U.S. Department
of Transportation

**United States
Coast Guard**

Technical Guide: Practices for Respiratory Protection

COMDTINST M6260.2C

U.S. Department of Transportation

United States Coast Guard

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U. S. Coast Guard

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COMMANDANT INSTRUCTION M6260.2C

Subj: TECHNICIAL GUIDE: PRACTICES FOR RESPIRATORY PROTECTION

Ref: (a) Safety and Environmental Health Manual, COMDTINST M5100.47(series)
(b) Naval Engineering Manual, COMDTINST M9000.6(series) (NOTAL)
(c) Marine Safety Manual, Vol I, COMDTINST M16000.6(series) (NOTAL)
(d) Medical Manual, COMDTINST M6000.1(series) (NOTAL)

1. PURPOSE. This instruction provides technical information necessary for the safe use of respiratory protection devices and requirements for administering the respiratory protection program. Intended users are units with work environments where respiratory protection is required.

2. ACTION. Area and district commanders; commanders, maintenance and logistics commands; commanding officers of Headquarters units; Commander, Coast Guard Activities Europe; and chief of offices and special staff divisions at Headquarters shall ensure compliance with the provisions of this instruction. For units within the chain of command of a group, the group commander shall be responsible for the implementation and administration of the respiratory protection program.

3. DIRECTIVES AFFECTED. Technicial Guide: Practices for Respiratory Protection, COMDTINST M6260.2B, is canceled.

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4. DISCUSSION. Proper selection, use, and care of respiratory protective devices used in hazardous environments are essential to protecting the health of Coast Guard personnel using these devices. The requirements of this manual reflect Coast Guard responsibility under the Occupational Safety and Health Act. Major changes to the manual are summarized below:

   a. Reflects changes to the Coast Guard organization as a result of the creation of the Office of Health and Safety and the maintenance and logistics commands (MLCs).

   b. Updates respiratory protection practices to reflect changes in Federal and consensus safety and health standards.

5. SCOPE. This manual applies to all operations (including those aboard vessels and in non-Coast Guard work environments) where respiratory equipment is necessary to protect personnel from health hazardous environments. Excluded are:

   a. Underwater breathing systems (refer to Coast Guard Diving Policies and Procedures Manual, COMDTINST M10560.4 (series)).

   b. Aircraft oxygen systems.

   c. Protection against military munitions.

   d. Firefighting respiratory protective equipment.

6. RESPONSIBILITIES.

   a. Units.

      (1) Units Attached to a Group. Group commanders shall determine if the requirements of this manual are applicable to units within the group by following the guidance provided in Chapter 1.

      (2) Other Units. Commanding officers shall determine if the requirements of this manual are applicable to their units by following the guidance provided in Chapter 1.

   b. If applicable, group commanders or commanding officers shall:

      (1) Designate a person responsible for coordinating the respirator program. See Chapter 2.

(2) Ensure that the other requirements of this manual are implemented.

c. Commander (k), maintenance and logistics commands shall:

(1) Assist units in determining if the requirements of this manual are applicable.

(2) During the annual safety and environmental health audits conducted IAW the provisions of reference (a):

(a) Identify the need for respiratory protection and the type of respirator required at units;

(b) Identify personnel in the Occupational Medical Monitoring Program (OMMP) who should also be medically evaluated for respirator usage; and

(c) Evaluate unit respirator programs to ensure all of the required program elements of Chapter 1 are incorporated.

(3) Assist units with respirator selection.

(4) Assist units in meeting respiratory protection program training and fit-testing requirements.

(5) Provide other assistance to units as requested.

Alan M. Steinman

ALAN M. STEINMAN
Chief, Office of Health and Safety

RECORD OF CHANGES			
CHANGE NUMBER	DATE OF CHANGE	DATE ENTERED	BY WHOM ENTERED

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(2) Respirators Available through the National Supply System
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(4) Qualitative Fit-Test Procedures: Saccharin Solution Aerosol
(5) Qualitative Fit-Test Procedures: Isoamyl Acetate
(6) Qualitative Fit-Test Procedures: Irritant Smoke
(7) Qualitative Fit-Test form

CHAPTER 1. DETERMINING REQUIRED PROGRAM ELEMENTS

A. **Requirements**. This manual provides the information necessary to establish an effective respiratory protection program. The following outline identifies a systematic approach for establishing and implementing a respiratory protection program.

1. **Unit Operations Requiring a Respirator Program**. Determine if a respirator program is required at the unit by identifying unit operations requiring respiratory protection:

   a. From the report of the most recent safety and environmental health audit or inspection.

   b. From Commandant, maintenance and logistics command (MLC), or district instructions requiring respiratory protection during certain operations.

   c. By requesting assistance from Commander (k), MLC or District Commander (m).

2. **Unit Operations Not Requiring a Respirator Program**. If respirators are not required for use during work operations at the unit, then the requirements of this manual are not applicable to the unit.

3. **Unit Respirator Program**. Units having personnel who routinely use respirators are required to implement a respirator program containing the following program elements:

   a. Appoint a Respirator Program Coordinator (RPC). See Chapter 2.

   b. Establish a written unit respiratory protection program. See Chapter 3.

   c. Fit test respirator users annually. See Chapter 6.

   d. Train respirator users annually. See Chapter 7.

   e. Establish a respirator cleaning/maintenance program. See Chapter 8.

   f. Ensure that respirator users are medically evaluated. See Chapter 9.

   g. Establish/maintain the required documentation. See Chapter 10.

CHAPTER 2. RESPONSIBILITY AND ACCOUNTABILITY FOR A RESPIRATORY PROTECTION PROGRAM

A. Discussion. When respiratory protection is required to be used at a unit, the unit will implement a respiratory protection program. This Chapter provides guidance on the structure of the program at the unit level.

B. Program Responsibilities. Commanding officers and officers-in-charge shall implement a respiratory protection program and appoint a Unit Respirator Program Coordinator (RPC) who will be responsible for coordinating and administering the program. The RPC may be the same individual as the unit safety supervisor or the unit safety and health coordinator identified in reference (a). The command shall ensure that assigned personnel have the necessary training to conduct the program. See Section 2-C below. Documentation of training received by the RPC shall be maintained by the unit.

1. Unit Respirator Program Coordinator Responsibilities.

   a. Administer the Unit Respiratory Protection Program.

   b. Assure that the correct respirator is used to protect against the hazard and that all respirators are NIOSH/MSHA approved (with the exception of OBAs for firefighting aboard cutters). See Chapters 4 and 5.

   c. Ensure that self contained and supplied air systems deliver air which meets breathing air standards. See enclosure (1) to this manual.

   d. Periodically observe and evaluate the actual use of respirators by unit personnel.

   e. Ensure that the other program elements of Chapter 1 are implemented.

2. Supervisor Responsibilities.

   a. Assure proper use of respirators during operations or activities where required to prevent hazardous exposures.

   b. Assure respirators are cleaned/maintained in accordance with this instruction.

   c. Report to the unit RPC situations which may require use of a respirator so that the correct respirator is selected.

3. **Employee Responsibilities**.

a. Use provided respiratory protection in accordance with instructions and training received.

b. Inspect respirators before and after each use and immediately report any malfunction to the supervisor.

c. When applicable, conduct positive and negative fit checks of respiratory equipment prior to use.

d. Report to the supervisor situations which may require respirator use and those in which respirators are not being used as required.

e. Clean and maintain respirators as directed.

C. **Training**.

1. The training offered by Commandant (G-K) for unit safety supervisors and Commandant (G-M) for collateral duty safety and health coordinators provides recipients with the skills necessary to carry out the duties of a unit RPC. This training is conducted on a periodic basis and is announced by Commandant directive.

2. Commercial training sources also offer courses which will provide RPCs with the skills needed to coordinate a respirator program. Contact Commandant (G-KSE); Commander (k), MLC; or District Commander (m) for additional information and scheduling of these courses.

CHAPTER 3. SAMPLE RESPIRATORY PROTECTION PROGRAM

A. **Purpose**. This Chapter provides a "fill-in-the-blank" respirator program which the unit can use to meet the requirement for a written respiratory protection program.

B. **Sample Program**. See Exhibit 3-1 for a sample unit respiratory protection program instruction.

Exhibit 3-1

SAMPLE RESPIRATORY PROTECTION INSTRUCTION

CG (UNIT NAME) INST 6260.1
(Date)

COAST GUARD (UNIT NAME) INSTRUCTION 6260.1

Subj: Respiratory Protection Program

Ref: (a) Technical Guide: Practices for Respiratory Protection COMDTINST M6260.2(series)
(b) Safety and Environmental Health Manual, COMDTINST M5100.47(series)
(c) Medical Manual, COMDTINST M6000.1(series)

1. **PURPOSE**. This instruction implements the Coast Guard (Unit Name) Respiratory Protection Program.

