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# Respiratory Protection Program

UNC Greensboro

(Revised 2019)

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## Table of Contents

1. General.....	1
1.1 Purpose.....	1
1.2 Scope.....	1
1.3 Responsibilities.....	1
2. Program Elements.....	2
2.1 Selection and Use of Respiratory Protective Devices.....	2
2.2 Classification and Description of Respirators.....	3
3. Training.....	5
3.1 Face-fit and leak testing.....	5
4. Record Keeping.....	6
5. Maintenance, Care and Inspection of Respiratory Protective Devices.....	6
6. Medical Evaluations.....	7
7. Air Quality.....	8
8. Program Evaluation.....	9
Appendix A: Definitions.....	10
Appendix B: Training Records.....	13
Appendix C: OSHA Respirator Medical Evaluation Questionnaire.....	15
Appendix D: Supplemental Information for the PLHCP.....	23
Appendix E: Fit Test Protocols.....	25
Appendix F: Fit Test Records.....	31
Appendix G: Information for Employees Using Respirators When Not Required Under the Standard.....	33
Appendix H: Cartridge and Canister Change Schedule.....	35
Appendix I: Medical Determination Form.....	38

# **1. General**

## **1.1 Purpose**

This document provides information and guidance for the UNCG Respiratory Protection Program. This document outlines the minimal acceptable requirements for a respiratory protection program, delineates responsibilities, provides selection criteria in determining respiratory protection needs, and lists currently approved respiratory protective devices used at UNCG. This document implements the provisions of Title 29, Code of Federal Regulations (CFR), Section 1910.134, Respiratory Protection.

## **1.2 Scope**

This document is applicable to all UNCG personnel who are performing duties requiring the use of respiratory protection to prevent unnecessary exposure to airborne concentrations of toxic materials equal to or greater than the permissible limits established in existing Federal, and local occupational safety and health standards or criteria. This document is also applicable to all UNCG employees who are performing duties requiring the use of respiratory protection to prevent exposure to infectious diseases.

## **1.3 Responsibilities**

### **1. EH&S Dept Shall:**

- a. Through the EH&S Dept., the Director of Safety (or designee) is the Program Administrator.
- b. Review the operations for which respiratory protective equipment may be required.
- c. Make periodic surveys of operations and equipment at the University to assure adequate protection of employees is being provided.
- d. Specify the appropriate Equipment. The job situation, exposures involved, exposure levels, and respiratory protection factors will be taken into consideration when specifying a respirator.
- e. Provide training on the storage, use and care of respiratory protective equipment.
- f. Ensure employees are medically approved for use of respiratory protective equipment.
- g. Generate a written Respiratory Protection Program and update as needed.
- h. Conduct reviews and evaluations during annual inspections to determine the effectiveness of the Respiratory Protection Program.
- i. Conduct fit testing.

### **2. Department Heads Shall:**

- a. Contact EH&S Dept. when they suspect a respirator may be required for a job.
- b. Ensure that employees are provided with respirators at no cost to the employee.
- c. Supervise employee use and maintenance to determine the continued effectiveness of the Respiratory Protection Program.

- d. Attend training on the proper storage, use and maintenance of respiratory protective equipment.
- e. Ensure that employees are scheduled and receive medical exams, when required. (See Medical Evaluations)
- f. Ensure that the employee completes the appropriate medical questionnaire for respirator use and provides this to the PLHCP. (Appendix C)
- g. Ensure that the Supplemental information for PLHCP form is completed and provided to the PLHCP. (Appendix D)
- h. Supply necessary parts and equipment to clean and maintain the respirator.
- i. Ensure that employees clean and maintain the respiratory protective equipment properly.
- j. Ensure that emergency use respiratory protective equipment is inspected monthly according to the manufacturer's recommendations.
- k. Ensure that employees using respirators voluntarily are provided with the information in appendix G.
- l. Ensure that employees using respirators are provided an initial fit test before use and an annual fit test thereafter.

3. Employees Shall:

- a. Attend training on the storage, use and care of respiratory protective equipment.
- b. Be clean shaven in areas where facial hair may prevent a proper face seal.
- c. Store, use and maintain respirators in accordance with instructions given in training.
- d. Report to the supervisor any operations or jobs which they suspect respiratory protection may be needed.

4. PLHCP Shall:

- a. Provide the EH&S Dept. with written results verifying medically fit to use a negative respirator and/or restrictions of use. Form included in Appendix J.

