

Carnegie Mellon University Respiratory Protection Written Program

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1.0	Respiratory Protection Plan Overview
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General elements and structure of the Carnegie Mellon University Respiratory Protection Plan (RPP) are presented in this document. Copies of the RPP are available from the Department of Environmental Health and Safety (EH&S). The RPP is also present on the EH&S web page, www.cmu.edu/ehs.

The RPP is a requirement of OSHA, per 29 CFR 1910.134, and consists of the following procedures:

Procedure #	Title
1.0	Respiratory Protection Plan Overview
2.0	Respirator Selection Procedures
3.0	Respirator Medical Evaluation Procedures
4.0	Respirator Fit Testing Procedures
5.0	Respirator Use Procedures
6.0	SCBA/Supplied Air System Procedures
7.0	Respirator Cleaning, Maintenance, Change Schedule, Storage Procedures
8.0	Respirator Training Procedures
9.0	Respirator Program Evaluation and Update Procedures
10.0	Respirator Recordkeeping Procedures

Purpose

It has been determined that employees of Carnegie Mellon University may become exposed to respiratory hazards during their work. These hazards may include particulates, dusts, gases and vapors. The purpose of this Respiratory Protection Program (RPP) is to ensure that all Carnegie Mellon employees are protected from overexposures to these respiratory hazards. This is accomplished as far as feasible by implementing engineering control measures - (for example, general and local ventilation, enclosure or isolation, and substitution of less hazardous processes or materials). When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators may be required.

Some employees have expressed a desire to wear respirators during certain operation that do not REQUIRE respiratory protection, per OSHA regulation or by Carnegie Mellon determination. These employees (or their supervisors) must notify the department of Environmental Health and Safety (EH&S) of their desire to use respirators voluntarily, in these cases. Respirator use may be permitted in these cases if the use will not jeopardize the health or safety of the employee as determined by the RPP Program Administrator. The portions of this RPP applicable to voluntary respirator use will be outlined in “**Scope and Application**”.

Student (non-employee) and visitor (non-contractor) participation in respirator use will be limited to voluntary use of disposable face-piece units, unless other use is approved in writing by the Program Administrator (PA).

Contractors (non-Carnegie Mellon employees) working on campus property shall be subject to their employer’s Respiratory Protection Program.

Scope and Application

There are three categories of respirator users at Carnegie Mellon University:

1. Voluntary users of disposable filtering face-piece units
2. Voluntary users of half mask air purifying respirators
3. Required users of disposable filtering face-piece units, half mask air

purifying, full face purifying and/or SCBA respirators

The various elements of the RPP apply differently to each category of use.

1. Voluntary users of disposable filtering face-piece units are addressed only by a portion of the Training Procedures element of the RPP, specifically, that which informs these users of the limitations of the face piece.
2. Voluntary users of half mask or full face air purifying respirators are addressed by all procedures GS 1.1 through GS 1.10, except GS 1.6. There is NO voluntary use of SCBA respirator systems.
3. Required uses of respiratory protection are addressed by all procedures, excepting that required use of filtering face-pieces does NOT require either a fit test or a medical evaluation.

The RPP augments the applicable portions of the Carnegie Mellon Emergency Operations Plan, Chemical Hygiene Plan, Hazard Communication Program and Radiation Safety Program dealing with the need for respiratory protection.

Employees participating in the RPP do so at no cost to them. The expense associated with their participation will be borne by the university.

A summary of the respirator use at Carnegie Mellon University is presented as **TABLE 1**.

TABLE 1

VOLUNTARY AND REQUIRED RESPIRATOR USE AT CARNEGIE MELLON UNIVERSITY		
<i>Respirator Type</i>	<i>Department/Process</i>	<i>Use</i>
Filtering Face piece (dust mask)	Permitted throughout campus	<i>Voluntary</i>
N95 Maintenance-free mask	Health Services , for isolation areas FMS , for dust/mist/particulate exposure	<i>Required</i> <i>Voluntary</i>
Half Mask or Full Face APR with dust/mist, organic vapor, acid gas or combination cartridges	EH&S , for emergency response in areas of chemical, biological or radiological contamination FMS and FINE ARTS , for dust/mist/chemical/particulate exposure during activities where these hazards may be present, such as maintenance work in or near fume hoods or their exhaust, and shop activities University Police , for exposures to riot control chemicals Bone Tissue Engineering Consortium , for potential exposures to formaldehyde.	<i>Required</i> <i>Voluntary or required</i> <i>Required</i> <i>Voluntary</i>
Self-contained breathing apparatus	EH&S , for emergency response purposes only	<i>Required</i>
Powered Air Purifying Respirators (PAPR)	Health Services for pandemic protection as determined by EH&S	<i>Required</i>

