



RESPIRATORY PROTECTION PROGRAM

UNIVERSITY OF NORTH CAROLINA AT CHARLOTTE

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SAFETY AND ENVIRONMENTAL HEALTH

Purpose

To define the policy of The University of North Carolina at Charlotte concerning the personal safety and health of all staff, faculty, students and visitors on the University campus; and to delegate responsibilities for assuring compliance with appropriate standards for safety and health.

Policy

The University shall engage in a program of voluntary compliance with the Occupational Safety and Health Act of North Carolina and with all applicable federal, state and local regulations and codes. To be effective, this program must be proactive instead of reactive and must embody the proper attitudes toward injury, illness and property damage prevention on the part of all members of and visitors to the University community.

The program shall be designed to provide not only a safe and healthy working, teaching and learning environment, but also an atmosphere of safety and health awareness through training and employee and student involvement. The participation and earnest cooperation of all faculty, staff, students and visitors shall be actively encouraged.

Procedures

All members of and visitors to the University Community share the responsibility to provide and maintain a safe and healthful working, teaching and learning environment and to reduce or eliminate known hazards. Each individual is expected to exercise appropriate care in the conduct of his or her activities to preserve the safety and health of self and others.

Certain areas of University activity have been identified as requiring special attention to safety and health considerations. Such areas and activities have unique policies or rules, and may have specialized tools, equipment, or training programs. Each of these special features is designed to increase safety and reduce the risk of injury to persons or property.

All members and visitors to the University community are expected to observe these requirements. The supervisor of the area is responsible for enforcing safety and health standards and supplying appropriate equipment and training. Questions related to safety and health matters should be directed initially to the supervisor in charge of the particular area.

Responsibilities

A. Executive Authority and Responsibility

1. As chief administrative officer, the Chancellor of The University of North Carolina at Charlotte has legal responsibility for compliance with the occupational safety and health standards at the University and for all reports required.
2. The Vice Chancellor for Business Affairs is delegated responsibility for proper administration, implementation, and enforcement of the provisions of these regulations.

B. Administrative Responsibility

1. **Safety and Health Director.** The Safety and Health Director is responsible for planning and recommending programs that adhere to all applicable federal, state and local laws and regulations pertaining to safety and health. In addition, the Safety and Health Director will provide assistance to responsible supervisors for implementation of safety and health programs in their areas. The Safety and Health Director maintains appropriate accident records and publishes such reports as may be required.

This position will report to the Vice Chancellor for Business Affairs through the Assistant Vice Chancellor of Human Resources.

2. **Safety and Health Committees.** A University Safety and Health Committee representing different areas of the University community shall be appointed by the Chancellor. The committee shall be responsible for University-wide policy issues, and serve as an advisory unit to the Vice Chancellor for Business Affairs on such matters.

An operational safety committee also shall be appointed by the Chancellor to assist the University Safety Committee in performing workplace inspections, reviewing injury and accident records, reviewing training records, and performing other appropriate functions as required.

Additional safety committees may be called together to address specific safety and health issues (i.e., radiation safety and biohazard safety). Appointments to such committees shall be made by the Chancellor or his designate and the candidates shall be chosen from areas of the campus community affected by those safety/health issue(s).

C. Implementation

An important part of any successful safety program is the individual workplace supervisor, be it the faculty member in the classroom, laboratory or shop, the maintenance foreman on the job or the administrative department head in an office.

Supervisors must exhibit proper attitudes towards safety and health as models to those they supervise or instruct.

It is expected that each department will furnish such equipment as deemed necessary to provide the mandatory protection of employees and students. It is also expected that each department will require the use of all such equipment whenever needed, and will invoke disciplinary action or administrative sanction in cases of failure to do so. Departments are encouraged to appoint their own Safety Committee and Safety Representative to deal with area safety on a regular basis. The University Safety and Health Committee shall provide for effective communication with all Unit Safety Committees operating throughout the campus.

D. Planning and Financing

While it is recognized that the individual department is largely responsible for developing proper attitudes toward safety, it is also important that each department plan for and develop safe procedures and safe working areas for all those under supervision.

Safety considerations must become a vital part of budget planning for all new and existing programs. Responsibility for planning and development of budget requests for Departmental Safety Programs shall rest with the individual department. The Safety and Health Director shall serve as a resource person to departments in the interpretation of standards as they affect each of the workplaces on campus, making recommendations for the most expeditious and economical means to bring the areas into compliance.

With recommendations from the Safety and Health Director, the Associate Vice Chancellor for Facilities Management, and the University Safety and Health Committee, final prioritization of funding for safety compliance rests with the Vice Chancellor for Business Affairs.

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- [Appendix A](#) 29 CFR 1910.134 OSHA (Appendix C) - Respirator Medical Evaluation Questionnaire
- [Appendix B](#) Physician or Licensed Health Care Professional Recommendation For Respirator Use
- [Appendix C](#) Respiratory Protection Selection Decision Tree
- [Appendix D](#) 29 CFR 1910.134 OSHA (Appendix A) - Fit Testing Procedures
- [Appendix E](#) Respirator Use Certification
- [Appendix F](#) 29 CFR 1910.134 OSHA (Appendix D) – Voluntary respirator usage

POLICY

It is the policy of the UNC Charlotte to protect its employees from hazardous atmosphere through a program of recognition; evaluation; engineering, administrative and work practice controls; and personal protective equipment, including respirators. Hazard elimination and engineering and work practice controls shall be employed to control employee exposure to within allowable exposure limits as much as possible. Respirators and other personal protective equipment shall be provided to employees under this program. The University is committed to full compliance with applicable federal and state regulations pertaining to employee respiratory protection.

OBJECTIVE

This document is UNC Charlotte's Respiratory Protection Program and is designed to protect employees by establishing accepted practices for respirator use, providing guidelines for training and respirator selection, and explaining proper storage, use and care of respirators. This program also serves to help the University and its employees comply with Occupational Safety and Health Administration (OSHA) respiratory protection requirements as found in 29 CFR 1910.134.

Definitions of key terms used in the Respiratory Protection Program can be found in the definitions section of the OSHA Respiratory Protection Standard - 1910.134 (b).

This Respiratory Protection Program establishes the minimum standards for the use and maintenance of respiratory protective equipment such that:

- The correct type of equipment is selected;
- It is maintained clean and in serviceable condition;
- A good fit is obtained; and
- The user is appropriately trained in the use, care and limitations of the protective device;
- Employees are medically able to wear respiratory protection;
- The Respiratory Protection Program is evaluated for effectiveness.

