

RESPIRATORY
PROTECTION
PROGRAM

UNIVERSITY OF HAWAII AT MANOA

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RESPIRATORY PROTECTION PROGRAM

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RESPIRATORY PROTECTION PROGRAM

1.0 Introduction

It is the policy of the University of Hawaii to provide its employees with a safe and healthful working environment. Occupational exposure to harmful airborne particulates and/or gases and vapors should be controlled whenever possible by engineering and administrative controls.

The purpose of this program is to ensure the protection of all employees from respiratory hazards through the proper use of respirators. Respirators are to be used only when engineering controls (e.g. enclosure or confinement of the operation, ventilation or substitution of less toxic materials) are not feasible, while engineering controls are being installed or repaired or in emergencies. When respirators are to be used, all requirements of this document shall be met.

This program does not apply to contractors as they are responsible for providing their own respiratory protection program and respiratory protective equipment.

2.0 Responsibilities

2.1 Environmental Health and Safety Office

The Environmental Health and Safety Office (EHSO) is responsible for establishing and maintaining a respiratory protection program consistent with the goal of protecting University personnel. EHSO will implement a Respiratory Protection Program which is designed and organized to ensure respirators are properly selected, used and maintained by University personnel, and meets the Hawaii Occupational Safety and Health (HIOSH) respiratory protection standard.

EHSO is also responsible for evaluating those tasks for which respiratory protection is thought to be necessary, determine the degree of hazard posed by the potential exposure, determine whether engineering or administrative controls are feasible, and will specify which respiratory protection device is to be used at each task. In addition, EHSO will train personnel in the selection and use of respiratory protective devices, conduct qualitative and quantitative fit testing, and issue necessary protective devices.

2.2 Departmental Units/Supervisors

Each department shall be responsible for implementing the provisions of this program. Supervisors will ensure each employee under his or her supervision using a respirator has received medical evaluation to wear a respirator and appropriate training in its use. Supervisors will ensure the availability of appropriate respirators and parts, provide

adequate storage facilities and ensure proper respirator equipment maintenance. Supervisors must be aware of tasks requiring the use of respiratory protection, and ensure all employees in such work use the appropriate respirators at all times.

2.3 Respirator Wearer

It is the responsibility of each respirator wearer to wear his/her respirator when and where required and in the manner in which he/she was trained. Respirator wearers must report any malfunctions of the respirator to his/her supervisor immediately. The respirator wearer must guard against damage to the respirator, clean/maintain the respirator as instructed, and store the respirator in a clean, sanitary location.

2.4 Others

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

Contractors are required to develop and implement a respirator protection program for their employees who must enter into or work in areas where exposure to hazardous materials cannot be controlled or avoided. This program must meet all elements of the HIOSH regulations.

3.0 Issue of Respirators

Respiratory protection devices are issued by the department head or designated respirator program coordinator for the department.

Respirators are issued only to those employees who have passed the respirator medical evaluation; have been fit tested and received appropriate training in its use.

4.0 Medical Evaluation

A qualified physician shall evaluate the medical status of any employee required to wear a respirator in accordance with HIOSH respirator medical evaluation criteria. Job tasks requiring the use of a respirator shall not be assigned until the employee has been deemed physically able to wear a respirator without undue physical or psychological risk.

The University shall not allow any employee to wear a particular type of respirator if, in the opinion of a licensed physician, the employee might suffer undue physical or psychological harm due to wearing the respirator.

A determination as to whether or not an employee can wear a respirator is made initially upon employment, and re-evaluation thereafter if:

- An employee reports medical signs and symptoms that are related to ability to use a respirator;
- The physician, supervisor or EHSO program manager deems it necessary; or
- A change occurs in the workplace conditions (e.g., physical work effort, protective clothing, temperature) that may result in a substantial increase in the physiological burden placed on an employee.

Appendix A (Medical Clearance for Respirator Use) may be obtained from the supervisor prior to conducting the medical evaluation.

Based on the overall health of the individual and special medical tests as appropriate, the examining physician determines whether or not the individual will be restricted from wearing respiratory protective equipment. If a medical restriction is applied, the employee, his/her supervisor, and EHSO are formally notified of the restriction.

Specific medical tests and procedures will be determined by a qualified physician and will be in accordance with HIOSH medical surveillance requirements.

5.0 Selection and Use of Respiratory Protective Devices

5.1 Respirator Use

Respiratory protection is authorized and issued for the following personnel:

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

5.2 Respirator Use for Biohazards

Respirators for use in areas where biohazards are used or stored must be selected based on the review of the laboratory procedures, protocols, biological agents proposed for use, etc. The Biosafety Program will conduct a risk assessment and determine the appropriate

Biosafety Level rating for the laboratory and the corresponding level of personal protective equipment required.

If employees are required to wear respirators for protection against potentially infectious aerosols in their work environment, they must be placed in a respiratory protection program and comply with all applicable provisions of the program.

5.3 Voluntary Use of Respirators

When an employee chooses to use a dust mask for comfort, and not for protection against levels of contaminants that would require respiratory protection, the employee does not need training or fit testing but must be informed of Appendix B. If an employee chooses to use a non-disposable, tight fitting facepiece (i.e. rubber half-face) for comfort, then the employee must be placed in the University's respiratory protection program.

The department/supervisor shall authorize voluntary use of respirators as requested by all other workers on a case-by-case basis, depending on specific workplace conditions and the results of exposure evaluations.

5.4 Hazard Evaluation

The selection of a proper respirator for any given situation requires consideration of the following factors:

➤ Nature of Hazard

The type of hazard, physical and chemical properties, health effect, airborne concentration, permissible exposure limit (PEL), immediately-dangerous -to-life-or-health (IDLH) concentrations and warning properties.

➤ Characteristics of Operation

Type of operation or process, work area layout, materials used or procedure and work activities.

➤ Location of Hazardous Area

Distance to safe area and escape route.

➤ Respirator use time period (routine, non-routine, emergency, or rescue)

➤ Respirator Wearer Activity

Continuous or intermittent during the work shift; light, medium, or heavy work rate.