## **2. Program Elements**

### **2.1 Selection and Use of Respiratory Protective Devices**

1. Respirators are considered an acceptable method of protecting the health of the UNCG personnel only under the following circumstances:
  - a. When it has been determined to the satisfaction of EH&S Dept that there are no feasible engineering or work practice controls that can be used to adequately control the hazard
  - b. During intermittent, nonroutine operations (i.e., not exceeding 1 hour/day for 1 day/week)

- c. During the interim periods when engineering controls are being designed and/or installed
  - d. During emergencies
- 2. Voluntary Usage: It is not the policy of UNCG to provide respiratory protection if not needed; however, if an employee has special medical considerations, an appropriate respirator will be provided and all provisions of this policy will apply. The department head is to ensure that the information provided in Appendix G is provided to the said employee.
- 3. All respirators to be used must be certified by the National Institute for Occupational Safety and Health (NIOSH) and shall only be used in accordance with the terms of that certification.
- 4. The correct respirator shall be specified for each job. The EH&S Dept., on the basis of environmental evaluations and/or requirements set forth in 29CFR 1910, Subpart Z, for specific substances, shall determine the type of respiratory protective device best suited for the task. Respirator selection and use shall take into account health and safety factors, such as nature of hazard, intended use and limitations of respiratory protective devices, movement and work-rate limitations, emergency escape time and distance requirements, and training requirements. Employee acceptance of respirators is influenced by comfort; ability to breathe without objectionable resistance; adequate visibility under all conditions; provisions for wearing prescription lenses, if necessary; ability to communicate; ability to perform all tasks without undue interference; confidence in the face piece fit; and convincing evidence that a respirator is necessary and that appropriate action is being taken, where possible, to eliminate the need for respiratory protective equipment.

## **2.2 Classification and Description of Respirators**

Industrial respiratory protective devices have been designed, tested, and approved for protection against specific industrial exposures. These devices are conveniently grouped into two general classifications according to mode of operation.

- 1. Air Purifying Respirators
  - a. Gas masks and chemical cartridges (gases and vapors).
  - b. Particulates (dusts, fog, fume, mist, smoke, and sprays).
  - c. Combination (gas, vapor, and particulate).
    - (i) Cartridges should be changed according to the manufacturer's directions or on the basis of breakthrough data, if available. Respirators using cartridges or canisters must be equipped with an end-of-service-life indicator (ESLI) certified by NISOH. If there is no ESLI available a change schedule will be formulated based on the manufacturers recommendations, objective information or data that will ensure the cartridges or canisters are changed before the end of their service life. The UNCG cartridge or canister change schedule is contained in appendix H.

## 2. Atmosphere Supplying Respirators

- a. Self-contained.
- b. Hose-mask.
- c. Airline.
- d. Combination self-contained and hose mask or airline.

- (i) Some respirators have a means for indicating the remaining service life. Some type of warning is available for all self-contained breathing apparatus. This may be a pressure gauge, timer, audible or physical alarm. The user should understand the operation and limitations of each type of warning device.

## 3. Limitations and Use of Respiratory Protective Devices

- a. The degree of respiratory hazard, as it refers to the selection and classification of respirators, depends upon the atmospheric oxygen concentration; contaminant's physical state, toxicity and concentration; the presence of other contaminants or stress factors in the working environment; and employee exposure time and susceptibility. Respiratory hazards may be classified as gas and vapor contaminants (immediately or not immediately dangerous to life or health), particulate contaminants (immediately or not immediately dangerous to life or health), and oxygen deficiencies. Each classification requires a different degree of respiratory protection.
- b. Respirator selection and use in atmospheres immediately dangerous to life or health (includes additional personnel requirements). It is the policy of UNCG that employees will not enter atmosphere immediately if it is probable that atmospheres are immediately dangerous to life or health. However, in the event of an emergency, properly trained personnel will be contacted to assist.
  - (i) In areas where the wearer, with failure of the respirator, could be overcome by a toxic or oxygen-deficient atmosphere, at least one individual person shall be present with suitable rescue equipment in the form of self-contained breathing apparatus and protective clothing. Communications (visual, voice or signal line) shall be maintained between both or all individuals present. Planning shall be such that one individual will be unaffected in any likely incident and have the proper rescue equipment to be able to assist the other(s) in case of emergency.
  - (ii) Specific provisions shall be made available for any type of entry into a toxic or oxygen-deficient atmosphere in accordance with UNCG permit required confined space entry procedures.

Other considerations for respirator selection:

- a. Exposure time: Worker time usually determines the length of time for which respiratory protection is needed, including the time necessary to enter and exit a contaminated area.
- b. Activity of the wearer: The work to be covered, work rate, and mobility required of the wearer in carrying out his work should be considered in respirator selection.
- c. Unusual hazards: Unique factors, which may add additional dimensions to the hazard potential and must be considered when selecting respirators include, for example, skin absorption of the contaminant, skin irritation, eye irritation, and radiation of skin or whole body.
- d. Vision: All face pieces will restrict, to some degree, the wearer's vision.
- e. This may increase accident potential. Other problems include wearing of prescription glasses and fogging of the respirator lens.
- f. Communications: Effective speech communication may be required in jobs for which the respirator is being selected. Conventional respirators distort the human voice. The respirator valve usually provides the pathway for some speech transmission over short distances in relatively quiet areas. However, talking can induce face piece or component leakage and should be limited while wearing the respirator. Mechanical and/or electrical speech transmission devices which eliminate these problems are available.
- g. Low Temperatures: Major problems in the use of full face pieces at low temperatures are poor visibility and freezing of the exhalation valves.
- h. High Temperatures: A person working in areas of high ambient or radiant temperature is under stress. Any additional stress resulting from use of respirators should, therefore, be minimized. This can be done by selecting and using respirators having minimum weight and breathing resistance. Supplied-air respirators, hoods and suits having an adequate supply of cool breathing air are recommended.