RESPIRATORY PROTECTION PROGRAM RESPONSIBILITIES

The Respiratory Protection Program is administered by the Safety & Environmental Health Office (S&EH). Specifically, the S&EH Industrial Hygienist shall be responsible for the management and administration of the Respiratory Protection Program and for conducting an annual review and evaluation of its effectiveness. S&EH provides a central body for evaluating, fitting, and maintaining respiratory protection and for training University personnel in its use. S&EH shall conduct respirator fit testing as required or deemed necessary. In addition, S&EH shall coordinate medical surveillance for program participants.

In addition to those defined by the University Safety and Environmental Health Policy Statement, the following individuals bare responsibility for the plan as described below.

1. The Safety and Health Director is responsible for:
 - Planning and recommending environmental health and safety programs which comply with all federal, state and local laws and regulations;
 - Overseeing the activities of the Industrial Hygienist; and
 - Ensuring that required training is performed.
2. The Industrial Hygienist, under the direction of the Safety and Health Director, has responsibility to:
 - Develop the Respiratory Protection Program;
 - Work with administrators, supervisors and employees to implement the provisions of the Program;
 - Monitor the procurement and use of respirators within all University facilities;
 - Be familiar with the current legal requirements concerning respirator use; and
 - Annually review the Respiratory Protection Program and seek ways to improve it.
3. The Supervisor, who has overall responsibility for his or her employees, including responsibility to:
 - Be familiar with University policies and programs which pertain to his or her job duties and work areas;
 - Ensure that employees know and follow the Respiratory Protection Program rules, that protective equipment is available and in working order, and that appropriate training has been provided;
 - Request assistance from S&EH as needed; and
 - Allocate or secure funds for respiratory equipment and medical exams as needed.
4. Employees are responsible for:
 - Understanding and complying with University policies and programs which pertain to the duties they perform;
 - Using appropriate personal protective equipment as required by the operation being conducted;
 - Following both oral and written instructions from his or her supervisor; and
 - Requesting information and training when unsure if respiratory protection is necessary.

PROGRAM PARTICIPATION

This program applies to all UNC Charlotte employees who need to wear a respirator to perform assigned duties. Examples of chemicals or operations that pose potential respiratory hazards and involve respirator use are:

1. Asbestos abatement operations – entire campus
2. Lead base paint abatement – entire campus

Participants

Individuals must wear respiratory protection, and therefore participate in the respiratory protection program, when any of the following conditions or circumstances apply:

- Performing jobs during which workers are specifically required by state or federal regulation to wear respiratory protection;
- Participating in activities which produce airborne contaminants that cannot be controlled adequately by engineering methods; such as spray applying paints or pesticides;
- Working in atmospheres containing levels of toxic materials which could reasonably be expected to exceed permissible or recommended exposure limits;
- Working in an atmosphere which is, may be, or may become oxygen deficient; and
- When protection from bio-aerosols, such as tuberculosis, is warranted.

Exemption

Filtering facepieces (dust masks) are not “tight fitting” respirators, do not form a seal with the wearer’s face, and therefore, do not require fit testing. Dust masks do not cause appreciable resistance to breathing, and therefore, do not require medical clearance prior to disbursement. However, Employees and students that wear filtering facepieces are required to read and certify OSHA appendix D “Voluntary respirator use”, found in Appendix F of this document. Supervisors may procure and distribute NIOSH approved dust masks freely. The Safety Office should be contacted for approval of the dust masks selected for distribution.

It is recommended that facial hair be removed in the area of the face-to-mask contact. However, dust masks can still provide substantial (although diminished) protection from nuisance dusts when facial hair interferes with the fit. Employees should not be denied dust masks because of facial hair. In addition, employees do not need to be excluded from tasks requiring the use of dust masks due to facial hair. (Please note these exceptions for facial hair do not apply to non-disposable respirators.)

MEDICAL SURVEILLANCE

Prior to being fitted for a respirator, the individual's medical status shall be evaluated by a physician to determine if they are physically able to safely use a respirator. Initial medical evaluations shall be provided at no cost to the employee during normal working hours. Those individuals who fail to meet any medical clearance criteria established by the attending physician may not participate in the University Respiratory Protection Program, will not be issued a respirator, and may not utilize a respirator in the course of their employment at the University. Individuals participate in the program must complete an "OSHA Respirator Medical Evaluation Questionnaire" (see Appendix A), to be presented to the attending physician at his/her initial program physical.

In addition to the OSHA Respirator Medical Evaluation Questionnaire, the attending physician shall be provided the following information:

- The type and weight of the respirator to be used by the employee;
- The duration and frequency of respirator use;
- The expected physical work effort;
- Additional protective clothing and equipment to be worn; and
- Temperature and humidity extremes that may be encountered.

The attending physician will review the OSHA Respirator Medical Evaluation Questionnaire, additional information and the results of the physical exam and decide if, in his or her opinion, the individual can safely wear a respirator. The physician will report his or her decision on the "Physician or Licensed Health Care Professional Recommendation for Respirator Use" form (see Appendix B). The physician should place the original Questionnaire in the individual's medical file.

Follow-up medical evaluations will be provided to participants of the Respiratory Protection Program who provide a positive response to any question among questions 1 through 8 in Section 2 of the Respiratory Medical Evaluation Questionnaire or whose initial medical examination demonstrates the need for follow-up medical examination.

Additional medical evaluations will be provided if:

- An employee reports medical signs or symptoms that are related to the ability to use the respirator;
- A Physician or other Licensed Health Care Professional (PLHCP), supervisor, or the respirator program administrator informs the employer that an employee needs to be reevaluated;
- A change occurs in the workplace conditions that may result in a substantial increase in the physiological burden placed on the employee.

RESPIRATORY PROTECTION EQUIPMENT SELECTION

S&EH shall be responsible for the selection of most respirators. Specialized equipment such as Powered Air Purifying Respirators (PAPR) may be obtained under the guidance of S&EH. Half-mask respirators are available to employees through departmental request after hazard evaluation and approval by S&EH. Respirators shall be equipped with appropriate filters and/or cartridges to protect against the specific hazard(s) required. The selection of respiratory protection type by S&EH personnel shall be performed following the “Respiratory Protection Decision Tree” (see Appendix C) and in accordance with the American National Standards Institute - Standards for Respiratory Protection (ANSI Z88.2) 1992. The S&EH Department will evaluate the potential exposure to determine the appropriate protection factor of the respirator.