2. **BACKGROUND**. Workplace hazards may be controlled using engineering or administrative methods (including the use of respirators). Whenever technically and practically possible, exposures shall be controlled using engineering methods. However, engineering controls may not be feasible for some operations, or may not provide complete employee protection. For these operations, respiratory protection may be used to control inhalation exposures. In addition, actual or potential emergencies may arise that may require respiratory protection.

3. **POLICY**. It is the policy of this command that all personnel who are required to wear respiratory protection to perform their duties shall be included in the unit respiratory protection program. It is also the policy of this command that the requirements of reference (a) will be followed in carrying out this unit's respiratory protection program.

4. **ASSIGNMENT OF RESPIRATOR PROGRAM COORDINATOR (RPC)**. (Name of RPC) is hereby designated as the unit RPC. The RPC will follow the requirements of references (a) and (b) in carrying out the program.

5. **WORK SURVEILLANCE**.

   a. Reference (b) requires safety and environmental health audits of units by Commander (k), MLC. The last audit of this unit is available from the RPC. The following hazardous operations were identified which require use of respiratory protection to protect personnel: (Attach additional sheets, if necessary.)

(cont'd)

OPERATION	LOCATION	TYPE OF RESPIRATOR

5. b. As a result, all personnel conducting these operations must wear the prescribed respirators in accordance with the guidance provided by the unit RPC.

6. **RESPONSIBILITY OF PERSONNEL**. Personnel who are required to wear respiratory protection shall use the equipment in accordance with this instruction and the training they receive.

7. **RESPIRATOR SELECTION**. Respirators for operations not listed above shall be selected based on the hazards to which personnel are exposed. The selection process shall be directed by the RPC following the guidelines of reference (a).

8. **PERSONNEL TRAINING AND FIT TESTING**. The RPC will arrange to train and fit test all personnel required to use respirators in accordance with the guidelines of reference (a). A record of the training and fit testing will be maintained by the RPC and a copy placed in each person's personnel record.

9. **MEDICAL EVALUATION**. All occupationally exposed personnel who are required to wear a respirator shall be evaluated to ensure that wearing the respirator does not present an undue physical burden. For personnel enrolled in the Occupational Medical Monitoring Program (OMMP), the evaluation shall be conducted as part of the OMMP exam. For personnel not enrolled in OMMP, periodic medical evaluations for respirator use shall be in accordance with the guidance in reference (c).

_____
COMMANDING OFFICER

CHAPTER 4. TYPES AND SOURCES OF RESPIRATORY PROTECTION

A. **Introduction**. This Chapter describes various types and categories of respiratory protection and provides ordering information for respirators.

B. **Discussion**. There are two basic types of respirators; atmosphere-supplying and air-purifying.

1. **Atmosphere-Supplying Respirators**. Atmosphere-supplying respirators have their own air source and supply air into the respirator facepiece. There are two categories:

   a. Self-contained breathing apparatus (SCBAs) which supply air from a source (typically a cylinder) carried by the user.

   b. Supplied-air respirators (SARs) which supply air from a source (usually an air compressor) located some distance away and connected to the user by an air-line hose.

2. **Air-Purifying Respirator**. Air-purifying respirators do not have a separate air source. These respirators draw ambient air across a filter or purifying cartridge before the air enters the facepiece.

3. **Positive and Negative Pressure**. Atmosphere-supplying respirators can be further defined by the air flow supplied. There are two categories - positive pressure and negative pressure.

   a. **Positive Pressure**. Maintain a positive pressure in the facepiece during both inhalation and exhalation. The two main types of positive-pressure respirators are pressure-demand and continuous flow.

      (1) Pressure-Demand Respirators. A type of positive-pressure respirator in which a pressure regulator and an exhalation valve on the mask maintain the mask's positive pressure except during high breathing rates. If a leak develops in a pressure-demand respirator, the regulator sends a continuous flow of clean air into the facepiece, preventing penetration by contaminated ambient air.

(2) Continuous-Flow Respirators. A type of positive-pressure respirator which send a continuous stream of air into the facepiece at all times. Some supplied-air systems are designed to operate in the demand mode. During inhalation, a negative pressure exits inside the facepiece of these respirators. Coast Guard policy prohibits the use of demand mode supplied-air respirators.

b. **Negative Pressure**. Air is drawn into the facepiece via the negative pressure created by user inhalation. The main disadvantage of negative-pressure respirators is that if any leaks develop in the system (e.g., a crack in the hose or an ill-fitting mask or facepiece), the user draws a certain amount of contaminated air into the facepiece during inhalation. Except as specified in reference (b) for Coast Guard cutters, negative pressure SAR's or SCBA's are not approved for use.

C. **Approved Respirators**. With the exception of OBAs as specified in reference (b) aboard cutters, only respirators that have been tested and approved by the Mine Safety and Health Administration (MSHA) or the National Institute for Occupational Safety and Health (NIOSH) shall be used.

D. **Description of Respiratory Protective Devices**. The following sections provide brief descriptions of respirator devices.

1. **Self-Contained Breathing Apparatus (SCBA)**.

a. A self-contained breathing apparatus (SCBA) consists of a facepiece connected by a hose and regulator to an air source (such as compressed air or an oxygen-generating chemical) carried by the wearer. Only positive-pressure SCBAs and SAR's with escape SCBA's are allowed for entry into atmospheres that are immediately dangerous to life and health (IDLH).

NOTE: **For Cutters**. In accordance with reference (b), entry into any space suspected of or determined to be IDLH is STRICTLY PROHIBITED using the respirators carried onboard cutters with the following exception: situations where there is an extreme emergency and the commanding officer authorizes entry using the best available supplied-air respirator.

b. Escape-only SCBAs (also called Emergency Escape Breathing Devices or EEBDs) are continuous-flow devices with hoods that can be donned to provide

(cont'd) immediate emergency protection. Escape SCBA shall be available where such emergency protection is, or may, be necessary. Escape SCBAs shall not be used for entry into IDLH environments; they are to be used for emergency escape only. For marine safety operations, guidance on the use of EEBDs is provided in reference (c).

c. There are two types of SCBAs used in the Coast Guard: open-circuit positive pressure, and closed-circuit negative pressure. In an open-circuit SCBA, air is exhaled directly into the ambient atmosphere. In a closed-circuit SCBA (called an Oxygen Breathing Apparatus, OBA), exhaled air is recycled by removing the carbon dioxide with an alkaline scrubber and by replenishing the consumed oxygen with oxygen from a solid source.

d. Compressed breathing air and compressors used for filling tanks must meet the requirements listed in enclosure (1) to this manual.

2. **Supplied-Air Respirators (SARs).**

a. Supplied-air respirators (also known as air-line respirators) supply air to a facepiece via a supply line from a stationary source. Pure oxygen shall never be substituted for air in Supplied-Air Respirators. SARs are available in positive-pressure and negative-pressure modes. Only positive-pressure SARs are approved for use in Coast Guard. SARs are not allowed for entry into IDLH atmospheres (MSHA/NIOSH 30 CFR Part 11) unless the apparatus is equipped with an escape SCBA.

b. The air source for supplied-air respirators may be compressed air cylinders, an air pump, or a compressor that delivers ambient air to the facepiece. SARs suitable for use with compressed air are classified as "Type C" supplied-air respirators as defined in MSHA/NIOSH 30 CFR Part II. All SAR couplings must be incompatible with the outlets of other gas systems used on site (OSHA 29 CFR 1910.134(d)) to prevent a worker from connecting to an inappropriate compressed gas source.

(cont'd) The SAR air line impairs worker mobility and is vulnerable to puncture from rough or sharp surfaces, chemical permeation, and damage from contact with heavy equipment. To the extent possible, all such hazards should be removed prior to use. When in use, air lines should be kept as short as possible (300 feet is the longest approved hose length for SARs), and other workers and vehicles should be kept away from the air line.

c. Breathing air quality and the compressors providing the air must meet Grade D specifications listed in enclosure (1).

3. **Combination SCBA/SAR**. A relatively new type of respiratory protection is available that uses a regulator to combine the features of a SCBA with a SAR. The user can operate the respirator in the SCBA or SAR mode, through either the manual or automatic switching of air sources. This type of respirator allows entry into and exit from an area using the self-contained air supply, as well as extended work periods within a contaminated area while connected to the air.

