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ORNL/TM-9916

Respiratory Protection Program

Programmatic Description

Industrial Hygiene Department

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ORNL/TM-9918

Health Division
Industrial Hygiene Department

Respiratory Protection Program
Programmatic Description

J. M. Brooks

W. E. Porter

Date Published - March 1986

OAK RIDGE NATIONAL LABORATORY

Oak Ridge, Tennessee 37831

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ORNL RESPIRATOR PROGRAM - A PROGRAMMATIC DESCRIPTION

J. M. Brooks
W. E. Porter

ABSTRACT

The ORNL Respirator Program is designed to provide employees with devices which afford maximum protection with minimum inconvenience and discomfort. Teamwork is essential since a comprehensive program involves the Medical Department, the Industrial Hygiene Department, Radiation and Safety Surveys, the Operations Division, Quality Assurance and Inspection, and the Fire Department. The purpose of this manual is to describe in detail the ORNL Respirator Program. Included are discussions of the following elements: quality assurance, selection, fit-testing, maintenance and issue, certified breathing air for self-contained breathing apparatus, inspection, program surveillance, available devices, and standard operating procedures. As program modifications develop and improvements are made, periodic revisions may be necessary. The Industrial Hygiene Department will perform this task on an "as required" basis.

I. INTRODUCTION

The ORNL Respirator Program was designed to accomplish the following objectives:

1. A formal standard practice procedure regarding the use of respirators, defining divisional responsibilities, and describing a minimum acceptable program.
2. Standard Operating Procedures documenting divisional activities.
3. A quality assurance program for respiratory devices.
4. A central facility for filling air tanks for self-contained breathing apparatus (SCBA).
5. Quantitative fit-testing to confirm reliability of the devices on an individual basis.
6. A systematic and efficient inspection of all devices stored for "emergency use."
7. The continued effectiveness of the program to be ensured by a committee of the MMES respirator program coordinators.

An essential element of a minimum acceptable program for use of respirators is a formal standard practice procedure (SPP). This SPP outlines and defines divisional responsibilities and describes a minimum acceptable program. The SPP was prepared by the Industrial Hygiene Department staff and reviewed by the Respiratory Protection Task Force (RPTF). A major goal of the RPTF was to investigate problems common to all Energy Systems plants arising from the use of respirators. The published SPP is incorporated in the ORNL Industrial Hygiene Manual as SPP-IH-1.2 and is included as Appendix A of this report.

Quality assurance tests are performed on all new and used respiratory protective equipment. A detailed discussion of the quality assurance program is given in Section II.

The Industrial Hygiene Department has established a Respiratory Protective Equipment Center (RPEC) for the purpose of training in selection and use of respiratory protective devices, quantitative fit-testing, and maintenance and issue of all devices except SCBA. Details of each of these elements are given in Sections III, IV, and V, respectively.

Section VI contains a detailed discussion of the inspections required for devices stored for non-routine use.

Section VII deals with the mechanisms for program surveillance.

Section VIII contains a discussion of the training program and the inspection and maintenance of self-contained breathing apparatus (SCBA) by the Fire Department.

Section IX identifies all available devices by photograph.

Section X contains the Divisional Standard Operating Procedures defined in the responsibilities section of the SP on use of respirators.

II. QUALITY ASSURANCE

It is essential that quality assurance tests be performed on new and used equipment to ensure that the device gives the wearer maximum protection.

All new equipment (facepieces and canisters) received by the Finance and Materials Division is subject to quality assurance testing. Any significant failure rate is reported to the vendor. (A failure rate of $>2/100$ is considered significant.)

All used facepieces are subject to quality assurance testing. The distinct possibility of mishandling or abuse of the facepiece necessitates this action. Full-face and half-face respirators are tested by a DOP challenge test.

The only canisters tested are those specified for particulates, for example, those with absolute filters. This includes combination cartridges with particulate filters. The rejection rate for these canisters using the standard DOP test is between 1 and 5%. Sorbent-only canisters are not subject to quality assurance, since no test is available to predict their acceptability. All canisters are discarded after use.

Stepwise procedures that detail the quality assurance for respirators and canisters are given in Section X.D.

III. TRAINING IN SELECTION AND USE OF RESPIRATORY PROTECTIVE DEVICES

An essential element of the safe use of respiratory protective devices is a basic understanding of what factors influence their selection and use. Training in the use of respiratory protective equipment is accomplished through two separate programs coordinated by the Industrial Hygiene Department.

The primary method of training the respirator wearer is through a comprehensive instructional session administered every 18 months in conjunction with the respirator fitting (or re-fitting) procedure. The instruction received at this training session includes a detailed explanation concerning the appropriate use, care, and limitations for each type of device that the wearer might be expected to use. This material is presented in a videotape and by a trained technician during the fit-test procedure. An outline which shows the minimal content of this presentation is included in Section X.E.3 of this document.

The second part of the training of respirator wearers is performed within each employee's division by a representative(s) designated as the divisional trainer(s) for the respiratory protection program. Each year the Industrial Hygiene Department selects a pertinent topic regarding respiratory protection for annual training. Divisional trainers are then instructed and supplied material relating to this topic to convey to their employees. The trainer(s) is responsible for instructing every member of the respiratory protection program in their division concerning the selected topic. The Industrial Hygiene Department provides support to the trainers by supplying them with instructional material, information to provide to employees, and assistance regarding presentations upon request.

IV. QUANTITATIVE FIT-TESTING

The point at which the respirator is most likely to fail is the seal between the facepiece and the wearer's face. Hence, every individual who wears a respirator, even occasionally, must be tested for face fit using a quantitative fit-test procedure.

During the course of the quantitative fit-test, the employee is further instructed in the following areas: (1) limitations of each device, (2) parts of the facepiece to inspect and what to look for, and (3) the proper method for donning the device.

Fit-testing, using a polydispersed DOS (dioctylsebecate) aerosol as the test material, is normally performed on all facepieces in use at the Laboratory. Percent penetration is determined by comparing the concentration of the aerosol outside the facepiece with the concentration detected inside the facepiece.

The stepwise procedures for quantitative fit-testing are given in Section X.E.3.

V. MAINTENANCE AND ISSUE

Following all necessary quality assurance testing by the Quality Assurance and Inspection Department, the devices are transported to the Industrial Hygiene Department for maintenance and packaging for reissue.

The maintenance of facepieces involves a visual inspection for defects (cracking of rubber, deterioration of straps, defective exhalation and inhalation valves, broken or cracked lenses, etc.). If repairs are necessary, appropriate quality assurance tests are repeated.

Normally, only three types of facepieces are used: the Comfo II (MSA), the Ultravue (MSA), and the Ultra-Twin (MSA). The facepieces accommodate a variety of canister combinations; therefore, the canisters and facepieces are packaged separately. At the time of issue, the appropriate canister is determined based on the user's needs and issued with the appropriate facepiece.

The stepwise procedure for maintenance and issue is given in Section X.E.5.

All issue or reissue of respiratory protective equipment is a function of the Industrial Hygiene Department. All such equipment in general stores is issued on an authorized signature basis, which includes the ORNL Shift Supervisors (for off-shift emergencies) and the Industrial Hygiene Department staff.