Responsibilities University Administration

The President, Provost, Vice Presidents, Deans and Department Heads are responsible for the safety and health of all Carnegie Mellon employees

Program Administrator

The Program Administrator is responsible for administering the RPP. Duties of the Program Administrator include:

- Identifying work areas, processes or tasks that require workers to wear respirators, and evaluating hazards
- Selection of respiratory protection options
- Monitoring respirator use to ensure that respirators are used in accordance with their certifications.
- Arranging for and/or conducting training in respiratory protection
- Ensuring proper storage and maintenance of respiratory protection equipment
- Conducting qualitative fit testing, arranging for quantitative fit testing where needed
- Administering the medical surveillance program
- Maintaining records required by the RPP
- Evaluating the program
- Updating the written program as needed
- The Program Administrator may assign the above duties to a suitable trained deputy within the Department of Environmental Health and Safety.

The Program Administrators of the RPP at Carnegie Mellon University are:

Mark R. Banister, CIH, CCHO, CHMM markb2@andrew.cmu.edu
Michael Fouch mfouch@andrew.cmu.edu

Supervisory Personnel and Principal Investigators (PIs)

Supervisors and PIs are responsible for:

- Identifying to the Program Administrator the names of persons who may need to wear respiratory protection
- Ensuring that employees under their supervision (who participate in the RPP) have received appropriate training, fit testing and annual medical evaluation
- Ensuring the availability of appropriate respirators and accessories
- Being aware of the tasks requiring the use of respiratory protection
- Enforcing the proper use of respiratory protection when necessary
- Ensuring that respirators are properly cleaned, maintained and stored according to the RPP
- Coordinating with the Program Administrator on how to address respiratory hazards or other concerns regarding the RPP.

Respirator Users

The respirator user is responsible for:

- Using their respirator in accordance with instructions and training
- Cleaning and maintaining his/her respirator
- Reporting any malfunction with the respirator to their supervisor
- Informing their supervisor of any respiratory hazards that they feel are not adequately addressed in the workplace and of any question they have regarding the RPP.

2.0 Respirator Selection Procedure

Policy The Respiratory Protection Program (RPP) Program Administrator (PA) will select all respirators to be used at Carnegie Mellon, based on the hazards to which employees are exposed, the anticipated exposure levels, and in accordance with all OSHA and other applicable regulations.

All respirators used on campus (excepting disposable face-pieces worn voluntarily) shall be supplied by the Department of Environmental Health and Safety.

Hazard Evaluation The PA shall perform a hazard evaluation for all operations or processes where overexposures to airborne contaminants may be present. This evaluation will include:

- Identification of the hazardous substance(s) applicable to the situation
- A determination of the potential exposure levels to these substances, through evaluation of the process, discussions with employees and supervisors, and/or air monitoring
- Whether less hazardous materials or processes may be used that would eliminate the need for respiratory protection
- Whether engineering controls may correct an overexposure situation, eliminating the need for respiratory protection
- The details of the hazard evaluation shall be documented in written form and maintained in EH&S files.

Respirator Selection The PA shall select an appropriate respirator based on the results of the hazard evaluation. The selection will be made in consideration of the following :

- Ensuring that anticipated exposure levels will be maintained below any applicable PEL, corrected for the protection factor of the respirator
- Whether respirator use is mandatory or voluntary
- The results of an employee's medical evaluation
- Any other protective equipment the employee may need to wear and/or the actual tasks to be performed while using the respirator or mask
- The availability of suitable protection for the agent(s) of concern

Approved Respirators The PA shall consider only respirators, respiratory systems and cartridges approved by NIOSH or MSHA. Cartridges must be clearly identified as suitable for the hazards identified in the evaluation. Respirators from at least two different manufacturers are available to employees, to help ensure that a properly-fitting respirator may be selected.

NOTE: Air purifying respirators are NEVER to be used in oxygen deficient atmospheres or Immediately Dangerous to Life or Health (IDLH) conditions.