### **3. Training**

UNCG will ensure that personnel required to use or to supervise other personnel using respiratory protective devices are provided training annually, or as needed as outlined in Appendix B- Respirator Training Certification.

#### **3.1 Face-fit and leak testing**

Every respirator wearer shall receive fitting instructions including demonstrations and practice in how the respirator should be worn, how to adjust it, and how to determine if it fits properly. This service shall be provided by the EH&S Dept. It is the department head's responsibility to ensure that the employee receive an initial fit test as well as an annual fit test. Employee's wearing respirators for asbestos protection must be fit tested at least every six months. Records of fit-tests shall be retained by the EH&S Dept.

1. Quantitative fit testing of respirators is required by OSHA for selected contaminants (refer to 29 CFR 1910). These systems generate atmospheres of some test substance and continuously monitor the internal (inside mask) and external conditions so that accurate protection factors can be determined. Quantitative fit testing is the preferred method for all negative pressure respirator device fit testing.
2. Appendix E contains the qualitative and quantitative fit testing protocol and appendix F contains the fit testing record. The fit testing record shall be completed and signed by both the person performing the fit test protocol and by the employee being tested.

#### **4. Record Keeping**

1. Department records of respirator training, face-fit and leak-testing shall be kept for at least the duration of employment or as specified by specific contaminant exposure (refer to 29 CFR 1910). Appendix B contains an example of the Respiratory Protective Devices Training Certification form.
2. The EH&S Dept. shall also keep on ongoing list of departments utilizing respirators at UNCG.

#### **5. Maintenance, Care and Inspection of Respiratory Protective Devices**

When respirators are issued to individuals, the individual is responsible for primary maintenance and care of his/her respirator. Where respirators are used collectively or kept ready for emergencies, the supervisor is responsible for establishing respirator maintenance and cleaning program. Equipment shall be properly maintained to retain its original effectiveness.

1. All respirators shall be inspected routinely before and after each use.
2. A respirator that is not routinely used but kept ready for emergency use shall be inspected after each use and at least monthly by the department supervisor to assure that it is in satisfactory working condition.
3. Self-contained breathing apparatus shall be inspected monthly. Air and oxygen cylinders shall be fully charged according to the manufacturer's instructions. It shall be determined that the regulator and warning devices function properly. A tag attached to the assembly shall be initialed by the inspector.

The following procedure is recommended for cleaning and disinfecting respirators:

1. Remove any filters, cartridges, or canisters.
2. Wash face piece and breathing tube in a cleaner-disinfectant solution. A brush may be used to facilitate dirt removal.
3. Rinse completely in clean, warm water.

4. Air dry in a clean area.
5. Clean other respirator parts as recommended by the manufacturer.
6. Inspect valves, head straps, and other parts; replace defective parts with new ones.
7. Insert new filters, cartridges or canisters periodically as specified by the manufacturer; make sure the seal is tight.
8. Place in plastic bag or other closed container for storage.

Replacement or repair shall be done only by experienced persons using parts designed for the respirators. No attempt shall be made to replace components or to make adjustments or repairs beyond the manufacturer's recommendations. Reduction or admission valves or regulators shall be returned to the manufacturer or to a trained technician for adjustment or repair.

Respirator storage shall be as follows:

1. After inspection, cleaning, and necessary repair, respirators shall be stored to protect against dust, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals and other contaminants. Respirators placed at stations and work areas for emergency use should be stored in compartments built for that purpose, clearly marked to indicate the content, and must be quickly accessible at all times. Routinely used respirators, such as dust respirators, may be placed in ziplock bags.
2. Respirators shall be packed or stored so the face piece and exhalation valve will not be damaged by being subjected to crushing or cramming.
3. Instructions for proper storage of emergency respirators, such as gas masks and self-contained breathing apparatus, are found in use and care instructions usually mounted inside the carrying case lids.

## **6. Medical Evaluations**

Workers shall not be assigned to tasks requiring the use of respirators unless it has been determined by medical evaluation that they are physically and psychologically able to perform their work while wearing the prescribed respiratory protection. Medical evaluations shall be completed initially prior to fit test or respirator usage and additionally if any of the following conditions are met:

- An employee reports medical signs or symptoms that are related to ability to use a respirator.
- A PLHCP, Supervisor, or the respiratory program administrator informs the employer that an employee needs to be reevaluated.
- Information from the respiratory protection program, including observations made during fit testing and program evaluation, indicates a need for employee reevaluation: or
- A change occurs in workplace conditions (e.g, physical work effort, protective clothing, temperature) that may result in a substantial increase in physiological burden placed on an employee.