4. **Escape Devices**. Escape devices have a single function--to allow a person to escape from a respiratory hazard which occurs suddenly. Escape-only SCBAs (also called Emergency Escape Breathing Devices, EEBD's) are described in paragraph 4-D-1.b. above.

5. **Other Supplied-Air Respirators**.

   a. **Hose Mask; Hose Mask with Blower**. These devices are not approved for use in the Coast Guard.

   b. **Abrasive-Blasting Respirator**. This is an air supplying respirator that has been modified by the addition of a covering to protect the wearer's head and shoulders and the respirator's viewing window from abrasive materials. It is designed for use in abrasive blasting operations. It shall not be used in oxygen deficient atmospheres or IDLH atmospheres. These devices must meet the same breathing air requirements as other air-supplied respirators.

6. **Air-Purifying Respirators**.

   a. Air-purifying respirators consist of a facepiece and an air-purifying device. Air-purifying respirators selectively remove specific airborne contaminants (particulates, gases, vapors, fumes) from ambient air by filtration, absorption, adsorption, or chemical reactions.

(cont'd) The following lists the conditions that <u>exclude</u> the use of air-purifying respirators:

(1) Oxygen-deficient atmospheres (less than 19.5 percent oxygen).

(2) IDLH concentrations.

(3) Entry into an unventilated or confined space area where the exposure conditions have not been characterized.

(4) Presence or potential presence of unidentified contaminants.

(5) Contaminant concentrations exceed designated maximum use concentration(s).

(6) Identified gases or vapors have inadequate warning properties unless specifically authorized by Commandant (G-KSE) or Commander (k), MLC.

(7) Powered air-purifying respirators (PAPRs) shall not be used in areas containing potentially flammable atmospheres or exposed combustible or flammable liquid surfaces unless the PAPR has been certified as intrinsically safe by an independent third party testing organization such as Underwriters Laboratory (UL), Factory Mutual Research Corporation (FM) or the Canadian Standards Association (CSA).

b. There are three types of air-purifying devices: particulate filters; cartridges and canisters, which contain sorbents for specific gases and vapors; and combination devices. Air-purifying respirators operate in the negative-pressure mode.

(1) Particulate Filters. Particulate filters are often referred to as dust, mist and fume respirators. These respirators remove particulates (dust and/or fumes) from the air by capturing them on a filter. THESE RESPIRATORS DO NOT PROTECT AGAINST ORGANIC VAPORS. They are available in both full and half facepiece models. Single use or disposable respirators are also available; however, users of these respirators may experience difficulty in achieving and demonstrating a good face seal.

(2) Chemical Cartridge and Canister Respirators. In these respirators, air is drawn across a cartridge containing a sorbent material (e.g., charcoal). The chemical contaminant in the air reacts with the sorbent material and is filtered out. These respirators will work only if the cartridge sorbent material matches the chemical contaminant. Refer to the cartridge container to determine the type of chemicals which the cartridge will filter. This type of respirator is also available in a single-use or disposable form. If you have any questions concerning which respirator cartridge to use, contact Commandant (G-KSE); Commander (k), MLC; District Commander (m); or the respirator manufacturer.

(3) Combination Devices. Combination devices such as combination cartridges contain more than one section for mechanical filtration and/or chemical adsorption. Although these devices are designed to remove more than one contaminant, it is still critical that the selected combination device provides protection for the contaminants of concern in the workplace.

(4) Paint Spray Respirators. Paint spray respirators are one type of combination air-purifying respirators and consist of an organic vapor cartridge covered by a paint mist prefilter. Paint mist is trapped on the filter and the vapors pass through the filter and are trapped on the cartridge. Paint spray respirators have the same limitations as other air-purifying respirators and <u>shall not</u> be used for spray painting of ship compartments or other similar poorly ventilated spaces where high vapor concentrations can occur quickly or where oxygen concentration may be reduced. These situations require the use of a supplied-air respirator. This type of respirator also comes in single use or disposable form.

(5) Replacement of Air-Purifying Element in Respirators.

(a) Particulate Filters. Replace particulate filters when breathing resistance increases. It is generally recommended that the filter be changed daily when the operation work involves extended exposure to dusty conditions. No attempt should be made to clean the filters--they should be discarded.

(b) Chemical Cartridges and Canisters.

NOTE: A substance is considered to have adequate warning properties when its odor, taste, or irritant effects are detectable and persistent at concentrations below the exposure limit. A substance is considered to have poor warning properties when its odor or irritation threshold cannot be detected until the exposure limit is exceeded.

1. For substances with good warning properties, the cartridge should be replaced when the contaminant's odor can be smelled, irritation occurs, or the contaminant can be tasted by the wearer. If the wearer experiences any of these, then the cartridge sorbent has become saturated with contaminant and "breakthrough" of the contaminant has occurred.

2. Some cartridges have an end-of-service-life-indicator (ESLI) built in. These cartridges should be replaced when the indicator change becomes visible. **WARNING:** Use of an air-purifying respirator for substances with poor warning properties is prohibited unless specified in commandant instruction or authorized by Commander (k), MLC or District Commander (m).

(c) Disposables. For single use or disposable respirators, follow the procedures given above only discard the entire respirator.

E. <u>Sources of Respirators</u>. Enclosure (2) provides a list of approved respirators which are available through the National Supply System.

CHAPTER 5. SELECTION AND USE OF RESPIRATORS

A. **Introduction**. Selection of the proper respirator is the most critical element in a respirator program. Failure to select the appropriate respirator and to use it correctly may lead to serious injury or death.

B. **Respirator Selection**.

1. **Procedure**. Respirators will be selected as follows:

   a. As designated in the report of the most recent safety and environmental health inspection or audit of the unit; or

   b. As designated by Commandant, MLC, or district instructions requiring specific respirators during certain work operations; or

   c. By requesting assistance from Commandant (G-KSE); Commander (k), MLC; or District Commander (m).

2. **Selection Based on Hazards**. Respirators must be selected on the basis of the hazards to which employees are exposed. The following factors shall be considered by the occupational health professional when selecting a respirator:

   a. Adequate oxygen concentration (19.5 percent).

   b. Physical, chemical, and toxicological properties of the contaminant(s) involved.

   c. Airborne concentration of the contaminant(s).

   d. Nature of the work operation.

   e. Commandant directives applicable to specific hazards.

   f. Warning properties and odor threshold of the contaminant(s).

   g. IDLH concentration for the contaminant.

   h. Allowable exposure level for the contaminant.

   i. Length of time per work shift the respirator will be worn.

3. **Guidelines for Respiratory Protection**. General respiratory protection guidelines for various work operations are listed in enclosure (3).

CHAPTER 6. RESPIRATOR FIT-TESTING

A. **Introduction**. Respirators do not work properly unless they fit the wearer. The quality of respirator fit is determined by the seal where the respirator meets the wearer's face. Matching the wearer's facial features to the appropriate respirator size and shape is critical. Most manufacturers provide several respirator shapes in two or three sizes. Procedures for matching the appropriate respirator size and shape to each user and testing the respirator seal are described in this Chapter.

B. **Requirements**

1. All personnel who use air-purifying respirators shall undergo a respirator fit-test. Quantitative fit-testing is the preferred method of fit-testing but this method requires elaborate equipment and must be performed under the direction of a Coast Guard industrial hygienist or a properly trained safety and occupational health professional. Qualitative fit-testing is an acceptable alternative if performed using the isoamyl acetate, saccharin solution or irritant smoke protocols.

2. The results of the fit-test shall be used to select a respirator that provides an acceptable fit. Additional qualitative fit-testing shall be done on a annual basis or whenever the wearer's facial features have changed sufficiently to reduce the quality of fit. Respirators shall not be worn when conditions prevent a good face seal. Such conditions may be a growth of beard, sideburns, or temple pieces on glasses. Employees with these conditions shall not be fit-tested until the condition is corrected. Employees with any of these conditions shall not perform work operations requiring respiratory protection until a successful fit-test is performed. This may require the removal of the interfering condition. Fit-testing shall be conducted annually for each user of a respirator unless otherwise stipulated by Coast Guard directive or Federal regulation.

C. **Procedures**. Unit RPC's shall either:

1. Request assistance in completing respirator fit-testing from Commander (k), MLC or District Commander (m); or

2. Follow the protocol outlined below to fit-test personnel.

D. **Commercial Sources of Fit-Testing**. Commander (k), MLC and District Commander (m) have information on commercial suppliers of respirators who also offer no cost respirator training and fit testing.