Note that a respirator's approval is nullified when any of the following occur:

- Components are mixed between different types of makes of respirators
- Non-approved components are used
- The respirator is modified in any way
- A respirator is used in an atmospheric condition for which it is not approved

- The approval label is no longer legible

3.0	Medical Evaluation Procedure
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Policy Employees who are either required to wear respirators, or who choose to wear an Air Purifying Respirator voluntarily (and have been approved to by the Program Administrator (PA)), must be approved to wear the respirator by a licensed physician. Employees who are not approved by a physician to wear a respirator shall not be permitted to use one while at work.

Approval Process Medical approval to wear a respirator is obtained by completing this process:

1. Obtain a respirator user's medical questionnaire from the EH&S office. If the employee is unable to read the questionnaire, the PA may assist in this activity. The PA will also provide a suitable envelope, postage paid, for submittal of the questionnaire to the University's designated physician. The PA will also include a cover letter to identify the activity requested of the physician.
2. The employee will submit the medical questionnaire to the university's Physician or other licensed Health Care Professional (PLHCP), currently, Dr. Donald McGraw, 916 College Avenue, Pittsburgh PA 15232, UPMC Health System, for physician approval.
3. The respiratory physician will supply written approval for respirator use for an individual based on the questionnaire results in most cases. In other cases, the physician will request a visit and examination of the potential respirator user. The potential user will schedule this visit directly with the physician. After this visit is made, the physician will either issue an approval without qualification, an approval with qualification or qualifications, or the indication that the employee is not approved for the respirator use planned.
4. All employees will be granted the opportunity to speak with the physician about their medical evaluation, if they so request
5. All medical examinations are to remain confidential between the employee and the physician.
6. All documentation of the physician's approval or disapproval will be maintained in the EH&S offices. However, no medical records or information will be contained in these documents.

Annual Update On an annual basis, all participants of the RPP will be asked to complete and return to the PA the "Annual Update Form for Respirator Users" (**Attachment 2**), indicating whether their respirator use conditions or medical conditions have changed in the past year. If the PA or the employee feels that any changes may affect their ability to use their respirator, the medical approval process will begin again.

4.0	Fit Testing Procedures
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Policy Fit testing is required for all employees wearing any Carnegie Mellon supplied respirator, *other than a dust mask or a filtering face piece.*¹ This includes all users, including voluntary ones.

Fit Testing Frequency

Fit testing will occur

- Prior to an employee's initial use of a respirator
- At least annually after
- When there have been changes in the employee's physical condition that could affect respiratory fit, such as changes in body weight, facial scarring or dental work.

Employees will be fit tested with the make, model and size of respirator that they will actually wear. Employees will be provided with a choice of models and styles to help ensure a successful fit. If corrective glasses or goggles are to be worn with the respirator, they must be worn in a manner that does not interfere with the seal of the facepiece. Eyeglasses with temple bars or straps that pass between the sealing surface and the individual's face shall not be used. Corrective lenses can be mounted inside certain respirators and area available where needed.

Fit Testing Methodology

The PA will conduct the fit tests for all but the SCBA apparatus, following one of the OSHA approved methods found in 29 CFR 134 and as outlined in Attachment 3. Fit testing of SCBA equipment shall be performed by the equipment supplier.

There has been no need identified at the University for Quantitative Fit testing. If this becomes necessary, the PA will identify an outside consultant to perform this function, as needed.

Employees who do not have a current fit test on record with the PA will not be permitted to wear their respirator.

¹ The N95 "no-maintenance" masks require fit testing, per the manufacturer's requirements.

GS 1.5	Respirator Use Procedures
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Use Conditions Employees will use their respirators under the conditions specified by the RPP and in accordance with the training they receive for the use of their particular unit. In addition, the respirator shall not be used in a manner for which it is not certified by NIOSH or the manufacturer.

Employees are not permitted to use their respirators in any of these circumstances:

- They are not currently medically approved for respirator use
- They do not have a current fit test recorded by the Program Administrator (PA)
- They have facial hair or any other condition that may interfere with the respirator fit

User Seal Check All employees shall conduct user seal checks each time that they wear their respirator. Employees shall use the positive and negative leak check procedures as follows:

Positive Check: Close of the exhalation valve with the palm of the hand and exhale gently into the facepiece. The fit is considered satisfactory if a slight positive pressure can be build up inside the facepiece without any evidence of leakage.