➤ Respirator Characteristics, Capabilities, and Limitations

Table 1 in Appendix C describes some of the characteristics, capabilities and limitations of various types of respirators.

➤ Respirator Protection Factor

Table 2 in Appendix C shows typical respirator protection factors for different types of respirators. A respirator protection factor is a measure of the degree of protection the respirator provides.

Appendix D (Respirator Protection Worksheet) is provided for the hazard evaluation and respirator selection.

The hazard evaluation is performed by the EHSO's Workplace Safety/Industrial Hygiene section, prior to commencing any routine or non-routine tasks requiring respiratory protection. Each department may request assistance from EHSO to assess the hazard. Periodically thereafter, but not less than every 12 months, a review of the actual and/or potential exposure is made to determine if respiratory protection continues to be required, and if so, if the previously chosen respirator still provide adequate protection.

Records of all hazard evaluations are maintained by EHSO's Workplace Safety/Industrial Hygiene section, with copies of the evaluation also maintained by each department.

5.5 Respirator Selection

Table 3 in Appendix C shall be used to select a respirator that is appropriate for the type of protection that is needed. Conditions of use covered by these guidelines include working in oxygen-deficient atmospheres, working where levels of contaminants exceed permissible exposure levels and working in environments immediately dangerous to life and health (IDLH).

Table 4 in Appendix C shall be used in selecting the appropriate respirator for protection against asbestos. NIOSH (National Institute of Occupational Safety and Health) Certified Equipment List, and/or NIOSH Respirator Selection Decision Logic may also be used as respirator selection guides.

5.6 Identification of Respirator Cartridges and Gas Mask Canisters

Respirator cartridges and canisters are designed to protect against individual or a combination of potentially hazardous atmospheric contaminants, and are specifically labeled and color coded to indicate the type and nature of protection they provide.

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

"DO NOT WEAR IN ATMOSPHERE IMMEDIATELY DANGEROUS TO LIFE. MUST BE USED IN AREAS CONTAINING AT LEAST 20 PERCENT OXYGEN. DO NOT WEAR IN ATMOSPHERES CONTAINING MORE THAN ONE-TENTH PERCENT ORGANIC VAPORS BY VOLUME. REFER TO COMPLETE LABEL ON RESPIRATOR OR CARTRIDGE CONTAINER FOR ASSEMBLY, MAINTENANCE, AND USE."

5.7 Warning Signs

A. Particulate Air-Purifying

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

B. Gas or Vapor Air-Purifying

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

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

If no discrepancies are observed, replace the cartridge or canister. If any of the warning properties appear again, the concentration of the contaminants may have exceeded the cartridge or canister design specification. When this occurs a respirator with a higher protection factor must be used, such as an airline respirator or self-contained breathing apparatus (SCBA).

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

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

D. Supplied Air Respirator

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

6.0 Respirator Training

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

EHSO provides training to respirator wearers in the use, maintenance, capabilities, and limitations of respirators, initially upon assignment of personnel to tasks requiring the use of respirators. Retraining is given annually thereafter.

The training program will include the following:

1. Nature and degree of respiratory hazard.
2. Respirator selection, based on the hazard and respirator capabilities and limitations.
3. Donning procedures and fit tests.
4. Care of the respirator, e.g., need for cleaning, maintenance, storage, and/or replacement.
5. Use and limitations of respirator

No employee is allowed to wear a respirator in until he/she has been trained.

The respirator training record is provided in Appendix E.

7.0 Respirator Fit Testing

Each person required to wear a negative pressure air purifying respirator shall undergo qualitative fit testing. A proper face to facepiece seal shall be obtained prior to respirator assignment and use. Air purifying respirators shall be worn when conditions prevent a good face seal; these conditions are discussed in Section 7.1.

The face to facepiece fit (positive and negative pressure tests) shall be checked by the wearer each time the respirator is donned. Detailed procedures on fit testing of air purifying respirators are contained in Appendix F.

Respirator fitting is done initially upon employment of new employees whose work requires the use of respirators or when an employee changes to a job classification which requires respiratory protection. Refitting is done at least every year thereafter.

Individual fit testing records are kept on each individual by each department, with copies provided to EHSO Workplace Safety/Industrial Hygiene Section. Records of respirator fit test (Appendix G) shall be kept for at least the duration of employment.

7.1 Respirator Sealing Problems

7.1.1 Facial Hair

No employee is allowed to wear a respirator, in the workplace for either routine or non-routine task if he has facial hair which comes between the sealing periphery of the facepiece and the face, or if facial hair interferes with normal functioning of the exhalation valve of the facepiece.

7.1.2 Glasses and Eye/Face Protective Devices

Proper fitting of a respirator protective device facepiece for individuals wearing corrective eyeglasses or goggles, may not be established if temple bars and straps extend through the sealing edge of the facepiece. If eyeglasses, goggles, face shield or welding helmet must be worn with a respirator, they must be worn so as not to adversely affect the seal of the facepiece. If a full-facepiece is used, special prescription glasses inserts are available if needed.

7.1.3 Miscellaneous Sealing Problems

Scars, hollow temples, very prominent cheekbones, deep skin creases, and lack of teeth or dentures may cause facepiece sealing problems.

8.0 Respirator Maintenance and Cleaning

8.1 Maintenance

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

8.2 Cleaning of Respirators

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

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

The following procedure is recommended for cleaning and disinfecting respirators:

- Remove and discard all used filters, cartridges or canisters.
- Remove respirator elements and valve flaps.
- Wash facepiece in warm water, about 140 degrees Fahrenheit or as directed by the manufacturer. Detergent containing a bactericide is preferred. The bactericide is generally a quaternary ammonia compound. The facepiece and parts should be scrubbed with a soft brush to ensure that all foreign matter is removed from surface contacting the wearer's face.
- If the detergent used in washing does not contain a bactericide, a disinfectant rinse must follow. Reliable disinfectants may be from some simple household solutions. Two tablespoons of chlorine bleach added to a gallon of water will produce a hypochlorite solution that disinfects respirators effectively with a simple immersion. An aqueous solution of iodine made by adding one teaspoon of tincture of iodine per

gallon of water will serve as an adequate disinfectant and will not damage rubber or plastic respirator facepiece. Immersing the unit is sufficient.