E. **Protocol**.

1. **Fit-Testing**. Qualitative fit-testing shall be performed using the saccharin solution, isoamyl acetate or irritant smoke protocol as described in enclosures (4), (5), and (6) to this manual.

2. **Fit-Test Kit**. Enclosure (2) provides information on two fit test kits available through the National Supply System; a saccharin solution fit test kit and an irritant smoke fit test kit.

3. **Documentation and Recordkeeping**. The following documentation concerning respirator fit-testing shall be kept on file at the unit or group: name of individual and date fit-tested; respirator manufacturer, model, and size; and results of respirator fit-test. This information may be recorded on the form shown in enclosure (7) or in an equivalent format.

4. **Daily Fit Checks**. These checks shall be performed each time a respirator is worn and shall be used as part of the respirator training program. See Chapter 7 of this manual.

   a. **Negative Pressure Test**. This test can be conducted on respirators equipped with tight fitting facepieces.

      (1) Respirator Types.

         (a) For self-contained breathing apparatus, combination SAR/SCBA, and supplied-air respirators, block the end of the breathing tube so that it will not allow the passage of air.

         (b) For negative-pressure air-purifying respirators, cover the inlet opening of the respirator's cartridge(s) or filter(s) with the palm.

      (2) Wearers are instructed to inhale gently and hold their breath for at least 10 seconds.

(3) If the facepiece collapses slightly and no inward leakage of air into the facepiece is detected, it can be reasonably assumed that the respirator has been properly donned and the exhalation valve and facepiece are not leaking.

b. **Positive Pressure Test**. This test can be conducted on respirators equipped with tight fitting facepieces which contain both inhalation and exhaustion valves.

(1) For self-contained breathing apparatus, combination SAR/SCBA, supplied-air respirators, and for negative-pressure air-purifying respirators, the exhalation valve is closed off so that it will not allow the passage of air.

(2) Wearers are instructed to exhale gently for at least 10 seconds.

(3) The respirator has been properly donned if a slight positive pressure can be built up inside the facepiece without the detection of any outward leakage of air between the sealing surface of the facepiece and the wearer's face.

CHAPTER 7. RESPIRATOR USER TRAINING PROGRAM

A. **Requirements**. Coast Guard units which issue and use respirators shall establish a respirator training program.

B. **Procedure.** Unit RPC's shall either:

1. Request assistance in establishing and implementing unit respirator training programs from Commander (k), MLC or District Commander (m); or

2. Follow the protocol given below to train personnel.

C. **Respirator Training Program Protocol**. In accordance with Federal regulations, respirator training programs shall contain the following program elements:

1. Personnel using respirators shall be familiar with the written respirator program. See Chapter 3.

2. Respirator users shall be trained in the proper use and limitations of respirators. See Chapter 4.

3. Individuals responsible for issuing respirators shall be adequately instructed to ensure the correct respirator is issued. See Chapter 5.

4. Training shall provide personnel an opportunity to handle the respirator, ensure that it fits properly, test its facepiece to face seal, wear it in normal air for a long familiarity period, and, finally, to wear it in a test atmosphere. Every respirator wearer shall receive fitting instructions including demonstrations and practice in how the respirator should be worn, how to adjust it, and how to determine if it fits properly. See Chapter 6.

D. **Commercial Sources of Training**. Commander (k), MLC or District Commander (m) have information on commercial suppliers of respirators who also offer no cost respirator training and fit testing.

E. **Unit Training Log**. Training shall be repeated on a annual basis. A written record will be made of the individuals trained and the date of training. The record will be retained as part of the unit training log.

CHAPTER 8. RESPIRATOR CLEANING, INSPECTION, MAINTENANCE, AND STORAGE PROGRAM

A. **Introduction**. Cleaning and maintenance of respirators are integral parts of the overall respirator program. Wearing a dirty, poorly maintained or malfunctioning respirator can be more dangerous than not wearing a respirator at all. Workers wearing defective devices think they are protected when, in reality, they are not. Emergency escape and rescue devices are particularly vulnerable to poor maintenance since they generally are used infrequently. Serious injury or death can result from wearing a defective device during emergency escape or rescue.

B. **Disposables**. If only single-use or disposable respirators are used at a unit, a cleaning and maintenance program is not required. See Sections 8-C and and 8-E below.

C. **Cleaning**.

1. **Discussion**. Use of a respirator results in the exterior surface becoming dirty and/or contaminated. The interior surface is exposed to sweat and other body secretions which can, over a period of time, cause dermatitis. In addition, use of the same respirator by different people may lead to the transmission of skin conditions between wearers and/or dermatitis. To prevent these occurrences, the following procedures will be followed:

   a. If feasible, respirators shall be issued for the exclusive use of an employee and shall be cleaned after each day's use.

   b. Respirators used by more than one individual must be cleaned and disinfected after each use.

   c. Respirators maintained for emergency use shall be cleaned and disinfected after each use.

2. **Respirator Cleaning Procedure**. Follow the manufacturer's recommendations for disassembly and cleaning. If they are not available, use the following procedure:

   a. 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. If defects are found, take the respirator to the person designated to repair respirators or discard and obtain a new respirator.

b. Wash components in warm water with a mild detergent. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.

c. Rinse components thoroughly in clean, warm running water.

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

e. Reassemble facepiece (replace filters, cartridges, and canisters, where necessary).

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

3. <u>Respirator Disinfection Procedure</u>. Use the following procedure. Note any manufacturer's restrictions on sterilizing chemicals.

a. Disassemble and wash respirator. Follow directions given in paragraphs 8-C-2.a., b. and c. of this Chapter.

b. Prepare disinfecting solution. One of the following shall be used:

(1) Hypochlorite solution: made by adding approximately two teaspoons of laundry bleach to one quart of warm water; or

(2) Aqueous solution of iodine: made by adding one-fourth teaspoon of tincture of iodine to one quart of warm water. Note: This procedure should not be used for personnel with an iodine allegery.

c. Soak respirator components for two minutes in one of the solutions. Do not exceed the recommended time because this may damage some respirator parts.

d. Rinse components thoroughly in clean, warm, 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.

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

f. Reassemble facepiece, replacing filters, cartridges, and canisters, where necessary.

g. Test the respirator to ensure that all components work properly and store in a plastic bag.

h. For "common use" respirators (i.e., respirators assigned to a workplace, but not individually issued), attach a tag or label to the respirator clearly identifying the date it was cleaned and person who cleaned it.

D. **Inspection**. Respirators shall be inspected after each use. Routine daily inspection shall be done by the user after cleaning and disinfection. Follow the outline in paragraphs 8-C-1. through 8-C-3. of this Chapter. Respirators used on a non-routine basis (including emergency escape and rescue devices) shall be inspected monthly. A written record of these inspections of emergency equipment shall be maintained by the unit.

1. **Inspection of Air-Purifying Respirators**. Before and after each use, the user shall:

a. Examine the facepiece for:

(1) Excessive dirt.

(2) Cracks, tears, holes or physical distortion of shape from improper storage.

(3) Inflexibility of rubber facepiece (stretch and knead to restore flexibility).

(4) Cracked or badly scratched lenses in full facepieces.

(5) Incorrectly mounted full facepiece lenses, or broken or missing mounting clips.

(6) Cracked or broken air-purifying element holder(s), badly worn threads or missing gasket(s), if required.

b. Examine the head straps or head harness for:

(1) Breaks.

(2) Loss of elasticity.

(3) Broken or malfunctioning buckles and attachments.

(4) Excessively worn serrations on head harness which might permit slippage (full facepieces only).

c. Examine the exhalation valve for the following after removing its cover:

(1) Foreign material under the valve seat (i.e., detergent residue, dust particles or human hair).

(2) Cracks, tears, or distortion in the valve material.

(3) Improper insertion of the valve body in the facepiece.

(4) Cracks, breaks or chips in the valve body, particularly in the sealing surface.

(5) Missing or defective valve cover.

(6) Improper installation of the valve in the valve body.

d. Examine the air-purifying element for:

(1) Incorrect cartridge, canister or filter for the hazard.

(2) Incorrect installation, loose connections, missing or worn gasket or cross-threading in the holder.

(3) Expired shelf-life date on the cartridge or canister.

(4) Cracks or dents in the outside case of the filter, cartridge or canister.

e. If the device has a corrugated breathing tube, examine it for:

(1) Broken or missing end connectors.