VI. INSPECTION OF DEVICES STORED FOR NON-ROUTINE USE

The standards detailed in Title 29 CFR, Part 10, Section 1910.134 specify that all respiratory protective devices stored for non-routine use are to be inspected monthly. Because it was felt that this frequency was not necessary, the DOE agreed to a study aimed at determining a minimum frequency for such inspections. The results of this study and subsequent discussions with DOE have led to the establishment of an inspection program as outlined in Section X.E.4 of this document. The established frequency of inspection is semi-annually.

Inspection of the respiratory protective devices in the emergency cabinets consists of checking the number and condition of the respirators and the air-purifying canisters. All emergency air-purifying respirators are stored with the canisters in place inside a sealed clear plastic bag. Any respirators found to have old canisters or disturbed protective coverings are replaced. All respirators and canisters are replaced approximately every two years. After the cabinets are checked, they are then resealed, and notification of the inspection is placed on the outside of the cabinet.

VII. PROGRAM SURVEILLANCE

The ANSI Z88.2-1980 document entitled "Practices for Respiratory Protection" specifies:

"Section 3.5.15. An appraisal of the effectiveness of the respirator program shall be carried out at least annually. Action shall be taken to correct defects found in the program.

Section 3.5.2 Program Administration. The plant or company industrial hygiene, health physics, safety engineering, or fire department shall administer the program in close liaison with the medical department. Responsibility and authority for the respirator program shall be assigned to a single person. In small plants or companies having no formal industrial hygiene, health physics, or safety engineering department, the respirator program shall be administered by an upper level superintendent, foreman, or other qualified person responsible to the principle manager. The administrator shall have sufficient knowledge of respiratory protection to properly supervise the respirator program."

Pursuant to Section 3.6 requirements, the Industrial Hygiene Department will administer the ORNL Respirator Program. W. E. Porter serves as Program Coordinator, and J. M. Brooks as alternate.

The MMES respirator program coordinators for ORGDP, Y-12, and PGDP will perform an annual evaluation of the ORNL Respirator Program and prepare a report of the findings of the review. The ORNL respirator program coordinator will detail plans to correct any deficiencies and set a target date for their implementation. The review will be conducted annually on a calendar year basis.

VIII. SELF-CONTAINED BREATHING APPARATUS (SCBA)

The Fire Department is the major user of the self-contained breathing apparatus (SCBA). Therefore, training, inspection, and maintenance is their responsibility. The Industrial Hygiene Department is responsible for quantitative fit-tests for assuring the adequacy of facepiece fits.

The essential elements of this program include:

- (1) Detailed instruction and training in donning and wearing the SCBA.

- (2) Inspection and maintenance procedures to be followed to ensure the devices are maintained in the best possible condition.
- (3) Certification of breathing air in accordance with requirements of the specification for Grade D breathing air, as described in Compressed Gas Association Commodity Specification G-7.1-1966.

Inspection of SCBA devices is performed monthly. Only factory-trained and certified personnel are permitted to repair the SCBAs. Breathing air certification is currently made at the time the large tube trailer is filled, in accordance with the Industrial Hygiene SPP1.9, entitled "Breathing Air Quality for Compressed Gas Sources."

IX. AVAILABLE DEVICES

The Stores Department maintains an adequate supply of respiratory protection devices, as determined by the respirator program coordinator for the ORNL program needs. Photographs of all such devices and equipment are shown in Appendix C. As equipment is added or deleted, appropriate corrections will be made to this section.

An approved signature list is maintained by the Finance and Materials Division for the purchase of respiratory protection devices. This list includes members of the Industrial Hygiene Department and the Laboratory Shift Supervisors Office. Other Laboratory personnel must obtain respiratory protection devices from the Industrial Hygiene Department, as outlined in Section X.E.5.

X. STANDARD OPERATING PROCEDURES

This section includes Divisional Standard Operating Procedures which detail the responsibilities for the Respirator Program, as defined by SPP-IH-1.2 entitled "Use of Respiratory Protective Equipment."

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A. Medical Department

A.1. Medical Clearance for Individuals Who Wear Respiratory Protective Devices

It is the responsibility of the Medical Department to review the health status of all employees who may be required to wear respiratory equipment. Based on the overall health of the individuals and special medical tests (pulmonary function studies, EKG, etc.), the examining physician determines whether or not the individual will be restricted from wearing respiratory protective equipment. If a restriction is applied, appropriate supervision is formally notified.

Medical considerations include, but are not limited to the following:

1. Claustrophobia
2. Angina on exertion
3. Coronary artery disease
4. Severe asthma
5. Fragile or brittle diabetics
6. Obstructive lung disease
7. Punctured ear drums
8. Epilepsy
9. Physical deformities which prevent an adequate face-piece seal
10. Abnormal pulmonary function

Clearly, the list of considerations is incomplete. The application of a restriction cannot be based on any rigid set of conditions, symptoms, or diseases. The examining physician considers the total health of the employee in applying any restriction.

B. Radiation and Safety Surveys

B.1 Radiation Survey Functions Relating to the Cleaning and Decontamination of Respiratory Protective Equipment

1.0 SCOPE

This procedure is the guide for radiation survey monitoring of respirators after use in the field and after decontamination and sterilization procedures in the decontamination laundry. It is essentially the same as Health Physics and Safety IP-No. 309.

2.0 PROCEDURE

2.1 Routine deliveries of the respiratory equipment to and from the decontamination laundry are the responsibility of the Operations Division. (See Operations Division Standard Operating Procedure, page 21).

2.2 Before delivery to the cleaning facility, a radiation and safety survey representative surveys the equipment and separates the parts into four batches as follows:

- 2.2.1 Equipment with no detectable β , γ , α direct readings. Smear checks are not required in this category as all equipment is smeared after cleaning and prior to reuse. Place equipment in a plastic bag and identify with a tag (preferably a material transfer tag) stating "No detectable β , γ , α - no smear check."
- 2.2.2 Equipment with detectable radiation up to 1 mR/hr β , γ , and/or up to 3000 dis/min α direct readings, no smear check is required. Place equipment in a plastic bag and tag with materials transfer tag, giving the radiation readings obtained.
- 2.2.3 Equipment with readings from 1 mR/hr up to 20 mR/hr β , γ , and/or from 3000 to 25,000 dis/min α direct readings, no smear check is required. Place equipment in a plastic bag and tag with materials transfer tag, giving the radiation readings obtained.

- 2.2.4 Equipment exceeding the limits in Item 3 is confiscated and discarded to the burial ground. (In some cases, it may be reasonable to cut away the straps from full facepiece masks and bring the piece to within acceptable limits.)
- 2.3 The following actions will aid laundry personnel in the decontamination effort:
 - 2.3.1 Outline small contaminated spots on equipment and show readings with ballpoint pen.
 - 2.3.2 Indicate on the Radiation Material Transfer tag if the equipment has been subjected to alpha contamination only.
- 2.4 Following decontamination in the laundry facility, the equipment is subjected to a detailed survey (including smears) by a health physics representative. Any equipment showing positive evidence of contamination (detectable above background on direct readings or smears) is rejected for further cleaning. Equipment shown to be contamination-free by this survey is released for delivery to the Quality Assurance and Inspection Department for quality assurance tests.

C. Operations Division

C.1 Decontamination and Cleansing of Respiratory Protective Equipment

1.0 SCOPE

This procedure details the steps necessary for proper decontamination and cleansing of all respiratory protective devices used in the field.