Negative Check: Close off the inlet of the canister, cartridges or filters by covering them with the palms of the hands and inhale gently so that the facepiece collapses slightly; and hold the breath for 10 seconds. The facepiece should remain slightly collapsed with no inward leakage.

In the event of any noted malfunction of the respirator, the employee is required to leave the hazardous area immediately. They are not permitted to return unless the problem is corrected or a properly functioning respirator has replaced the malfunctioning one.

GS 1.6	SCBA and Supplied Air System Procedures
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An SCBA and supplied air system are present at the university for a very specific and limited application. The system is for use by EH&S personnel only, only in emergency response situations, and only when accompanied by City of Pittsburgh hazmat personnel. The unit is present in the office of the Director of Environmental Health and Safety, in the FMS Building. The system consists of a pressure demand facepiece, an air tank supply (Grade D breathing air is required), a back-up/spare air tank, and the related tubing and accessories to complete the system.

Currently, there are two people approved for use of the system, the EH&S Director and the EH&S Chemical Safety Specialist. All aspects of this Respiratory Protection Program apply to these individuals. Their training and fit testing *for this application* is provided by the supplier of the system, Premier Safety and Service, Inc.

Maintenance of the System

On a monthly basis, the system is to be inspection and tested by one of the above users OR by the Respiratory Protection Officer. The following steps comprise this monthly inspection:

1. Inspect all parts of the system, checking for damaged or worn parts. Replace or repair all damaged or worn parts.
2. Open the air tank and check the pressure. It typically is about 3500 psi. If it falls below 2000 psi, return the tank for a replacement, and have the spare in place as the primary tank.
3. Pressurize the lines and then close the tank to check for leaks of the system. Consider either audible leaks and/or drops in pressure of the system (1-2 minutes) for this evaluation. If either occurs, submit the unit for repair and servicing to the supplier.
4. Bleed the pressure in the lines (with the red button) and ensure that the alarm indicating low pressure goes off at 1000 psi. If the alarm does not go off at the correct time, submit the system to the supplier for servicing.
5. Document each of the above items on a form and retain it with the system.

The monthly maintenance has been scheduled on the Director of EH&S scheduling tool.

GS 1.7	Cleaning Maintenance, Change Schedule, Storage Procedures
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Maintenance of SCBA units is discussed in procedure GS 1.6.

Cleaning Respirators for the exclusive use of the employee are to be cleaned as often as necessary. Respirators for shared usage shall be cleaned after each use.² The cleaning process is as follows:

- Remove any cartridges from the half mask unit.
- Wash the face-piece in a mild detergent:water solution. Do not use organic solvents for cleaning.
- Rinse completely in clean warm water.
- Wipe the mask surfaces with sanitizing wipes, available from the PA.
- Air-dry the mask in a clean area—hang by the straps to avoid distending the face piece in the drying process.
- Reassemble the respirator and place in a clean, dry bag or similar container
- Contact the PA if cleaning supplies are needed

Inspection Prior to each use, the user should inspect his/her respirator as outlined in training. Any problems or malfunctions should be addressed before the respirator is used. Users should contact their supervisors or the PA with any questions in this area. This inspection includes the following checks:

- Valves and valve seats are not damaged, worn, dirty or “stuck” in place
- That there are no cracks or other damage in the respirator body
- That the strap elastic is in good condition, with appropriate flexibility
- That the respirator is clean with no other defects
- That the proper cartridge is being used, considering the contaminants in the work area

Change Schedule Respirator cartridges should be changed if any of the following occur:

- Organic vapor or acid gas odors are noted while those cartridges are being worn
- Difficulty in breathing due air resistance due to clogged filters

Storage Respirators shall be stored in a clean, dry area, and in accordance with the manufacturer’s instructions. Respirators issued to specific individuals should have the name of that individual marked on the outside of the respirator storage container. Respirator filters or cartridges shall be stored in a closed plastic bag or other device when not in use and must never be stored in the open environment.

² The N95 "no-maintenance" respirators do not have any cleaning requirements.

GS 1.8	Respirator Training Procedures
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The OSHA Respiratory Protection Standard requires training for certain participants of the Respiratory Protection Program (RPP). The Program Administrator (PA) will provide training to respirator users and their supervisors on the contents of the RPP and their responsibilities under it, and on the OSHA Respiratory Protection standard. Additional training for persons using SCBA equipment will be provided by the manufacturer of the equipment. Workers must receive training *prior to* using a respirator in the workplace. Supervisors will also be trained prior to using a respirator in the work place or prior to supervising employees that must wear respirators.