(2) Missing or loose hose clamps.

(3) Deterioration, determined by stretching the tube and looking for cracks.

(4) Cuts, tears, and punctures.

2. <u>Inspection of Supplied Air Respirators</u>. Before and after use, the user should:

a. If the device is a tight-fitting facepiece, use the procedures outlined under air-purifying respirators, except those pertaining to the air-purifying elements.

b. If the device is a hood, helmet, blouse, or full suit, use the following procedures:

(1) Examine the hood, blouse or full suit for rips and tears.

(2) Examine the protective headgear for general condition with emphasis on the suspension inside the headgear.

(3) Examine the protective face shield for cracks or breaks or impaired vision.

(4) Make sure the protective screen is intact and secured correctly over the face shield of abrasive blasting hoods and blouses.

c. Examine the air supply systems for:

(1) Integrity and good condition of air supply lines and hoses (including attachment and end fittings).

(2) Correct operation and condition of all regulators.

(3) Air pressure (psi) and volume (cfm) compatibility with the air supplied respirator used.

3. **Inspection of Self Contained Breathing Apparatus (SCBA)**. Before and after each use, the user should:

a. Use the procedures outlined under air-purifying respirators, except those pertaining to the air-purifying elements.

b. Examine the air supply systems for:

(1) Integrity and good condition of air supply lines and hoses (including attachment and end fittings).

(2) Correct operation and condition of all respirators.

c. Determine that the high pressure cylinder of compressed air is fully charged.

d. On closed-circuit SCBA (OBAs), insure that a fresh oxygen generating canister is installed. (OBAs are only authorized for fire fighting aboard Coast Guard vessels.)

e. On open-circuit SCBA, insure the cylinder is fully charged. All SCBAs are required to have a warning device that indicates when the 25% level is reached.

f. Compressed breathing air cylinders are hydrostatically tested in accordance with the following: Steel or aluminum cylinders -- every five years; aluminum/fiberglass wrapped cylinders -- every three years minimum.

g. More specific inspection guidance can be found in NFPA No. FSP-57 (NOTAL).

E. **Maintenance and Repair**. Maintenance and repair of respirators must be done by thoroughly trained personnel. Replacement parts for respirators must be those of the manufacturer of the equipment. DO NOT INTERCHANGE REPLACEMENT PARTS BETWEEN DIFFERENT BRANDS OR MANUFACTURERS. SUCH SUBSTITUTION OF PARTS OR MODIFICATION WILL INVALIDATE THE MSHA/NIOSH APPROVAL OF THE RESPIRATOR. The maintenance and repair of SCBA equipment shall be done only by personnel trained and certified by the manufacturer.

F. **Storage**. Respirators shall be stored in a clean, sealable, plastic bag placed in a clean, dry location away from direct sunlight and separated from any chemical contaminants. Freshly cleaned respirators should be placed in plastic bags until reissue. They should be placed in a single layer with the facepiece and exhalation valve in an undistorted position to prevent rubber or plastic from taking a permanent distorted "set." Air-purifying respirators kept ready for non-routine or emergency use should be stored in a cabinet with individual compartments. The respirator storage cabinet should be readily accessible. Emergency SCBA's shall be stored in a chest or wall-mounted case. The location of SCBA storage shall be clearly marked.

CHAPTER 9. MEDICAL MONITORING

A. **Discussion**. Wearing a respirator makes breathing more difficult and may, for some people, add a physiological burden large enough to be a hazard to their health.

B. **Requirements**.

1. All personnel whose job requires them to routinely wear a respirator shall be medically evaluated for respirator usage. Users shall be medically evaluated in the following manner:

   (a) If enrolled in occupational medical monitoring program (OMMP), the user will be evaluated for respirator usage as part of their OMMP physical examination;

   (b) If the user is not enrolled in the OMMP, the user shall be evaluted for respirator usage in accordance with the guidance in reference (d).

2. Procedures for medical evaluation of respirator users is provided in reference (d).

3. Follow the procedures outlined in Chapter 4 of reference (a) for entry into the OMMP program.

4. The examining physician shall make an SF-88 or CG-5447 entry indicating whether the individual is able to wear a respirator in the performance of their work.

CHAPTER 10. DOCUMENTATION AND RECORD KEEPING

A. Discussion. The following summarizes documentation and record keeping requirements contained in this document as required by Federal law.

TYPE OF RECORD	DOCUMENTATION REQUIRED	FREQUENCY
1. Unit Respirator Program (Chapter 3)	Chapter 3 document with blanks filled in	Initially--update as appropriate
2. Health Risk Assessment (COMDTINST M5100.47(series)	S&EH audit or inspection report documenting activities requiring respiratory protection, type of respirator, etc.	Annual
3. Fit-Testing (Chapter 7)	Individuals fit-tested, date, type/model of respirator, fit-test procedure used	Annual
4. Medical Evaluation (Chapter 9)	Physician's statement that individual is able to wear respirator (SF-88 entry)	Annual or IAW resp. eval. schedule
5. Training (Chapter 7)	Subject matter covered, names of individuals trained, date training provided, signature of individual trained	Annual
6. Analysis of Breathing Air (for airline respirators and SCBAs). (Enclosure (1))	Results of tests for % oxygen, water, hydrocarbons, carbon monoxide, odor, carbon dioxide	Annual
7. Breathing Air Compressor Inspection (Enclosure (1))	Records denoting proper operation of high temperature and/or carbon monoxide alarm	Every 6 months

RESPIRABLE AIR FOR SUPPLIED-AIR AND SELF-CONTAINED RESPIRATORS.

1. **Air Quality**. Breathing air shall be of high purity and shall at least meet the requirements of the Compressed Air Commodity Specification (Grade D specifications described below). Compressed oxygen shall not be used in supplied-air respirators or in open circuit self-contained breathing apparatus.

COMPRESSED AIR COMMODITY SPECIFICATION

LIMITING CHARACTERISTICS	MAXIMUM CONCENTRATION
Percent Oxygen (v/v) (Balance Predominately Nitrogen)	atm 19.5 - 23.5 (Note 1)
Water	(Note 2)
Hydrocarbons (Condensed) (Mg/M3 of Gas)	5
Carbon Monoxide (Parts Per Million Parts of Air - ppm)	10
Odor	(Note 3)
Carbon Dioxide (ppm)	1000

NOTE 1: The term "atm" (atmospheric) denotes the oxygen content normally present in atmospheric air; the numerical value denotes the oxygen limits for synthesized air.

NOTE 2: The water content of compressed air required for any particular grade may vary with the intended use from saturated to very dry.

NOTE 3: The presence of a pronounced odor should render the air unsatisfactory for breathing purposes.

2. **Air Compressors**. Breathing air provided by compressors shall meet air quality requirements stated above. The compressor shall be equipped with necessary electrical safety and standby devices. Compressors shall be constructed and situated to provide an intake of outdoor air and to avoid entry of contaminated air into the system. A receiver of sufficient capacity to enable the

2. (cont'd) respirator wearer to escape from a contaminated atmosphere in event of compressor failure, and alarms to indicate compressor failure shall be installed in the system. Alarms must be tested and calibrated in accordance with manufacturer's instructions and must sound in an occupied space. If an oil-lubricated compressor is used, it shall have a high temperature or carbon monoxide monitor alarm or both. If equipped with a carbon monoxide monitor, the monitor shall be calibrated in accordance with manufacturer's instructions. If only a high-temperature alarm is used, the air from the compressor shall be tested at least every 3 months for carbon monoxide to ensure that it meets the requirements stated above.

3. **Shipboard Air Compressors**. Ship's service air compressors do not meet the requirements given above and are not authorized for use as a source of breathing air. Enclosure (2) provides information on a portable pneumatic breathing air pump which operates using ship's service air.

4. **Air Pumps**. Breathing air provided by a portable air pump such as Rhine Air (see enclosure 2) is not required to be tested for Grade D specifications. However, air pumps shall be placed outside of work areas to ensure that contaminants are not entrained into the air supply. In addition, ensure that the fan inlet hose is the approved hose for the air pump. Use of a non-approved hose will significantly reduce flow of supply air and is not permitted.

5. **Inspection and Testing**. The Respirator Program Coordinator (RPC) shall ensure that the air supply system is inspected at least every 6 months and breathing air is tested by a qualified individual at least annually. The objective is to ensure that the safety systems described in the section above are functioning adequately. The results of the inspection and tests shall be recorded in the unit respiratory protection program file.