Once the type of respiratory protection is selected by S&EH, selection of the specific manufacturer, model and size will be made by the program participant with consideration of comfort, proper positioning of the face piece on the nose and chin, tendency of the facepiece to slip, and room for safety glasses or goggles if required.

If an employee’s position at the University requires the use of a respirator, but the attending physician determines that use of a negative pressure respirator may place the employee’s health at increased risk due to a medical condition, Powered Air-Purifying Respirator (PAPR) shall be provided by the University.

VOLUNTARY USE OF RESPIRATORS

Employees, at their request, may be provided with **filtering facepiece “dust mask”** respirators to use in areas that have been determined to be non-hazardous. In addition, employees may supply their own **filtering facepiece** respirators for use in non-hazardous situations upon approval of the S&EH Department. Employees must fill out and submit Appendix F to the S&EH office before voluntarily using a filtering facepiece respirator. It must be noted that voluntary usage of ½ face, full face and other high protection level respiratory PPE requires full medical evaluation and S&EH approval before usage. Employees who use voluntarily use respirators will be provided with a copy of 29 CFR 1910.134 Appendix D (appendix F of this program), “Voluntary Dust Mask Usage.”

RESPIRATOR FITTING AND FIT TESTING

Prior to issuing a tight fitting air-purifying respirator or tight fitting atmosphere-supplying respirator, the University Industrial Hygienist shall ensure an acceptable seal can be established between the specific model and size of respirator to be issued and the face of the program participant, using a qualitative fit test. Men with facial hair or stubble which interfere with the seal of the respirator may not be fit tested until the facial hair is removed. Fit testing will be performed in accordance with OSHA accepted fit test protocols (Appendix D) using isoamyl acetate (banana oil), saccharin solution, denatonium benzoate (bitrex™), or stannic chloride (irritant smoke). If available, a quantitative fit test apparatus may be substituted following the manufacturer instructions and OSHA quantitative fit test protocols. After a successful fit test, the University Industrial Hygienist shall complete a “Respirator Use Certification” (Appendix E).

Fit testing must be repeated annually, or semi-annually as required by specific OSHA standards (e.g. asbestos, acrylonitrile, lead, benzene or formaldehyde). In addition, individuals must be re-tested if any of the following conditions occurs:

- A weight change of greater than 20 pounds.
- Significant facial scarring in the area of the face piece seal.
- Significant dental changes; such as the removal of multiple teeth or the fitting of dentures.
- Reconstructive or cosmetic surgery.

TRAINING

A qualified S&EH representative shall instruct each employee prior to their first respirator use and annually thereafter. Training may be partially conducted with the aid of videotape. Education and training in the use of respirators shall include:

- A complete description of the respirator selection process and the reason for the selection of the specific equipment issued;
- The nature, extent, and effects of respiratory hazards to which the employee may be exposed as required under the Hazard Communication standard (29 CFR 1910.1200);
- Why the respirator is necessary and how improper fit, usage, or maintenance can compromise the effectiveness of the respirator;
- An explanation of the operation, limitations, and capabilities of the selected respirator(s);
- Instruction in procedures for inspection, donning and removal, checking the fit and seals, and in the wearing of the respirator, including sufficient practice to enable the employee to become thoroughly familiar with, confident, and effective in performing these tasks;
- Explanation of the procedures for maintenance and storage of the respirator;
- Instruction on how to deal with emergency situations involving the use of respirators or with respirator malfunctions; and
- The contents of the OSHA Respiratory Protection standard and of the written respiratory protection program, its location and availability.

FILTERING FACEPIECES (DUST MASKS)

A filtering facepiece (dust mask) is a negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering media. Several manufacturers and varieties of dust masks are approved for protection from low concentrations of nuisance dust such as household dusts, pollen, and wood dusts. Dust masks may not be used in harmful, hazardous, toxic, or oxygen deficient atmospheres. Dust masks offer limited protection due to poor sealing characteristics. Employees who use voluntarily use dust mask respirators will be provided with a copy of 29 CFR 1910.134 Appendix D (appendix F of this program), "Voluntary Dust Mask Usage."

When using a dust mask the wearer must:

- Put on the mask and adjust strap placement and tension for proper fit.
- If the mask is equipped with adjustable nose bridge, pinch it tightly to the face.
- Discard disposable dust masks after each use.

STANDARD OPERATING PROCEDURES FOR USE OF RESPIRATORS

All personnel assigned to wear a respirator shall conscientiously guard the respirator against damage at all times. If a respirator malfunction occurs, leave the area, remove the respirator, and contact S&EH to arrange appropriate repairs. Inform the Respirator Program Administrator of any change in medical or physical status that may impede the ability to safely wear a respirator.

When using any tight fitting respirator, including half mask, full facepiece, PAPR, supplied-air or SCBA, the wearer must:

- Use only in the atmospheres specified during respirator selection.
- Be certain that glasses or goggles are worn in such a manner that they do not interfere with the seal of the facepiece.
- Be clean-shaven in the area of the respirator seal.
- Leave the area if any contaminant odors are detected through the mask, or if breathing becomes difficult
- Leave the respirator use area to wash their faces and respirator facepieces as necessary to prevent skin irritation associated with respirator use.
- Perform the job with caution to insure that the face-piece to face seal is not broken.

If any problems occur (i.e., respirator malfunction, fatigue, anxiety, contaminant breakthrough, increased effort needed to breathe, etc.), exit the area, remove the respirator, and notify the Safety Office. Remember that the key to maximum respiratory protection with a respirator is to obtain and maintain a comfortable, pressure-tight seal.

Half-Mask, Full Facepiece and Powered Air-Purifying (PAPR) Respirators

Air purifying respirators are equipped with filters and/or cartridges that remove contaminants from the air as the wearer breathes. Since air-purifying respirators do not supply air, they must not be used in oxygen-deficient or Immediate Danger to Life and Health (IDLH) atmospheres. In addition, they cannot be used to protect against chemicals with poor olfactory (odor) warning properties. Air purifying respirators must only be used for protection from the specific agent or agents listed on the color coded canisters or filters. Program participants must describe the environment in which they intend to use the respirator so that S&EH will choose the appropriate canisters or filters for the application.