The elements of this medical evaluation shall be the responsibility of a physician or other licensed health care professional (PLHCP) and may consist of pulmonary function screening, which may include the determination of the forced expiratory volume in 1 second (FEV1) and the forced vital capacity (FVC). It may also include other procedures, such as tests of the cardiovascular and respiratory systems, which the medical examiner considers useful in evaluating the ability to use the respirators.

Appendix C contains the Medical Questionnaire & Evaluation and for Respirator Use form which must be completed. This form must be reviewed and signed by the PLHCP. The medical questionnaire and examinations shall be administered confidentially during the employee's normal working hours or at a time and place convenient to the employee.

The information in Appendix D must be provided to the PLHCP before a recommendation is made concerning an employee's ability to use a respirator.

1. The type and weight of the respirator to be used by the employee;
2. The duration and frequency of the respirator use (including use for rescue and response);
3. The expected physical effort;
4. Additional protective clothing and equipment to be worn; and
5. Temperature and humidity extremes that may be encountered.

Follow-up medical evaluations shall be provided if:

1. An employee gives a positive response to any question among questions 1 through 8 in Section 2, Part A of the Medical Questionnaire.
2. An employee demonstrates the need for a follow-up medical exam as determined by the PLHCP.

The follow-up medical evaluation shall include any medical tests, consultations, or diagnostic procedures that the PLHCP deems necessary to make a final determination.

## **7. Air Quality**

Compressed air, compressed oxygen, liquid air and liquid oxygen used for respiration shall be of high purity.

1. Cylinders shall be tested and maintained as prescribed in the Shipping Container Specifications of the Department of Transportation (49 CFR 178).
2. Oxygen shall meet the requirements of the United States Pharmacopeia for medical or breathing oxygen: Oxygen at least 99 percent, carbon dioxide less than 300 ppm, carbon monoxide less than 10 ppm, and nitric oxide and nitrogen dioxide less than 5 ppm. Compressed oxygen shall not be used in supplied air respirators or in open circuit self-contained breathing apparatuses that have previously used compressed air. Oxygen must never be used with air line respirators.
3. Breathing air for respirators may be supplied from cylinders or air shall meet at least the requirements of the specification for grade D breathing air as defined in American National Standards Institute (ANSI) Standard Z86.1; Compressed Gas Association (CGA) Specification G-

7.1, viz.: oxygen 19.5-23.5 percent, hydrocarbons (condensed) less than 5 mg/m<sup>3</sup>, carbon monoxide less than 10 ppm, and carbon dioxide less than 1000 ppm.

4. The compressor for supplying breathing air shall be equipped with necessary safety and standby devices as stated below. Compressors shall be constructed and situated so as to avoid entry of contaminated air into the system. Suitable in-line air purifying sorbent beds and filters shall be installed and maintained to further assure breathing air quality. An air storage receiver of sufficient capacity to enable the respirator wearer to escape from a contaminated atmosphere in event of a compressor failure, and alarms to indicate compressor failure and/or overheating shall be installed into the systems. When feasible, oil-free compressors should be procured when obtaining additional or replacing existing compressors used for supplying breathing air. If an oil-lubricated compressor is used, it shall have a high-temperature or carbon monoxide alarm, or both.
5. If only a high-temperature alarm is used, the air from the compressor should be tested for carbon monoxide at least monthly, or more frequently as indicated, to insure that it meets air quality specifications. Accurate records of these test results should be maintained by the appropriate supervisory personnel.
6. Air line couplings shall be incompatible with outlets for other gas systems to prevent inadvertent servicing of air line respirators with nonrespirable gases or oxygen.
7. Breathing gas containers shall be marked in accordance with American National Standard Method of Marking Portable Compressed Gas Containers to Identify the Material Contained, Z48.1-1954; Federal Specification BB-A-1034a, June 21, 1968; Air, Compressed for Breathing Purposes; or Interim Federal Specification GG-B-00675b, April 27, 1965, Breathing Apparatus, Self-Contained.

## **8. Program Evaluation**

The EH&S Dept. shall routinely review the workplace during worksite inspections to ensure that the written respiratory protection program is being properly implemented, and consult with employees to ensure that they are using respirators properly. Following the completion of any review, the program will be revised/updated in order to correct any identified deficiencies before further respirator use is authorized.