6. **Source of Air Testing**. The following commercial laboratory provides breathing air testing services by mail:

   Texas Research Institute, Inc.
   Environmental Division
   9063 Bee Cave Road
   Austin, TX 78733
   (512) 263-2101

RESPIRATORS AVAILABLE THROUGH THE NATIONAL SUPPLY SYSTEM

Ordering information is provided below for three companies which supply respirators and one company which supplies portable breathing air pumps through the National Supply System's Paperless Ordering Placement System (POPS). Procurement requests for respirators ordered through the National Stock System must be forwarded to Routing Identification Code S9G at the following address:

Defense General Supply Center
Attn: DGSC-OSCC
8000 Jefferson Davis Highway
Richmond, VA 23297-5501
(804) 279-4490/4006

1. 3M Occupational Health & Safety
St. Paul, MN 55144-1000
(800) 328-1667

CODE*	PART	NATIONAL STOCK NUMBER
Respirators:		
A	Disposable dust-mist	4240-01-246-0314
B	Disposable toxic fume-mist	4240-01-108-4171
C	Disposable Organic vapor	4240-01-074-8390
D	Disposable Organic vapor with dust prefilter	
	(Respirator)	4240-01-074-8390
	(Pre-filter)	4240-01-246-7148
	(Pre-filter retainer)	4240-01-179-0250
M	Reusable Half-face Chemical Cartridge (S/M)	4240-01-246-5401
M	Reusable Half-face Chemical Cartridge (M/L)	4240-01-246-5404
S	Reusable Full-face Chemical Cartridge	4240-01-246-6426
Y	Reusable Full-face cartridge respirator with welding faceshield	
	(Respirator)	4240-01-246-6426
	(Welder's faceshield kit)	4240-01-320-1953
Filter/Cartridges:		
1	Toxic-dust mist	
	(Cartridge)	4240-01-246-5412
	(Cartridge retainer)	4240-01-247-2920
2	Toxic-fume-dust mist/High Efficiency Filter	
	(Cartridge)	4240-01-246-5411
	(Cartridge retainer)	4240-01-231-7718

*Respirator Code used in Enclosure (3)

3M Occupational Health & Safety (continued)

3	Organic vapor	4240-01-246-5407
5	Organic vapor with paint prefilter	
	(Cartridge)	4240-01-246-5407
	(Cartridge retainer)	4240-01-235-0823
	(Filter retainer)	4240-01-247-2920
	(Filter)	4240-01-246-5413
7	Acid Gas	4240-01-246-5408

Kits: (kits contain)

M-3	3 reusable Half-face organic vapor respirators (S/M) 5 pair cartridge retainers, 20 organic vapor cartridges	4240-01-259-4571
M-3	3 reusable Half-face organic vapor respirators(M/L) 5 pair cartridge retainers, 20 organic vapor cartridges	4240-01-259-4576
M-2	3 reusable Half-face high efficiency respirators (S/M) 5 pair cartridge retainers, 20 high efficiency cartridges	4240-01-259-4575
M-2	3 reusable Half-face high efficiency respirators (M/L) 5 pair cartridge retainers, 20 high efficiency cartridges	4240-01-259-4580
M-5	3 reusable Half-face paint spray respirators (S/M) 5 pair cartridge retainers, 20 organic vapor cartridges, 100 paint spray prefilters	4240-01-259-4572
M-5	3 reusable Half-face paint spray respirators (M/L) 5 pair cartridge retainers, 20 organic vapor cartridges, 100 paint spray prefilters	4240-01-259-4577
T	Type C Supplied Air Kit, for compressor: fullface respirator, regulator valve, waist belt, shoulder strap, air hose (25 ft)	4240-01-259-4597
T	Type C Supplied Air Kit, for air pump: fullface respirator, regulator valve, waist belt, shoulder strap, air hose (25 ft)	4240-01-265-2722
T	Compressed breathing air hose- 100 ft (no more than 300 ft allowed for supplied air respirator)	4240-01-167-2799
	Respirator Fit Test Kit, saccharin test: fit test hood, saccharin solution	4240-01-248-8146
	Eyeglass frame and mount (with case)	4240-01-301-0728

*Respirator Code used in Enclosure (3)

2. Mine Safety Appliances Co.
   Pittsburgh, PA 15230
   (800) 672-2222

CODE*	PART	NATIONAL STOCK NUMBER
Respirators:		
M	Reusable Half-face Chemical Cartridge (S)	4240-01-150-7937
M	Reusable Half-face Chemical Cartridge (M)	4240-01-022-8501
M	Reusable Half-face Chemical Cartridge (L)	4240-01-086-7670
S	Reusable Full-face Chemical Cartridge (S)	4240-01-248-9139
S	Reusable Full-face Chemical Cartridge (M)	4240-01-199-0077
S	Reusable Full-face Chemical Cartridge (L)	4240-01-248-9140
N	Reusable Half-face belt mounted welder's (S)	4240-01-248-8075
N	Reusable Half-face belt mounted welder's (M)	4240-01-248-8073
Filter/Cartridges:		
1	Toxic-dust mist (Type H)	4240-01-230-6894
2	Toxic-fume-dust mist (Sparkfoe Type H)	4240-01-243-4201
3	Organic vapor (GMA)	4240-01-230-6892
5	Organic vapor with paint prefilter	
	(Cartridge, GMA)	4240-01-230-6892
	(Paint pre-filter)	4240-01-231-0150
	(Paint pre-filter cover)	4240-01-020-8782
7	Acid Gas	4240-01-103-8475

3. Willson Safety Products
   Reading, PA 19603-0622
   (215) 376-6161

CODE*	PART	NATIONAL STOCK NUMBER
Respirators:		
A	Disposable dust-mist	4240-01-094-9534
M	Reusable Half-face Chemical Cartridge (S)	4240-01-249-5366
M	Reusable Half-face Chemical Cartridge (M)	4240-01-249-5365
S	Reusable Full-face Chemical Cartridge	4240-01-253-0996

*Respirator Code used in Enclosure (3)

Willson Safety Products (continued)

Filter/Cartridges:

2	Toxic-fume-dust mist	4240-01-249-5542
3	Organic vapor	4240-01-249-5540
4	Organic vapor with dust/mist pre-filter	
	(Cartridge)	4240-01-249-5540
	(Filter retainer)	4240-01-250-6407
	(Filter)	4240-01-104-1217
5	Organic vapor with paint prefilter	
	(Cartridge)	4240-01-249-5540
	(Filter retainer)	4240-01-250-6408
	(Filter)	4240-01-094-3215
7	Acid Gas	4240-01-104-1218

Kits:
(kits contain)

M-1	One reusable Half-face organic vapor respirator one pair organic vapor cartridges	4240-01-088-8547
M-2	One reusable Half-face dust/mist respirator one pair dust/mist filters	4240-01-249-5493
M-5	One reusable Half-face paint spray respirator one pair organic vapor cartridges with paint pre-filters	4240-01-088-8546

Irritant Smoke Fit-test Kit	4240-01-343-2221
Replacement smoke tubes (pack of six)	4240-01-366-2578

4. Rhine Air, Inc.
   Santee, CA 92071
   (619) 449-6520

CODE*	PART	NATIONAL STOCK NUMBER
Air Pumps, Respirator		
T	Pneumatic (air) driven breathing pump (low pressure, oil free)	4310-01-084-9665
	Pneumatic inlet hose (100 ft.)	4240-01-251-8160
T	Explosion-proof electric driven breathing pump (low pressure, oil free)	4310-01-135-7607
T	Full face constant flow facepiece with 100 ft. breathing hose	4240-01-251-9403

*Respirator Code used in Enclosure (3)

RESPIRATOR GUIDE FOR WORK OPERATIONS

1. This enclosure provides general information on the types of respiratory protection used in various Coast Guard operations. **THIS ENCLOSURE CANNOT BE USED TO REPLACE THE SELECTION CRITERIA OF CHAPTER 5 OF THIS MANUAL.** Actual environmental conditions may require a greater degree of protection than indicated herein.