When using a negative pressure half-mask or full facepiece air-purifying respirator the wearer must:

- Use the mask only in the atmospheres specified during the selection process.
- Don and adjust the mask as trained in the fitting session.
- Perform a Positive Pressure Check: Close off the exhalation valve and exhale gently into the facepiece. The face seal is considered satisfactory if a slight positive pressure can be built up inside the facepiece without any evidence of outward leakage of air at the seal. For most respirators this method of leak testing requires the wearer to first remove the exhalation valve cover before closing off the exhalation valve and then carefully replacing it after the test.
- Perform a Negative Pressure Check: Close off the inlet opening of the canister or cartridge(s) by covering with the palm of the hand(s), inhale gently so that the facepiece collapses slightly, and

hold the breath for ten seconds. If the facepiece remains in its slightly collapsed condition and no inward leakage of air is detected, the seal of the respirator is considered satisfactory.

- Leave the respirator use area immediately to change the filter elements whenever they detect the warning properties of the contaminant or a change in breathing resistance.

Donning a half mask respirator:

1. Remove the respirator from the plastic bag and inspect it as described below under “Maintenance and Care of Respirators.”
2. Install the appropriate cartridges/filters.
3. Insert chin, pull the harness over the head, clasp the lower straps together behind the neck and adjust the straps tightness.
4. Perform positive and negative fit checks.

Half-Mask Respirator removal:

1. Exit the area and decontaminate as required, including the respirator.
2. Unclasp the straps, and remove the respirator.
3. Clean the respirator as described below in “Maintenance and Care of Respirators.”
4. Replace the respirator into the plastic bag (do not seal the bag tightly).

Donning the Full-Face Respirator

1. Remove the respirator from the plastic bag and inspect it as described below under “Maintenance and Care of Respirators.”
2. Install the appropriate cartridges/filters.
3. Grasp the front of the mask and insert chin.
4. Push mask against forehead, center it on the face, and using the opposite hand, pull strap assembly over the head.
5. Tighten the lower, side and finally upper straps evenly.
6. Perform positive and negative fit checks.

Removing the Full-Face Respirator

1. Exit the area and decontaminate as required, including the respirator.
2. Loosen all the straps.
3. Grasp the front of the mask and pull up and away while lowering the head.
4. After insuring that all the straps are loosened to their tabs, pull the strap harness assembly over the head.
5. Clean the respirator as described below in “Maintenance and Care of Respirators.”
6. Replace the respirator into the plastic bag (do not seal the bag tightly).

Donning the Powered Air Purifying Respirators (PAPR)

Hood-type PAPR units may be used by men with substantial facial hair. S&EH will assist individuals or departments in selecting the best PAPR for a specific job.

1. Remove the respirator from the plastic bag and inspect it as described below under “Maintenance and Care of Respirators.”
2. Install the appropriate cartridges/filters.
3. Check battery and respirator flow with rotometer provided by PAPR manufacturer.
4. Fasten the battery and filter pack belt around the waist.
5. Turn the unit on.
6. Grasp the front of the mask and insert chin.
7. Push mask against forehead, center it on the face and using the opposite hand, pull strap assembly over the head.
8. Tighten the lower, side and finally upper straps evenly.

Removing the Powered Air Purifying Respirators (PAPR)

1. Exit the area and decontaminate as required, including the respirator.
2. Loosen all the straps.
3. Grasp the front of the mask and pull up and away while lowering the head.
4. After insuring that all the straps are loosened to their tabs, pull the strap harness assembly over the head.
5. Turn the unit off.
6. Remove the battery and filter belt.
7. Clean the respirator as described below in “Maintenance and Care of Respirators.”
8. Replace the respirator into the plastic bag (do not seal the bag tightly).

Maintenance and Care of Respirators

The basic elements of respirator maintenance include inspection for defects, replacement of defective parts, respirator cleaning and storage.

Inspection for Defects

The ongoing maintenance of the respirators themselves is an essential part of the Respiratory Protection Program. Primary responsibility for maintaining a given respirator in clean and serviceable condition lies with the program participant to whom the respirator is assigned. S&EH will assist individuals by inspecting the respirator at the annual fit test and by recommending replacement parts as needed.

Respirator inspection shall include at a minimum:

- Checking facepiece for excessive dirt, cracks, tears or holes, distortion, cracked or loose fitting lenses.
- Checking head straps for breaks or tears, loss of elasticity, broken or malfunctioning buckles.
- Checking inhalation and exhalation valves for missing valves, detergent residue, dust particles or dirt on valve or valve seat, cracks tears or distortion in the valve or the valve seat, or missing exhalation valve cover.
- Checking filters or canisters for appropriateness to the hazard, missing or worn gaskets, cracks or dents in filter housing or expired date.
- Checking hoses for cracks or holes and missing or lose clamps.

When a respirator is utilized for protection against gases or vapors, the respirator filters or cartridges should be replaced if contaminant odor is detected (breakthrough) or breathing resistance increases noticeably.

Cleaning

Respirators shall be cleaned according to the following schedule:

- Routinely used respirators issued for the exclusive use of an employee shall be cleaned and disinfected after each day's use;
- Routinely used respirators issued to more than one employee shall be cleaned and disinfected after each use; and,
- Respirators maintained for emergency use shall be cleaned and disinfected after each use.

Respirators will be cleaned in the following manner:

1. Remove filters, cartridges, or canisters. Disassemble facepieces by removing speaking diaphragms, demand and pressure-demand valve assemblies, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.
2. Wash components in 43 °C (110 °F) water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.
3. Rinse components thoroughly in clean, warm 43 °C (110 °F), preferably running water. Drain.
4. When the cleaner used does not contain a disinfecting agent, respirator components should be immersed for two minutes in one of the following:

- Hypochlorite solution (50 PPM of chlorine) made by adding approximately one milliliter of laundry bleach to one liter of water at 43 °C (110 °F); or,
 - Aqueous solution of iodine (50 PPM iodine) made by adding approximately 0.8 milliliters of tincture of iodine (6-8 grams ammonium and/or potassium iodine/100 cc of 45% alcohol) to one liter of water at 43 °C (110 °F); or,
 - Other commercially available cleansers of equivalent disinfectant quality when used as directed, unless the respirator manufacturer recommends against their use.
5. Rinse components thoroughly in clean, warm 43 °C (110 °F), preferably running water. Drain. The importance of thorough rinsing cannot be overemphasized. Detergents or disinfectants that dry on facepieces may result in dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.
 6. Components should be hand-dried with a clean lint-free cloth or air-dried.
 7. Reassemble facepiece, replacing filters, cartridges, and canisters where necessary.
 8. Test the respirator to ensure that all components work properly.