The training course will address these topics:

- The Carnegie Mellon RPP
- The OSHA Respiratory Protection standard
- The respiratory hazards they may be exposed to and their health effects
- Proper selection and use of respirators
- Limitations of their respirators
- Respirator donning and user seal/fit checks
- Fit testing
- Emergency use procedures (where applicable)
- Maintenance and storage of the respirator
- Medical issues that may affect one's ability to wear a respirator

Employees will be trained at least annually, provided they continue to wear their respirator. More frequent training may be performed if necessary.

Voluntary users receive information on the limitations of the filtering face-piece upon initial use and by routine newsletters and postings afterward.

These postings include Fact Sheets on these subjects:

- Voluntary use of filtered face-pieces
- Use of Millennium Respirators
- General Information for Respirator Users

Fact Sheets are available on the EH&S web site at:

<http://www.cmu.edu/ehs/fact-sheets/index.html>

GS 1.9	Respirator Program Evaluation Procedures
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The Program Administrator will conduct periodic evaluations of the university's workplaces to ensure that the provisions of this program are being implemented. The evaluations will include regular consultations with employees who use respirators, their comments at the time of their annual training update and air monitoring results.

This evaluation will occur at least annually and more often as conditions change or problems are found with the program.

GS 1.10	Respirator Record Keeping Procedures
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The Respiratory Protection Plan (RPP) will be maintained in the EH&S offices and will be available on the Carnegie Mellon EH&S web page. A copy will also be provided to any participant in the program who requests one.

Also maintained in the EH&S offices are copies of the physician approvals or disapprovals of users, fit test records, training records, and any other related aspect of the RPP.

Attachment 1

OSHA Respirator Medical Evaluation Questionnaire

OSHA Respirator Medical Evaluation Questionnaire

You have been identified by your supervisor as someone who may wear a respirator either on a voluntary basis or as a requirement of your position. Either way, it is necessary to determine whether you are physically able to wear a respirator before one is given to you. A respiratory physician will make this determination based on your answers to this questionnaire. The physician *may* request an office visit and certain tests before a final determination is made.

1. It is **required** that you complete **Part A, Section 1** of this questionnaire.
2. It is **required** that you complete **Part A, Section 2** from **question 1 through question 9** of this questionnaire. You are **not required** to complete **questions 10 through 15** of the questionnaire, but you are welcome to do so.
3. Please complete **Part B** of the questionnaire as best as you can. We understand that you may not know all of the information these questions ask.
4. Please sign below at **EMPLOYEE SIGNATURE** and submit this form in the envelope provided to the University's Respiratory Physician.

EMPLOYEE SIGNATURE

PRINT NAME CLEARLY

For use by the Physician or Other Licensed Health Care Professional, only

To the PLHCP:

Check the **ONE** that applies

- I have reviewed Part A Section 2 of this questionnaire with the employee and I do not recommend that a physical examination be performed at this time
- I have reviewed Part A Section 2 of this questionnaire with the employee and I am recommending that a physical examination be performed a this time
- I have reviewed Part A Section 2 of this questionnaire without the employee and I do not recommend that a physical examination be performed at this time
- I have reviewed Part A Section 2 of this questionnaire without the employee and I am recommending that a physical examination be performed at this time.

PLHCP Signature

Date

OSHA Respirator Medical Evaluation Questionnaire

Carnegie Mellon University wants 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 supervisor will not look at or review your answers, and your employer will tell you how to deliver or send this questionnaire to the Physician or other Licensed Health Care Professional (PLHCP) who will review it. OSHA mandates that you have the right to contact the PLHCP who will review this questionnaire, in the event of any questions regarding either this form or the results. Here is the contact information for the PLHCP:

Dr. Donald McGraw 412-363-1060 or 412-292-4149

Can you read? (circle one) **YES** **NO**

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 all information **CLEARLY**).

1. Today's Date _____
2. Your name _____
3. Your age, to nearest year _____
4. Sex (circle one) **MALE** **FEMALE**
5. Your height _____ feet _____ inches
6. Your weight _____ pounds
7. Your job title _____
8. Your phone number³ _____
9. Best time to reach you at the above number _____
10. Have you worn a respirator in the past? (Circle one) **YES** **NO**

If "**YES**", what type?