- Other surfaces of the respirator facepiece covered with accumulations of paint, enamel, or lacquer may be wiped with cloth that has been soaked with an appropriate cleaning agent. If found effective, mineral spirits, turpentine or naphtha may be used; these solvents, however, will degrade the facepiece in time. After cleaning, the agent is wiped from the facepiece and the washed thoroughly. Soap and warm water is the best cleaning solution.
- An organic solvent or stripping agent should never be used for soaking respirator parts. Plastic or rubber components can be adversely affected by solvents.
- Water-based paints or enamels can be removed from the respirator parts with cloth soaked in a soap and water solution.

8.3 Replacement Parts/Filters

- Consult the manufacturer or distributor for replacement parts and filters. Manufacturers may assign their filters/cartridges specific end-of-service-life or change schedule.
- Do not attempt to remove paint, varnish, or lacquer from cartridges or filters. When these air purifying elements contain accumulation of paint, enamel, or lacquer, they must be discarded.
- When air-purifying respirators are used for protection against gases and vapor, cartridges must be changed when the wearer has worn the cartridges for a total of eight (8) hours, when the wearer smells the gas or vapor or when cartridges have reached the manufacturer's end-of-service-life.
- Filter elements (cartridges to protect against particulates) must be changed when the wearer has worn the cartridges for a total of eight (8) hours, whenever an increase in breathing resistance is detected or whenever the filter has reached the manufacturer's end-of-service-life.

8.4 Storage

After inspection, cleaning, and any necessary minor repairs, store respirators to protect against sunlight, heat, extreme cold, excessive moisture, damaging chemicals or other contaminants. Respirators placed at stations and work areas for emergency use shall be stored in compartments built for that purpose, shall be quickly accessible at all times and will be clearly marked. Routinely used respirators, such as half-mask or full-face air-

purifying respirators, shall be placed in sealable plastic bags. Respirators may be stored in such places as lockers and tool boxes only if they are first placed in carrying cases or cartons. Respirators shall be packed or stored so that the facepiece and exhalation valves will rest in a normal position and not be crushed. Emergency use respirators shall be stored in a sturdy compartment that is quickly accessible and clearly marked.

8.5 Inspection

Respirators shall be inspected as follows:

- All respirators used in routine situations shall be inspected before each use and during cleaning.
- All respirators maintained for use in emergency situations shall be inspected at least monthly and in accordance with the manufacturer's recommendations, and shall be checked for proper function before and after each use.
- Emergency escape-only respirators shall be inspected before being carried into the workplace for use.

Respirator inspections include the following:

- A check of respirator function, tightness of connections, and the condition of various parts including, but not limited to, the facepiece, head straps, valves, connecting tube, and cartridges, canisters or filters
- Check of elastomeric parts for pliability and signs of deterioration.
- Self-contained breathing apparatus shall be inspected monthly. Air and oxygen cylinders shall be maintained in a fully charged state and shall be recharged when the pressure falls 90% of the manufacturer's recommended pressure level.

For Emergency Use Respirators the additional requirements apply:

- Certify the respirator by documenting the date the inspection was performed, the name (or signature) of the person who made the inspection, the findings, required remedial action, and a serial number or other means of identifying the inspected respirator.
- Provide this information on a tag or label that is attached to the storage compartment for the respirator, is kept with the respirator, or is included in inspection reports stored as paper or electronic files. This information shall be maintained until replaced following a subsequent certification.

8.6 Repair of Respirators

Respirators that fail inspection or are otherwise found to be defective will be removed from service to be discarded, repaired or adjusted in accordance with the following procedures:

- Repairs or adjustments to respirators are to be made only by persons appropriately trained to perform such operations and shall use only the respirator manufacturer's NIOSH-approved parts designed for the respirator.
- Repairs shall be made according to the manufacturer's recommendation and specifications for the type and extent of repairs to be performed; and

9.0 Recordkeeping

In order to maintain surveillance on and control of the program, four sets of records are recommended:

- Hazard assessment (industrial hygiene monitoring data)
- Medical assessment and surveillance
- Training
- Respirator Care and maintenance

Copies of these records are retained by the respective departments.

10.0 Surveillance of Respirator Use

Appropriate surveillance shall be maintained of work area conditions and degree of employee exposure or stress. When there is a change in work area conditions or degree of employee exposure or stress that may affect respirator effectiveness, the employer shall re-evaluate the continued effectiveness of the respirator.

The respirator wearer shall leave the respirator use area when the following conditions are met or needed:

1. To wash their faces and respirator facepieces as necessary to prevent eye or skin irritation associated with respirator use.
2. If vapor or gas breakthrough is detected, if there is a change in breathing resistance, or leakage of the facepiece.
3. To replace the respirator's filter, cartridge or canister.

If the employee detects vapor or gas breakthrough, changes in breathing resistance or leakage of the facepiece, the employer must replace or repair the respirator before allowing the employee to return to the work area.

11.0 Program Evaluation

Evaluations shall be conducted as necessary to ensure that the provisions of the current written program are being effectively implemented and that it continues to be effective.

The department will conduct an annual review and evaluation of the program. Any problems that are identified during this assessment shall be corrected. Factors to be assessed include, but are not limited to:

- Respirator fit (including the ability to use the respirator without interfering with effective workplace performance);
- Appropriate respirator selection for the hazards to which the employee is exposed;
- Proper respirator use under the workplace conditions the employee encounters; and
- Proper respirator maintenance

APPENDIX A

MEDICAL CLEARANCE FOR RESPIRATOR USE

Part I: TO BE COMPLETED BY THE SUPERVISOR

EMPLOYER _____

Employee's Name

Social Security Number

Date of Birth

Supervisor's Name

Department

Circle Type of Respirator(s) to be used:

Atmosphere-supplying respirator
Open-circuit SCBA
Supplied-air respirator
Air-purifying (nonpowered)

Continuous-flow respirator
Closed circuit SCBA
Combined air-line, SCBA
Air-Purifying (powered)

Level of Work Effort (circle one):

Light

Moderate

Heavy

Strenuous

Extent of Usage:

