worn;</li> <li><input type="checkbox"/> Temperature and humidity extremes that may be encountered.</li> <li><input type="checkbox"/> Copy of the written respiratory protection program.</li> <li><input type="checkbox"/> Copy of the respiratory protection standard (29 CFR 1910.134).</li> </ul>	
Written recommendations are obtained from the PLHCP regarding each employee's ability to wear a respirator, and that the PLHCP has given the employee a copy of these recommendations.	
Employees who are medically unable to wear a negative pressure respirator are provided with a powered air-purifying respirator (PAPR) if they are found by the PLHCP to be medically able to use a PAPR.	
Employees are given additional medical evaluations when: <ul style="list-style-type: none"> <li><input type="checkbox"/> Employee reports signs and/or symptoms related to their ability to use a respirator, such as shortness of breath, dizziness, chest pains or wheezing.</li> <li><input type="checkbox"/> The medical evaluator or supervisor informs the Program Administrator that the employee needs reevaluation.</li> <li><input type="checkbox"/> Information from this program, including observations made during fit testing and program evaluation, shows a need for reevaluation.</li> <li><input type="checkbox"/> A change occurs in workplace conditions that may result in an increased burden on the employee.</li> </ul>	
<b>Fit Testing</b>	
Employees who are using tight fitting respirator face pieces have passed an appropriate fit test prior to being required to use a respirator.	
Fit testing is conducted with the same make, model and size that the employee will be expected to use at the worksite.	
Fit tests are conducted annually and when different respirator face pieces are to be used.	
Provisions are made to conduct additional fit tests in the event of physical changes in the employee that may affect respirator fit.	
Employees are given the opportunity to select a different respirator face piece, and be retested, if their respirator fit is unacceptable to them.	
Fit tests are administered using OSHA-accepted QNFT or QLFT protocols.	

# QUALITATIVE RESPIRATOR FIT-TEST (QLFT)

## GENERAL INFORMATION

Employee Name:	Department:	Tester:
Employee ID No:	Date of Fit-Test:	Expiration Date:
Type of Test: <input type="checkbox"/> Irritant Smoke <input type="checkbox"/> Isoamyl Acetate <input type="checkbox"/> Saccharin Solution <input type="checkbox"/> Bitrex		Respirator Used For: <input type="checkbox"/> Asbestos <input type="checkbox"/> Lead <input type="checkbox"/> Painting <input type="checkbox"/> Other _____

## RESPIRATOR INFORMATION

Manufacturer:	Model No.	Face-piece:	
Size (if applicable):	TC (Approval) No.:		
<b>TEST INFORMATION</b> (check PASS or FAIL for each item)			
<i>TEST</i>	<i>PASS</i>	<i>FAIL</i>	<i>REMARKS</i>
1	Sensitivity check		
2	Successful positive/negative pressure fit checks?		
3	Hair growth between skin and facepiece sealing surface?		
4	Subject having any difficulty breathing?		
5	Normal breathing		
6	Deep breathing		
7	Turning head side to side		
8	Moving head up and down		
9	Talking (recite Rainbow Passage)		
10	Grimacing (contorting face)		
11	Normal breathing		

## ADDITIONAL COMMENTS

\_\_\_\_\_  
Tester's Signature / Date:

\_\_\_\_\_  
Employee's Signature / Date:

### Respirator Inspection Checklist

Respirators shall be inspected to ensure that they are in proper working condition. Non-emergency respirators shall be inspected according to the training received immediately before use and during cleaning. The respirator shall be inspected to determine if it is in need of replacement parts or repairs, or if it should be discarded. Inspection shall include:

YES	NO	ITEM
		<b>Air-purifying Respirators</b>
		Face-pieces must be checked for:
		Excessive dirt (clean all dirt from facepiece)
		Cracks, tears, or holes (obtain new facepiece)
		Distortion (allow facepiece to "sit" free from any constraints and see if distortion disappears, if not obtain new facepiece)
		Cracked, scratched, or loose-fitting lenses (contact respirator manufacturer to see if replacement is possible, otherwise obtain new facepiece)
		Head straps should be checked for:
		Breaks or tears (replace head straps)
		Loss of elasticity (replace head straps)
		Broken or malfunctioning buckles or attachments (obtain new buckles)
		Slippage of facepiece (replace head strap)
		Inhalation and exhalation valves should be checked for:
		Detergent residue, dust particles, or dirt on valve or valve seat (clean residue with soap and water)
		Cracks, tears, or distortion in the valve material or valve seat (contact manufacturer for instructions)
		Missing or defective valve cover (obtain valve cover from manufacturer)
		Filter element(s) should be checked for:
		Proper application
		Approval designation
		Missing or worn gaskets (contact manufacturer for replacement)
		Worn threads, both the filter threads and the facepiece, whichever is applicable
		Cracks or dents in filter housing (replace filter)
		Missing or loose hose clamps (obtain new clamps)
		<b>Atmosphere-supplying Respirators</b>
		Face-pieces must be checked for:
		Excessive dirt (clean all dirt from facepiece)
		Cracks, tears, or holes (obtain new facepiece)
		Distortion (allow facepiece to "sit" free from any constraints and see if distortion disappears, if not obtain new facepiece)
		Cracked, scratched, or loose-fitting lenses (contact respirator manufacturer to see if replacement is possible, otherwise obtain new facepiece)
		Head straps should be checked for:
		Breaks or tears (replace head straps)
		Loss of elasticity (replace head straps)
		Broken or malfunctioning buckles or attachments (obtain new buckles)
		Slippage of facepiece (replace head strap)
		Inhalation and exhalation valves should be checked for:
		Detergent residue, dust particles, or dirt on valve or valve seat (clean residue with soap and water)
		Cracks, tears, or distortion in the valve material or valve seat (contact manufacturer for instructions)
		Missing or defective valve cover (obtain valve cover from manufacturer)
		Hood, helmet, or full suit, if applicable, should be checked for:
		Headgear suspension (adjust properly)
		Cracks or breaks in face shield (replace face shield)
		Protective screen to see that it is intact and fits correctly over the face shield, (obtain new screen)
		Air supply system should be checked for:
		Breathing air quality
		Breaks or kinks in air supply hoses and end fitting attachments (replace hose and/or fitting)
		Tightness of connections
		Proper setting of regulators and valves (consult manufacturer's recommendations)

		Correct operation of air-purifying elements and carbon monoxide or high-temperature alarms
		Air cylinder, if present and used, is charged