2. **Respirators and Filter Cartridges Available.**

	CODE DESIGNATION
a. **Disposable Type Respirators.**	
Half Face. (Facepiece and filtering device)	
Dust - Mist	A
Toxic Dust - Fume-Mist	B
Organic Vapor	C
Organic Vapor with Dust/Mist Prefilter	D
Organic Vapor with Paint Mist Prefilter	E
b. **Reusable Type Respirators.**	
Half Face. (M and N are facepieces which must be matched to appropriate cartridges listed in 2.c.)	
Replaceable Filter - Chemical Cartridge	M
Replaceable Filter - Chemical Cartridge (Belt Mounted)	N
Type C Continuous Flow Supplied Air	O
Powered Air - Purifying Respirator	P
Full Face. (S and Y are facepieces which must be matched to appropriate cartridges listed in 2.c.)	
Replaceable Filter - Chemical Cartridge	S
Type C Continuous-Flow Supplied-Air	T
Self-Contained Breathing Apparatus	V
Powered Air-Purifying Respirator	X

Full-face respirator with welding faceshield ..... Y

c. **Replaceable Filter-Chemical Cartridge Sets.**

(**NOTE:** These cartridges are used on respirator mask types M, N, S, and Y.)

		CODE DESIGNATION
(1)	Toxic Dust-Mist	1
(2)	Toxic Dust-Fume-Mist/High Efficiency	2
(3)	Organic Vapor	3
(4)	Organic Vapor with Dust/Mist Prefilter	4
(5)	Organic Vapor with Paint Mist Prefilter	5
(6)	Pesticide	6
(7)	Acid Gas	7

3. **Respirator Selection.**

TYPICAL EXPOSURE	RESPIRATOR (See Code)
Abrasive Blasting	T
Asbestos Fibers	(Refer to COMDTINST 6260.16 (series))
Benzene	(Refer to COMDTINST 6260.22 (series))
Chipping, Grinding (Needle Gun)	A or M-1

(cont'd)

TYPICAL EXPOSURE	RESPIRATOR (See Code)
Chromate Paint: aerosal can	M-5
Chromate Paint: spray gun	T
Chromium Compounds as Dusts or Mists	M-2
Composite fiber work (sanding/grinding)	M-1
Fiberboard Cutting	A or M-1
Fiberglass Dust	M-2
Fiberglass Lay-up (solvent exposure in shops)	M-3
Fiberglass work (drilling, grinding in shops)	M-2 or S-2
Fiberglass work (solvent exposure in confined spaces)	O or T
Fuel Cell Entry	T
Insecticides, Rodenticides	M-6 or S-6
Lead Fume	M-2
Metal Cleaning - Alkali; or Acid and Solvent Mix (outdoors and in shop)	M-4
Oil Mist	M-1
Oxygen Deficiency	V
Painting with Brush (indoors; solvent based paints)	E or M-5
Painting, spray (outdoors)	E or M-5
Painting, spray (indoors and in ships)	O or T
Polyurethane Foaming - large jobs	O or T

(cont'd)

TYPICAL EXPOSURE	RESPIRATOR (See Code)
Polyurethane Foaming - small jobs	C or M-3
Polyurethane Painting	T
Sandblasting or Grit Blasting	T
Sand or Grit Blasting (clean-up)	M-2
Solvent Cleaning (organic solvents; shops; dip or wipe)	C or M-3
Solvent Cleaning (shipboard)	T
Welding, Burning, Cutting (metals; shop; no local exhaust ventilation)	B or N-2
Welding, Burning, Cutting (shipwork; open areas)	B or N-2
Welding, Burning, Cutting (shipwork; confined area)	O
Woodworking	A or M-1

QUALITATIVE FIT-TEST PROCEDURES: SACCHARIN SOLUTION AEROSOL

1. **Saccharin Solution Aerosol Protocol**. There are three parts to this procedure: Taste Threshold Screening; Respirator Selection; and Fit-Testing. The following equipment is required for the procedure:

   a. Variety of respirators (three sizes of respirators from at least two manufacturers) with particulate (dust/mist) filter cartridges.

   b. Mirror (to assist test subject don respirator).

   c. Fit-test reading passage.

   d. Test enclosure (12" in diameter, 14" in height).

   e. DeVilbiss Model 40 Inhalation Medication Nebulizer.

   f. Saccharin solution.

NOTE: The nebulizer, test enclosure, and saccharin are available as a kit from safety equipment suppliers and the 3M Corporation in Minneapolis, Minnesota (see Enclosure (2) for ordering information).

2. **Taste Threshold Screening**.

   a. Threshold screening as well as fit testing employees shall use 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 movement of the head when a respirator is worn. The enclosure should be loose fitting to ensure adequate oxygen replacement.

   b. The test enclosure shall have a three-quarter inch hole in front of the test subject's nose and mouth area to accommodate the nebulizer nozzle.

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

   d. The test subject shall don the test enclosure. For the threshold screening test, subject shall breathe through open mouth with tongue extended.

e. Using a DeVilbiss Model 40 Inhalation Medication Nebulizer, 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 or equivalent.

f. The threshold check solution consists of 0.83 grams of sodium saccharin, USP in water. It can be prepared by putting 1 cc of the test solution (see paragraph below) in 100 cc of water.

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

h. Ten squeezes are repeated rapidly and then the test subject is asked whether the saccharin can be tasted.

i. If the first response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whether the saccharin is tasted.

j. If the second response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whether the saccharin is tasted.

k. The test conductor will take note of the number of squeezes required to elicit a taste response.

l. If the saccharin is not tasted after 30 squeezes (step (j)), the test subject may not perform the saccharin fit-test.

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

n. Correct use of the nebulizer means that approximately 1 cc of liquid is used at a time in the nebulizer body.

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

3. **Respirator Selection**. Respirators shall be selected as described in enclosure (5) to this manual, except that each respirator shall be equipped with a particulate (dust/mist) filter cartridge.

4. **Fit-Test**.

a. The fit-test uses the same test enclosure described above.

b. Each test subject shall wear his respirator for at least 10 minutes before starting the fit-test.

c. The test subject shall don the test enclosure while wearing the respirator selected above. This respirator shall be properly adjusted and equipped with a particulate (dust/mist) filter cartridge.

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

e. A second DeVilbiss Model 40 Inhalation Medication Nebulizer 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 or equivalent.

f. The fit-test solution is prepared by adding 83 grams of sodium saccharin to 100 cc of warm water.

g. As before, the test subject shall breathe through the open mouth with tongue extended.

h. The nebulizer is inserted into the hole in the front of the enclosure and the fit-test solution is sprayed into the enclosure using the same technique as for the taste threshold screening and the same number of squeezes required to elicit a taste response in the screening.

i. After generation of the aerosol, the test subject shall be instructed to perform the following exercises for one minute each:

(1) Normal breathing.

(2) Deep breathing. Be certain breaths are deep and regular.

(3) Turning head from side-to-side. Be certain movement is complete. Alert the test subject not to bump the respirator on the shoulders. Have the test subject inhale when his head is at either side.

(4) Nodding head up-and-down. Be certain motions are complete and made about every second. Alert the test subject not to bump the respirator on the chest. Have the test subject inhale when their head is in the fully up position.

(5) Talking. 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, which will test the respirator seal. Alternative passages which serve the same purpose may also be used.

(6) 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."

j. Every 30 seconds, the aerosol concentration shall be replenished using one-half the number of squeezes as initially.

k. The test subject shall so indicate to the test conductor if at any time during the fit-test the taste of saccharin is detected.

l. If the saccharin is detected, the fit is deemed unsatisfactory and a different respirator shall be tried.

m. Successful completion of the test protocol shall allow the use of the tested respirator.

QUALITATIVE FIT-TEST PROCEDURES: ISOAMYL ACETATE

1. **Isoamyl Acetate Protocol**. There are three parts to this procedure: Odor Threshold Screening; Respirator Selection; and Fit-Testing. The following equipment is required for the procedure:

   a. Three 1-liter glass jars with metal lids (e.g., Mason jars).

   b. Distilled or bottled water.

   c. Isoamyl acetate (called IAA or banana oil).

   d. Clean dropper or pipette.

   e. Labels (for the jars).

   f. Variety of respirators (three sizes of respirators from at least two manufacturers) with organic vapor cartridges.

   g. Mirror (to assist test subjects don respirator).

   h. Fit-test chamber (consists of: clear 55 gallon drum liner suspended over a round 2 foot diameter frame, with a small hook inside the top center of the chamber; top of chamber should be 6 inches above the test subject's head).

   i. Fit-test reading passage (taped to the inside of the chamber).

   j. Paper towels (piece of paper towel will be wetted with pure IAA and hung on the hook inside the fit-test chamber).