1. On a daily basis
2. Occasionally - but more than once a week
3. Rarely - or for emergency situations only

Length of Time of Anticipated Effort in Hours: _____

Special work Considerations (i.e. high places, temperature, hazardous material, protective clothing, etc., if none, state none)

Date _____ Supervisor _____

Part II TO BE COMPLETED BY THE EMPLOYEE

EMPLOYEE _____

Have you worn a respirator? Yes _____ or No _____

If yes, describe any difficulties noted with respirator usage:

Date _____

Employee's Signature

Part III. TO BE COMPLETED BY PHYSICIAN

Class (Circle One):

1. No restriction on respirator use
2. Some specific use restrictions (explain below)
3. No respirator use permitted (explain below)

Restrictions:

Date _____

Examining Physician's Signature

APPENDIX B

VOLUNTARY USE OF RESPIRATORS

Information For Employees Using Respirators When Not Required Under The Standard

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

You should do the following:

1. Read and heed all instructions provided by the manufacturer on use, maintenance, cleaning and care, and warning 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 certifies respirators. A label and statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is designed for and how much it will protect you.
3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke.
4. Keep track of your respirator so that you do not mistakenly use someone else's respirator.

APPENDIX C

TABLE 1: CAPABILITIES AND LIMITATIONS OF RESPIRATORS

ATMOSPHERE-SUPPLIED RESPIRATORS

Atmosphere-supplying respirators provide protection against oxygen deficiency and toxic atmospheres. The breathing is independent of ambient atmospheric conditions.

General limitations: Except for some air-line suits, no protection is provided against skin irritation by materials such as ammonia and hydrogen chloride, or against sorption of materials such as hydrogen cyanide, tritium, or organic phosphate pesticides through skin. Facepieces present special problems in individuals required to wear prescription lenses. Use of atmosphere-supplying respirators in atmosphere immediately dangerous to life or health is limited to specific devices under specified conditions (see Table 2).

Self-Contained Breathing Apparatus (SCBA)

The wearer carries his/her own breathing atmosphere.

Limitations: The period over which the device will provide protection is limited by the amount of air or oxygen in the apparatus, the ambient atmospheric pressure (service life of open-circuit devices are cut in half by a doubling of the atmospheric pressure), and the type of work being performed. Some SCBA devices have a short service life (less than 15 minutes) and are suitable only for escape (self-rescue) from a respirable atmosphere.

Chief limitations of SCBA devices are their weight or bulk, both, limited service life, and the training required for maintenance and safe use.

Closed-Circuit SCBA:

The closed circuit operation conserves oxygen and permits longer service life at reduced weight. The negative-pressure type produces a negative pressure in the respirator inlet covering during inhalation, and this may permit inward leakage of contaminants, whereas the positive-pressure type always maintains a positive pressure in the respiratory inlet covering and is less apt to permit inward leakage of contaminants.

Open-Circuit SCBA:

The demand type produces a negative pressure in the respiratory inlet covering during inhalation, whereas the pressure-demand type maintains a positive pressure in the respiratory inlet covering during inhalation and is less apt to permit inward leakage of contaminants.

Appendix C
Table 1 Continued

Supplied-Air Respirators

The respirable air supply is not limited to the quantity the individual can carry, and the devices are lightweight and simple.

Limitations: Limited to use in atmosphere from which the wearer can escape unharmed without the aid of the respirator, except when equipped with an auxiliary self-contained air supply.

The wearer is restricted to movement by the hose and must return to a respirable atmosphere by retracing his route of entry. The hose is subject to being severed or pinched off.

Hose Mask

The hose inlet blower must be located and secured in a respirable atmosphere.

(a) Hose mask with blower

If the blower fails, the unit still provides protection although a negative pressure exit in the facepiece during inhalation.

(b) Hose mask without blower

Maximum hose length may restrict application of device.

Air-line Respirator (Continuous Flow, Demand, and Pressure-Demand Types):

The demand type produces a negative pressure in the facepiece on inhalation, whereas continuous-flow and pressure-demand types maintain a positive pressure in the respiratory inlet covering and are less apt to permit inward leakage of contaminants.

Air-line suits may protect against atmospheres that irritate skin or that may be absorbed through the unbroken skin.

Limitation: Air-line respirators provide no protection if the air supply fails. Some contaminants such as tritium may penetrate the material of an air-line suit and limit its effectiveness.

Other contaminants such as fluorine may react chemically with the material of an air-line suit and damage it.

Combination Air-line Respirators with Auxiliary SC Air Supply

The auxiliary self-contained air supply on this type of device allows the wearer to escape from a

Appendix C
Table 1 Continued

dangerous atmosphere. This device with the auxiliary self-contained (SC) air supply is approved for escape and may be used for entry when it contains at least 15-minute auxiliary SC air supply. (See Table 2).

Air-Purifying Respirators

General Limitations: Air-purifying respirators do not protect against oxygen-deficient atmosphere or against skin irritations by sorption through the skin of airborne contaminants.

The maximum contaminant concentration against which an air-purifying respirator will protect is determined by the design efficiency; capacity of the cartridge, canister, or filter, and the facepiece-to-face seal on the user. For gases and vapors, the maximum concentration for which the air-purifying element is designed is specified by the manufacturer or is listed on the labels of cartridges and canisters.

Nonpowered air-purifying respirators will not provide the maximum design protection specified unless the facepiece or mouthpiece/nose clamp is carefully fitted to the wearer's face to prevent inward leakage. The time period over which protection is provided is dependent on the canister, cartridge, or filter type; concentration of contaminant; humidity levels in the ambient atmosphere; and the wearer's respiratory rate.

The proper type of canister, cartridge, or filter must be selected for the particular atmosphere conditions. Nonpowered air-purifying respirators may cause discomfort due to a noticeable resistance to inhalation. This problem is minimized in powered respirators. Respirator facepieces present special problems to individuals required to wear prescription lenses. These devices do not have advantage of being small, light and simple in operation.

Use of air-purifying respirators in atmospheres immediately dangerous to life or health is limited to specific devices under specified conditions (See Table 2).