2.0 PREPARE THE MASKS FOR MACHINE WASHING

- 2.1 Remove the canisters from the masks.
- 2.2 Turn the sides of the masks up so that the straps lay across the outside face of the masks.
- 2.3 Place the masks (inside face down) in the baskets used in the washing operation.
- 2.4 Three baskets (each a different size) are required for making an assembly to be inserted into the washer. Stack the baskets so that the largest is on bottom and the smallest on top. Lock the baskets together with the fasteners provided on each basket. When properly

connected, each end of the assembly is tapered to match the inside contour of the washer. Two of these assemblies can be washed at the same time.

- 2.5 Place the basket assembly in the Troy washer and fasten securely to the washer with the wing-nut fastener provided for this purpose.

3.0 MACHINE WASH THE MASKS

- 3.1 Rinse the masks for a minimum of three minutes at a water level of six inches and a water temperature of 90°F. Drain the water from the washer.
- 3.2 Repeat Step 3.1. These rinses are necessary to remove mud, etc., that may be on the masks.
- 3.3 Add one-half pound of "SBS-50" (a washing compound made by the Sugar Beet Products Company) to the washer. Wash the masks for a minimum of ten minutes at a water level of six inches and a water temperature of 90°F. Drain the water from the washer.
- 3.4 Rinse the masks for a minimum of three minutes at a water level of eight inches and a water temperature of 80°F. Drain the water from the washer.
- 3.5 Add about four ounces of glacial acetic acid to the washer. Rinse for a minimum of three minutes at a water level of eight inches and a water temperature of 70°F. Drain the water from the washer.
- 3.6 Rinse the masks for a minimum of three minutes at a water level of eight inches and a water temperature of 70°F. Drain the water from the washer.
- 3.7 Add two ounces of "Jet Dry" (drying agent made by Economics Laboratory) to the washer and repeat Step. 3.6.
- 3.8 Remove the basket assembly from the washer.

4.0 DRY THE MASKS

- 4.1 Remove the other masks from the baskets and hang them in the cabinet dryer. Dry the masks for 1-1/2 to 2 hr at a temperature ranging from 125°F at the top of the cabinet to 135°F at the bottom of the cabinet.
- 4.2 When dry, deliver the masks to the health physics survey area where they are checked for radioactive contamination.

5.0 HAND WASH THE MASKS

- 5.1 Remove the canister from the mask and clean the canister as specified in Step 3.0 above.
- 5.2 Fill the hot sink used for hand washing masks with tap water. Add a measuring container full of either "SBS-50" or "No. 101 Germicidal Detergent" (made by the American Optical Corporation) to the water.
- 5.3 Using a small scrub brush, wash the masks in the cleaning solution prepared in Step 5.2 above. In the adjoining sink, thoroughly rinse the masks in clean tap water.
- 5.4 Wash the glass with "Safety Lens Cleaner No. 70F" (made by the American Optical Corporation) and then dry the masks as specified in Step 4.0.

6.0 TRANSPORT CLEAN (GREEN TAGGED) FACEPIECES TO THE QUALITY ASSURANCE AND INSPECTION DIVISION FOR QUALITY ASSURANCE

7.0 DELIVER ALL DEVICES TO THE INDUSTRIAL HYGIENE DEPARTMENT FOR INSPECTION, REPAIR, REPACKAGING, AND ISSUE

D. Quality Assurance and Inspection Department

The Quality Assurance and Inspection Department has the responsibility for all quality assurance tests on respiratory devices and associated canisters:

- D.1 Quality assurance for used full-face and half-face respirators.
- D.2 Quality assurance for new high-efficiency filters, canisters containing high-efficiency filters, and full-face and half-face respirators.
- D.3 Dioctyl phthalate (DOP) penetration test, quality assurance for new high-efficiency filters and canisters with high-efficiency filters.

A standard operating procedure for each specific quality assurance test was prepared which describes each of the activities.

D.1 Quality Assurance for Used Full-Face and Half-Face Respirators

1.0 SCOPE

This procedure outlines the steps necessary for testing the integrity of full-face and half-face respirators. The test was designed to identify defective facepieces and prevent their issue for field use.

2.0 PROCEDURE

2.1 Facepieces with obvious defects (missing straps, broken lenses, missing exhalation or inhalation valves, etc.) are set aside. All such devices are sent to the Industrial Hygiene Department for repair prior to quality assurance testing.

2.2 DOP penetration test

2.2.1 Place facepiece complete with sealer on test head.

2.2.2 Determine percent penetration.

2.2.3 Facepieces with percent penetration of >0.03 are tagged and sent to the Industrial Hygiene Department for appropriate repair.

2.2.4 Remove test sealer and place acceptable facepieces in containers marked "Q.C. Accepted" for transport to the Industrial Hygiene Department for further inspection, repackaging, and issue.

D.2 Quality Assurance for NEW High-Efficiency Filters, Canisters Containing High-Efficiency Filters, and Full-Face and Half-Face Respirators

1.0 SCOPE

All new high-efficiency filters and combination canisters having high-efficiency filters and full- and half-face respirators shall be DOP-penetration tested before being stocked in the Finance and Materials Division.

2.0 TEST PROCEDURES

2.1 DOP penetration test (canisters)

2.1.1 All filters are tested for penetration

2.1.1.1 Penetration less than 0.03% - filter accepted as satisfactory.

2.1.1.2 Penetration greater than 0.03% - filter rejected and returned to manufacturer.

- 2.1.2 Satisfactory filters are stamped "Q.C. Tested," dated, and returned to stock.
- 2.1.3 Record number of filters DOP-tested, number testing satisfactorily, and penetration of each filter showing greater than 0.03% penetration.
- 2.2 DOP penetration (full-face and half-face respirators)
 - 2.2.1 All facepieces upon receipt at stores will be transferred to Quality Assurance and Inspection Department for quality assurance tests.
 - 2.2.2 Follow test procedure outlined in SOP-D.1 ¶2.2.
 - 2.2.3 Following quality assurance, all devices will be sent to "stock."

D.3 Diethyl Phthalate (DOP) Penetration Test, Quality Assurance for NEW High-Efficiency Filters and Canisters with High-Efficiency Filters

1.0 SCOPE

This procedure covers the inspection and testing of new high-efficiency respirator filters and canisters. They are challenged with a polydispersed aerosol of diethyl phthalate (DOP) in such a manner that any penetration of the aerosol through the canister or frame leakage around the filter is detected. The concentration of the aerosol is measured before and after the canister by means of light-scattering photometric techniques.

2.0 TEST PROCEDURES

- 2.1 Photometer. National Instrument Laboratory Percent Penetration Meter.
- 2.2 Aerosol generator. Air-operated, atomizing-nozzle.
- 2.3 Fixture. The canister is inserted into an appropriate fixture that will simulate actual use while being tested.

3.0 PROCEDURE

- 3.1 The canisters are delivered from the Finance and Materials Division (Building 7001) by the plant transportation services to the Quality Assurance and Inspection Department (Building 2000).
- 3.2 Visual inspection of each canister is conducted for dents or gouges in the threaded areas or sealing surfaces.
- 3.3 Canisters having obvious defects shall be stamped "Rejected" and set aside for disposal.