³ A number where you can be reached by the PLHCP who reviews this questionnaire

11. Check the type of respirator that you will be using (you can check more than one category). Contact your supervisor if you are unsure of the type of respirator you will be using.

	N, R or P disposable respirator (i.e., a filter-mask or other non-cartridge type unit)
	Half-face cartridge respirator
	Full-face cartridge respirator
	Powered air-supplying respirator
	Supplied air/self-contained breathing apparatus

Section 2 (Mandatory)

Questions 1 through 9

These questions must be answered by every employee who has been selected **or volunteers** 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, 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

These questions must be answered by every employee **who has been selected to use either a full-facepiece 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
[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.]

If “yes,” how long does this period last during the average shift? _____ Hours _____ Minutes

- b. **Moderate** (200 to 350 kcal per hour): Yes/No
[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.]

If “yes,” how long does this period last during the average shift? _____ Hours _____ Minutes

- c. **Heavy** (above 350 kcal per hour): Yes/No
[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.).]

If "yes," how long does this period last during the average shift? _____ Hours _____ Minutes

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):

a. Name of the first toxic substance: _____

Estimated maximum exposure level per shift: _____

Duration of exposure per shift: _____

b. Name of the second toxic substance: _____

Estimated maximum exposure level per shift: _____

Duration of exposure per shift: _____

c. Name of the third toxic substance: _____

Estimated maximum exposure level per shift: _____

Duration of exposure per shift: _____

d. Indicate the name(s) of any other toxic substances that you'll be exposed to while using your respirator:

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

Attachment 2

Survey Form for Annual Update for Approved Respirator Users

Survey Form for Annual Update for Approved Respirator Users

This form is used to update our records regarding your use of respiratory protection and also to evaluate the effectiveness of the Carnegie Mellon University Respiratory Protection Program.

1. The most recent respirator medical questionnaire we have for you is dated:

Since then, have there been any changes in your medical condition that may affect your ability to wear a respirator? (For example, have you developed any lung or breathing problems, heart conditions, difficulty in hearing or vision, problems with moving or bending, etc?)

No, my medical status has remained the same as in my most recent questionnaire

Yes, my medical status has changed. (Please complete a new medical questionnaire.)

2. What are the specific activities you use your respirator for? What are the contaminants you need to be protected from?

Activities	Contaminants

Yes No Are any of these activities or contaminants different than in previous years?

3. Do you understand the proper procedures for inspecting, using and maintaining your respirator?

Yes No I understand the proper procedures for inspecting my respirator before each use

Yes No I understand the proper procedures for putting on and fit testing my respirator before each use

Yes No I understand the proper procedures for cleaning and caring for my respirator

4. Do you understand the limitations of your respirator? (Situations where the respirator will NOT protect you properly.)

Yes, I understand that my respirator will not protect me in the following situations:

- ✓ When the respirator is not correctly fitted to my face
- ✓ When I am in a confined space
- ✓ When I am exposed to carbon monoxide, sewer gas, or any contaminant not listed on my cartridges
- ✓ When I am in an area with VERY HIGH chemical levels

No, I am not sure when my respirator protects me or not.

5. Do you feel that the Carnegie Mellon Respiratory Protection Program is working well to protect your health from contaminants in the areas you work?

Yes

No If no, please describe below:

Please complete the following:

Name _____

Job Title _____

Supervisor _____

Signature _____

Date _____

Qualitative Fit Test Procedures

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 facepiece up to the face and eliminate those that obviously do not give an acceptable fit.
5. The more acceptable facepieces 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 facepiece 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 facepiece 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) Employers must perform the following test exercises for all fit testing methods prescribed in this appendix, except for the CNP quantitative fit testing protocol and the CNP REDON quantitative fit testing protocol. For these two protocols, employers must ensure that the test subjects (*i.e.*, employees) perform the exercise procedure specified in Part I.C.4(b) of this appendix for the CNP quantitative fit testing protocol, or the exercise procedure described in Part I.C.5(b) of this appendix for the CNP REDON quantitative fit-testing protocol. For the remaining fit testing methods, employers must ensure that employees perform the test exercises in the appropriate test environment in the following manner:

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

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

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

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

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

Rainbow Passage

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These

take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.

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

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

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

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

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 face seal 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.