Vapor-and-Gas Removing Respirators

Limitations: No protection is provided against particulate contaminants. A rise in canister or cartridge temperature indicates that a gas or vapor is being removed from the inspired air.

An uncomfortably high temperature indicates a high concentration of gas or vapor and requires an immediate return to fresh air.

Use should be avoided in atmosphere where the contaminant(s) lack sufficient warning properties (i.e. odor, taste, or irritation at a concentration in air at or above the permissible exposure limits). (Vapor-and-gas removing respirators are not approved for contaminants that lack adequate warning properties).

Appendix C
Table 1 Continued

Not for use in atmospheres immediately dangerous to life or health unless the device is a powered-type respirator with escape provisions (See Table 2).

Full Facepiece Respirator:

Provides protection against eye irritation in addition to respiratory protection.

Quarter-Mask and Half-Mask Facepiece Respirators:

A fabric covering (facelet) available from some manufacturers shall not be used.

Mouthpiece Respirator:

Shall be used only for escape applications. Mouth breathing prevents detection of contaminant by odor. Nose clamp must be securely in place to prevent nasal breathing.

A small, lightweight device that can be donned quickly.

Particulate-Removing Respirators

Limitations: Protection against non-volatile particles only. No protection against gases and vapors.

Not for use in atmospheres immediately dangerous to life or health unless the device is a powered-type respirator with escape provisions (See Table 2).

Full Facepiece Respirator:

Provides protection against eye irritation in addition to respiratory protection.

Quarter-Mask and Half-Mask Facepiece:

A fabric covering (facelet) available from some manufacturers shall not be used unless approved for use with respirator.

Mouthpiece Respirator:

Shall be used only for escape applications. Mouth breathing prevents detection of contaminant by odor. Nose clamp must be securely in place to prevent nasal breathing.

A small, lightweight device that can be donned quickly.

Appendix C
Table 1 Continued

Combination Particulate-and-Vapor-and Gas-removing Respirators

The advantages and disadvantages expressed above of the mode of operation being used will govern. The mode with the greater limitations (air-purifying mode) will mainly determine the overall capabilities and limitations of the respirator since the wearer may for some reason fail to change the mode of operation even though conditions would require such a change.

Note: Table 1 was reproduced from ANSI Z88.2-1980 (American National Standard Practices for Respiratory Protection).

APPENDIX C

Table 2

Respirator Protection Factors

Respirator type	Permitted for Use in Oxygen Deficient Atmosphere	Permitted for Use in Immediately Dangerous to Life or Health Atmosphere	<u>Respirator Protection factor</u>	
			Qualitative test	Quantitative test
Particulate filter, quarter mask or half- mask facepiece (b,c)	No	No	10	As measured in each person with a max. of 100
Vapor-or-gas-removing quarter mask or half-mask facepiece (c)	No	No	10 or max. use limit of cartridge or canister, which-ever is less	Same as above or max. use cartridge or canister, which-ever is less (g,h)
Combination particulate filter and vapor-or-gas-removing, quarter-mask or half-mask facepiece (b,c)	No	No	10 or max. use limit of cartridge or canister, which-ever is less	Same as previous respirator (g,h)
Particulate-filter, full facepiece (b)	No	No	100	As measured on each person with max. of 100 if dust, fume, or mist filter is used, or maximum of 1000 if high-efficiency filter is used.

Appendix C
Table 2 Continued

Respirator type	Permitted for Use in Oxygen Deficient Atmosphere	Permitted for Use in Immediately Dangerous to Life or Health Atmosphere	<u>Respirator Protection factor</u>	
			Qualitative test	Quantitative test
Vapor-or-gas-removing full facepiece	No	No	100 or max. use limit of cartridge or canister for vapor or gas, whichever is less	As measured on each person with max. of 1000 or max. use limit of cartridge or canister for vapor or gas, whichever is less (g,h)
Combination particulate filter and vapor-or-gas-removing, full facepiece (b)	No	No	100 or max. use limit of cartridge for vapor or gas, whichever is less	As measured on each person with max. of 100 if dust, fume, or mist filter is used and max. of 1000 if high-efficiency filter is used or max. Use limit of cartridge or canister for vapor or gas, whichever is less (g,h)
Powered particulate filter, any respiratory inlet covering (b,c,d)	No	No (yes, if escape provisions are provided)	N/A	N/A
			No tests are required due to positive pressure operation of respirator. The max. protection factor is 100 if dust, fume, or mist filter is used and 1000 if high-efficiency filter is used.	

Appendix C
Table 2 Continued

Respirator type	Permitted for Use in Oxygen Deficient Atmosphere	Permitted for Use in Immediately Dangerous to Life or Health Atmosphere	<u>Respirator Protection factor</u>	
			Qualitative test	Quantitative test
Powered vapor-or-gas-removing, any respirator inlet covering (c,d)	No	No (yes, if escape provisions are provided)	N/A	N/A
			No tests are required due to positive pressure operation of respirator. The maximum protection factor is 3000, or max. use limit of cartridge or canister for vapor or gas, whichever is less. (g,h)	
Powered combination particulate-filter and vapor-or-gas- removing, any respirator inlet covering (b,c,d)	No	No (yes, if escape provisions are provided)	N/A	N/A
			No tests are required due to positive pressure operation of respirator. The maximum protection factor is 100 if dust, fume, or mist filter is used and 3000 if high-efficiency filter is used, or maximum use limit of cartridge or canister for vapor or gas, whichever is less. (g,h)	
Airline demand, quarter mask or half-mask (facepiece, with or without escape provisions). (c,e)	Yes	No	10	As measured on each person, but limited to the use of respirator in concentrations of contaminants below the immediately dangerous to life-or-health (IDLH) values.
Airline demand, full facepiece, with or without escape provisions (e)	Yes	No	100	(same as respirator type)