- 3.4 The canister is inserted into a fixture that will simulate actual use while being tested.
- 3.5 Adjust photometer for use in accordance with the operational requirements of the instrument.
- 3.6 Adjust aerosol and photometer to obtain a reading of 100% on the display meter while sampling upstream of the canister at 32 liter/min.
- 3.7 Connect sampling line to downstream side of canister; continue sampling 32 liter/min; leave until aerosol photometer stabilizes.
- 3.8 The test reveals penetration of DOP through the canister or any frame leakage around the filter. Canisters exhibiting penetration of DOP of 0.03% or greater shall be rejected.
- 3.9 These canisters shall be stamped "reject" and set aside for return to the manufacturer.
- 3.10 Acceptable canisters shall be stamped with date of test and packaged to protect threads and sealing surfaces.
- 3.11 Tested canisters are picked up by plant transportation services for delivery to the Industrial Hygiene Department (Building 3550).

4.0 REPORTS

- 4.1 Monthly reports are submitted to the Operational Safety Office and the Industrial Hygiene Department regarding the number of canisters tested and the number rejected.

E. Industrial Hygiene Department

The Industrial Hygiene Department has the responsibility for the following elements of the ORNL Respirator Program:

- E.1 Training of personnel for respiratory protective devices
- E.2 Selection of respirators and canisters
- E.3 Quantitative fit-testing
- E.4 Inspection of devices stored for non-routine use
- E.5 Maintenance and issue of respiratory protective devices
- E.6 Evaluation of continued program effectiveness

These activities are described in the Standard Operating Procedures (SOP-E.1-E.6).

E.1 Training of Personnel for Respiratory Protective Devices

1.0 SCOPE

This procedure covers the individual training of personnel in the proper inspection, selection, limitations, care and maintenance, storage, proper donning, and use of the devices.

2.0 EQUIPMENT

2.1 Video cassette recorder.

2.2 Videotape. A prepared videotape "ORNL Respirator Training and Fitting."

3.0 PROCEDURE

3.1 The personnel receiving the training phase of respiratory protection are presented with the videotape presentation "ORNL Respirator Training and Fitting."

3.2 The following topics are reemphasized by open discussion.

3.2.1 Hazard evaluation and effects of acute or chronic exposure.

Acute exposure is that exposure leading to an immediate short-term effect. An example would be carbon monoxide inhalation. Chronic exposure is that exposure which has an effect that is not immediate, but appears after a period of time. Examples are asbestosis, berylliosis, and lead poisoning.

3.2.2 Engineering ventilation controls for routine processes.

3.2.3 Selection of the respirator and proper canister or cartridge.

3.2.4 Capabilities of the respirator and protection factor against particulates and gases.

3.2.5 Emergency situations and the use of air-filtering devices in rescue and emergency shutdown procedures, with particular emphasis on oxygen deficiency.

3.2.6 Familiarization with MSA Ultravue, MSA Ultra-Twin, and MSA Comfo respirators.

- 3.2.6.1 Lens. Visual check to detect cracked or dirty lenses.
 - 3.2.6.2 Mask body. Visual check to detect non-pliable, cracked, or deteriorated rubber.
 - 3.2.6.3 Strap assembly. Check to see if all straps are present and in usable condition.
 - 3.2.6.4 Exhalation valve. Lift the exhalation valve cover and expose the valve. Gently lift the valve diaphragm and check for sticking rubber, debris, or foreign matter which will interfere with the seal. Replace the exhalation valve cover.
 - 3.2.6.5 Inhalation valve. Check the inhalation valve to see if it is stuck. Visually check the canister threads and receptacle for dents.
 - 3.2.6.6 Inspect the inside area of the facepiece for dust or lint.
- 3.3 The proper donning of all facepieces will be demonstrated and then practiced by individuals.

E.2 Selection of Respirators and Canisters

1.0 SCOPE

This procedure covers the selection of proper respiratory protection for use in hazardous or irritating atmospheres.

2.0 PROCEDURE

- 2.1 The person picking up respiratory protection equipment will report to Building 3550 in Room 2. A member of the Industrial Hygiene Department will be contacted.
- 2.2 The Industrial Hygiene Department staff will make the following determination before issuing the equipment.
 - 2.2.1 What is the nature of the hazard and where is the operation being conducted? The atmospheric hazard should be identified as either radioactive or non-radioactive. The contaminant should be further classified as particulate such as dust, fog, fume, mist, spray, smoke, or vapor. Also, the atmospheric hazard may include two or more contaminants.

- 2.2.2 What is the amount of radioactivity or concentration of other atmospheric contaminants (if known)?
- 2.2.3 What is the nature of the work requirements as to the length of time in the area, physical exertion required to complete the job, and possibly the extent of confinement of movement?
- 2.3 Based on the above inquiries, the respiratory protection equipment will be selected using the following criteria:
 - 2.3.1 Full-face respirators (MSA Ultra-Twin or MSA Ultravue) will be required when the contaminant atmosphere is greater than 100 times the TLV, but not exceeding 1000 times the TLV.
 - 2.3.2 Half-face respirators are adequate in most cases up to 100 times the TLV.
 - 2.3.3 Oxygen-deficient or contaminated atmospheres (<19.5% O₂) that are immediately dangerous to life or health (IDLH) will exclude the use of air-purifying devices and air-supplied devices. A pressure demand, self-contained breathing apparatus (SCBA) is the only approved respiratory protection device for this type of environment at ORNL.
 - 2.3.4 Oxygen-deficient atmospheres (<19.5% O₂) that are not IDLH will require the selection of one of the following devices.
 - 2.3.4.1 Continuous flow airline half or full mask.
 - 2.3.4.2 Continuous flow airline helmet or suit.
 - 2.3.4.3 SCBA.
 - 2.3.5 All atmospheres (gas, particulate, or combination contaminants) which are not immediately dangerous to life or health and are not oxygen-deficient will require the use of one of the following types of air-purifying devices with appropriate filter/sorbent media.
 - 2.3.5.1 Half-face mask.
 - 2.3.5.2 Full-face mask.
 - 2.3.5.3 Airline, half or full-face mask.
 - 2.3.5.4 Hose mask, full- or half-face.

- 2.4 The proper canister shall be supplied with the appropriate facepiece. Particulate contamination is adequately filtered by high-efficiency particulate filter media. Most organic vapors and acid gases are adequately adsorbed by the activated charcoal bed in the canister. Special chemical filters are necessary for certain contaminants such as mercury or pesticides. Combination canisters are available for particulate and chemical hazards.
- 2.5 Any workplace environment which has a variety of atmospheric contaminants shall require consultation with a member of the Industrial Hygiene Department.

E.3 Quantitative Fit-Testing

1.0 SCOPE

This procedure describes the steps necessary for performing quantitative fit tests, including both half- and full-face respirators. The procedure also includes instruction which is given to all respirator wearers concerning respirator use, limitations, and inspection.