PAPRs and SCBAs should be cleaned following the manufacturers recommendations.

Storage

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

Repairs

The employer shall ensure that respirators that fail inspection are removed from service and repaired or adjusted. Repairs or adjustments to respirators are to be made only by S&EH or other persons appropriately trained to perform such operations, using parts designed for the respirator. No repairs shall be performed that are outside the manufacturer's recommendations concerning the type and extent of repairs that can be performed.

CARTRIDGE REPLACEMENT

Air purifying respirators used for particulate control require HEPA filter cartridge change out when air flow through the cartridge/s is restricted in such a manner as to increase breathing effort of person wearing respirator.

Air-purifying respirators used for protection against chemical contamination must be replaced as necessary. Change schedules are based on type of contaminant, concentration of contaminant, temperature, and humidity. Contact the S&EH Department prior to using an air-purifying respirator for chemical exposure.

The following information will be used to determine the life of an organic cartridge: This method is from chapter 36 of the AIHA publication "The Occupations Environment - Its Evaluation and Control." The "Rule of Thumb" method of cartridge life determination is:

- 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%.

POTENTIAL IMMEDIATELY DANGEROUS TO LIFE AND HEALTH (IDLH) ATMOSPHERES

University personnel are not to enter an atmosphere that is oxygen-deficient, oxygen-enriched, or has unknown or potentially IDLH concentrations of a hazardous chemical. Charlotte Mecklenburg Fire Department personnel are equipped with Self Contained Breathing Apparatus (SCBA) equipment that will allow for safe entry into IDLH atmospheres if necessary. The following conditions have the capability to present IDLH atmospheres on campus:

1. The release of refrigerants from chiller units in various campus facilities can produce IDLH atmospheres. Mechanical rooms in various campus facilities are equipped with air conditioning chiller units that use refrigerants. If a large quantity of refrigerant is released from a chiller unit an IDLH atmosphere can be produced within the mechanical room due to oxygen displacement. Refrigerants are heavier than air and can settle out in low lying areas such as sumps and pits. Mechanical rooms with chiller equipment are equipped with refrigerant detection alarm devices to warn entrants of hazardous atmospheric conditions due to refrigerant release.

University employees and contractors are not permitted to enter the mechanical rooms when the refrigerant alarm is sounding unless the unit is being tested or serviced and it is known that there is no refrigerant release or leak. Charlotte Mecklenburg Fire Department personnel that are equipped with SCBA or supplied air respirator may enter an oxygen deficient atmosphere if conditions require entry.

2. Manholes and other confined spaces can contain oxygen deficient or hazardous IDLH atmospheres, such as hydrogen sulfide and carbon monoxide, if not properly ventilated prior to entry. UNC Charlotte personnel and contractors are required to ventilate confined spaces prior to entry if atmospheric conditions are shown to be hazardous on a RKI confined space four gas meter or equivalent. The confined space must be tested in a stratified method to show that the entire space has safe oxygen levels and is free from hazardous atmospheric constituents throughout the entire confined space. Confined space entry procedures must be followed to enter any permit required confined space.

Appendix A

OSHA Respirator Medical Evaluation Questionnaire

To the employer:

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

To the employee:

Can you read (circle one): Yes/No

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

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

1. Today's date: _____

2. Your name: _____

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 If ``yes,"
what type(s): _____

OSHA Respirator Medical Evaluation Questionnaire

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

- | | |
|--|--------|
| 1. Do you currently smoke tobacco, or have you smoked tobacco in the last month: | Yes/No |
| 2. Have you ever had any of the following conditions? | |
| a. Seizures (fits): | Yes/No |
| b. Diabetes (sugar disease): | Yes/No |
| c. Allergic reactions that interfere with your breathing: | Yes/No |
| d. Claustrophobia (fear of closed-in places): | Yes/No |
| e. Trouble smelling odors: | Yes/No |
| 3. Have you ever had any of the following pulmonary or lung problems? | |
| a. Asbestosis: | Yes/No |
| b. Asthma: | Yes/No |
| c. Chronic bronchitis: | Yes/No |
| d. Emphysema: | Yes/No |
| e. Pneumonia: | Yes/No |
| f. Tuberculosis: | Yes/No |
| g. Silicosis: | Yes/No |
| h. Pneumothorax (collapsed lung): | Yes/No |
| i. Lung cancer: | Yes/No |
| j. Broken ribs: | Yes/No |
| k. Any chest injuries or surgeries: | Yes/No |
| l. Any other lung problem that you've been told about: | Yes/No |
| 4. Do you currently have any of the following symptoms of pulmonary or lung illness? | |
| a. Shortness of breath: | Yes/No |
| b. Shortness of breath when walking fast on level ground or walking up a slight hill or incline: | Yes/No |
| c. Shortness of breath when walking with other people at an ordinary pace on level ground: | Yes/No |
| d. Have to stop for breath when walking at your own pace on level ground: | Yes/No |
| e. Shortness of breath when washing or dressing yourself: | Yes/No |
| f. Shortness of breath that interferes with your job: | Yes/No |
| g. Coughing that produces phlegm (thick sputum): | Yes/No |
| h. Coughing that wakes you early in the morning: | Yes/No |
| i. Coughing that occurs mostly when you are lying down: | Yes/No |
| j. Coughing up blood in the last month: | Yes/No |
| k. Wheezing: | Yes/No |
| l. Wheezing that interferes with your job: | Yes/No |
| m. Chest pain when you breathe deeply: | Yes/No |
| n. Any other symptoms that you think may be related to lung problems: | Yes/No |
| 5. Have you ever had any of the following cardiovascular or heart problems? | |
| a. Heart attack: | Yes/No |
| b. Stroke: | Yes/No |
| c. Angina: | Yes/No |
| d. Heart failure: | Yes/No |
| e. Swelling in your legs or feet (not caused by walking): | Yes/No |
| f. Heart arrhythmia (heart beating irregularly): | Yes/No |