Appendix C
Table 2 Continued

Respirator type	Permitted for Use in Oxygen Deficient Atmosphere	Permitted for Use in Immediately Dangerous to Life or Health Atmosphere	<u>Respirator Protection factor</u>	
			Qualitative test	Quantitative test
Airline, continuous flow or pressure demand type, any facepiece without escape provisions (e)	Yes	No	N/A	N/A
			No tests are required due to positive pressure operation of respirator. The protection factor provided by the respirator is limited to use of the respirator in concentrations of contamination below (IDLH) values.	
Airline, continuous flow or pressure demand type, any facepiece, with escape provisions (c,e)	Yes	Yes	N/A	N/A
			No tests are required due to positive pressure operation of respirator. The maximum protection is 10,000 plus. (f)	
Airline, continuous flow helmet, hood or suit without escape (e) provisions	Yes	No	N/A	N/A
			No tests are required due to positive pressure operation of respirator. The protection factor provided by the respirator is limited to use of the respirator in concentrations of contamination below (IDLH) values.	
Airline, continuous flow helmet, hood or suit with escape provisions (e)	Yes	Yes	N/A	N/A
			No tests are required due to positive pressure operation of respirator. The maximum protection factor is 10,000 plus. (f)	
Hose mask, with or without blower, full facepiece	Yes	No	10	As measured on each person, but limited to the use of respirator in concentrations of contaminants below the IDLH values.

Appendix C
Table 2 Continued

Respirator type	Permitted for Use in Oxygen Deficient Atmosphere	Permitted for Use in Immediately Dangerous to Life or Health Atmosphere	<u>Respirator Protection factor</u>	
			Qualitative test	Quantitative test
Self-contained breathing apparatus, demand-type open circuit or negative-pressure type closed-circuit quarter mask or half-mask facepiece (e)	Yes	No	10	As measured on each person, but limited to the use of the respirator in concentrations of contaminants below the IDLH values.
Self-contained breathing apparatus, demand-type open circuit or negative pressure type closed-circuit, full facepiece or mouthpiece/nose clamp (e)	Yes, if respirator used for mine rescue and mine recovery operation	No (yes, if respirator used for mine rescue and mine recovery operation)	100	As measured on each person, but limited to the use of the respirator in concentrations of contaminants below the IDLH values, except when the respirator is used for mine rescue and mine recovery operations
Self-contained breathing apparatus, pressure-demand type open-circuit or positive pressure-type closed-circuit, quarter mask or half-mask facepiece, full-facepiece, or mouthpiece/nose clamp (e)	Yes	Yes	N/A	N/A
			No tests are required due to positive pressure operation of respirator. The maximum protection factor is 10,000 plus (f)	
Combination Respirator not listed	The type and mode of operation having the lowest respirator protection factor shall be applied to the combination respirator.			

N/A means not applicable since a respirator-fitting test is not carried out.

Appendix C
Table 2 Continued

- a) A respirator protection factor is a measure of the degree of protection provided by a respirator to a respirator wearer. Multiplying the permissible time-weighted average concentration or the permissible ceiling concentration, whichever is applicable, for a toxic substance, or the maximum permissible airborne concentration for a radionuclide, by a protection factor assigned to a respirator gives the maximum concentration of the hazardous substance for which the respirator can be used. Limitations of filters, cartridges and canisters used in air-purifying respirator shall be considered in determining protection factors.
- b) When the respirator is used for protection against airborne particulate matter having a permissible time-weighted average concentration less than 0.05 milligram particulate matter per cubic meter of air or less than 2 million particles per cubic foot of air, or for protection against airborne radionuclide particulate matter, the respirator shall be equipped with high-efficiency filter(s).
- c) If the air contaminant causes eye irritation, the wearer of a respirator equipped with a quarter mask or half-mask facepiece or mouthpiece and nose clamp shall be permitted to use a protective goggles or to use a respirator equipped with a full facepiece.
- d) If the powered air-purifying respirator is equipped with a facepiece, the escape provision means that the wearer is able to breathe through the filter, cartridge or canister and through the pump. If the powered air-purifying respirator is equipped with a helmet, hood or suit, the escape provision shall be an auxiliary self-contained supply of respirable air.
- e) The escape provision shall be an auxiliary self-contained supply of respirable air.
- f) The protection factor measurement exceeds the limit of sensitivity of the test apparatus. Therefore, the respirator has been classified for use in atmospheres having unknown concentrations of contaminants.
- g) The service life of a vapor-or-gas-removing cartridge or canister depends on the specific vapor or gas, the concentration of the vapor or gas in air, the temperature and humidity of the air, the type and quantity of the sorbent in the cartridges or canister, and the activity of the respirator wearer. Cartridges and canisters may provide only very short service lives for certain vapors and gases. Vapor/gas service life testing is recommended to ensure that cartridges and canisters provide adequate service lives. Reference should be made to published reports which give vapor/gas life data for cartridge and canisters.
- h) Vapor and gas removing respirators are not approved for contaminants that lack adequate warning properties of odor, irritation, or taste at concentrations in air or above the permissible exposure limits.

Note: Respirator protection factor for an air-purifying respirator equipped with a mouthpiece/nose clamp form of respiratory-inlet covering are not given, since such respirators are approved only for escape purposes.

APPENDIX C

TABLE 3

SELECTION OF RESPIRATORS

I. These respirators are permitted for use in an oxygen-deficient atmosphere where the level of contaminants exceed the PEL

Not immediately dangerous to life or health (Oxygen concentration above 16.0% but below 19.5%)

1. Air-line, demand, quarter or half mask facepiece, with or without escape provisions
2. Air-line, demand, full facepiece, with or without escape provisions
3. Air-line, continuous-flow or pressure-demand type, and facepiece without escape provisions
4. Air-line, continuous-flow, helmet hood, or suit, without escape provisions
5. Hose mask, with or without blower, full-facepiece
6. Self-contained breathing apparatus, demand-type open circuit or negative pressure-type closed circuit, quarter or half-mask facepiece (a)
7. Self-contained breathing apparatus, demand-type open circuit or negative pressure type closed circuit, full facepiece or mouthpiece/nose clamp (a)
8. Air-purifying, half-mask, or full facepiece respirator with chemical canister and/or appropriate filter

Immediately dangerous to life or health (Oxygen Concentration below 16.0%)

1. Air-line, continuous-flow or pressure demand type, and facepiece with escape provisions
2. Air-line, continuous-flow, helmet, hood, or suit, with escape provisions
3. Self-contained breathing apparatus, pressure demand type open-circuit or positive pressure type closed-circuit, quarter or half mask, full facepiece, or mouthpiece/nose clamp

Appendix C
Table 3 Continued

II. These respirators are permitted for use when the levels of contaminants (gas, vapor, or particulates) exceed the PEL and IDLH conditions exist.