2.0 PROCEDURE

2.1 Quantitative Fit-Test Procedure

2.1.1 Start-up of aerosol generator.

2.1.1.1 Turn on generator air and dilution air switch simultaneously.

2.1.1.2 Check generator air pressure and dilution air pressure and adjust if necessary.

2.1.1.3 Turn on circulating fans in test chamber and allow about 15 minutes for equilibration.

2.1.2 Start-up of aerosol detector assembly.

2.1.2.1 Turn power switch on.

2.1.2.2 Turn lamp switch on.

2.1.2.3 Set sample switch to the clear position.

2.1.2.4 Turn flow control switch on.

- 2.1.2.5 Check sample airflow using rotameter (approx. 3 lpm).
- 2.1.2.6 Allow 15 minutes stabilization time.
- 2.1.3 Adjustment of aerosol detector assembly.
 - 2.1.3.1 Set range select to 100% full scale.
 - 2.1.3.2 Set sample switch to upstream setting.
 - 2.1.3.3 Adjust meter to 100% full scale using gain control.
 - 2.1.3.4 Set sample switch to clear.
 - 2.1.3.5 Set range switch to 1% full-scale setting.
 - 2.1.3.6 Adjust meter to 0 using stray light setting.
- 2.1.4 Fitting and testing procedure (general).
 - 2.1.4.1 The purpose of the fit-test procedure is twofold.
 - (a) Provide a quantitative measure of protection to the user.
 - (b) Provide an opportunity to train the respirator user in proper donning of the device and self-check for proper fit.
 - 2.1.4.2 The fit-test procedure also allows the respirator wearer to become accustomed to the equipment and to know when a proper fit is achieved.
- 2.1.5 Fitting and testing procedure (half-face respirator).
 - 2.1.5.1 Assist the subject in placing the respirator over the mouth and nose.
 - 2.1.5.2 Hook the straps and adjust the tension.
 - (a) The upper strap should angle up over the ears and around the head without slipping.
 - (b) The bottom strap should go straight around the upper part of the neck.
 - 2.1.5.3 Instruct the subject on proper self-check procedures.
 - (a) Pinch off the sample line adaption.
 - (b) Close off the cartridge opening with the palms, being careful not to exert excessive pressure.

NOTE: The calibration procedure should be checked after entry of the test subject into the chamber since some escape of the aerosol will occur. This procedure will only require several seconds after the operator becomes proficient.

- 2.1.5.4 Instruct the subject to enter the test chamber using the air-lock doors properly to prevent the escape of large amounts of the test atmosphere.
- 2.1.5.5 Instruct the subject to hook up the sample line from the mask to the aerosol detector.
- 2.1.5.6 Check detector calibration and zero.
- 2.1.5.7 Set sample switch to the downstream position.
- 2.1.5.8 Instruct the subject to proceed through the posted exercises 1-6, noting by number on the chart when the the exercises are being performed.

EXERCISES:
 1. Normal breathing
 2. Deep breathing
 3. Move head from side to side
 4. Bend at the waist and move head from side to side
 5. Talking (1,2,3...etc.)
 6. Normal breathing
- 2.1.5.9 Instruct the subject to tighten straps or reset respirator if good fit is not obtained and repeat the above steps.
- 2.1.5.10 Set sample switch to clear position.
- 2.1.5.11 Instruct subject to exit chamber using air-lock doors.
- 2.1.5.12 Assist in removing respirator.
- 2.1.5.13 Disinfect respirator prior to re-use.
- 2.1.6 Fitting and testing procedures (full-face mask).
 - 2.1.6.1 Instruct and assist subject in donning respirator.
 - (a) Loosen the head straps to their maximum adjustment.
 - (b) Fold the head strap assembly up over the top of the respirator allowing free access to the sealing surface of the respirator.
 - (c) Place the respirator on the face with the chin wall into the molded contour of the mask.

- (d) Fold the head strap assembly well over the head to remove any wrinkling of the head strap assembly at the crown of the head.
- (e) Tighten the lower side straps first.
- (f) Tighten the upper side straps second.
- (g) Repeat Steps e and f.
- (h) Snug the forehead strap.
- (i) Assure that the mask is snug, but not overly tight.

2.1.6.2 Follow the steps of the previously outlined procedure.

2.1.7 During or following donning and testing procedures, other general items concerning respirator usage should be covered.

2.1.7.1 Checking the condition of the respirator prior to use.

- (a) Check the inhalation and exhalation valves to assure that they are not stuck, warped, or missing.
- (b) Check the general condition of the facepiece and straps for excessive wear, warping, and cracking.
- (c) Check the fit of the cartridges or canister.
- (d) Check for physical damage of the cartridge or canister.

2.1.7.2 Respirators cannot provide a proper seal when facial hair or glasses frames come between the sealing surface and the skin. Even a day's beard growth can compromise the seal. Tests will not be conducted in such cases.

2.1.7.3 The end of a canister or cartridge's useful life can be detected when breathing resistance becomes excessive or when the air contaminant can be detected by smell or irritation through the mask, indicating breakthrough.

- 2.1.7.4 The user should immediately leave the contaminated area if eye or throat irritation develops, if dizziness occurs, or the odor of the contaminant is detected.
- 2.1.7.5 The respirator should only be used for materials and concentrations that are approved by NIOSH (National Institute for Occupational Safety and Health) since some contaminants require special cartridges or are not recommended for use with air-purifying respirators.
- 2.1.7.6 Contact lenses can hold irritant or toxic chemicals in intimate contact with the eye, defeating the eye's natural cleansing ability. No contacts are to be worn with respirators. Full-face respirators can be fitted with special glasses holders.
- 2.1.7.7 Respirators do not supply oxygen for oxygen-deficient atmospheres. If oxygen deficiency is suspected, have the air checked.
- 2.1.7.8 Protection of the wearer depends upon the diligence of the wearer in following respirator-use guidelines and practices.
- 2.1.7.9 When in doubt, contact the Industrial Hygiene Department before using the respirator.

E.4 Inspection of Devices Stored for Non-Routine Use

1.0 SCOPE

This procedure formalizes the routine inspection requirements for respiratory protective equipment stored for non-routine use.

2.0 PROCEDURE

This procedure outlines the responsibilities of the Industrial Hygiene Department for the inspection of respiratory protective devices stored for non-routine use and establishes the frequency and inspections required.

- 2.1 The Industrial Hygiene Department will maintain a current list of all emergency cabinets and respiratory protection equipment contained in each cabinet.
- 2.2 The Instrumentation and Controls Division will provide the Industrial Hygiene Department with computer services for compilation of information concerning respiratory protection equipment located in emergency cabinets.
- 2.3 The Industrial Hygiene Department will obtain a computer printout of the emergency cabinet information on a semi-annual basis.
- 2.4 The printout list will then be used as a worksheet for checking each emergency cabinet and recording the results of the inspections.
- 2.5 The ORNL Emergency Cabinet Worksheet contains the following information which is checked for accuracy at the time of each inspection.
 - 2.5.1 Cabinet identification number.
 - 2.5.2 Building number.
 - 2.5.3 Location.
 - 2.5.4 Cabinet monitor.
 - 2.5.5 Quantity and types of respirators.
 - 2.5.6 Bandage status.
 - 2.5.7 Cabinet condition.
 - 2.5.8 Respirator cartridge date.
 - 2.5.9 Initials of inspector.
 - 2.5.10 Date of inspection.
- 2.6 The completed worksheet is used to enter the results of the inspection.
- 2.7 A label is placed on each emergency cabinet after inspection, indicating that the respiratory protective equipment was checked, with the name of the inspector and the date.
- 2.8 The content and condition of the equipment will be inspected semi-annually.
- 2.9 Respirators and respirator filter cartridges will be replaced as needed.

E.5 Maintenance and Issue of Respiratory Protective Devices

1.0 SCOPE

This procedure covers the maintenance and issue of respiratory protective devices.