## **Appendix A: Definitions**

## **Definitions**

For the purpose of this policy, the following definitions apply:

1. **NIOSH-certified:** Tested and listed as satisfactory by the National Institute for Occupational Safety and Health (NIOSH).
2. **Contaminant:** A harmful, irritating, or nuisance material in concentrations exceeding those normally found in ambient air.
3. **Disinfection:** The destruction of pathogenic organisms, especially by means of chemical substances.
4. **Dusts:** Solid particles, mechanically produced, with a size ranging from submicroscopic to macroscopic.
5. **Emergency:** An unplanned event when a hazardous atmosphere of unknown chemical or particulate concentration suddenly occurs, requiring immediate use of a respirator for escape from or entry into the hazardous atmosphere to carry out maintenance or some other task.  
Note: This may or may not include cleanup, maintenance, or repair in unknown contaminant concentrations or oxygen deficiency.
6. **Evacuation or escape:** An unplanned event when a hazardous atmosphere of unknown chemical or particulate concentration suddenly occurs, requiring immediate use of a respirator for exiting the area only.
7. **Fumes:** Solid particles generated by condensation from the gaseous state, generally after volatilization from molten metals, with a size usually less than 1 micrometer in diameter.
8. **Gases:** Substances which are gaseous at ordinary temperatures and pressures.
9. **Immediately dangerous to life or health:** A condition posing an immediate threat to life or health, or an immediate threat of severe exposure to contaminants likely to have adverse delayed effects on health. This condition includes atmospheres where oxygen content by volume is less than 16 percent.
10. **Mists:** Suspended liquid droplets generated by condensation or by breaking up of liquid with a size ranging from submicroscopic to macroscopic.
11. **Oxygen deficient atmosphere:** An atmosphere containing 19.5 percent or less oxygen by volume.
12. **Particulate matter:** A suspension of fine solid or liquid particles or fibers in air, such as dust, fog, fume, mist, smoke or sprays.
13. **Pneumoconiosis-producing dust:** Dust which, when inhaled, deposited, and retained in the lungs, may produce signs, symptoms, and findings of pulmonary disease.
14. **Radon daughters:** Particulate decay products of radon.

15. **Respirator:** An approved safety device designed to provide the wearer with respiratory protection against inhalation of airborne contaminants and for some devices, protection against oxygen-deficient atmospheres.
16. **Respiratory minute volume:** The amount of air inspired per minute.
17. **Shall:** Indicates a requirement that is essential to meet the currently accepted standards of protection or Federal rules and regulations.
18. **Should:** Indicates an advisory recommendation that is to be applied when practical.
19. **Vapor:** The gaseous state of a substance that is solid or liquid at ordinary temperature and pressure.

## **Appendix B: Training Records**

**THE UNIVERSITY OF NORTH CAROLINA at GREENSBORO RESPIRATORY PROTECTION DEVICES**

Dept: \_\_\_\_\_ Location: \_\_\_\_\_ Date: \_\_\_\_\_

Trainer: \_\_\_\_\_ Title: \_\_\_\_\_ Time: From \_\_\_\_\_ To \_\_\_\_\_

**CERTIFICATION**

\_\_\_\_\_ Instruction in the nature of the hazard, whether acute, chronic, or both, and a frank appraisal of what may happen if the respirator is not used.

\_\_\_\_\_ Explanation of why more positive engineering or process-oriented controls are not immediately feasible to reduce or eliminate the need for respirators.

\_\_\_\_\_ A discussion of the reasons for selection of a particular respirator for specific operations.

\_\_\_\_\_ A discussion of the respirator's capabilities and limitations.

\_\_\_\_\_ A discussion of the recognition of the end of the service life of cartridges/canisters of filters (e.g., detecting odor of organic vapor through the canister/cartridge, manufacturer's specific termination date, or an increase in breathing resistance).

\_\_\_\_\_ Emergency situations.

\_\_\_\_\_ Detailed instructions on cleaning, maintenance and proper storage of respirators

\_\_\_\_\_ Positive/negative pressure tests

\_\_\_\_\_ Any special training required. Specify: \_\_\_\_\_

EMPLOYEE NAME	EMPLOYEE ID NUMBER	SIGNATURE

Prepared By: \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_  
 Reviewed By: \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_

Route copies to: Office of Safety

**Appendix C: OSHA Respirator Medical Evaluation Questionnaire**



## 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:

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-facepiece type, powered-air purifying, supplied-air, self-contained breathing apparatus).
12. Have you worn a respirator (circle one): Yes/No
13. If "yes," what type(s): \_\_\_\_\_

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

1. Do you currently smoke tobacco, or have you smoked tobacco in the last month: Yes/No
2. Have you ever had any of the following conditions?
  - a. Seizures: 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: 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-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

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):

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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):

**Appendix D: Supplemental Information for the PLHCP**



***Information to be completed by the supervisor and provided to the PLHCP at time of employee's medical evaluation***

Employee Name: \_\_\_\_\_

Type of Respirator to be used: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Weight of respirator to be used: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Duration of respirator use: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Frequency of respirator use: \_\_\_\_\_  
\_\_\_\_\_

Expected physical effort (heavy/ moderate/light): \_\_\_\_\_

Additional Protective clothing and equipment to be worn: \_\_\_\_\_

Estimated extreme temperatures to be encountered during respirator use:  
\_\_\_\_\_  
\_\_\_\_\_

Estimated humidity extremes to be encountered during respirator use:  
\_\_\_\_\_

## **Appendix E: Fit Test Protocols**

## **Quantitative Fit Test Procedures**

### **1. General:**

- a. The method applies to the negative-pressure nonpowered air-purifying respirators only.
- b. The employer shall assign one individual who shall assume the full responsibility for implementing the respirator quantitative fit test program.