1. Air-line, continuous-flow or pressure-demand type, any facepiece, with escape provisions (a)
2. Air-line, continuous-flow, helmet, hood, or suit, with escape provisions (a)
3. Self-contained breathing apparatus, pressure-demand type open-circuit or positive pressure-type closed circuit, quarter-or half-mask, full facepiece, or mouthpiece/nose clamps.
4. Powered particulate-filter, any respiratory-inlet covering (b,c,d)
5. Powered vapor-or-gas-removing, any respiratory-inlet covering
6. Powered combination particulate-filter and vapor-or-gas-removing, any respiratory-inlet covering (b,c,d)

Notes on Table 3

- (i) For the purpose of this part, "immediately dangerous to life or health" (IDLH) is defined a condition that either poses an immediate threat to life and health or an immediate threat of severe exposure to contaminants, such as radioactive materials which are likely to have adverse delayed effects on health;
- (ii) The escape provision shall be an auxiliary self-contained supply of respirable air of sufficient capacity.
- (iii) Small letter (a) means if the air contaminant causes eye irritation, the wearer of a respirator equipped with a quarter or half-mask or mouthpiece/nose clamp shall be permitted to use either a protective goggle or a respirator equipped with a full facepiece;
- (iv) Small letter (b) means when the respirator is used for protection against airborne particulate matter having a permissible time-weighted average concentration less than 0.05 milligram particulate matter per cubic meter of air or less than 2 million particulate per cubic foot of air, or for protection against radionuclide particulate matter, the respirator shall be equipped with a high-efficiency filter(s);
- (v) Small letter (c) means the respirator is permitted only if escape provisions are provided; and
- (vi) Small letter (d) means if the powered air-purifying respirator is equipped with a facepiece, the escape provisions means the wearer is able to breathe through the filter, cartridge, or canister and through the pump. If the powered air-purifying respirator is equipped with a helmet, hood, or suit, the escape provision shall be an auxiliary self-contained supply of respirable air.

APPENDIX C

TABLE 4

RESPIRATORY PROTECTION GUIDE FOR ASBESTOS CONCENTRATIONS

The following guide has been developed from current HIOSH regulations to assist in determining the type of respiratory protection needed at various levels of asbestos exposure.

<u>Airborne Asbestos Concentration</u>	<u>Required Respiratory Protection</u>
Not in excess of 2 fibers/cc	Half-mask respirator with HEPA filter
Not in excess of 10 fibers/cc	Full facepiece respirator with HEPA filter
Not in excess of 20 fibers/cc	Powered air-purifying respirator with HEPA filters. Supplied-air respirator with continuous flow
Not in excess of 200 fibers/cc	Full facepiece supplied-air pressure demand respirator
Greater than 200 fiber/cc or unknown concentration	Full facepiece supplied-air pressure demand respirator with auxiliary escape device

APPENDIX D

RESPIRATOR SELECTION WORKSHEET

1. Material

A. Chemical Name _____

B. Trade Name _____

C. Formula _____

D. Allowable Concentration Limits, TLV or PEL:

(1) HIOSH 12-202-4 _____

(2) Current ACGIH _____

(3) Short-term Exposure Limit (STEL) _____

(4) Other limits _____

2. Form in which it will be used

A. ____ Liquid B. ____ Solid C. ____ Gaseous

D. If gaseous, is it an () organic vapor, () acid gas, or () other _____?

3. Maximum expected concentration

A. ____ Parts per million (ppm) B. ____ Milligram per cubic meter (mg/cm³)

C. Duration of exposure to maximum expected concentration _____

4. Will material be heated

A. ____ Yes B. ____ No C. If so, to what temperature _____

5. What is the odor threshold of the material? _____

6. At what concentration is the material considered to be immediately dangerous to life or health? _____

7. Can the substance be absorbed through the skin? _____

APPENDIX D Continued

	<u>Yes</u>	<u>No</u>
8. Is the substance an irritation to the eyes?	()	()
Is the substance an irritant to the respiratory tract?	()	()
Is the substance an irritant to the skin?	()	()
9. At what concentration is the substance an irritant? _____		
10. If the substance is known to be flammable, which are the lower and upper flammable limits in percent by volume? _____		
11. What is the vapor pressure of the material? _____		
12. Will the material be mixed with other chemicals? ____ Yes ____ No		
If so, give details _____		

	<u>Yes</u>	<u>No</u>
13. Is there any possibility of oxygen deficiency?	()	()
14. Can good ventilation in the area be maintained?	()	()
15. Will the exposure be continuous?	()	()
16. Will the respiratory device be used for routine exposure?	()	()
Will the respiratory device be used as an escape device?	()	()
Will the respiratory device be used as an emergency re-entry device?	()	()
17. Provide as much further detail as possible concerning exposure conditions.		

* Note: This worksheet is a modification of Mine Safety Appliances Bulletin 1000-16, and acknowledgement is hereby given to MSA for the original idea.