2.0 PROCEDURE

- 2.1 The facepieces and canisters are received from the Quality Assurance and Inspection Division and are appropriately marked "Q.C. Accepted." The new facepieces or canisters from stores must have the required DOP check prior to Industrial Hygiene Department inspection and issue.
- 2.2 The Industrial Hygiene Department will repair facepieces which fail the DOP test and reroute the devices to Quality Assurance and Inspection for Q.C. acceptance.
- 2.3 The Industrial Hygiene Department will perform the following inspection and maintenance functions on all face pieces.
 - 2.3.1 Lens. The lenses must be clean and free of all hairline cracks, and they must be properly sealed on the facepieces. If a new lens must be installed, the facepiece will be routed to Quality Assurance and Inspection for testing.
 - 2.3.2 Straps. The straps must be elastic and stretchable. They will be replaced if unserviceable.
 - 2.3.3 Valves. All valves and seats must be completely functional. Any small defect will require replacement of the valve or rejection of the facepiece.
 - 2.3.4 Facepiece. The facepiece shall be clean, pliable, and completely serviceable. Those that are unserviceable because of dirt or lint will be sent to the laundry. All those with defects will be destroyed.
- 2.4 "Q.C. Accepted" facepieces will be packaged in plastic bags and stored for issue.
- 2.5 The devices will be issued according to the selection criteria (Section E.2).

E.6 Evaluation of Continued Program Effectiveness

1.0 SCOPE

This procedure covers the annual evaluation of the respiratory protection program. The evaluation will be performed by staff members responsible for the respiratory protection program from the other Energy Systems installations.

2.0 PROCEDURE

- 2.1 The ORNL Respiratory Protection Program will be evaluated on an annual basis in order to determine program effectiveness.
- 2.2 The evaluation will consist of a meeting with representatives from the other three Energy Systems installations during which problems will be addressed.
- 2.3 The evaluation will address the following items:
 - 2.3.1 Reports of respirator or cartridge failures.
 - 2.3.2 Technical aspects of quantitative fit-testing.
 - 2.3.3 Annual (divisional) training program.
 - 2.3.4 Training associated with refitting.
 - 2.3.5 Compliance with refitting frequency requirement.
 - 2.3.6 Maintenance and cleaning.
 - 2.3.7 Respirator use.
 - 2.3.8 Respirator inspection.
 - 2.3.9 Recordkeeping.
 - 2.3.10 Technical information.
 - 2.3.11 Miscellaneous items.

F. Fire Department

The Fire Department has the responsibility for the following elements of the ORNL Respirator Program:

- F.1 Training in use of SCBA
- F.2 Scott authorized in-house repair facility for complete maintenance, overhaul, and tank-filling facility for SCBA

F.1 Training in Use of SCBA

1.0 SCOPE

This procedure covers the training of individual personnel in the proper method of using SCBA, its operation, and limitations.

2.0 PROCEDURE

This procedure outlines the Fire Department's responsibility in teaching designated personnel the proper way to don and use the SCBA available to personnel in the Laboratory. All parts, i.e., tank, valves, straps, hooks, pressure demand regulator, and by-pass and familiarization with the unit's limitations and warning system are covered.

- 2.1 The Fire Department instructor begins by describing in detail all parts of the SCBA, their functions, proper uses, and limitations.
- 2.2 Proper method of donning the SCBA unit is demonstrated many times to the class, and each employee is required to practice until he becomes thoroughly familiar with the procedure.
- 2.3 The employees are given a semi-annual refresher training, either by the instructor or via video tape.
- 2.4 The Fire Department instructor's outline of the course of training in the use, parts examination, and function of the SCBA unit is as follows:
 - 2.4.1 Overall visual examination of unit in carrying case and demonstration of the proper way of removing the unit from the case and donning same in one motion. (This step should be repeated as required by students.)
 - 2.4.2 SCBA parts examination and operation:
 1. Display the combination of facepiece, head straps, hose, and connector. Visually check the connector threads. Check the hose for cracks and connection tightness, check head straps for proper operation, check mask for tightness.
 2. Check tank pressure (maintaining between 1800 and 2216 PSI) and tank valve operation.

3. Check demand valve and by-pass valve for proper operation.
4. Check warning bell for proper operation by closing tank valve and opening by-pass valve.
5. Be sure tank and by-pass valves are closed and pressure demand valve is open before storing SCBA for use.
6. Check all harness lines and fasteners for proper operation.
7. Fully extend all mask and body harness straps before storing.
8. Clean facepiece with tincture of green soap, rinse thoroughly, and dry after each use.
9. Problem or malfunctioning SCBA units must be tagged "Out of Service" and the Fire Department contacted. A replacement unit will be provided until repairs are completed.

F.2 Scott Authorized In-House Repair Facility for Complete Maintenance, Overhaul, and Tank-Filling Facility for SCBA

The Fire Department is currently in the process of changing from SCBA tank filling from a tank trailer to a compressed air system. This SOP will be issued upon completion of the new system.

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INDUSTRIAL HYGIENE PROCEDURE USE OF RESPIRATORY PROTECTIVE EQUIPMENT

1.0 POLICY

It is the policy of ORNL to protect employees from exposure to atmospheric contamination (radioactive or chemical) by utilizing facilities and equipment that have all feasible safeguards incorporated into their design. When effective engineering controls are not feasible, or while they are being initiated, protection will be provided by the use of personal respiratory protective equipment (respirators).

2.0 SCOPE

This procedure establishes a mechanism whereby the proper selection, use, maintenance, and care of respiratory protective equipment shall be accomplished.

3.0 REFERENCES

- 3.1 ANSI-Z88.2, "Practices for Respiratory Equipment"
- 3.2 ANSI-Z48.1, "Marking Compressed Gas Containers"
- 3.3 ANSI-Z86.1, "Commodity Specification for Air"
- 3.4 Current Edition, "Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment and Biological Exposure Indices," American Conference of Governmental Industrial Hygienists
- 3.5 10 CFR 20, "Standard for Protection Against Radiation"
- 3.6 29 CFR 1910.134, "Respiratory Protection"
- 3.7 Federal Specification BB-Z-1034A, "Compressed Air for Breathing Purposes"

4.0 DEFINITIONS

- 4.1 Respirator - A device provided to protect the wearer from inhalation of harmful or nuisance atmospheres. Respirators may function by air purifying and/or air supplying techniques.

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- 4.2 Atmospheric contamination - The term applies equally to gases such as nitrogen oxides, carbon monoxide, and carbon dioxide; the vapors of volatile substances such as benzene and carbon tetrachloride; toxic dusts, fumes, and other particulates; radioactive materials.
- 4.3 Respirator program coordinator - The individual assigned the responsibility for the development, implementation, and overall supervision of an acceptable respirator program.
- 4.4 Divisional trainers - An individual assigned the responsibility for annual retraining of employees on the respiratory protection program within his/her division.
- 4.5 Approved respirator wearer - An employee who has met the following requirements is considered to be an approved respirator wearer:
- (1) Current medical approval (within 18 months)
 - (2) Current quantitative fit test and training (within 18 months)
 - (3) Has received current divisional training (within one year)
 - (4) Does not have facial hair that interferes with the seal of the respirator

5.0 RESPONSIBILITIES

5.1 Medical Department

- 5.1.1 Perform the necessary physical examination and/or special medical tests to ensure that employees are medically fit to wear respiratory protective devices.
- 5.1.2 Apply medical restrictions as required, and notify appropriate supervision of all such restrictions.

5.2 Industrial Hygiene Department

- 5.2.1 Designate an individual to serve as the program coordinator for all air-purifying respiratory protective equipment.
- 5.2.2 Develop and maintain a program to ensure that all employees are properly fitted with respiratory protective devices and trained in their use.