OSHA Respirator Medical Evaluation Questionnaire

- g. High blood pressure: Yes/No
- h. Any other heart problem that you've been told about: Yes/No
6. Have you ever had any of the following cardiovascular or heart symptoms?
- a. Frequent pain or tightness in your chest: Yes/No
 - b. Pain or tightness in your chest during physical activity: Yes/No
 - c. Pain or tightness in your chest that interferes with your job: Yes/No
 - d. In the past two years, have you noticed your heart skipping or missing a beat: Yes/No
 - e. Heartburn or indigestion that is not related to eating: Yes/No
 - f. Any other symptoms that you think may be related to heart or circulation problems: Yes/No
7. Do you currently take medication for any of the following problems?
- a. Breathing or lung problems: Yes/No
 - b. Heart trouble: Yes/No
 - c. Blood pressure: Yes/No
 - d. Seizures (fits): Yes/No
8. If you've used a respirator, have you ever had any of the following problems?
(If you've never used a respirator, check the following space and go to question 9:)
- a. Eye irritation: Yes/No
 - b. Skin allergies or rashes: Yes/No
 - c. Anxiety: Yes/No
 - d. General weakness or fatigue: Yes/No
 - e. Any other problem that interferes with your use of a respirator: Yes/No
9. Would you like to talk to the health care professional who will review this questionnaire about your answers to this questionnaire: Yes/No
- Questions 10 to 15 below must be answered by every employee who has been selected to use either a full-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
 - e. 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

OSHA Respirator Medical Evaluation Questionnaire

- 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

OSHA Respirator Medical Evaluation Questionnaire

(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

OSHA Respirator Medical Evaluation Questionnaire

If "yes," describe this protective clothing and/or equipment: _____

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

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

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

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

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

Name of the first toxic substance: _____

Estimated maximum exposure level per shift: _____

Duration of exposure per shift: _____

Name of the second toxic substance: _____

Estimated maximum exposure level per shift: _____

Duration of exposure per shift: _____

Name of the third toxic substance: _____

Estimated maximum exposure level per shift: _____

Duration of exposure per shift: _____

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

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

Source: Occupational Safety and Health Administration (2003). Respiratory Protection. *Occupational Safety and Health Standards for General Industry* [On-Line]. www.osha.gov

Appendix B

**PHYSICIAN OR LICENSED HEALTH CARE PROFESSIONAL
RECOMMENDATION FOR RESPIRATOR USE**

Employee Information

Name: _____ SS#: _____

Department: _____ Phone: _____

Supervisor: _____ Date: _____

Physician or Licensed Health Care Provider Medical Recommendations

After reviewing the employee's OSHA Respirator Medical Evaluation Questionnaire and examining the employee, please state below any **limitations on respirator use** related to the medical condition of the employee, or relating to the workplace conditions in which the respirator will be used, **including whether or not the employee is medically able to use the respirator:**

Please state here the need for any follow-up evaluations:

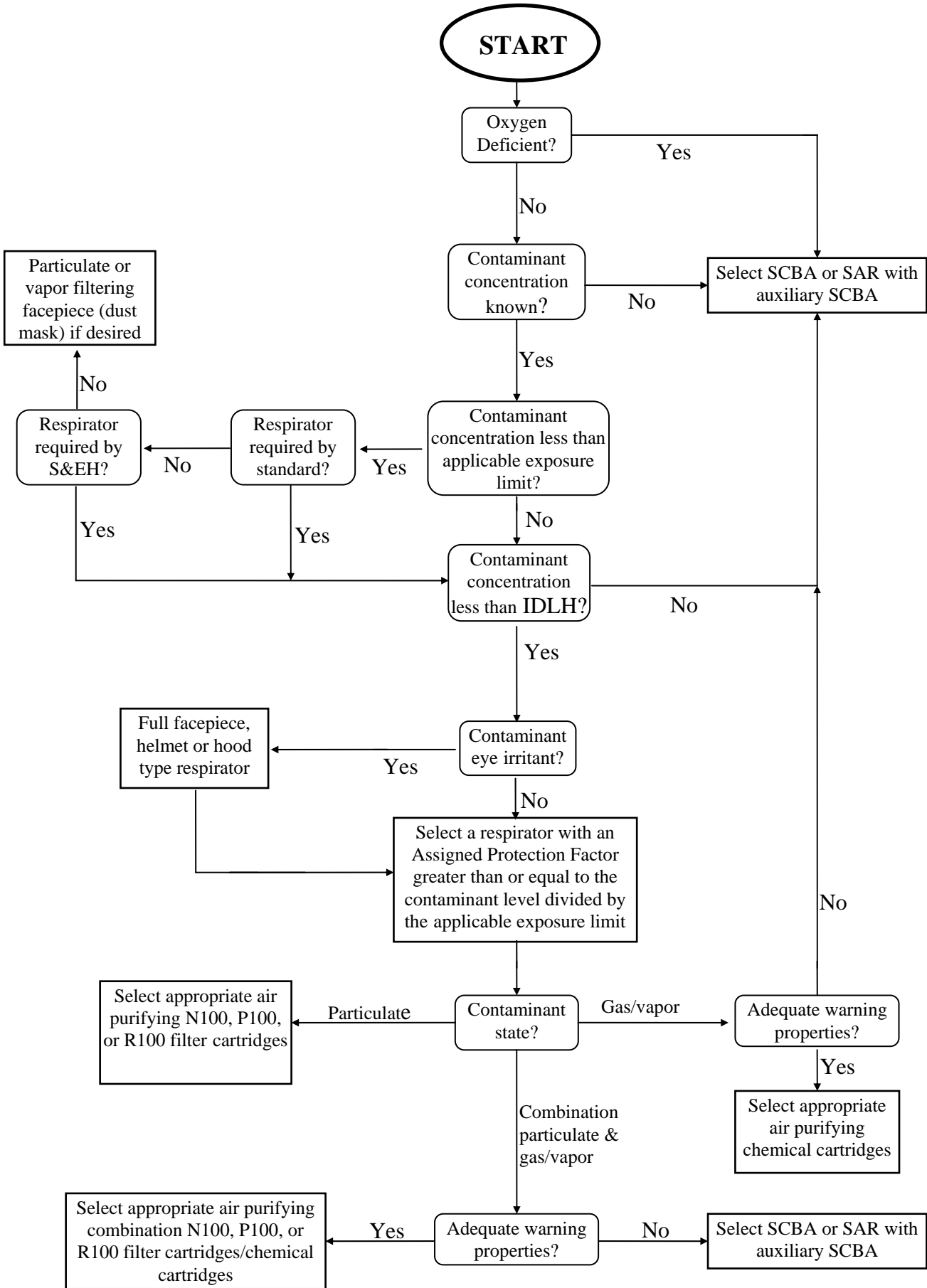
Please sign below, indicating that you have examined the above employee and provided them with a copy of this written recommendation.