### **2. Definition:**

- a. Quantitative Fit Test means the measurement of the effectiveness of a respirator seal in excluding the ambient atmosphere. The test is performed by dividing the measured concentration of challenge agent in a test chamber by the measured concentration of the challenge agent inside the respirator facepiece when the normal air purifying element has been replaced by essential perfect purifying element.
- b. Challenge Agent means the air contaminant introduced into a test chamber so that its concentration inside and outside the respirator may be compared.
- c. Test Subject means the person wearing the respirator for quantitative fit testing.
- d. Normal Standing Position means standing erect and straight with arms down along the sides and looking straight ahead.
- e. Fit Factor means the ratio of challenge agent concentration outside with respect to the inside of a respirator inlet covering(facepiece or enclosure).

### **3. Apparatus:**

- a. Instrumentation. Corn oil, sodium chloride or other appropriate aerosol generation, dilution, and measurement systems shall be used for quantitative fit test.
- b. Test chamber. The test chamber shall be large enough to permit all test subjects to freely perform all required exercises without distributing the challenge agent concentration or the measurement apparatus. The test chamber shall be equipped and constructed so that the challenge agent is effectively isolated from the ambient air yet uniform in concentration throughout the chamber.
- c. When testing air-purifying respirators, the normal filter or cartridge element shall be replaced with a high-efficiency particulate filter supplied by the same manufacturer.

- d. The sampling instrument shall be selected so that a strip chart record may be made of the test showing the rise and fall of challenge agent concentration with each inspiration and expiration at fit factors of at least 2,000.
- e. The combination of substitute air-purifying elements (if any), challenge agent, and challenge agent concentration in the test chamber shall be such that the test subject is not exposed in excess of PEL to the challenge agent at any time during the testing process.
- f. The sampling port on the test specimen respirator shall be placed and constructed so that there is no detectable leak around the port, a free air flow is allowed into the sampling line at all times and so there is no interference with the fit or performance of the respirator.
- g. The test chamber and test set-up shall permit the person administering the test to observe one test subject inside the chamber during the test.
- h. The equipment generating the challenge atmosphere shall maintain the concentration of challenge agent constant within a 10 percent variation for the duration of the test.
- i. The time lag (interval between an event and its being recorded on the strip chart) of the instrumentation may not exceed 2 seconds.
- j. The tubing for the test chamber atmosphere and for the respirator sampling port shall be the same diameter, length and material. It shall be kept as short as possible. The smallest diameter tubing recommended by the manufacturer shall be used.
- k. The exhaust flow from the test chamber shall pass through a high-efficiency filter before release to the room.
- l. When sodium chloride aerosol is used, the relative humidity inside the test chamber shall not exceed 50 percent.

#### 4. Procedure Requirements:

- a. The fitting of half-mask respirators should be started with those having multiple sizes and a variety of interchangeable cartridges and canisters such as the MA comfort II- M, North M. Survivor M, A-O M, or Scott-M. Use either of the tests outlined below to assure that the face piece is properly adjusted.
  - i. Positive pressure test: With the exhaust port(s) blocked, the negative pressure of slight inhalation should remain constant for several seconds
  - ii. Negative pressure test: With the intake port(s) blocked, the negative pressure slight inhalation should remain constant for several seconds
- b. After a facepiece is adjusted, the test subject shall wear the facepiece for at least 5 minutes before conducting a qualitative test by using either of the methods described below and using the exercise regime described in 5 a, b, c, d, and e.
  - i. Isoamyl acetate test: When using organic vapor cartridges, the test subject who can smell the odor should be unable to detect the odor of isoamyl acetate squirted into the air near the most vulnerable portions of the facepiece seal. In a location which is separated from the test area, the test subject shall be instructed to close her/his eyes during the test period. A combination cartridge or canister with organic vapor and high-efficiency filters shall be given an opportunity to smell the odor of isoamyl acetate before the test is conducted.