APPENDIX E

RESPIRATOR PROTECTION TRAINING RECORD

This is to certify that the following individuals were trained at a minimum on the following elements of the respirator protection program:

- University of Hawaii Policy
- Respirator Protection Regulations
- Proper Respirator Protection
- Limitations of Respirators
- Proper Use and Fitting
- Proper Maintenance

Date: _____

Department: _____

Name (Please Print)	Signature
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____
5. _____	_____
6. _____	_____
7. _____	_____
8. _____	_____
9. _____	_____
10. _____	_____

Instructor's Signature

APPENDIX F

QUALITATIVE FIT TEST PROCEDURE

The following is the negative pressure, positive pressure, and qualitative fit test protocol:

A. Respiratory Selection

1. The test subject shall be allowed to pick the most comfortable respirators, including respirators of various sizes from different manufacturers. The selection shall include various sizes of elastomeric half facepieces, from at least two manufacturers. Each respirator shall be equipped with a combination of high-efficiency particulate air (HEPA) and acid - gas cartridges.
2. The selection process shall be conducted in a room separate from the fit- test room to prevent odor fatigue. Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension, and how to determine a "comfortable" respirator. This instruction may not constitute the subject's formal training on respirator use, as it is only a review.
3. The more comfortable facepieces are noted; the most comfortable mask is donned and worn at least five minutes to assess comfort. All donning and adjustments of the facepiece shall be performed by the test subject without the assistance from the test conductor or other person.
4. Assessment of the comfort shall include reviewing the following points with the test subject and allowing the test subject adequate time to determine the comfort of the respirator:
 - Positioning of mask on nose
 - Room for eye protection
 - Room to talk
 - Positioning mask on face and cheeks
5. The following criteria shall be used to help determine the adequacy of the respirator fit:
 - Chin properly placed
 - Strap tension
 - Fit across nose bridge
 - Distance from nose to chin
 - Tendency to slip
 - Self-observation in mirror

APPENDIX F Continued

6. The test subject shall conduct the conventional negative-and-positive fit checks (Section B and C) before the irritant smoke test is conducted. The subject shall be told to "seat" the mask by rapidly moving the head from side-to-side and up and down, while taking a few deep breaths.

B. Negative Pressure Test

For this test, the user closes off the inlet of the cartridges or filters by covering the palms or squeezing the breathing tube so it does not allow air to pass; inhales gently so that the facepiece collapses slightly; and holds his/her breath for about 10 seconds.

If the facepiece remains slightly collapsed and no inward leakage is detected, the respirator probably fits tightly enough. This test, of course, can only be used on respirators with tight fitting pressure modifying the facepiece seal and causing false results.

- C. This test is very similar in principle to the negative pressure test. It is conducted by closing off/covering the exhalation valve and exhaling gently into the facepiece. The respirator fit is considered acceptable if slight positive pressure can be built up inside the facepiece without any evidence of outward leakage around the face piece. For some respirators, this test required that the wearer remove the exhalation valve cover. This removal often disturbs the respirator fit if not done before the respirator is put on. This test is easy for respirators whose valve cover has a single small port that can be closed by the palm or finger.

D. Fit Test

1. The test subject shall be allowed to smell a weak concentration of the irritant smoke to familiarize the subject with the characteristic odor.
2. The test subject shall properly don the respirator selected as above, and wear it for at least 10 minutes before starting the test.
3. The test conductor shall review this protocol with the test subject before testing.
4. The test subject shall perform the conventional positive-pressure and negative-pressure fit tests (see HIOSH 64.1 Fit check appendix). Failure of either check shall be cause to select an alternate respirator.
5. Break both ends of a stannic chloride smoke tube. Attach a short length of tubing to one end of the smoke tube. Attach the other end of the smoke tube to a low pressure air pump set to deliver 200 milliliters per minute or to an aspirator squeeze bulb.

APPENDIX F Continued

6. Advise the test subject that the smoke can be irritating and to keep the eyes closed while the test is performed.
7. The test conductor shall direct the stream of irritant smoke from the tube towards the face seal area of the test subject. The person conducting the test shall begin with the tube at least 12 inches from the facepiece and gradually move to within one inch, moving around the whole perimeter of the mask.
8. The test subject shall be instructed to do the following exercises while the respirator is being challenged by the smoke. Each exercise shall be performed for one minute.
 - a. Breathe normally.
 - b. Breathe deeply. Be certain breaths are deep and regular.
 - c. Turn head all the way from one side to the other. Be certain movement is complete. Inhale on each side. Do not bump the respirator against shoulder.
 - d. Nod head up and down. Be certain motions are complete and made every second. Inhale when head is in the full-up position (looking towards the ceiling). Do not bump the respirator against the chest.
 - e. Talk aloud and slowly for several minutes. The following paragraph is called the "Rainbow Passage". Reading it will result in a wide range of facial movements and thus, be useful to satisfy this requirement. Alternative passages which serve the same purpose may also be used.

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 his reach, his friends say he is looking for the pot of gold at the end of the rainbow.

- f. Jog in place.
- g. Breathe normally

APPENDIX F Continued

9. The test subject shall indicate to the test conductor if the irritant smoke is detected, the test conductor shall stop the test. In this case, the tested respirator is rejected and another respirator shall be selected.
10. Each test subject passing the smoke test (i.e., without detecting smoke) shall be given a sensitivity check of smoke from the same tube to determine if the test subject reacts to the smoke. Failure to evoke a response shall void the fit test.
11. Steps 4, 9, and 10 of this fit test protocol shall be performed in a location with exhaust ventilation sufficient to prevent general contamination of the testing area by the test agents.
12. The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface.
13. If hair growth or apparel interferes with a satisfactory fit, they shall be altered or removed so as to eliminate interference and allow a satisfactory fit. If a satisfactory fit is still not attained, the test subject must use a positive-pressure respirator such as a powered air purifying respirator, supplied air respirator or self-contained breathing apparatus.
14. If a test subject exhibits difficulty in breathing during the tests, he or she shall be referred to a physician trained in respirator disease or pulmonary medicine to determine whether the test subject can wear a respirator while performing his or her duties.
15. Qualitative fit testing shall be repeated at least once a year or more often if required under another standard.
16. In addition, because the sealing of the respirator may be affected, qualitative fit testing shall be repeated immediately when the test subject has:
 - (a) A weight change of 20 pounds or more
 - (b) Significant facial scarring in the area of the facepiece seal
 - (c) Significant dental changes (i.e., multiple extractions without prosthesis or acquiring dentures)
 - (d) Reconstructive or cosmetic surgery
 - (e) Any other condition that may interfere with facepiece sealing

APPENDIX G
RESPIRATOR FIT TEST RECORD

Employee Name: _____ Date: _____

Respirator Brand/Model # _____

Respirator Type: _____

Respirator Size: _____

Fit Result: Irritant Smoke () No Fit () Fit

Comments: _____

Signature of Respirator Fit Tester

Date