Attending Physician or Licensed Health Care Provider signature

Attending Physician or Licensed Health Care Provider name (please type or print)

Please forward a copy of this form to:
University of North Carolina at Charlotte, Safety and Environmental Health Office
9201 University City Blvd.
Charlotte, NC 28223

Appendix C Respiratory Protection Selection Decision Tree



Appendix D

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

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

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

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

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

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

Rainbow Passage

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

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

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

(8) Normal breathing. Same as exercise (1).(b) Each test exercise shall be performed for one minute except for the grimace exercise which shall be performed for 15 seconds. The test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried. The respirator shall not be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated.

B. Qualitative Fit Test (QLFT) Protocols

1. General

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

(b) The employer shall ensure that QLFT equipment is kept clean and well maintained so as to operate within the parameters for which it was designed.

2. Isoamyl Acetate Protocol

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

(a) Odor Threshold Screening

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

(1) Three 1 liter glass jars with metal lids are required.

(2) Odor-free water (e.g., distilled or spring water) at approximately 25 deg. C (77 deg. F) shall be used for the solutions.

(3) The isoamyl acetate (IAA) (also known as isopentyl acetate) stock solution is prepared by adding 1 ml of pure IAA to 800 ml of odor-free water in a 1 liter jar, closing the lid and shaking for 30 seconds. A new solution shall be prepared at least weekly.

(4) The screening test shall be conducted in a room separate from the room used for actual fit testing. The two rooms shall be well-ventilated to prevent the odor of IAA from becoming evident in the general room air where testing takes place.

(5) The odor test solution is prepared in a second jar by placing 0.4 ml of the stock solution into 500 ml of odor-free water using a clean dropper or pipette. The solution shall be shaken for 30 seconds and allowed to stand for two to three minutes so that the IAA concentration above the liquid may reach equilibrium. This solution shall be used for only one day.

(6) A test blank shall be prepared in a third jar by adding 500 cc of odor-free water.

(7) The odor test and test blank jar lids shall be labeled (e.g., 1 and 2) for jar identification. Labels shall be placed on the lids so that they can be peeled off periodically and switched to maintain the integrity of the test.

(8) The following instruction shall be typed on a card and placed on the table in front of the two test jars (i.e., 1 and 2): "The purpose of this test is to determine if you can smell banana oil at a low concentration. The two bottles in front of you contain water. One of these bottles also contains a small amount of banana oil. Be sure the covers are on tight, then shake each bottle for two seconds. Unscrew the lid of each bottle, one at a time, and sniff at the mouth of the bottle. Indicate to the test conductor which bottle contains banana oil."

(9) The mixtures used in the IAA odor detection test shall be prepared in an area separate from where the test is performed, in order to prevent olfactory fatigue in the subject.

(10) If the test subject is unable to correctly identify the jar containing the odor test solution, the IAA qualitative fit test shall not be performed.

(11) If the test subject correctly identifies the jar containing the odor test solution, the test subject may proceed to respirator selection and fit testing.

(b) Isoamyl Acetate Fit Test

(1) The fit test chamber shall be a clear 55-gallon drum liner suspended inverted over a 2-foot diameter frame so that the top of the chamber is about 6 inches above the test subject's head. If no drum liner is available, a similar chamber shall be constructed using plastic sheeting. The inside top center of the chamber shall have a small hook attached.

(2) Each respirator used for the fitting and fit testing shall be equipped with organic vapor cartridges or offer protection against organic vapors.

(3) After selecting, donning, and properly adjusting a respirator, the test subject shall wear it to the fit testing room. This room shall be separate from the room used for odor threshold screening and respirator selection, and shall be well-ventilated, as by an exhaust fan or lab hood, to prevent general room contamination.

(4) A copy of the test exercises and any prepared text from which the subject is to read shall be taped to the inside of the test chamber.

(5) Upon entering the test chamber, the test subject shall be given a 6-inch by 5-inch piece of paper towel, or other porous, absorbent, single-ply material, folded in half and wetted with 0.75 ml of pure IAA. The test subject shall hang the wet towel on the hook at the top of the chamber. An IAA test swab or ampule may be substituted for the IAA wetted paper towel provided it has been demonstrated that the alternative IAA source will generate an IAA test atmosphere with a concentration equivalent to that generated by the paper towel method.

(6) Allow two minutes for the IAA test concentration to stabilize before starting the fit test exercises. This would be an appropriate time to talk with the test subject; to explain the fit test, the importance of his/her cooperation, and the purpose for the test exercises; or to demonstrate some of the exercises.

(7) If at any time during the test, the subject detects the banana-like odor of IAA, the test is failed. The subject shall quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.

(8) If the test is failed, the subject shall return to the selection room and remove the respirator. The test subject shall repeat the odor sensitivity test, select and put on another respirator, return to the test area and again begin the fit test procedure described in (b) (1) through (7) above. The process continues until a respirator that fits well has been found. Should the odor sensitivity test be failed, the subject shall wait at least 5 minutes before retesting. Odor sensitivity will usually have returned by this time.

(9) If the subject passes the test, the efficiency of the test procedure shall be demonstrated by having the subject break the respirator face seal and take a breath before exiting the chamber.

(10) When the test subject leaves the chamber, the subject shall remove the saturated towel and return it to the person conducting the test, so that there is no significant IAA concentration buildup in the chamber during subsequent tests. The used towels shall be kept in a self-sealing plastic bag to keep the test area from being contaminated.

3. Saccharin Solution Aerosol Protocol

The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test. (a) Taste threshold screening. The saccharin taste threshold screening, performed without wearing a respirator, is intended to determine whether the individual being tested can detect the taste of saccharin.

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

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

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

(4) Using a DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent, the test conductor shall spray the threshold check solution into the enclosure. The nozzle is directed away from the nose and mouth of the person. This nebulizer shall be clearly marked to distinguish it from the fit test solution nebulizer.

(5) The threshold check solution is prepared by dissolving 0.83 gram of sodium saccharin USP in 100 ml of warm water. It can be prepared by putting 1 ml of the fit test solution (see (b)(5) below) in 100 ml of distilled water.

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

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

(8) If the first response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whether the saccharin is tasted. If the test subject reports tasting the sweet taste

during the second ten squeezes, the screening test is completed. The taste threshold is noted as twenty regardless of the number of squeezes actually completed.

(9) If the second response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whether the saccharin is tasted. If the test subject reports tasting the sweet taste during the third set of ten squeezes, the screening test is completed. The taste threshold is noted as thirty regardless of the number of squeezes actually completed.