- ii. Irritant fume test: When using high-efficiency filters, the test subject should be unable to detect the odor of irritant fume (stannic chloride or titanium tetrachloride ventilation smoke tubes) squirted into the air near the most vulnerable portions of the facepiece seal. The test subject shall be instructed to close her/his eyes during the test period.
        - a. The test subject may enter the quantitative testing chamber only if she or he has obtained a satisfactory fit as stated in 4b of this Appendix.
        - b. Before the subject enters the test chamber, a reasonably stable challenge agent concentration inside the respirator shall be measured in the test chamber.
        - c. Immediately after the subject enters the test chamber, the challenge agent concentration inside the respirator shall be measured to ensure that the peak penetration does not exceed 5 percent for a half-mask and 1 percent for a full face piece.
        - d. A stable challenge agent concentration shall be obtained prior to the actual start of testing.
          1. Respirator retraining straps may not be overtightened for testing. The straps shall be adjusted by the wearer to give a reasonably comfortable fit typical of normal use.
5. Exercise Regime: Prior to entering the test chamber, the test subject shall be given complete instructions as to her/his part in the test procedures. The test subject shall perform the following exercises, in the order given, for each independent test.
  - a. Normal Breathing (B). In the normal standing position, without talking, the subject shall breathe normally for at least one minute.
  - b. Deep Breathing(B). In the normal standing position the subject shall do deep breathing for at least one minute pausing so as not to hyperventilate.
  - c. Turning head side to side(SO). Standing in place the subject shall slowly turn his/her head from side between the extreme positions to each side. The head shall be held at each extreme position for at least 5 seconds. Perform for at least three complete cycles.
  - d. Moving head up and down (UP). Standing in place, the subject shall slowly move his/her head up and down between the extreme position straight down. The head shall be held at each extreme position for at least 5 seconds. Perform for at least three complete cycles.
  - e. Reading (R). The test subject (keeping eyes closed) shall repeat after the test conductor the rainbow passage at the end of this section. The subject shall talk slowly and aloud so as to be heard clearly by the test conductor or monitor. (f) Grimace(G). The test subject shall grimace, smile, frown, and generally contort the face using facial muscles. Continue for at least 15 seconds.
  - f. Bend over and touch toes(B). The test subject shall bend at the waist and touch toes and return to upright position. Repeat for at least 30 seconds.
  - g. Jogging in place(J). The test subject shall perform jog in place for at least 30 seconds.
  - h. Normal Breathing(NB). Same as exercises a.

### **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. Termination: /the test shall be terminated whenever any single peak penetration exceeds 5 percent for half-masks and 1 percent for full facepieces. The test subject may be refitted and retested. If two of the three required tests are terminated, the fit shall be deemed inadequate.
7. Calculation of Fit Factors:
8.
  - a. The fit factor determined by the quantitative fit test equals the average concentration inside the respirator.
  - b. The average test chamber concentration is the arithmetic average of the test chamber concentration at the beginning and of the end of the test.
  - c. The average peak concentration of the challenge agent inside the respirator shall be the arithmetic average of the peak concentrations found for each breath during the exercise.
  - d. The average peak concentration for an exercise may be determined graphically if there is not a great variation in the peak concentrations during a single exercise.
9. Interpretation of Test Results: The fit factor measured by the quantitative fit testing shall be lowest of the three protection factors resulting from three independent tests.
10. Other Requirements:
  - a. The test subject shall not be permitted to wear a half-mask or full facepiece mask if the minimum fit factor 100 or 1,000, respectively, cannot be obtained. If hair growth or apparel interfere with a satisfactory fit, then they shall be altered or removed so as to eliminate interference and allow a satisfactory fit. If a satisfactory fit is still not attained, the test subject must use a positive-pressure respirator such as powered air-purifying respirators, supplied air respirator, or self-contained breathing apparatus.
  - b. The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface.
  - c. If a test exhibits difficulty in breathing during the tests, she or he shall be referred to a physician trained in respirator diseases or pulmonary medicine to determine whether the test subject can wear a respirator while performing immediately.
  - d. The test subject shall be given the opportunity to wear the assigned respirator for one week. If the respirator does not provide a satisfactory fit during actual use, the test subject may request another QNFT which shall be performed immediately.
  - e. A respirator fit factor card shall be issued to the test subject with the following information:
    - a. Name.
    - b. Date of fit test.
    - c. Protection factors obtained through each manufacturer, model, and approval number of respirator tested.
    - d. Name and signature of the person that conducted the test.
  - f. Filters used for qualitative or quantitative fit testing shall be replaced weekly, whenever increased breathing resistance is encountered, or when the test agent has altered the integrity of the film media

. Organic vapor cartridges/canisters shall be replaced daily or sooner if there is any indication of breakthrough by the test agent.

#### 11. Repetition of Test:

In addition, because the sealing of the respirator may be affected, quantitative fit testing shall be repeated immediately when the test subject has a :

- a. Weight change 20 pounds or more,
- b. Significant facial scarring in the area of the facepiece seal,
- c. Significant dental changes; i.e., multiple extractions without prosthesis, or acquiring dentures.
- d. Reconstructive or cosmetic surgery, or
- e. Any condition that may interfere with facepiece sealing.