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- 5.2.3 Provide the consulting services necessary to ensure the proper selection of respiratory protective devices.
 - 5.2.4 Maintain, inspect, repair, and re-issue all such devices.
 - 5.2.5 Periodically inspect and replace all such devices stored for emergency use.
 - 5.2.6 Prepare standard operating procedures that describe the essential elements of the respirator program.
 - 5.2.7 Prepare a programmatic description of all aspects of the respirator program.
 - 5.2.8 Provide instruction and training materials to divisional trainers.
 - 5.2.9 Maintain a current file of personnel on the respiratory protection program and provide each division with a list of employees requiring re-fit testing and training.
 - 5.2.10 Schedule and provide quantitative fit-testing and training services every 18 months for personnel in the program and for new program members at the request of supervision.
- 5.3 Supervision
- 5.3.1 Ensure that all employees who wear these devices, even occasionally, are approved respirator wearers and thoroughly trained in their use. (Training, fitting, and testing shall be coordinated through the Industrial Hygiene Department.)
 - 5.3.2 Maintain a current record of employees who are on the respiratory protection program as provided by the Industrial Hygiene Department.
 - 5.3.3 Contact the Industrial Hygiene Department for scheduling employees for initial fitting/training or for re-fitting and retraining. Personnel that are not medically approved cannot be scheduled for a fit-test.

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- 5.3.4 Provide the employee with the devices appropriate for the operation.
- 5.3.5 Ensure the use of these devices in operations where they are required.
- 5.4 Employee
 - 5.4.1 Use the provided respiratory protection in accordance with instruction and training received.
 - 5.4.2 Guard against damage and misuse of the respirator.
 - 5.4.3 Report any malfunction of the respirator to his/her supervisor.
 - 5.4.4 When required to be fitted or to wear respiratory protection, the employee must be clean-shaven, and without facial hair, mustache, or sideburns which will interfere with the sealing surface.
- 5.5 Applied Health Physics
 - 5.5.1 Provide necessary surveys on devices used in potentially contaminated areas, and appropriately tag them prior to their return to the decontamination laundry for cleaning and sterilization.
 - 5.5.2 Ensure that all canisters used in ^{131}I and/or alpha contamination areas are discarded immediately after use.
 - 5.5.3 Ensure that all devices are free of contamination following decontamination and sterilization procedures in the laundry.
 - 5.5.4 Specify, in conjunction with the Industrial Hygiene Department, the respirator necessary for protection against exposure to radioactive materials or chemicals.
 - 5.5.5 Prepare an operating procedure detailing the responsibilities of Health Physics in surveying and tagging used respirator protective equipment preparatory to sending to decontamination laundry.

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5.6 Operations Division

- 5.6.1 Ensure that all respirators are thoroughly decontaminated and properly sterilized.
- 5.6.2 Collect all used facepieces and transport them to the laundry for decontamination and sterilization.
- 5.6.3 Transport all clean facepieces and tested canisters to the Industrial Hygiene Department.
- 5.6.4 Prepare standard operating procedures to describe the above operations in detail.

5.7 Inspection Engineering

- 5.7.1 Perform quality assurance tests on all canisters and facepieces as required by the Industrial Hygiene Department.
- 5.7.2 Perform physical tests on all cylinders used for breathing air.
- 5.7.3 Prepare detailed standard operating procedures describing the above operations.

5.8 Guard and Fire Department

- 5.8.1 Conduct training and inspection program on all aspects of self-contained breathing apparatus.
- 5.8.2 Ensure that the quality of compressed air used to fill self-contained breathing apparatus tanks meets the Compressed Gas Association Commodity Specification for Air, G-7.1, 1973.
- 5.8.3 Prepare detailed standard operating procedures describing the above operations.

5.9 Laboratory Shift Supervisor

- 5.9.1 Serve as program coordinator for all self-contained breathing apparatus.

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6.0 RESPIRATOR PROGRAM

Following are the essential elements of the respirator program. A more complete description (implementation) of these items is included in the programmatic description prepared and maintained by the Industrial Hygiene Department.

- 6.1 The Industrial Hygiene Department Head will be the Respiratory Protection Program Administrator.
- 6.2 The Medical Director will determine the physical and psychological factors pertinent to evaluating the overall fitness of an employee to wear different types of respiratory protective equipment.
- 6.3 Respiratory protective equipment shall be approved by either the National Institute for Occupational Safety and Health (NIOSH) or the DOE-designated testing agency.
- 6.4 Respirators shall be selected on the basis of the hazards to which the worker is exposed.
- 6.5 The user shall be instructed and trained in the proper use of respirators and their limitations.
- 6.6 Respirators shall be regularly cleaned, decontaminated, and sterilized.
- 6.7 Respirators shall be stored in a convenient, clean, and sanitary location.
- 6.8 Respirators used routinely shall be inspected during cleaning. Worn or deteriorated parts shall be replaced.
- 6.9 Appropriate surveillance of work conditions and records indicating the degree of employee exposure stress shall be maintained.
- 6.10 There shall be regular inspection and evaluation to determine the continued effectiveness of the program.
- 6.11 Respirators shall not be worn by employees with sideburns, beards, or mustaches which extend under the sealing surface of the respirator with the face. In borderline cases, Industrial Hygiene will make the decision as to acceptability.

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- 6.12 Contact lenses can hold irritant or toxic chemicals in intimate contact with the eye, defeating the eye's natural cleansing ability. No contacts are to be worn with respirators. Full-face respirators can be fitted with special glasses holders.
- 6.13 Employees added to the program are required to have medical approval for respirator wear prior to initial fit-testing and training, and medical re-approval will be required thereafter with each re-fit test.
- 6.14 Re-fit testing and training will be performed by the Industrial Hygiene Department every 18 months for active respiratory protection program members.
- 6.15 An annual training program will be conducted within the division, by a designated divisional trainer, for employees on the respiratory protection program.
- 6.16 Acceptable quantitative face-fit evaluation shall not exceed a one (1.0) percent penetration for the full-face respirator and a five (5.0) percent penetration for the half-face respirator.
- 6.17 Emergency cabinet respiratory protective devices will be inspected on a semi-annual basis.

ULTRA-TWIN FACEPIECE



COMFO FACEPIECE



AIR PURIFYING CARTRIDGES



GMR-C CANISTER



ULTRA-VUE FACEPIECE

ORNL-Photo 8167-85A

ULTRA-TWIN FACEPIECE



SPECTACLE KIT

ULTRA-VUE FACEPIECE



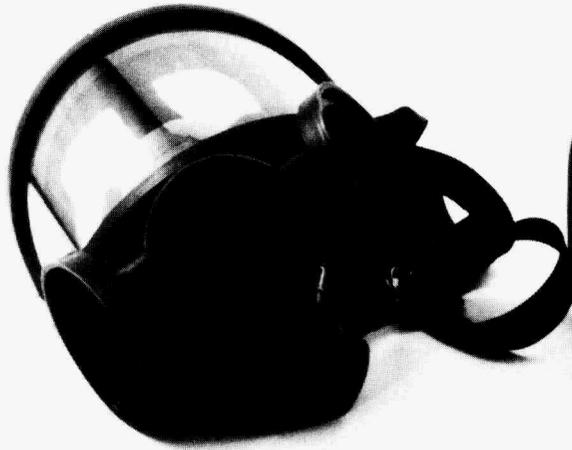
ORNL-Photo 8166-85A

BELT MOUNTED RESPIRATOR



AIR PURIFYING CARTRIDGES

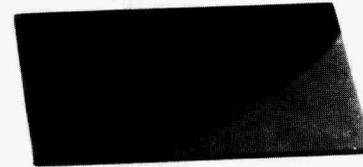
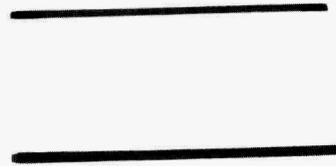
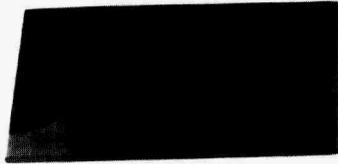
ULTRA-TWIN FACEPIECE