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

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

Note to paragraph 3. (a): If the test subject eats or drinks something sweet before the screening test, he/she may be unable to taste the weak saccharin solution.

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

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

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

(b) Saccharin solution aerosol fit test procedure.

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

(2) The fit test uses the same enclosure described in 3. (a) above.

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

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

(5) The fit test solution is prepared by adding 83 grams of sodium saccharin to 100 ml of warm water.

(6) As before, the test subject shall breathe through the slightly open mouth with tongue extended, and report if he/she tastes the sweet taste of saccharin.

(7) The nebulizer is inserted into the hole in the front of the enclosure and an initial concentration of saccharin fit test solution is sprayed into the enclosure using the same number of

squeezes (either 10, 20 or 30 squeezes) based on the number of squeezes required to elicit a taste response as noted during the screening test. A minimum of 10 squeezes is required.

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

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

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

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

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

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

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

(a) Taste Threshold Screening.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(b) Bitrex Solution Aerosol Fit Test Procedure.

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

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

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

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

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

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

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

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

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

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

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

5. Irritant Smoke (Stannic Chloride) Protocol

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

(a) General Requirements and Precautions

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

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

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

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

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

(b) Sensitivity Screening Check

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

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

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

(3) The test subject shall be allowed to smell a weak concentration of the irritant smoke before the respirator is donned to become familiar with its irritating properties and to determine if he/she can detect the irritating properties of the smoke. The test operator shall carefully direct a small amount of the irritant smoke in the test subject's direction to determine that he/she can detect it.

(c) Irritant Smoke Fit Test Procedure

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

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

(3) The test operator shall direct the stream of irritant smoke from the smoke tube toward the 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.

C. Quantitative Fit Test (QNFT) Protocols

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

1. General

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

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

2. Generated Aerosol Quantitative Fit Testing Protocol

(a) Apparatus.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(b) Procedural Requirements.

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

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

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

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

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

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

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

(8) Calculation of fit factors.

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

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

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

(A) Average peak penetration method means the method of determining test agent penetration into the respirator utilizing a strip chart recorder, integrator, or computer. The agent penetration is

determined by an average of the peak heights on the graph or by computer integration, for each exercise except the grimace exercise. Integrators or computers that calculate the actual test agent penetration into the respirator for each exercise will also be considered to meet the requirements of the average peak penetration method.

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

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

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

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

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

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

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

(a) Portacount Fit Test Requirements.

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

(2) Instruct the person to be tested to don the respirator for five minutes before the fit test starts. This purges the ambient particles trapped inside the respirator and permits the wearer to make

certain the respirator is comfortable. This individual shall already have been trained on how to wear the respirator properly.

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

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

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

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

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

(b) Portacount Test Instrument.

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

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

Appendix.

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

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

The CNP protocol provides an alternative to aerosol fit test methods. The CNP fit test method technology is based on exhausting air from a temporarily sealed respirator facepiece to generate and then maintain a constant negative pressure inside the facepiece. The rate of air exhaust is controlled so that a constant negative pressure is maintained in the respirator during the fit test. The level of pressure is selected to replicate the mean inspiratory pressure that causes leakage into the

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

(a) CNP Fit Test Requirements.

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

(2) The CNP system defaults selected for test pressure shall be set at -- 5 mm of water (-0.58 inches of water) and the modeled inspiratory flow rate shall be 53.8 liters per minute for performing fit tests.

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

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

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

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

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

(7) The QNFT protocol shall be followed according to section I.C. 1. of this appendix with an exception for the CNP test exercises.

(b) CNP Test Exercises.

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

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

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

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

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

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

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

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

(c) CNP Test Instrument.

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

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

Part II. New Fit Test Protocols

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

Appendix A.

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

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

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

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

Appendix E

RESPIRATOR USE CERTIFICATION

The University of North Carolina at Charlotte Environmental Health and Safety Office certifies that:

Test Subject Name: _____

Social Security Number: _____

Department: _____

has been successfully fit tested for and been trained in the use, care and limitations of the following respirator:

Manufacturer: _____

Model: _____

Size: _____

Cartridges: _____

THIS CERTIFICATION MUST BE RENEWED WITHIN ONE YEAR OF THE TEST DATE

ES&H Representative: _____

ES&H Signature: _____

Test Date: _____

Test Type: _____

The Test Subject certifies that he/she completed the fit test in good faith and did not detect the saccharin or Bitrex flavor or irritant smoke odor during the fitting portion of the test. In addition, the Test Subject understands that successful completion of a fit test is not a condition of continued employment at the University.

Test Subject Signature: _____

- Use only the brand, model and size respirator fitted.
- Perform negative and positive pressure fit checks each time the respirator is worn.
- Use only the recommended cartridges for that specific contaminant.
- Contact E/OS&H if you are unsure if your respirator is appropriate for an intended use.
- Clean your respirator after each use.

Appendix F

OSHA 1910.134 Appendix D - Voluntary “Dust Mask” Respirator Usage - University Operations

Information for employees using “dust mask” respirators in areas where they are not required but are voluntarily worn by the individual .

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 is 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 UNC – Charlotte provides dust mask respirators for your voluntary use, or if you provide your own dust mask respirator, you need to take certain precautions to be sure that the respirator itself does not present a hazard. *Please note that this document does NOT cover the usage of tight fitting half-face/full-face respiratory protection devices. These devices require respirator fit testing and are to be used in respirator required areas. Respirator required areas at the University include asbestos abatement operations (inside the containment area) and lead paint removal/disturbance operations.*

You should do the following when using dust mask respirators:

1. Read and follow 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 dust mask respirator is ONLY designed to filter dust particles. It will not protect you against vapors from evaporating solvents (gasoline, xylene, paint thinner, etc.) gases (carbon monoxide, argon, etc.) and acid vapors (sulfuric, nitric, etc.). Also, when working in environments that produce very small “sub micron” dust particles, such as when welding, an N95 (95% efficient) or N99 (99% efficient HEPA filter) rated dust mask is recommended for use instead of a standard dust mask due to increased filtration capability.
4. Keep track of your respirator so that you do not mistakenly use someone else's respirator.

By signing below I acknowledge that I have read this document and I am aware of the requirements of wearing a “dust mask” respirator on a voluntary basis.

Name: _____ Signature _____ Date: _____
Department: _____

Revision 1.0 – 03/28/2004 – Safety Office Copy – Please return signed copy to the Safety Office