#### 12. Recordkeeping:

A summary of all test results be maintained in the Office of Safety for 3 years. The summary shall include:

- a. Name of test subject.
- b. Date testing.
- c. Name of the test conductor.
- d. Fit factors obtained from every respirator tested (indicate manufacturer, model, size and approval number

## **Appendix F: Fit Test Records**



THE UNIVERSITY OF NORTH CAROLINA at GREENSBORO QUALITATIVE FIT TEST RECORD

\_\_\_\_\_ Qualitative Test      \_\_\_\_\_ Quantitative Test      Date: \_\_

Name of Employee: \_\_ID#\_\_: Department: \_\_\_\_\_ Physician's Written Approval for Respiratory Use: \_\_\_\_\_

History of Asthma, Bronchitis? \_\_\_\_\_ Contact Lense Wearer? \_\_\_\_\_

Respirator Selection (Indicate Make, Model, and Size):  
First Choice: \_\_ Second Choice: \_\_\_\_\_ Third Choice: \_\_\_\_\_ Final Selection: \_\_\_\_\_

Fit Test Protocol:

Results of Fit Testing:  
Pass \_\_ Fail \_\_

Unusual Conditions Affecting Fit Test:

Comments:

Signatures  
Person Performing Fit Test \_\_\_\_\_ Employee \_\_\_\_

Copies to: Office of Safety, Department

**Appendix G: Information for Employees Using Respirators When Not Required Under the Standard**

## **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.

Print Name: \_\_\_\_\_ Date: \_\_\_\_\_

Signature: \_\_\_\_\_

## **Appendix H: Cartridge and Canister Change Schedule**

## Cartridge/Canister Change Procedures

It is the dual responsibility of the department head, employee and the Office of Safety to determine appropriate change schedules for cartridges/canisters used in air purifying respirators. The cartridge-change schedule requirement applies only to respirators used for protection against gases or vapors, not particulates.

If available, the respirator wearer shall use the End-of-Service-Life Indicator (ESLI) to determine when to change out air-purifying elements.

If no ELSLI is available for a particular the following methods can be used to determine and appropriate change schedule:

1. Manufacturers Information:

Contact the manufacturer of the respirator or cartridge to determine the appropriate change schedule.

2. Use mathematical model:

The mathematical models can be used by following complex formulas. The mathematical models are broken down into two categories; predictive models and descriptive models. Each model has its own mathematical formula.

- a. Predictive Model: A copy of the predictive model developed by G.O. Wood can be found on the Internet at [www.osha-slc.gov/SLTC/respiratoryprotection/woodmodel.html](http://www.osha-slc.gov/SLTC/respiratoryprotection/woodmodel.html). This model looks at chemical and physical properties of different compounds to determine cartridge life. However, this model is the least accurate method because it does not look at actual experimental data.
- b. Descriptive Model: A copy of the descriptive model can be found at [www.osha-slc.gov/SLTC/respiratoryprotection/yoonmodel.html](http://www.osha-slc.gov/SLTC/respiratoryprotection/yoonmodel.html). The descriptive model looks at existing experimental data to set up a basic model. Once this model has been set up, it can be used to calculate values for points where experimental data is not available.

3. Rule of Thumb:

If the concentration of the chemical is less than 200 ppm and the chemical's boiling point is greater than 70°C, you can expect a service life of 8 hours at a normal work rate.

Service life is inversely proportional to work rate.

Reducing concentrations by a factor of 10 will increase the service life by a factor of 5.

Humidity above 85% will reduce service life by 50%.

**\*\*Note: This should NOT be the sole method of determining service life. It can only be used as a guide.\*\***

The following chemical specific standards are already addressed by OSHA:

Acrylonitrile 1910.1045(h)(2)(ii)	End-of-service life or end of shift (whichever occurs first)
Benzene 1910.1028(g)(2)(ii)	Every 1, 2 or 4 hours dependent upon concentration according to Table and at beginning of each shift
Butadiene 1910.1051(h)(2)(ii)	Every 1, 2 or 4 hours dependent upon concentration according to Table and at beginning of each shift
Formaldehyde 1910.1048(g)(2)(ii)	For cartridges, every three hours or end of shift (whichever is sooner); for canisters, every 2 or 4 hours according to the schedule
Vinyl chloride 1910.1017(g)(3)(ii)	End-of-service life or end of shift in which they are first used (whichever occurs first)
Methylene chloride 1910.1052(g)(2)(ii)	Canisters may only be used for emergency escape and must be replaced after use

If there are any questions with developing a cartridge change schedule the Office of Safety should be notified and appropriate measures will be taken to develop an appropriate change schedule.

**Appendix I: Medical Determination Form**

**University of North Carolina at Greensboro  
Medical Determination Form**

Employee Name: \_\_\_\_\_ Date: \_\_\_\_\_

It has been determined that \_\_\_\_\_ is medically able to use respiratory protective devices.

List any limitations that apply to the use of respiratory protective devices, or needs for a follow- up medical evaluation:

Physicians Signature: \_\_\_\_\_

Employees Signature: \_\_\_\_\_