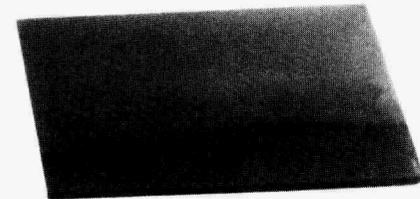
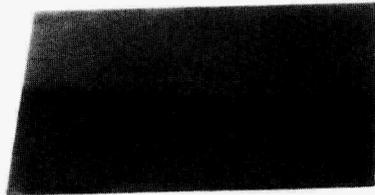
WELDING ADAPTER



ULTRA-VUE FACEPIECE



CLEAR LENS



SHADED LENSES





FRESH AIR STATION

ABRASIVE BLASTING HOOD
AND APRON

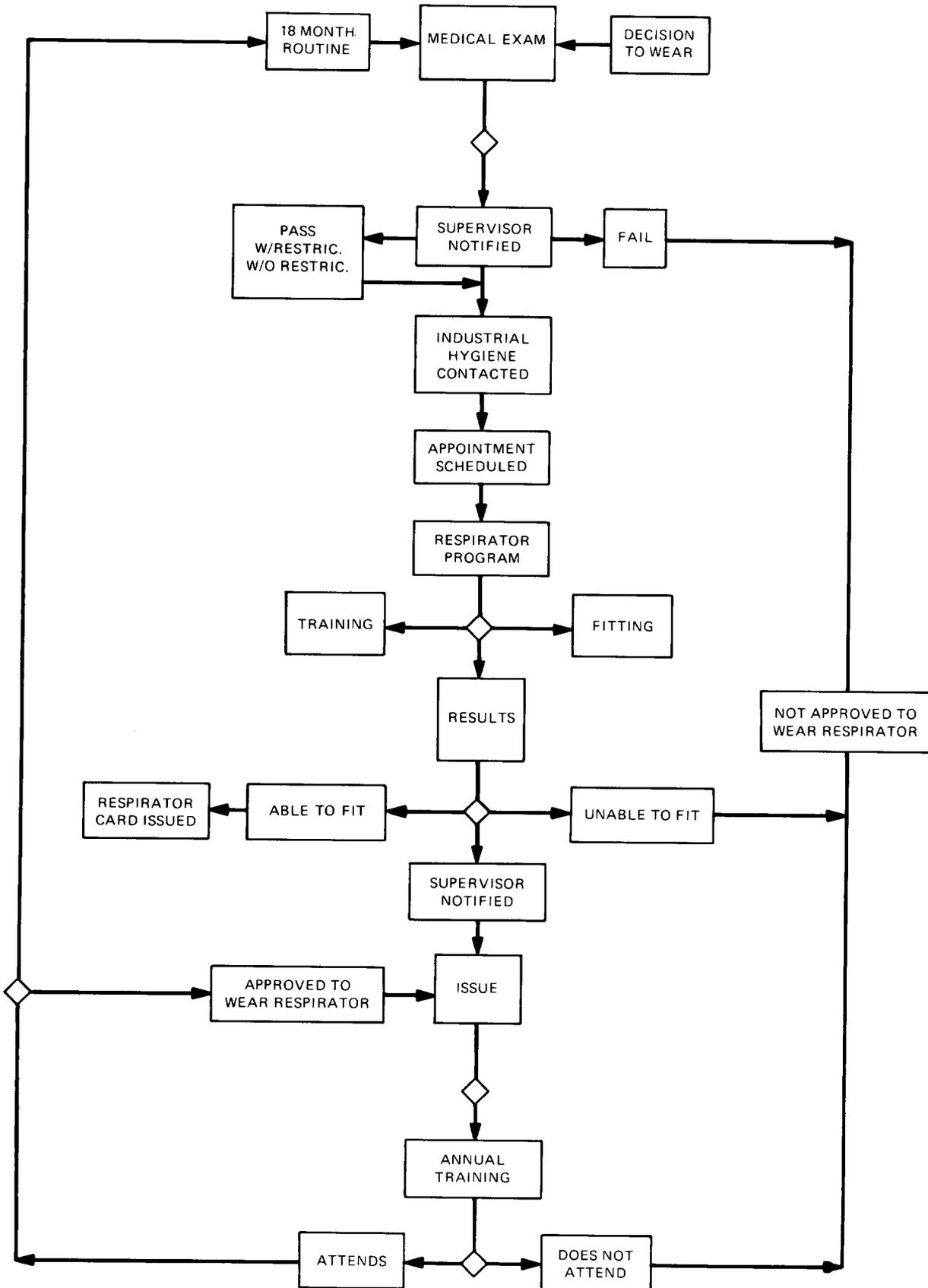
AIR SUPPLY LINE

ORNL-Photo 8170-85A



PRESSURE DEMAND SELF CONTAINED BREATHING APPARATUS (SCBA)

APPENDIX C – EMPLOYEES ON THE ACTIVE RESPIRATOR PROGRAM



INTERNAL DISTRIBUTION

- | | |
|------------------------|--|
| 1. H. L. Adair | 33-233. Industrial Hygiene Department |
| 2. W. A. Alexander | 234. B. A. Jerome |
| 3. R. L. Atchley | 235. L. J. King |
| 4. M. E. Baldwin | 236. E. H. Greig |
| 5. B. Barkenbus | 237. C. E. Lamb |
| 6. J. Bolinsky | 238. R. J. Lauer |
| 7. J. M. Brooks | 239. D. L. Laughlin |
| 8. J. S. Brown | 240. L. L. Leavell |
| 9. C. E. Bruce | 241. R. E. Leuze |
| 10. D. W. Burton | 242. A. W. Longest |
| 11. H. M. Butler | 243. R. K. McConathy |
| 12. V. T. Carmony | 244. R. V. McCord |
| 13. G. H. Coleman | 245. C. H. Miller |
| 14. S. G. Cortelyou | 246. Office of Safety & Health |
| 15. B. H. Cupp | 247. G. C. O'Kelley |
| 16. W. J. Derossett | 248. J. A. Otten |
| 17. A. D. Devaney | 249. D. B. Owlsey |
| 18. C. D. Devaney | 250. W. E. Porter |
| 19. J. Devore | 251. H. D. Rose |
| 20. G. J. Dixon | 252. R. G. Ross |
| 21. D. T. Duncan | 253. J. A. Setaro |
| 22. D. E. Dunning | 254. D. B. Slaughter |
| 23. J. A. Ealy | 255. E. P. Sothman |
| 24. F. K. Edwards, Jr. | 256. L. E. Stokes |
| 25. W. C. Fair | 257. H. H. Tuck |
| 26. D. M. Ferren | 258. W. L. Whaley |
| 27. A. S. Garrett, Jr. | 259. G. R. Whitaker |
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