2. **Odor Threshold Screening**.

   a. Three 1-liter glass jars with metal lids (e.g., Mason or Bell jars) are required.

   b. Odor-free water (e.g., distilled or spring water) at room temperature shall be used for the solution.

   c. The isoamyl acetate (IAA) (also known as isopentyl acetate and banana oil) stock solution is prepared by adding 1 cc of pure IAA to 800 cc of odor-free water in a 1-liter jar and shaking for 30 seconds. The solution shall be prepared new at least weekly.

d. 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 but may not be connected to the same recirculating ventilation system.

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

f. A test blank is prepared in a third jar by adding 500 cc of odor-free water.

g. The odor test and test blank jars shall be labeled 1 and 2 for jar identification. If the labels are put on the lids, they can be periodically dried off and switched to avoid people thinking the same jar always has the IAA.

h. The following instructions shall be typed on a card and placed on the table in front of the two test jars, 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."

i. 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.

j. If the test subject is unable to correctly identify the jar containing the odor test solution, the IAA Qualitative Fit-Test may not be used.

k. If the test subject correctly identifies the jar containing the odor test solution, he may proceed to respirator selection and fit-testing.

3. **Respirator Selection**.

a. The test subject shall be allowed to select the most comfortable respirator from a large array of various sizes and manufacturers that includes at least three sizes of elastomeric half facepieces and units of at least two manufacturers.

b. The selection process shall be conducted in a room separate from the fit-test chamber 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 assess a "comfortable" respirator. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator. This may not constitute his formal training on respirator use, only a review.

c. The test subjects should understand that they are being asked to select the respirator which provides the most comfortable fit for them. Each respirator represents a different size and shape, and if fitted properly, will provide adequate protection.

d. The test subject holds each facepiece up to his face and eliminates those which are obviously not giving a comfortable fit. Normally, selection will begin with a half-mask and if a fit cannot be found here, the subject will be asked to go to the full facepiece respirators.

e. The more comfortable facepieces are recorded; 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 paragraph (f), below. If the test subject is not familiar with using a particular respirator, subject shall be directed to don the mask several times and to adjust the straps each time, so that he/she becomes adept at setting proper tension on the straps.

f. Assessment of comfort shall include reviewing the following points with the test subject:

- Chin properly placed.
- Positioning of mask on nose.
- Strap tension.
- Fit across nose bridge.
- Room for safety glasses.

f. - Distance from nose to chin.
   - Room to talk.
   - Tendency to slip.
   - Cheeks filled out.
   - Self-observation in mirror.
   - Adequate time for assessment.

g. The test subject shall conduct the conventional negative and positive-pressure fit checks. Before conducting the negative or positive-pressure checks, the subject shall be told to "seat" his mask by rapidly moving the head side-to-side and up and down, taking a few deep breaths.

h. The test subject is now ready for fit-testing.

i. After passing the fit-test, the test subject shall be questioned again regarding the comfort of the respirator. If it has become uncomfortable, another model of respirator shall be tried.

j. The employee shall be given the opportunity to select a different facepiece and be retested if during the first two weeks of on-the-job wear the chosen facepiece becomes unacceptably uncomfortable.

4. **Fit-Test**.

a. The fit-test chamber shall consist of a clear 55 gallon drum liner suspended over a round 2 foot diameter frame, so that the top of the chamber is about 6 inches above the test subject head. The inside top center of the chamber shall have a small hook attached.

b. Each respirator used for the fitting and fit-testing shall be equipped with organic vapor cartridges or offer protection against organic vapors. The cartridges or masks shall be changed at least weekly.

c. After selecting, donning, and properly adjusting a respirator himself, 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 laboratory hood, to prevent general room contamination.

d. A copy of the following test exercises and rainbow (or equally effective) passage shall be taped to the inside of the test chamber.

e. Each test subject shall wear his respirator for at least 10 minutes before starting the fit-test.

f. Prior to entering, the test chamber should be collapsed several times to insure that carbon dioxide does not build up and that oxygen is replenished between fit-testing exercises. Upon entering the 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 three-quarters of 1 cc of pure IAA. The test subject shall hang the wet towel on the hook at the top of the chamber.

g. Allow two minutes for the IAA test concentration to be reached 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 cooperation, the purpose of the exercises, or to demonstrate some of the exercises.

h. Testing the seal.

(1) Have the test subject perform the following test exercises:

(a) Normal breathing.

(b) Deep breathing. Be certain breaths are deep and regular.

(c) Turning head from side-to-side. Be certain movement is complete. Alert the test subject not to bump the respirator on the shoulders. Have the test subject inhale when his head is at either side.

(d) Nodding head up-and-down. Be certain motions are complete and made about every second. Alert the test subject not to bump the respirator on the chest. Have the test subject inhale when his head is in the fully up position.

(e) Talking. 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, which will test the respirator seal. Alternative passages which serve the same purpose may also be used.

(f) Normal breathing.

(2) 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."

i. Each exercise described above shall be performed for at least one minute.

j. If at any time during the test the subject detects the banana-like odor of IAA, he shall quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.

k. Upon returning to the selection room, the subject shall remove the respirator, repeat the odor sensitivity test, select and put on another respirator, return to the test chamber, etc. The process continues until a respirator that fits well has been found. Should the odor sensitivity test be failed, the subject shall wait about five minutes before retesting. Odor sensitivity will usually have returned by this time.

l. If a person cannot be fitted with the selection of half-mask respirators, include full facepiece models in the selection process. When a respirator is found that passes the test, its efficiency shall be demonstrated for the subject by having him break the face seal and take a breath before exiting the chamber.

m. When the test subject leaves the chamber, he shall remove the saturated towel, returning it to the test conductor. To keep the area from becoming contaminated, the used towels shall be kept in a self-sealing bag. There is no significant IAA concentration buildup in the test chamber from subsequent tests.

n. Persons who have successfully passed this fit-test may be assigned the use of the tested respirator.

QUALITATIVE FIT-TEST PROCEDURES: IRRITANT SMOKE

1. **Irritant Fume Protocol**. There are two parts to this procedure and they are: Respirator Selection and Fit-Testing. The following equipment is required for the procedure:

   a. Variety of respirators (three sizes of respirators from at least two manufacturers) with high efficiency particulate cartridges.

   b. Mirror (to assist test subjects don respirator).

   c. Ventilation smoke tube (available through National Supply System- see enclosure (2) for ordering information).

   d. Short length of tubing.

   e. Squeeze bulb.

2. **Respirator Selection**. Respirators shall be selected as described in enclosure (5) to this manual, except that each respirator shall be equipped with high efficiency particulate cartridges.

3. **Fit-Test**.

   a. The test subject shall be allowed to smell a weak concentration of the irritant smoke to familiarize him with its characteristic odor.

   b. The test subject shall properly don the respirator selected as above, and wear it for at least 10 minutes before starting the fit-test.

   c. The test conductor shall review this protocol with the test subject before testing.

   d. The test subject shall perform the conventional positive pressure and negative pressure fit checks. Failure of either check shall be cause to select an alternative respirator.

   e. Break both ends of a ventilation smoke tube (available through safety equipment suppliers). Attach a short length of tubing to one end of the smoke tube. Attach the other end of the smoke tube to a squeeze bulb.

   f. Advise the test subject that the smoke can be irritating to the eyes and instruct him to keep his eyes closed while the test is performed.

g. The test conductor shall direct the stream of irritant smoke from the tube towards the face seal area of the test subject. He shall begin at least 12 inches from the facepiece and gradually move to within one inch, moving around the whole perimeter of the mask.

h. The following exercises shall be performed while the respirator seal is being challenged by the smoke. Each shall be performed for one minute.

(1) Normal breathing.

(2) Deep breathing. Be certain breaths are deep and regular.

(3) Turning head from side-to-side. Be certain movement is complete. Alert the test subject not to bump the respirator on the chest. Have test subject inhale when his head is at either side.

(4) Nodding head up-and-down. Be certain motions are complete. Alert the test subject not to bump the respirator on the chest. Have the test subject inhale when his head is in the fully up position.

(5) Talking--slowly and distinctly; count backwards from 100.

(6) Normal Breathing.

i. If the irritant smoke produces an involuntary reaction (cough) by the test subject, the test conductor shall stop the test. In this case, the test respirator is rejected and another respirator shall be selected.

j. Each test subject passing the smoke test without evidence of a response shall be given a sensitivity check of the smoke from the same tube to determine whether he reacts to the smoke. Failure to evoke a response shall void the fit-test.

k. Steps 3.e., 3.g., and 3.h. of this protocol shall be performed in a location with exhaust ventilation sufficient to prevent general contamination of the testing area by the test agents (IAA, irritant smoke).

l. Respirators successfully tested by the protocol may be used by the test subject.